AG:UTF/ETH/037/ETH
Final Report, Vol. 2

E T H I O P I A N   F U N D S - I N - T R U S T

ETHIOPIAN HIGHLANDS RECLAMATION STUDY

E T H I O P I A

FINAL REPORT

Volume 2

Report prepared for
the Government of Ethiopia
by
the Food and Agriculture Organization of the United Nations

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, 1986

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STRATEGY OBJECTIVES, OPTIONS AND PRESENTATION

10.1 ETHIOPIA'S BASIC OBJECTIVES

The objectives and rationale of the EHRS were given in sections 1.1 and 1.2 respectively. 1/ Chapter 1 also described the planning concepts, methodology, underlying principles and time horizon used in the formulation of the development strategy presented in this volume. The strategy presented is based on the statement of the resources base and broad requirements for development (as presented in Part I) and the more specific assessment of degradation, needs of conservation and evaluation of actions undertaken to date to combat degradation of resources (as presented in Part II) - as well as the underlying objectives of Ethiopia. The main purpose of this chapter is to summarize Ethiopia's objectives, to draw attention to priorities and options, and relate them to the requirements for sustained development.

Supreme political authority in Ethiopia is vested in the Worker's Party of Ethiopia (WPE) which has adopted a programme termed the "National Democratic Revolution of Ethiopia (GOE 1976). This programme aims to "build a new Ethiopia and lay a strong foundation for the transition to socialism ... establish a people's democratic

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1/ This volume follows on from the first volume of the EHRS Strategy Report which contains:

Part I: "Resources for rural development" (Chapters 1-5) (originally EHRS Working Paper 17).

Part II: "The degradation of resources and an evaluation of actions to combat it" (Chapters 6-9) (originally EHRS Working Paper 19).

This volume therefore begins with Chapter 10. Cross references to chapters or sections before Chapter 10 relate to the previous volume, the table of contents of which are also given at the beginning of this volume. A list of all EHRS reports and working papers is presented as Annex 2. Other bibliographic references are listed in Annex 3.

republic in which the freedom, equality, unity and prosperity of the Ethiopian peoples is ensured, in which self-government at different levels is exercised and which allows for unconditional exercise of human and democratic rights." (GOE 1976.) Similarly, "...the country's long-term goal is the creation of the necessary material, technical and cultural foundation for the building of a socialist society." (WPE 1984.) WPE's concept of socialism extends beyond references to equality and the redistribution of income and wealth to the actual public ownership of land, the socialist use of land through producer cooperatives and state farms, and the socialization of marketing, distribution and much of industry.

The Government's Ten-Year Perspective Plan (TYPP) is seen as a means to " hasten the implementation of the programme" (of the National Democratic Revolution) (GOE 1984). The TYPP gives highest priority to agriculture because of its overwhelming predominance in the economy. A major objective within the agricultural sector is the attainment of food self-sufficiency and the related need for food security. It is relevant to note here that two other major objectives are given priority in the TYPP:

- "to conserve, explore, develop and rationally utilize the country's natural resources ...
- "to ensure balanced development of all the regions of the country ... by distributing the fruits of the nation's socio-economic development fairly ..." (WPE 1984.)

The former of these major objectives recognizes that the conservation of Ethiopia's national resources is as much a Governmental responsibility as the defence of its national boundaries. It follows that it is the responsibility of Government to create economic and social conditions which promote conservation of resources by the users of those resources and to assist them in this task. This is one of the main subjects of subsequent chapters of this volume.

10.2 PRIORITY AMONG OBJECTIVES: GROWTH WITH EQUITY

In common with most other governments, the GOE's ultimate development goal is to ensure every Ethiopian a decent standard of living. Increased production is not the goal; it is a prerequisite for attaining it and, because it is quantifiable, it also serves as a partial indicator of progress. The other main indicator of progress is the relative distribution of benefits from increased production. These two criteria are usually referred to in development literature as 'growth and equity': the growth of the overall economy and a fair distribution of wealth and income among the population. Development is about, by, and for human beings. Improvements in living conditions involve many aspects: adequate food, employment, health, habitat and education - as well as the needs for self-reliance, minimal security, participation, and a sense of purpose. In view of the many aspects of development and its human nature, it is almost inevitable that conflicts arise in any list of development objectives. Balanced regional development often involves some sacrifice in overall economic growth, as does the pursuit of social and income distributional objectives. (Much has been written in development literature on the potential conflicts between the growth and equity objectives 1/.)

The underlying cause of the Ethiopian Revolution was the fact that Ethiopia had been developing for many years without the majority of the population benefitting from that development , i.e., growth without equity. 2/ In such circumstances, it was natural for the post-revolution Government to give top priority to progress toward redistributing wealth, income and opportunity. This was a huge task; the mass poverty of centuries and the structures which produced it could not be removed instantaneously. But in a period of less than ten years the Government and people of Ethiopia have made remarkable progress toward the distributional objective. This has involved fundamental political changes: replacement of the previous imperial regime by a political party (WPE) and mass organizations (the PA's and UDA's), a substantial redistribution of land and income in favour of the rural poor; the mass mobilization of peasants in development campaigns and substantial achievements in spreading literacy and other social services among the rural population. (These achievements were reviewed in Chapters 3 and 4.)

Chapters 4 and 5 drew attention to and offered explanations for the much more limited achievements in terms of economic growth, particularly in the increase of agricultural production. At the time of completing this report, Ethiopia's economy is in its worst crisis since the Revolution, prompted largely by the major 1983/84 drought following on the accumulated effects of slow growth in the previous decade. It is becoming increasingly obvious that, without significant economic growth, further progress in the achievement of non-growth objectives is likely to be ephemeral. Progress made in establishing an institutional and policy base through which benefits of growth can be distributed equitably can only be fully

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1/ See: Adelman, I. and C.T. Morris, 1973, Economic Growth and Social Equity in Developing Countries, Stanford Univ. Press; Kuznets, S., 1965, "Economic Growth and Income Inequality", Amer. Econ. Rev., March 1955; Stewart, F. and Streeten, P, 1976 New Strategies for Development: Poverty, Income Distribution and Growth, Oxford Econ. Papers, n.s. 28 (Nov. 1976).

2/ This emphasis was usually implicit: "...in all three Plan documents (covering the 1950s and 1960s) ... policies and the pattern of planned investment clearly are aimed at economic growth. Improved income distribution and employment creation are viewed as desirable concomitants of development policies, but they are not stressed as major policy objectives ..." T. James Goering, Some Thoughts on Future Strategies for Agricultural Development in Ethiopia. Unpublished paper, Planning Commission Office, Addis Ababa, September 1971.

utilized and sustained if accompanied by economic growth. For example, many more advantages will be reaped from the PA structure when peasants emerge from their primarily subsistence economies to participate more fully in the market economy.

Increasing the relative importance of the economic growth objectives does not necessarily imply that any of the principles of equity or socialism have to be abandoned or compromised. Ethiopia's friends would agree that it would be a mistake to abandon principles and commitments for the sake of short-term economic gains. While increasing emphasis is being put on economic growth, the principles of social equity and justice should be upheld. Although it is in no sense a substitute for economic growth or higher agricultural production, improved distribution of production, resources and output - besides being a worthwhile goal in itself - is also considered as a way to alleviate absolute poverty, increase production and reduce environmental degradation. Combined with even a moderate rate of economic growth, redistribution can have more impact on poverty, especially in the short- to medium-term, than rapid economic growth without it. Such gains have now been achieved in Ethiopia, and further poverty alleviation is now largely dependent on a period of sustained economic growth.

Essentially, what is now required is a further shift in emphases on the growth/equity objectives. Prior to the Revolution, emphasis was on growth - with only incidental attention to equity; since the Revolution, emphasis has basically been on EQUITY with growth. In view of the achievements already made with respect to equity (and the dependence of further progress in all objectives on growth), emphasis should now be placed on GROWTH WITH EQUITY, at least in the initial years of the strategy period. As economic growth occurs and gains momentum, increasing emphasis can again be placed on equity. The development strategy presented in this report thus aims at increasing economic growth - subject to no deterioration in the welfare of the poorest. This aim implies, among other things:

- a period of consolidation of the gains made thus far in pursuing the socialist objectives of the Government;

- recognition of the need to attain a balance between individual goals and aspirations and social/communal welfare so that the two become complementary rather than conflicting;

- strengthening efforts to attain the goal of self-reliance and particularly food self-sufficiency;

- further reinforcing the priority of broad-based rural development and the conservation-based development of the agricultural sector.

10.3 CONSERVATION AS A PREREQUISITE FOR SUSTAINABLE DEVELOPMENT AND SOCIALISM 1/

The interdependence between conservation and sustainable rural development in Ethiopia was emphasized in section 8.10.2. Increases in agricultural production can only be sustained in the longer term if the productivity of resources is protected and, if possible, increased through conservation, technological advances and improved efficiency. Ethiopians must accept the reality of the limitation of resources and of the carrying capacity of the Highlands ecosystems. The needs of future generations must be considered. The continued exploitive use of resources can only be at the expense of their children, just as much as the existing degradation today can be attributed to abuse of the land by previous generations. This is the underlying philosophy of conservation; its essential message may be summarized:

> We have not so much inherited the earth from our parents as borrowed it from our children.

Just as the ultimate objective of development is to provide every man, woman and child with a decent standard of living, the ultimate objective of conservation is to protect the earth's capacity to sustain development and to support life. Conservation is not an end in itself; it is an essential component of sustained development. Similarly, just as an ultimate objective of socialism is to eliminate exploitation, any action which exploits future generations is anti-socialist. Conservation is necessary to achieve the inter-generational objective of socialism.

Narrowly-based development efforts such as improved health services, better veterinary services, and even conservation measures taking land out of production can, if not accompanied by other complementary development measures, exacerbate problems of poverty and degradation in the longer term. On the other hand, conservation measures that take land out of production (bunding, hillside closure, reafforestation) have to be accompanied by complementary production measures if the immediate living standards of the peasants concerned are to be maintained.

In essence, Highlands conservation has to be accompanied by short-term measures to increase agricultural production to break the vicious circle by which poverty causes ecological degradation

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1/ Some of the themes in this section are elaborated upon in "World Conservation Strategy" (IUCN, UNEP, WWP 1978) and World Soil Charter (FAP 1982).

which, in turn, leads to more poverty and degradation. The Conservation-based Development Strategy aims to fully integrate conservation and development, a need which until now has practically not been recognized inside and outside Ethiopia. 1/

10.4 OBJECTIVES FOR CONSERVATION-BASED DEVELOPMENT

Soil conservation objectives have traditionally been related to reducing soil losses to tolerable levels, it being recognized implicitly that it is impossible to prevent soil losses altogether, especially on the sloping croplands which characterize much of the Ethiopian Highlands. Without quantification, the objective becomes to reduce soil losses per se - implied by present conservation policy and operations in Ethiopia. As concluded in Chapter 8, the degradation problem cannot be tackled on an adequate and replicable scale by merely continuing present policies. This conclusion provides the need and rationale for a new strategy, conservation, which is being conceptualized and articulated in this report as the Conservation-based Development Strategy.

Before pursuing further the implications of the above conclusion, it is first necessary to explore whether the traditional soil conservation objective can be made more relevant by reference to quantifiable tolerable soil losses. Quite apart from the statistical difficulties inherent in trying to quantify tolerable soil losses (section 6.5.1), there are considerable problems with the concept of tolerable soil losses, both technical and non-technical. To determine soil loss tolerances solely by reference to existing soil depth and net erosion rates ignores the main parameter - what requirements will be place on soil resources in the future. On the other hand, any soil losses in excess of soil formation rates imply reductions in soil depth. This threatens to call for evermore restrictive practices to further reduce soil losses, which take land out of short-run agricultural production without any direct compensation to the peasants concerned. With the implied reductions in living standards, this approach feeds the downward

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1/ Notable exceptions relate to recent FAO and WFP missions to evaluate the FFW conservation programme and the GOE/FAO/UNDP project ETH/81/003, which have recommended that the GOE formulate soil and water conservation programmes in the context of increased production with the theme "increased production through conservation." (GOE/FAO/UNDP 1983). This kind of thinking is exceptional, indicating the enormity of the task of promoting the Conservation-based Development Strategy (section 11.2).

spiral of poverty and degradation (section 10.3) and cannot be sustained, much less replicated, in the longer term.

Conservation objectives have to be related not so much to reducing the quantities of soil losses as to preserving and, if possible, increasing the capacity of soil to sustain agricultural (and forest) production; conservation activities have to be accompanied by short-term measures to increase production. The potential productivity of soil depends not only on its depth but also on the quality of its root zone, defined primarily by the characteristics of its A-horizon, which is determined primarily by its biological constituents and derivatives:

> "...only by encouraging further biological activity in the A-horizon does there appear to be any hope of improving its quality and at the same time accelerating the rate at which it develops and deepens, especially under conditions of excessive erosion. The very factors that will improve the A-horizon, especially those relating to plant growth and production and which result in increased harvestable yields, are also those which most effectively diminish erosion by providing more widespread cover to the soil against rainfall forces, and promoting better structural conditions in the soil profile." (Shaxson 1981a) 1/

Conservation objectives should therefore be related to improving the quality of the A-horizon while maintaining and/or increasing its depth, and concomitantly reducing soil erodibility by biological means and diminishing the effects of rainfall erosivity by vegetative ground cover, supported by physical structures. This meets both the conservation criterion of conserving the land's capacity to support production and the development objective of growth in production. This is the primary objective of Conservation-based Development. The objective of a Conservation-based Development Strategy may be stated:

1/ In a stimulating article, Shaxson raises questions very relevant to the EHRS: "Should 'soil conservation' be perpetuated as a discrete discipline? Does 'soil conservation' need, or can it justify, its own specialised extension service, as distinct from an 'agronomic' extension service on the one hand, or a 'land reclamation' service on the other? Are there relatively too many soil conservation engineers and not enough land husbandry specialists? What are the implications for research and extension?" Some possible answers to these questions in the Ethiopian context are suggested in the following chapters.

> To accelerate economic growth, subject to no increase in the absolute poverty of the poorest, by using resources for both short-run production gains and in such a way that their productivity is increased in the longer-term.

The objective of the Strategy has, in practice, to be related to motivational and technological criteria. An important criterion for any proposed "improvement" in land use is that its net result be equally or more profitable to the land user than the system it replaces. 'Profitability' in this context may also involve subsidies or taxation - issues which are discussed in section 11.6. Pursuit of the objective would further imply that land use should be compatible with its suitability and economic comparative advantage on a sustained basis, at present or reasonably projected levels of technology (section 11.1). Achievement of the objective also requires that development policies, projects and proposals should be assessed for their effects on the productive capacity of resources (section 15.1).

10.5 PRESENTING THE OPTIONS

There are alternative ways in which desired objectives might be achieved, even given Ethiopia's constraints. There is a broad range of options at the strategic level, and variations at the levels of individual policies and projects. Strategy options vary with respect to methods, time, place, scale, input and output patterns, organization, etc. The variations are not just technical in character, but also social, economic, financial and political. But even the technical options are frequently not clear-cut; there is often room for difference of opinion among competent professionals.

Often the choice between strategy alternatives is not so much mutually exclusive as a question of balance: more of one and less of the other. This is the case in the major issues of agriculture vs. industry; export promotion vs. import substitution; large-scale vs. small-scale production; collective vs. private production; irrigated vs. rainfed agriculture; within-area degradation solutions vs. resettlement; structural vs. vegetative methods of conservation; intensive area-specific development vs. extensive development; labour-intensive vs. capital-intensive techniques. In light of such considerations, and because of the social and political implications of many of the strategy proposals, the EHRS has sought to review options with respect to these and many other development issues as explicitly as practicable. Frequent reference is made to alternative strategy options in the appropriate sections of this Report. In this way it is intended to facilitate GOE decisions on key options. In practically all cases, the range of options is accompanied by the recommendations of the EHRS team, with the reasoning behind those recommendations. While the team's recommendations add up and reinforce each other to form a coherent whole, it is obvious that the overall strategy could be varied, both in its blending of different components and with respect to options within the components. Thus the strategy presented should not necessarily stand or fall by reference to single components or proposals. Furthermore, the "rolling" character of the strategy should be remembered (section 1.5.2).

One of the most important issues of the Highlands development strategy concerns the relative emphasis to be placed on individual peasant farms, Producer Cooperatives and State Farms. This is, unfortunately, also among the most sensitive issues - because proponents of one or another of these tend to become entrenched in rather dogmatic, as opposed to pragmatic, positions. It is in this context that three alternative assumptions on policy emphasis have been identified:

"(i) emphasis on the state farms and collective settlements...

(ii) peasant agriculture would be rapidly intensified through state provision of production inputs, marketing infrastructure and improved price incentives; appropriate technology derived from farming systems research would enable intensification to be achieved alongside improved conservation of soil and water resources; at the same time rural food security would be improved; these measures would enable the agricultural sector to make significantly increased contribution to national economic growth as well as raise the level of welfare of the majority of the people in the country;

(iii) the state apparatus for both direct production and assistance to peasant farmers would be progressively dismantled to be replaced by entrepreneurs and businesses operating in the private sector, and statutory control of prices and marketing would be replaced by the operation of free markets combined with more effective taxation of incomes on a progressive basis." (Report of the EHRS Advisory Mission, December 1984.)

The last of these scenarios would in many respects represent a reversal of current ideology and development policy and is considered to be too out of line with official thinking and policy to be generally acceptable. Nevertheless, some specific aspects of this scenario - for example, the relevance of mobilizing private sector capital, skills and initiative to complement those available to the public sector - are pursued further in some subsequent sections.

The first scenario has largely prevailed since the Revolution. The state farms are now contributing significantly to the nation's marketed food grains, but are doing so at high economic costs (section 5.7) while the growth of PC's, being largely dependent on the voluntary initiative of the peasants themselves, is a gradual process (section 3.6). In view of the strategy's aim to accelerate economic growth (section 10.2), less attention is focused on this approach in the following chapters. This is not to say that it is neglected; on the contrary, there are specific sections (12.8.4. and 12.8.5) concerned with state farms and PC's, while much of the substance of other sections, though written with peasant farming in mind, is relevant to other types of farming with little adaptation.

This leaves the intermediate or compromise policy emphasis on peasant farming, which accounts for around 95 percent of the area under crops and agricultural production. Although this share may fall if state farms and PC's are increasingly favoured, it is likely to do so only gradually 1/, so that peasant farming will be prevalent long into the strategy period. Because of its much larger share in the agricultural production, even small increases in peasant production will have much greater effects on economic growth than even large increases from the state farms and PC's. Increased production in the peasant sector is a prerequisite to sustain further advancement of growth and equity objectives of Ethiopia. Conversely, stagnant production in the peasant sector would not only threaten the outstanding institutional and income redistribution achievements of the past decade, it would threaten the livelihood of millions of Ethiopians, with far-reaching economic, social and political repercussions. The social reform and organizational achievements of the 1970s have significantly improved the possibilities to mobilize the peasant sector and, even more importantly, have substantially increased the opportunities for effective peasant participation in development. The major means of achieving more rapid economic growth is through the development of peasant agriculture.

Nevertheless, some changes in the character of peasant farming are proposed (section 11.6), especially with respect to land tenure. These involve some harmonization of the spirit of PC's with individual peasant farmers. Bearing in mind the rolling character of the strategy (which should give proportionately greater emphasis to state farms and PC's as these become relatively

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1/ It has been suggested in section 5.7 that priority with respect to state farms should be on consolidation and reducing costs. When these are producing financial surpluses net of their own capital replacement and land conservation requirements, such surpluses might be used for expanding their area.

more important to the economy), the agricultural strategy proposals presented in this report focus primarily - but not exclusively - on the peasant sector.

From Part I it may be concluded that there is substantial potential for development within Ethiopia, with its industrious people, its generally favourable climate for agriculture over a large part of the country, its adequate soils, etc. However, development constraints, also identified in Part I, inevitably impose major limits on the actions which can be undertaken at any given time. It therefore becomes necessary to give careful priority and sequence to the various measures for maximum impact. Whenever feasible, the sequencing of activities is related to three planning periods, as follows:

(i) Short-term: the next two years, through 1986/87;

(ii) Medium-term: the next nine years, through 1993/94;

(iii) Long-term, perspective period: the next 25 years, through 2009/10.

The short-term period allows for the completion of the project identification and preparation of follow-up investment, technical assistance and food-aid projects, and the securing of project funds. It also permits integration of the preferred agricultural and rural development strategy into the national perspective plan and the national shorter-term action plans (section 1.4). The medium-term period allows for completion of an extensive and considerably strengthened phase of research and development work on the agronomic and farm systems possibilities, while also conforming with the termination of the current TYPP period. The perspective framework to 2010 has been used, for reasons indicated in section 1.4, to examine socio-economic and degradation projections and to carry out cost-benefit analyses of alternative strategy options.

The strategy recommended in this report has been systematically built from many interrelated proposals derived from both micro- and macro-level analyses. The sequence of chapters 1/ follows from the macro- and micro-contexts presented in Part I, and the micro-level analysis of degradation costs and effects and previous actions to combat degradation presented in Part II. Thus Chapter 11 presents proposals specific to soil and water conservation. Chapter 12 integrates these proposals into the Highland patterns of farming and presents a harmonized strategy for agricultural development. This strategy is integrated into overall

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1/ This order (but not so much the substance) differs from that initially proposed in the EHRS Inception Report (December 1983), to reflect the recommendations of the EHRS Advisory Mission (December 1984) and the evolution of EHRS work.

rural development and national development strategy in Chapters 13 and 14 respectively, in each case drawing attention to subsectoral interrelations and priorities. The final Chapter, 15, outlines follow-up activities required to make the strategy operational. These include more detailed and rolling planning at progressively lower levels, policy and organization proposals, and proposals relating to investment, technical assistance, training and food aid projects. The analyses have thus been used to derive targets and policies from the bottom upwards, rather than to set targets from the top downwards (section 1.5.3).

10.6 FARM MODEL ANALYSES TO DIFFERENTIATE STRATEGY PROPOSALS

The strategy will only be successful in influencing resource use on a large and continuing scale if the users of resources are adequately motivated. The technical and macro-level analyses for formulating an internally consistent and cohesive package of policies and projects for increasing productivity of resources in the longer term are thus complemented by micro-level and social analyses designed to assess changes in farmer motivation to implement the proposed changes in resource use and development. The long-term technical and economic implications of alternative strategy options have been assessed in various EHRS working papers. Especially developed models of patterns of farming in the Highlands are presented in Annex 4. These models, in effect, indicate at the level of the average farm household in each of the nine subzones, the patterns of cropping, livestock, costs, production and income. The farm models illustrate the apparent land use and cropping patterns in specifically defined geographical areas (Chapter 2 describes the system of zoning) in quantitative terms of land use, inputs and outputs and thus provide some grounds for systematic comparison of development options and assessment of priorities. 1/ The models were used to help present, in quantitative as well as qualitative terms, the two alternative scenarios:

(a) the situation that would result if present land use trends continue;

(b) the situation that would prevail if changes in land use were effected by implementation of the appropriate components of the proposed strategy.

1/ The models provide a means for checking the consistency of various proposals at farm level. The models are derived from, and therefore are consistent with, the data presented in Part I (sections 4 and 5; also annexes 4 and 5).

Comparison of the two scenarios, and in particular the quantification of the net differences in physical inputs and outputs over a period of 25 years, permitted systematic assessments, based on standard cost-benefit techniques, of the effect of strategy proposals at both local and national levels:

(a) the micro-economy of the average farm units in the various sub-zones; e.g., would farmers benefit from the strategy? By how much? In what areas?

(b) macro-effects on the economy as a whole; e.g., by how much, when, where and at what costs would the strategy proposals, if applied in that particular sub-zone, benefit the national economy of Ethiopia?

The above-described quantitative analyses, contained in EHRS WP 18, complement analyses presented in other EHRS working papers. The models thus support (rather than replace) the role for "sensible professional judgement" (section 1.5.1) in selecting between alternative strategy proposals and in arriving at priority actions and areas.

The strategy has thus been formulated by reference to the indicated patterns, by sub-zones (see introductory paragraphs of Annex 4), and with the aim of improving land use in each sub-zone to make it more consistent with the sustaining of long-term development.

10.7 USES AND AUDIENCE OF THE STRATEGY PROPOSALS

The Strategy developed by the EHRS is necessarily broad and, to some degree, simplified, from certain more technical points of view. But it is hoped that the report:

- is instrumental in increasing attention and resources for combatting degradation, having offered explanations for the growing problem and its severity;

- increases awareness among all those concerned with Ethiopian development of the necessary contribution of conservation to human survival and sustainable development within Ethiopia;

- stimulates approaches to development more oriented toward conservation and in particular for integrating conservation and development;

- proposes in a convincing manner a coherent Conservation-based Development Strategy; and

- identifies the major issues, priorities for action and the main requirements to overcome the identified constraints in the pursuit of Conservation-based Development.

The strategy proposals are intended primarily for three groups of users (none of which is wholly separate from the others):

1. GOE policy makers and their advisers. Financial and technical resources are lacking to address all of the problems of conservation at once, and priorities need to be identified. The proposals should be relevant to all those levels of government with significant responsibilities for planning and managing rural development.

2. Conservationists and others directly concerned with the Highlands ecosystems. The strategy identifies those areas where conservation action is most urgently needed and where it is likely to yield the greatest and most lasting results. It also proposes ways in which conservation should feature more effectively in development, thereby increasing the likelihood that adequate resources and attention will be focused on the degradation problem and thus help to ensure that Ethiopia's development is sustainable.

3. Development practitioners, both inside and outside Ethiopia including external assistance agencies. The report demonstrates that conservation is not only necessary for the sustained development of Ethiopia, but can and should be effectively integrated into development actions and thus strengthen the foundations from which Ethiopia is striving to alleviate its poverty.

Chapter 11

LAND RECLAMATION AND CONSERVATION

11.1 OVERVIEW AND PRIORITIES

11.1.1 Land use for conservation-based development

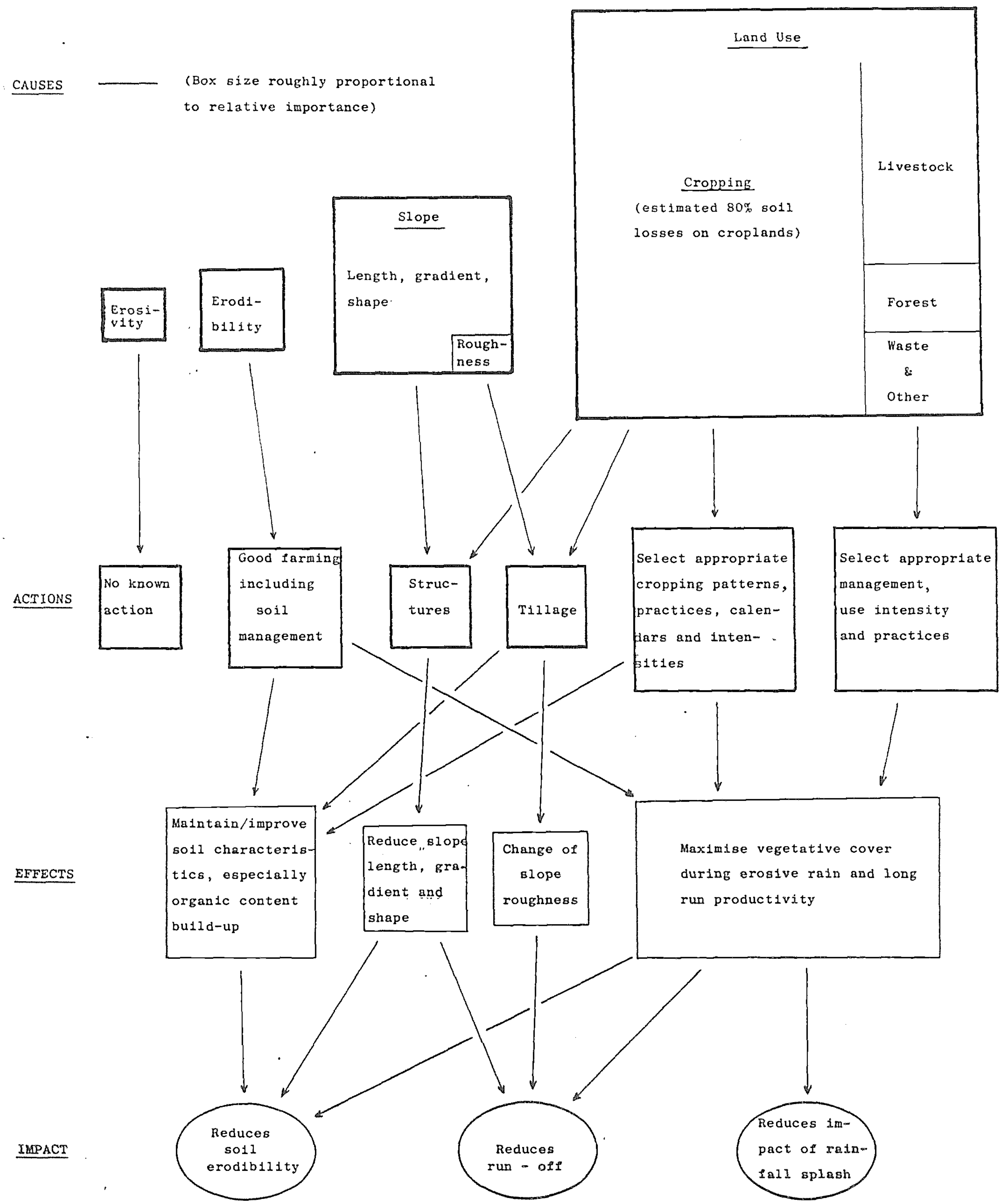
From the analysis of the causes of erosion presented in section 6.3.3, four major contributing factors were identified: rainfall erosivity, soil erodibility, land slope and land use (see also Fig. 6.4). It was concluded that by far the most important of these factors is land use, followed far behind by slope, erodibility and erosivity. Some indication of the relative importance of these factors is given by the size of the boxes in Figure III.1. Very little if anything can be done to reduce the erosivity of rainfall. Erosion therefore has to be tackled by acting on the other three factors. Because of the overwhelming importance of land use in accounting for variations in erosion rates, conservation objectives have to be sought through improvements in land use (see Figure 11.1). This refers to the selection of an appropriate use as well as to appropriate management in the selected use. These will depend on the existing forms of land use, but generally both should serve to provide more vegetative cover of the soil during periods of erosive rainfall, while increasing the sustainable economic production from the land. This, in essence, is Conservation-based Development.

Appropriate land use and management thus controls and prevents "erosion in three different but related ways: firstly, by protecting the surface of the soil, as far as possible, from the effects of raindrops directly striking the soil surface; secondly, by trying to ensure that the maximum amount of water reaching the soil surface is absorbed by the soil; thirdly, by attempting to make any water which cannot be absorbed drain off at velocities which are low enough to be non-erosive". (Sanders 1984.)

Categories of land use have been broadly grouped as cropping, grassland and forestry (section 5.1), generally reflecting a progression of decreasing intensity and annual value of use, with resulting erosion hazards (Chapter 6). Depending primarily on soil type but also on cropping characteristics, cropping can generally be undertaken on slopes up to five percent without the need for any special conservation structures and without causing significant

OVERVIEW OF STRATEGY FOR CONSERVATION BASED DEVELOPMENT

Figure 11.1



erosion. Annual cropping on slopes above five percent, even using good conservation farming practices, generally requires supporting conservation structures. 1/ Structures generally aim to interrupt slope length and reduce slope itself by the gradual formation of terraces. The steeper the slope, the greater the importance of structures. At slopes above 30 percent, such conservation structures may cover over a quarter of the land area, and annual cropping becomes more difficult and loss economic. Even so, the structures themselves become progressively less effective (reflecting likely maintenance levels, rather than technical designs). In view of such considerations, the 30-50 percent slope range - depending primarily on soil type and cropping practices - should be the target upper limit for annual cropping. The lower end of this range would be more relevant in areas where soils are already shallow (below 40 cm) and/or derived from siliceous parent materials and/or for "erosive" crops such as teff, requiring more ploughing. Some perennial crops such as tea can be grown on even steeper slopes without significant erosion hazard. Some 359 120 km^2 (67 percent) of the total study area have slopes less than 30 percent. Furthermore, the proportion of the land area with slopes less than 30 percent is 60 percent or greater in all altitudinal belts below 3 000 masl in the HPC and LPC zones. In the HPP zone, the altitudinal belts of 1 500-2 000 masl and above 2 500 masl have around 50 percent of their land area below slopes of 30 percent - the former belt in particular being that generally most suitable for perennial cropping.

Land of slopes higher than 30-50 percent should be used for perennial crops, grass and/or forest. 2/ As slope increases, and/or soil depth decreases, more attention should be given to stock and grazing management and minimal grazing techniques. Conversely, grasslands or forestlands on deep soils on slopes of less than 30 percent should, depending on population pressure and economic considerations 3/, be reclaimed for cropping and thus increase

---

1/ This holds for technology known to be applicable to the Highlands farming systems. Suggestions concerning good conservation farming practices as well as possible improvements in technology are made in subsequent sections.

2/ Grass, if properly managed, is almost as effective as forest in reclamation and conservation. In practice, steep slopes would probably be utilized most efficiently in a dual-purpose (wood-forage) system of sylvo-pastoralism.

3/ Some of the remaining forests of Ethiopia are on slopes of less than 30 percent. Since so little "original" forest remains in Ethiopia, it is not suggested here that these should be felled to provide more cropland.

opportunities for alleviating pressure on lands more marginal for cropping. Those lands on slopes less than 30 percent which are severely dissected by gulleys, or unsuitable for adequate drainage works, would need to be kept for grass or forest.

Obviously such indicative targets can be regarded only as very broad guidelines. Much more detailed assessment of the land capability of specific sites should be an essential continuing component of planning. Proposals for follow-up in this respect are made in Chapter 15.

The achievement of such land use targets will obviously be very gradual, as people cannot be stopped from cropping on slopes above 30-50 percent until other land and supporting socio-economic infrastructure are available. Measures to help achieve these targets (including migration, resettlement, irrigation, taungya, agro-forestry, rural industry and others) are proposed in subsequent sections. Such measures are necessary because the targets eventually <u>have</u> to be achieved; otherwise their "achievement" is ultimately inevitable by default - i.e., cropping and even other productive use of land will be curtailed by lack of soil left on such slopes. It is better not to wait for such an appalling result, both because Ethiopia cannot afford to write off large areas of its territory, and because erosion from such areas threatens even more valuable lands on less steep slopes.

> "The World Soil Charter calls for a commitment on the part of governments, international organizations and land users in general to manage the land for long-term advantage rather than for short-term expediency ... It is a major responsibility of governments that land use programmes include measures toward the best possible use of the land, ensuring long-term maintenance and improvement of its productivity, and avoiding losses of productive soil. The land users themselves should be involved, thereby ensuring that all resources available are utilized in the most rational way." <u>Source</u>: The World Soil Charter (FAP 1982).

11.1.2 <u>Area Priorities</u>

Two major criteria are used to rank areas in order of priority for conservation and reclamation: the technical urgency of action, and the potential economic gains. Technical urgency is differentiated as follows:

(i) irreversible damage to land resources, or serious off-site effects in the short run if no action is taken to control degradation;

(ii) action necessary to avoid significant loss of potential productivity, or to avoid undesirable off-site effects;

(iii) degraded situation but presenting no immediate increased hazard.

Once degradation reaches a certain stage, it can become self-perpetuating, and land is irreversibly lost. Before this stage, even severely degraded areas may one day need to be reclaimed with technology still beyond the horizon. Generally, the greater the urgency in these respects, the more likely action is to have a reclamation as opposed to a conservation character. Land conservation is essentially preventive, and costs are relatively low. Although they vary with the degree of land degradation risk, many land conservation measures are integral features of good farming and prudent land management. In contrast, land reclamation is only necessary after degradation has occurred: works tend to be more elaborate, costs higher and economic returns lower. Severely degraded soils, because of their shallow depth and low water-holding capacity, are unlikely to become very productive economically. The two criteria are negatively correlated: the more urgent action is likely to yield less in terms of economic returns and vice versa. It is difficult to decide which criteria should have greater weight, and it may not be absolutely necessary, as simultaneous actions are both possible and necessary on a number of fronts. 1/ It is considered that top priority for area-specific action in the immediate future should be given to those areas which are likely to become irreversibly degraded if present trends continue. Simultaneously, top priority should also be given to promoting the Conservation-based Development Strategy generally across the nation (see box). This approach combines prevention and cure. In practice, the combination is likely to be more effective, because any sizable area-specific project in an area threatened by irreversible degradation is also likely to include some areas less seriously threatened, where preventive action would be required. To the extent that opportunities for crop intensification and area expansion are limited within the severely degraded areas of the LPC and HPC zones, reclamation and conservation activities in these areas will probably have to be combined with the development of less densely populated areas in the HPP zone.

1/ They are made possible because the main resource input for conservation is labour, and the major means proposed for utilizing the labour is through improved farming practices. Labour in the HPP zone is not competing with labour in the LPC zone; labour has to be mobilized simultaneously in all zones for Conservation-based Development.

THE CONSERVATION-BASED DEVELOPMENT STRATEGY IN BRIEF

The degradation of land is caused by the abuse of land beyond its capability. Degradation seriously threatens sustainable development and future livelihood. It is the major factor contributing to the increasing severity and extent of famine in Ethiopia. Ultimately, the threat of degradation can only be averted by improving the use of land, so that land maintains or improves its productive capacity. Even the best land becomes degraded if abused, and even poor land is valuable if used peoperly. Structural measures of conservation (e.g., bunds, terraces, etc.) can only support the improved use of land, they cannot substitute for it. Improvements in land use have to be seen to be profitable to the land users - the peasants (or else subsidized). This means increasing agricultural (crop, livestock and forest) production in the short term. Thus for conservation to be replicated and sustained on the required scale in the Ethiopian Highlands, it has to be achieved through increased agricultural production. This means that conservation has to be fully integrated with development and viewed by all from peasants to top governmental decision makers (and their advisors), as the major, integral component of sustainable development. This is Conservation-based Development. It is only through a strategy of Conservation-based Development that sufficient resources can be mobilized to overcome the degradation threat to Ethiopia's survival - only thus can the vicious circle of poverty, degradation and poverty be broken. YOU (i.e., all Ethiopians and all those concerned with Ethiopia's development) HAVE TO THINK, ACT AND SPEAK CONSERVATION-BASED DEVELOPMENT IN CARRYING OUT YOUR DEVELOPMENT ACTIVITIES. PASS ON THIS SURVIVAL MESSAGE TO ALL THOSE NOT YET ACTING TO SUSTAIN LIFE IN ETHIOPIA.

Following closely on these top priorities is the need to give early attention to areas of annual cropping on steep lands which, if present trends continue, would also soon be threatened by irreversible degradation. The emphasis in such areas (most common in the most densely populated areas of the LPC and HPC zones) would again be twofold:

- reclamation and conservation of the steepest slopes by changing land use from cropping to grassland or forestland;

- conservation of sustainable croplands by both conservation farming (described below) and structures.

Table 11.1

SUGGESTED PRIORITY AREA OPTIONS IN CONSERVATION AND RECLAMATION
(the more * the higher the priority)

Priority option (by land use areas)	Priority zone/farming system (masl)	Priority conservation/reclamation measures	Major constraints 1/	Urgency	Possible speed of implementation	Acceptability to peasants	Technical success probability	Potential economic impact	Overall priority ranking
Land (usually grass or croplands) threatened in immediate future by irreversible degradation if present trends continue (soils <40 cm)	1. LPC >2500 2. LPC 2000-2500 3. HPC >2500 4. LPC <2000 5. HPC 2000-2500	1. Relocation of farms via migration/settlement. 2. Oversowing grasslands. 3. Grazing/stock mgmt. 4. Agro-forestry esp. taungya. 5. Woodlots.	1. Institutional motivation 2. Resettlement needs 3. Extension 4. Seed	***	**	*	*	*	1
Croplands (annuals) on slopes >30% and/or on soils <60 cm.	Most densely populated areas in: 1. LPC all 2. HPC farming systems 3. HPP >2500	1. Relocation of farms from slopes >30-50%, use for agri-sylvo pastoralism. (2) & (3) as above. 2. Conservation farming. 3. Conservation struct. 4. Promote perennials on steeper slopes. 5. Agro-forestry.	1. Institutional motiv. 2. Extension 3. Resettlement needs 4. Seeds 5. FFW food	***	*	**	**	**	2=
Croplands (annuals) on slopes 20-30%	1. HPC 2. HPP 3. LPC	1. Conservation farming 2. Agro-for. 3. Conservation struct. 4. Promote perennials on steeper slopes.	1. Motivation 2. Extension 3. Seeds 4. Fertilizer 5. FFW	**	**	***	***	***	3=

Table 11.1 (cont'd)

Priority option (by land use areas)	Priority zone/farming system (masl)	Priority conservation/reclamation measures	Major constraints 1/	Urgency	Possible speed of implementation	Acceptability to peasants	Technical success probability	Potential economic impact	Overall priority ranking
Croplands (annual) on slopes <10%	1. HPC 2. HPP 3. LPC	1. Conservation farming. 2. Drainage/irrigation. 3. Agro-for. 4. Grass strips.	1. Motivation 2. Extension 3. Seeds 4. Fertilizer 5. FFW	*	**	***	***	***	3=
Newly settled croplands (usually <10% slope)	1. HPP <2000 2. HPP 2000-2500 3. HPP >2500	1. Conservation farming. 2. Eucalyptus woodlots. 3. Grazing/stock mgmt. 4. Agro-for. 5. Drainage/irrigation.	1. Extension 2. Institutional motiv. 3. Seeds	***	***	**	**	***	2=
Grasslands on slopes >30%	Over-stocked areas in: 1. LPC 2. HPC	1. Destocking. 2. Oversowing grasslands. 3. Grazing management. 4. Cut-and-carry systems.	1. Motivation 2. Organization 3. Extension 4. Seed	**	**	**	**	*	4=
Grasslands on slopes <30%	Over-stocked areas in: 1. LPC 2. HPC	1. Destocking for croplands if land is suitable. 2, 3, 4, as above.	as above	*	*	**	**	*	5
Forestlands on slopes >30%	1. HPP 2. HPC 3. LPC	1. Management 2. Agro-forestry	1. Skilled manpower 2. Extension 3. Motivation	**	**	**	**	*	6
Forestlands on slopes <30%	1. HPP 2. HPC 3. LPC	1. Deforest'n for croplands if land suit. 2. Management 3. Agro-for.	as above	*	**	***	**	**	4=
Wastelands - already irreversibly degraded	1. HPP 2. HPC 3. LPC	Reclamation via: closure; oversowing grass (later, trees). 3. Drainage.	1. Institutional motiv. 2. Seed	*	***	***	*	*	7

1/ Specific suggestions on overcoming constraints are made in relevant sections of the report.

For reasons already stated, the achievement of the above changes in land use (i.e., removal of cropping from the steepest slopes) will have to involve some migration/resettlement to less densely populated areas in the HPP zone. Indeed, such areas are already the subject of emergency settlement and development efforts in the wake of the current famine in the LPC zone. It is important that the settlers do not bring with them their systems of land misuse. Early attention has therefore to be given to the development of productivity-raising, conservation farming in such productive areas by massive extension and appropriate organizational/motivational arrangements.

The next major area-specific priority is to conserve the most productive croplands of the HPC and HPP zones. These areas offer the greatest possibilities for increasing agricultural production in the shorter term, for achieving conservation through increased production and providing the greatest economic returns from investments in conservation. These high-potential lands are capable of producing greatly increased surpluses, which can be transferred to the lower-potential areas in the north and to the urban areas. 1/

The above suggested priorities, together with others, are ranked according to various explicit criteria in table 11.1. In short, top priority is given to areas threatened by irreversible degradation (mainly in the LPC zone and especially farming areas above 2 500 masl) and to the croplands of the highest potential in the HPC and HPP zones and to the newly settled croplands of the HPP zone. Lower priority is given to the conservation of grass and forest lands (which account for less of the Highlands erosion than the croplands - Chapter 6) and lowest priority to reclamation of the already irreversibly degraded wastelands (mainly in the LPC zone). An overview of priority activities for conservation to complement this area priority ranking is presented in the next section.

11.1.3 Priority activities

As degradation is caused primarily by the misuse of land beyond its capability, it follows that the major way to avoid degradation is to use land properly within its capability. Indicative targets for land use for Conservation-based Development were given in section 11.1.1. This section identifies priority activities for each major category of land use, in order of priority: croplands, grasslands and forestlands (section 11.1.2).

1/ The need to increase purchasing power in the north to finance such transfers is addressed in Chapter 13.

Emerging from Part II and the theme of Conservation-based Development is the general conclusion that for all land use conservation has to be achieved mainly through vegetative measures. Indeed, the aim of the Conservation-based Development Strategy is to increase economic production in each land use system, simultaneously providing denser vegetative cover during periods of erosive rains. Structural measures, implying an immediate decrease in production (caused by the loss of land area occupied by the structure) should be regarded as complementary, to be applied with vegetative measures when the latter, alone, are insufficient. Structural measures may provide support for vegetative measures, but they can never substitute them. Generally structures other than those required for drainage and gulley control are only necessary on croplands, and then only for annual crops. The greater the slope of lands under annual cropping, the greater is the need for structures to complement vegetative measures, but the greater, too, are the costs of the structures. Structural measures can only be effective if they are accompanied by improvements in land use to remove the original causes of degradation, and if they are accompanied by adequate maintenance. To minimize costs and maintenance requirements, and to promote farmer acceptability, structures should be designed and spaced to minimize the land area occupied.

The economic costs of structures are generally highest in the HPP zone and least in the LPC zone. They are highest in the lower altitude belts of all three zones, and lowest for the low-value farming patterns, reflecting the low opportunity costs of land and labour in these poorer sub-zones. Structures tend to generate the greatest benefits in the areas where losses from erosion are greatest. Combining cost and benefit analyses, the ERR generated by bunds (by far the most common and appropriate structure) is lowest in the HPP zone at between 4 and 6 percent over 50 years; highest in the LPC zone at around 13 percent; and about 10 percent in the HPC zone. 1/ These analyses, and the fact that vegetative measures become progressively easier and more effective as rainfall increases, lead to the conclusion that vegetative measures have to be stressed most of all in the high-potential zones. Vegetative measures should still be considered the preferred conservation technique in the LPC zone, but the shorter growing period implies that, compared to the high-potential zones, greater reliance has to be placed on structural measures. More emphasis should be placed on the use of grass strips, particularly on slopes of less than ten percent.

Vegetative measures on croplands generally coincide with 'good farming' practices concerning soil and water management.

1/ See WP 23 for suggested guidelines on recommended structural measures for different slopes, soils and zones.

Practices differ greatly depending on erosion hazard and the kind of farming system (i.e., earlier and/or shortened land preparation and planting; use of quick-maturing varieties; multiple-cropping systems 1/; closer spacing; forage cropping on fallows; ratooning; strip-cropping; and changing to less erosive crops 2/). The fact that such practices are widely used elsewhere, even in parts of East Africa, but remain exceptional in Ethiopia is a major reason for urgent field level demonstrations and extension efforts within the context of general agricultural extension.

Grassland conservation and reclamation is dependent essentially on oversowing legumes (the quickest and easiest option), closure (see below), cut-and-carry systems, and/or various measures of stock and grazing management (reduced stocking rates; selective, rotational and/or deferred grazing; use of live fences, etc.). The main constraints (Chapter 12) are organizational and motivational - how to motivate peasants to conserve grazing lands, on which the costs of degradation are borne by the community, but grazing of which benefits individual livestock owners. Grasslands should also be enriched and used more efficiently through techniques of sylvo-pastoralism.

Too much attention in reafforestation has been given to costly hillside terracing. Simple pitting, supplemented by cut-off drains as appropriate, is sufficient for afforestation in the HPP and HPC zones, while micro- or eyebrow-terraces, at half the cost of normal terraces, are generally sufficient in the LPC zone. Conservation/reclamation objectives can be met efficiently and more cheaply, with much higher ERR's, by natural revegetation on closed hillsides (if necessary, supplemented by enrichment planting and cut-off drains). Afforestation is clearly necessary to meet the growing wood deficit, but for more rapid conservation/reclamation, the third or more of the Highlands area with slopes too steep for cropping will require much more closure for natural revegetation rather than reafforestation. The main drawback of closure is the related need for greatly expanded training at the PA/DA levels on the utilization and management of closed hillsides.

The most serious constraint to conservation is the lack of appreciation by both peasants and government officials of its relevance and importance for sustained development, and of the links between conservation and development. Not only is prevention of degradation in the rest of this century much cheaper than the alternative of reclamation in the next century - it is necessary to

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1/ Inter-cropping; relay cropping; undercropping; overcropping.

2/ Details relating to each of these proposals are elaborated upon in subsequent sections.

sustain life and development. An enormous campaign of education, mass media publicity and training is required, aimed at all levels of the population, to promote the message of the Conservation-based Development Strategy and to mobilize resources for its implementation. Organized from within the ONPCC, the campaign would require specialist assistance in communications, education, training and extension. Capital assistance would be required for massive importation and distribution of radios, batteries, audio-visual aids, printing equipment and paper.

A parallel campaign is also required outside Ethiopia to increase the flow of development assistance to Ethiopia, and to orient that assistance to the programmes and projects reflecting the Conservation-based Development Strategy. Supporting roles should be played by UNDP, FAO, WB, UNEP and UNESCO. The necessary achievement of conservation through increased production should gain acceptance - even enthusiasm, among peasants, Government, external development agencies and bankers alike.

Conservation research, extension and training have to be fully integrated with mainstream agricultural research, education and training to develop and disseminate the technology required to sustain future Conservation-based Development. The growing tendency for segregation and the formation of new conservation agencies should be resisted. The existing agencies (such as the University, the IAR, the Agricultural Colleges and the FTC's) must be related directly to conservation, and in particular to the Conservation-based Development Strategy. With such relation, far more resources can be mobilized and applied much more effectively. More use should be made of the network of International Research Centres to undertake original agricultural research relevant to Ethiopia so that Ethiopian national research can become increasingly adaptive, with shorter gestation periods. Major national emphases in research should be directed toward improving land use, promoting vegetative measures for conservation and, through social and economic measures, motivating and mobilizing peasants in productivity-raising conservation farming. While conservation research should be wholly under the IAR, management and monitoring should be undertaken jointly by SWCD and IAR, and evaluation by the University - in each case with appropriate technical assistance and training.

Much of the required adaptive research, as well as useful training, monitoring and evaluation, could be undertaken by a pilot project. A quick start should be made by reorienting and expanding the existing SPCRP (Sirinka) project with its well chosen site (covering three agro ecological altitude levels), its existing infrastructure and professional and support staffing. More sites (especially in the HPP and HPC zones) as well as more staff, infrastructure, funds and organizational changes are required to enable the SPCRP to fulfill a truely pilot role. The problem of inducing massive peasant participation is made easier if they can be shown the successful results of earlier efforts. In selecting more sites for the pilot project, priority should be given to areas most likely to respond quickly to conservation-based development. More difficult sites should not be neglected, but should be given a 'low profile'.

Another major potential role for the pilot project is in developing peasant motivation more actively. Motivation for individual peasants to spontaneously invest in and conserve the land is lacking. It is proposed to tackle this through increased popular participation, appropriate pricing, marketing and credit policies, creating additional awareness and information on degradation, improving security of land tenure, extending FFW ("seed-for-work" programmes in food surplus areas) and most importantly by seeking to make conservation profitable to the individual by integrating it into development.

Particularly challenging is to arrive at workable and ideologically acceptable proposals for improving the security of land tenure. This problem, and the related plot fragmentation trend, would be partially alleviated by encouraging migration - as well as organizing resettlement - to less densely populated areas, but ultimately solutions have to be found in those areas where the problem arises. All land is already collectively owned by the state, and it has been suggested that this collective ownership by decentralized by creating smaller groups - within the PA, but not PC's - which could be called 'land conservation groups' or 'land cooperatives'. Each group (of perhaps 10 to 20 households) might be allocated a discrete plot, and the group should know that population increases have to be absorbed within this plot because all other land is already similarly allocated. The group would decide whether to share the proceeds from production on that land communally or retain the motivation associated with individual profit - but in all cases the group would be communally responsible to the PA for conserving the land. Group failure to conserve its plot would invoke penalties. The groups should be small enough to retain some of the motivation and initiative normally prevailing in extended families, but large enough for mutual support and cooperative investment and production activities. Government has not supported this suggestion, but the problem of insecurity of tenure of specific lands must be faced or incentives for conservation will remain feeble.

Table 11.2 ranks, according to various explicit criteria, suggested priority activities by zones and lists major characteristics and constraints. The activities concerned obviously overlap and in some cases are not alternatives - simultaneous action is required (indeed, is already underway) on several fronts. Furthermore, some of the activities have more to do with policy than with projects (whether investment, technical assistance, or food aid). Top priority, as suggested in the previous section, goes to launching a campaign to instill an understanding of Conservation-based

Development and enlist support for a Conservation-based Development Strategy. This is followed by interrelated activities in the areas of peasant motivation, extension and vegetative measures of conservation and reclamation.

11.2 PROMOTING THE MESSAGE OF CONSERVATION-BASED DEVELOPMENT

Lack of awareness of the need for and importance of conservation for sustained development was identified in section 8.8 as the most serious constraint limiting the nature, scope, size, replicability and sustainability of conservation activities in Ethiopia. This lack of awareness relates not so much to recognition that a degradation problem exists, but much more to ignorance as to the underlying causes, the severity of the problem and the nature of solutions - especially solutions other than in the form of physical structures - and the interrelations between conservation and agricultural development. This lack of awareness is common at all levels. But whereas peasants readily admit their ignorance in this matter, top policy makers, together with their Ethiopian and expatriate advisers, neither admit nor, perhaps, recognize the links between conservation and development.

There is a tendency for "educated" people to think that it is only the rural masses who need conservation education. This is totally unjustified, for conservation ignorance is probably far more damaging at top policy-making levels than at the individual farmer level. Policy makers are usually so immersed in their own fields that little thought is given to such multi-disciplinary subjects as the Highlands ecosystem or Conservation-based Development. If Ethiopian leaders and those concerned directly with development lack appreciation of the need for Conservation-based Development, one can hardly attribute blame to the primary degraders themselves, who are too concerned with day-to-day survival to be able to act for longer-term benefits. Even many of the professionals most directly concerned with conservation see it more in terms of a number of discrete activities (mainly bunding and tree planting) to be imposed on peasant systems of land use, rather than as essential components to be profitably integrated into farming systems. The rapporteur of a major international conference on conservation in 1980 listed as the first major conclusion:

> "...it appears conclusive therefore that the interests of future soil conservation programmes, particularly in deveoping countries, can best be served by creating a better awareness of the problems and solutions..." (Hauck 1981).

Table 11.2

SUGGESTED PRIORITY ACTIVITY OPTIONS IN CONSERVATION AND RECLAMATION 1/
(the more * the higher the priority)

Priority activity	Priority zone	Priority conservation/ reclamation measures	Major constraints	Urgency	Possible speed of implemen- tation	Accepta- bility to peasants	Technical success proba- bility	Potential economic impact	Overall priority ranking
Promoting message of Conservation-based Development	National	1. Mass media 2. Planning 3. Education 4. Agricultural training	1. Skilled manpower 2. Capital 3. Organiz.	***	***	***	**	***	1
Bunding and grass strips	Croplands in: 1. LPC 2. HPC 3. HPP	1. FFW 2. Stabilization 3. Link with con- serv. farming	1. FFW-food & logistics 2. Extension 3. Seed	***	***	*	**	*	4
Vegetative measures	1. HPP 2. HPC 3. LPC	1. Training 2. Extension 3. Seed 4. Adaptive research 5. Pilot prog.	1. Trained manpower & extension 2. Seed 3. Motivation 4. Adaptive FSR	***	**	***	***	***	2=
Extension	1. HPC 2. HPP 3. LPC	1. Promoting cons.based dev. 2. Appropriate land use 3. Vegetative measures 4. Structures 5. Grassland mgmt	1. Training 2. Motivation 3. Transport 4. Recurrent funds 5. Research 6. Seed	***	***	***	**	***	2=
Adaptive research	1. LPC 2. HPP 3. HPC	1. Soc-econ. mot. 2. Veg. measures 3. Multiple cropping 4. Erosivity-erod. maps 5. Zero tillage 6. Grazing mgmt.	1. Attitudes of researchers 2. Skilled manpower 3. Recurrent funds 4. Research sites	**	*	*	**	**	5=

Table 11.2 (cont'd)

Priority activity	Priority zone	Priority conservation/ reclamation measures	Major constraints	Urgency	Possible speed of implementation	Acceptability to peasants	Technical success probability	Potential economic impact	Overall priority ranking
Pilot project	1. HPC 2. HPP 3. LPC	1. Veg. measures 2. Land tenure 3. Zero tillage 4. Grazing mgmt.	1. Skilled manpower 2. Sites	***	***	***	**	**	3
Peasant motivation	National	1. Cons.based development 2. Land tenure 3. Pricing, marketing, credit 4. Participation	1. Poverty 2. Policies 3. Skilled manpower	***	**	***	***	***	2=
Grazing management	1. LPC 2. HPC 3. HPP	1. Extension 2. Seeds	1. Motivation 2. Organization 3. Extension 4. Seed	**	*	*	***	***	6
Revegetation by closure	1. LPC 2. HPC 3. HPP	1. Utilization of closed areas; enrichment planting	1. Extension 2. Organization 3. Motivation 4. Seed	**	***	*	***	**	7
Reafforestation	1. LPC 2. HPC 3. HPP	1. Agro-forestry on crop and grasslands 2. Woodlots on steep lands	1. Extension & training 2. Seedlings 3. Motivation	***	**	***	**	*	5

1/ There are many overlaps and interrelationships between these priority activities.

A massive education, publicity and training campaign is required to promote consciousness, attitudes and behaviour more compatible with conserving the productive capacity of Ethiopia's Highlands. The campaign has to enlist support for putting into action the Conservation-based Development Strategy and help in mobilizing resources for its implementation.

The required education campaign throughout the nation needs to be pitched at four different levels, if possible simultaneously:

(i) Politicians, administrators, and policy-makers and their advisers (Ethiopians and expatriates) in all GOE ministries and development agencies, to create awareness of the fact that an extremely serious situation exists, that a logical, feasible solution is available, and that it is in their and Ethiopia's best interests that it should be applied as soon as possible. It is these people who can influence development and land use on a massive scale through planning and budgetary mechanisms, mass media, education and training, agricultural research and extension priorities, etc. It is necessary to create an environment in which the whole Government is totally committed to the Conservation-based Development Strategy.

(ii) The mass of peasant farmers, to demonstrate to them that Conservation-based Development is in their best interests, and to teach them how to go about it.

(iii) The public at large, so that all Ethiopians feel it anti-social and unpatriotic not to consider conservation in their everyday attitudes and actions.

(iv) All technicians in the fields concerned, particularly in their training.

The Conservation-based Development Strategy, appropriately adapted in coverage and sophistication for each level of audience, has to be passed through all available means including the mass media, formal education, specific training, and meetings, seminars, etc. Organizers of the campaign - the ONPCC - would have to define precise programme objectives and components and, with assistance of communications specialists, identify appropriate media and techniques for each identified audience. Results, together with the techniques and materials used, should be regularly evaluated to determine their impact and to help in devising further relevant programmes which will attract interest and build enthusiasm. Case histories of successful conservation and sustainable development projects, locally based if possible, would be needed to support the programmes.

The Conservation-based Development Strategy needs to be publicized also outside Ethiopia in those agencies, both multi- and bilateral, assisting in Ethiopia's development. This might be done through international conferences, seminars, symposia and technical publications, by more conservation-oriented screening of project proposals both by GOE and the agencies concerned; by GOE orienting requests for assistance toward Conservation-based Development; and through the mass media. In this latter respect, international attention currently focused on the Ethiopian famine provides an opportunity to educate world opinion on the underlying degradation causes of the severity of the famine and explain the need for the Conservation-based Development Strategy.

Major roles in such an external campaign can be played by the United Nations in orienting its development thinking and its development programme (UNDP) in Ethiopia to support the Conservation-based Development Strategy. FAO, in particular, should modify its technical assistance programme and UNEP its conference programme so that they would more effectively assist conservation-based development. The World Bank, in its unique position in world development policy, should adapt its own Ethiopian lending programme to support the Conservation-based Development Strategy.

Promoting the message is an essential condition but not sufficient for implementing this Strategy. It must lead to the commitment of resources at both Government and farm levels. The campaign of information would be aimed primarily at those in the Government agencies, but the importance of motivating farmers is also stressed (section 11.6). The major rationale for Conservation-based Development is that by achieving conservation through increased production, conservation will evoke greater and more sustained acceptance, even enthusiasm, among peasants, Governments and external assistance agencies alike.

11.3 VEGETATIVE MEASURES

11.3.1 Introduction

The major strategy theme presented in this report is that conservation has to be achieved primarily through improved use of land. In no case can structural methods of conservation be an effective substitute for improved land use in which conservation is achieved primarily through improving vegetative ground cover. Structural measures of conservation involve the movement of earth, and this in itself creates an erosion hazard. Structures provide no protection against splash erosion - vegetation does. The importance of vegetation was illustrated by Hudson (1974) who cited an experiment in West Africa where the 10-year average soil loss from bare soil was 126.6 tons/ha;

but when the soil was completely protected from splash by fine wire gauze the loss was reduced to 0.9 tons/ha. In another research example, in maize grown 0.4 m apart in 1 m rows, the soil loss was 12.3 tons/ha/year but in a denser planting (0.27 m apart in 1 m rows) the soil loss was only 0.7 tons/ha. It is evident that preventing splash will greatly reduce soil loss; but even more important, the erosion process is cured at its source and more advanced stages of erosion are prevented from developing.

In addition to stopping splash and the resulting sheet erosion, vegetation alone will usually halt small gulley erosion; when used as a supplement to structural methods it will check large gulley and streambank erosion. On some sites vegetation can be used to reduce the frequency of soil slippage and slides. As compared to structural measures alone, the revegetation of exposed surfaces will usually have the additional advantages of lower cost, less maintenance, the direct production of crops -- a control which becomes more effective with each year of plant growth. Finally, vegetative methods take much less, if any, land out of production.

The efficacy of vegetation, whether trees, grass or shrubs, against erosion is due to:

- the protective canopy, which breaks the impact of raindrops and guards against splash erosion;

- the mat of litter, which further protects against raindrop splash, slows surface run-off and reduces water losses by evaporation;

- the channels of decayed roots in the soil, which aid infiltration;

- the physical binding of the soil with roots. In some cases the roots may anchor the soil mass to the parent material and in so doing reduce soil creep or landslides;

- the improvement of the soil structure and its water absorbing capacity through the addition of organic matter; and

- the process of transpiration, which removes water from the soil. This extends the period of infiltration, thus reducing surface run-off during small storms.

These considerations (and the fact that structures themselves use up land) suggest that whenever possible erosion control should be sought primarily by means of vegetative cover. Greatest vegetative protection is given by dense or close-growing plants, such as grasses or grass-legume mixtures, and when plants are fast-growing and high-yielding. Three particularly useful plants for conservation are described in the box.

Pigeon pea, Rhodes grass and Napier grass for Conservation 1/

Three plants - pigeon pea (*Cajanus cajan*), Rhodes grass (*Chloris gayana*) and Napier grass (*Pennisetum purpureum*) - are particularly valuable examples of multipurpose plants for restoring degraded lands, checking erosion, providing nourishing fodder, improving soil structure, retaining soil moisture and restoring overgrazed land.

Although many kinds of grasses and legumes serve this purpose, these three are representative of those which give good results in soil and climatic conditions in Ethiopia. They can grow in many kinds of soils up to an altitude of about 2 000 metres. At higher altitudes other grasses and legumes, e.g., oats and peas, are more suitable. Rhodes and Napier grasses are easily established by seeds and form rapid and spreading cover.

Grasses form a thick soil cover and their roots spread rapidly, binding soil particles together, improving soil structure. The cavities formed by dead roots greatly increase rain infiltration. The shielding, binding and filtering action of the grass foliage and roots controls erosion and helps hold soil in place on contour bunds. They can play an important part in gulley control, help stabilize the sediment which builds up behind check-dams, improve moisture and soil quality and turn sterile gulleys into valuable fodder producing land. Inside gulleys, grasses will reduce the velocity of water along the flooded bottoms. A good vegetative cover will intercept rainfall and help it infiltrate into the soil. Grass strips along gulley sides provide a strong defence against erosion.

Pigeon peas have a deep penetrating root-system, are thus drought-resistant and good for holding soil. Like most legumes, they enrich soil by restoring nitrogen and thus increase the growth of other plants/grasses when inter-planted. Pigeon peas grow vigorously, becoming bushy, and thus provide good ground cover. Pigeon pea seeds are high in proteins, are nutritious and tasty for humans. As forage, pigeon peas are especially important in supplementing proteins during the dry season, either by grazing or by cutting. Pigeon pea leaves spread around the stem of plants, such as coffee or fruit trees, can be used as an organic fertilizer and as a mulch. The leaves are rich in nitrogen and can substitute for chemical nitrogen fertilizer. They also add humus to the soil and improve its structure. When the stems of pigeon peas become thick enough, they can be used as fuelwood. Pigeon peas are food for the family and food for the farm, both stock and soil.

Better fodder ... better soil, more water, more food production. Conservation through increased production: Conservation-based Development.

1/ Adapted from a FAO filmstrip commentary with this title and specifically related to Ethiopia.

The prevalence of such plants depends essentially on the prevailing land use system. Changing to less intensive land use is usually an effective means of increasing natural vegetation cover - but this is also usually less productive. The challenge of Conservation-based Development is to develop each land use system in such a way that vegetative cover of the ground, particularly during erosive rains, is increased simultaneously with its sustainable economic productivity.

11.3.2 Forest lands and hillsides

Forested land is generally adequately protected against erosion, but natural forests are being depleted very rapidly for wood requirements and to meet land requirements for cropping and grazing. Forestry has therefore to be developed in such a way that it does not compete directly with cropping or livestock. This suggests the need for multipurpose forestry - more specifically, agro-forestry (section 12.5).

At present reafforestation efforts are primarily on steep and/or degraded hillsides which are usually terraced prior to planting (section 8.7). Hillside terracing for reafforestation has so far accounted for two-thirds of the labour put into the conservation programme, whereas 80 percent of erosion is from croplands. 1/ The proposal that greater attention be paid in the future to conservation of croplands emerged from the conclusions of Part II in which, furthermore, the very high costs (mainly labour) of hillside terracing for reafforestation were noted. Economic analyses (EHRS WP 18) suggest a substantially higher ERR in all three zones from hillside closure than from reafforestation, even with substantial cost reduction in the latter. With 33 percent of the Highlands having slopes greater than 30 percent, reafforestation of such areas would be both unnecessarily lengthy and expensive; therefore more reliance must be on closure for natural revegetation. Nevertheless, demand for wood is critical in some areas, and this should be the deciding factor in opting, in a particular locality, for reafforestation as opposed to hillside closure. In areas where wood is not a major constraint, reclamation of degraded hillsides should be undertaken more by closure. Proposals with respect to forestry development in general, and agro-forestry in particular, are made in sections 13.2 and 12.5, respectively.

There are many examples of hillsides which have been closed to livestock and on which there has been rapid regrowth of vegetation, even after one or two years (section 8.7.3). Werner (1982) has argued that, where the regrowth consists of bushes which reduce the area and the quality of grasses, then small stock might be grazed on closed hillsides in an organized rotational system. This may be difficult to organize, and it may be more practicable to encourage the removal of undersirable bushes by peasants seeking firewood, as has been done by the SWCD in the Mulu/Asbe Teferi catchment. Local peasant requirements should determine the balance of wood and forage requirements and the closed hillsides should be so managed.

1/ Some of the reafforested hillsides may have been used previously for cropping.

The major problem with hillside closure is the lack of technical knowledge at the DA and PA levels concerning the productive use of closed hillsides (section 8.7.3). There is a clear need for training at the PA and DA levels on management and productive use of closed hillsides and enrichment planting. Experience at Sirinka and elsewhere should be used to draw up guidelines specific to the different Highland agro-ecological zones and farming systems. Different methods, e.g., rotational and/or selective stock grazing vs. cut-and-carry systems, could be tried simultaneously under monitored conditions at the PA level so that the peasants themselves could influcence final recommendations. (see section 12.4).

HILLSIDE CLOSURE - SOME SUGGESTED SPECIES

Above 2 500 masl, natural revegetation with indigenous species generally provides good quality feed, at least until October, and because recommended utilization would probably be by cutting, much of this could be conserved as hay. There would be advantages in including species such as tall fescue to extend the growing period. Some exotic species with promise for these areas include Pennisetum clandestinum (already present in many areas), Setaria sphacelata and Cajanus cajan. From 2 000-2 500 masl there are more options. Sown species could include Rhodes, Setaria sphacelata, Desmodium uncinatum, Macrotyloma axillare, and perhaps Sesbania spp., Desmodium intortum, tall fescue and some Panicum spp. Below 2 000 masl for areas where rainfall exceeds about 900 mm, sown species could include Rhodes, Panicum spp., Paspalum plicatulum, Desmodium spp., Macrotyloma axillare, Macroptilium atropurpureum, Calopogonium mucunoides, Stylosanthes spp., and multipurpose trees such as Leucaena, Codariocalyx gyroids and Cajanus cajan. With lower rainfall, the major species could include Rhodes grass, Cenchrus ciliaries, Panicum antidotale, Macroptilium atropurpureum, Calopogonium mucunoides, Stylosanthes spp. and Leucaena.

11.3.3 Grasslands

Grasslands for grazing comprise the most widespread form of land use in Ethiopia, covering an estimated 60 percent of the area. Their livestock carrying capacity is determined by the plant growth that is in excess of what the plants need. Much of this excess can be cropped by livestock or wildlife without any damage. The problem arises primarily when livestock densities exceed carrying capacities, and a vicious degradation spiral starts (Figure 6.5). Overgrazed pastures only produce around half the dry matter content of properly stocked pastures (Jutzi and Haque, 1985). Overgrazed grasslands result in lower livestock productivity, nutritional stress, greater susceptibility to drought, etc., as well as increasing erosion hazards. The SCRP has demonstrated the degree of soil protection provided by grass: soil losses of around 6 tons/ha/p.a. on grasslands, compared to losses of 40 tons and over on similarly sloped arable lands. The most extensive areas of overgrazed grasslands in the Highlands are in the drought-susceptible areas of the LPC zone. But large parts of the rest of the LPC zone and the HPC zone are threatened both by dense livestock populations and by the spread of less palatable grass and legume species. Burning in such areas achieves short-run gains through encouraging young and more palatable shoots, but at the cost of longer-term losses of organic material which would otherwise have enriched the soil.

There is a range of options for restoration of degraded grasslands. Given the extent of the degrading grasslands in the Highlands and the human and capital resources available for tackling the problem, a minimal-technology approach has to be pursued. This is basically either closure with some enrichment planting or oversowing, or a combination of both.

Particular attention in oversowing should be given to using leguminous plants because of their high protein feed value and their soil improving qualities (see box). The selection of species of grasses and legumes depends on agro-ecological conditions. In most of the Highlands, rainfall is sufficient for perennial species but more attention might be given to the more drought-tolerant annuals in the lower rainfall areas of the LPC zone. Forage seeds study and production has been neglected in Ethiopia, but ILCA has carried out many trials (Mengistu, 1981) and further research is proposed as part of the Feeds and Forage Project now being approved by the World Bank. Species recommendations necessarily have to be site-specific, but Annex table A11.2 suggests grass and legume species for different altitudes of the Highlands, based on the findings of ILCA and others. Generally more reliance will have to be placed on local species tolerant of low fertility and heavy grazing. Regardless of species, many grasslands should revert to multipurpose land-use systems to supply fuel and timber as well as forage. 1/ Major characteristics of some multipurpose plant species recommended by the SWCD are listed in table A11.1. Indigenous acacia species once helped fulfill the dual wood-forage role and should now undoubtedly form a major component in such agro-forestry systems (section 12.5).

A major limiting factor with regard to edaphic grasslands is drainage. Certain grasslands are badly drained, and by the time the water table falls, lower temperatures and frosts inhibit growth. ILCA is experimenting with drainage systems on such vertisol areas (section 12.2). For grazing, it would probably be most cost-effective to introduce species more tolerant of waterlogging and growing during the cold season, but some structural drainage works might be considered to make such areas more accessible for livestock feeding, and to encourage plant growth in those areas of critical feed shortage during the rains.

1/ A useful survey of multi-purpose plant species for Highlands conservation, together with recommended planting techniques is given by Chadokhar (1984).

GRASSLAND PLANTS FOR LIVESTOCK
(Some definitions and explanations)

Fodder Crops are usually cut for livestock feed but can be grazed. Valuable for supplementing feed in dry periods.

Forage crops are usually grazed.

Grasses have a high nutritive value when young, but this diminishes rapidly after emergence of flowering stems, when their fibre content increases. Grasses are very efficient compared to other plants in providing ground cover and in maintaining or improving soil structure and fertility.

Legumes are richer in protein and minerals than grasses and retain their quality longer. When certain legumes grow together they can bring about "fixation" of nitrogen through the functioning of nodule-forming bacteria in their root cells. This enhances plant growth.

Browse plants have hard wood stems. They include both trees and shrubs, some of which are leguminous. Their stems, leaves and fruits are edible and they provide fairly high quality feed during dry periods.

Generally a high yield of dry matter which is both digestible and nutritious is often indicated by the leaf/stem ratio. The highest proportion of protein and lowest proportion of fibre content are found in the leaves. Thus the best grassland plants are usually those that remain leafy for the longest period after the start of the growing period. The dry matter content decreases and digestibility increases as the frequency of cutting or grazing increases. Cutting or grazing, besides weakening the plant's top growth, can also affect root growth. Grass roots continue growing normally (in active growth periods) when not more than 40 to 50 percent of their vegetative parts are eaten. If more than this is eaten, root growth is stunted and less able to reach stored soil moisture so that the grass is more susceptible to drought. Stunted root growth by reducing the plant's energy reserves also leads to slower vegetative recovery after cutting, grazing or drought. Forage digestibility is often inadequate for satisfactory animal age/weight gains during the advanced stages of plant growth, particularly in dry weather, when feed supplements are important. Supplementary feeding can also delay grazing on natural grasslands for about two to three weeks after the start of a new growth cycle at the end of a drought period, thereby giving forage plants time to develop fresh leaf and replenish depleted root energy reserves.

Indigenous seed multiplication at the PA level would help enlighten the local community on the importance of increasing feed availability and be an economic means of achieving a rapid and widespread increase in feed availability.

Seed should be distributed free of charge to encourage maximum use. Typically, seed should be sown on grasslands without cultivation and using very low seeding rates (for example, as low as 1 kg/ha). Oversowing is a major component on the proposed feeds and forage project which should, in its early stages, determine site characteristics which would enable successful oversowing without cultivation. Species such as Stylosanthes, Sitrato and Calepo have the capacity to establish, survive and spread even with heavy grazing pressures, and no modification of grazing should be required. Oversowing roadsides from vehicles should be given high priority as it is a low-cost and quick method of introducing species to a new area, although roadsides often have a micro-environment different from surrounding areas. The technique offers very long transects providing useful rough information on adaptation to a wide range of environments, where the plants are conspicuous to peasants and to local extension staff. Oversowing of all areas must involve local PA's to ensure subsequent interest and support.

Apart from increasing the carrying capacity of grasslands, the policy for their conservation-based development is to promote their improved grazing management. The techniques concerned are well known and include adjusting or deferring grazing to match carrying capacities (e.g., by relying more on cut-and-carry systems during critical grass growing periods 1/), selective stocking, and rotational grazing. Different pastures can be deferred each year in a rotation sequence that maintains productive vegetation in all of them. Live fences can be established from multipurpose (feed/wood/fuel) species such as Leucaena, Sesbania, Glircidea and/or even Acacia sp. and should be used to separate croplands from adjoining grasslands, to separate different crops, plots and fields and along roadsides, gulleys, waterways, etc. Croplands can thus be protected from damage from livestock prior to harvesting; after harvesting such fences make it easier to confine the animals to aftermath and stubble grazing. On pure grasslands, live fencing along contours can itself

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1/ At the very beginning of the growing season when the grasses break dormancy, their initial growth is dependent on stored nutrients. With the development of a leaf surface, photosynthesis becomes operative and this forms the ideal stage in which to graze. Many grasses which are highly palatable to some livestock can be killed as a result of continuous early grazing because the plant is unable to accumulate enough photosynthetic material to maintain growth.

help control erosion and can be laid out to facilitate rotational and deferred grazing. Suggestions on the establishment of live fences are made in section 12.5.

The main constraints to improved grazing management are not technical, but motivational and organizational: the grasslands are communally owned, while livestock are privately owned, giving rise to the overgrazing syndrome (section 5.6.5). Some suggestions to overcome these problems are made in sections 11.6 and 12.4. Further utilization of grasslands can additionally be pursued through improved stock feed techniques (section 12.4).

Further adaptive and area-specific research is needed for the continued development of the grasslands and a livestock nutritional strategy. In most areas, however, it is unnecessary to delay grasslands development until such research is undertaken. Many of the abovementioned proposals should be initiated immediately, with research playing a complementary role by providing refinements for subsequent incorporation into the strategy.

11.3.4 Croplands

Vegetative measures for conservation of croplands generally coincide with the practices of good farming, rational land use and efficient soil management. The requirements to sustain high yields are similar to those to minimize soil erosion from croplands.

Conservational land preparation measures are proposed in section 11.7; the use of herbicides and zero tillage is reviewed in section 12.2. The use of perennial crops, mixed and relay cropping to keep some plants in the ground all the year, strip cultivation techniques with only the seed line cultivated, or with wider cultivated strips alternated with grassed strips, are examples of "conservation cropping". While rainfall limits the extent to which perennials can be included in the cropping pattern, there is considerable scope for choice among annual crops. Crops which are broad-leaved and germinate quickly, such as beans, cover the ground faster and provide more effective control of erosion than, for example, maize. Strip cropping - i.e., growing alternate strips (up to 30 metres wide, depending on slope along the contours) - of erosion-resistant plants such as wheat, barley or even perennials with strips of wider-spaced crops such as maize and sorghum, has proven effective in controlling erosion at slopes of up to 20 percent. This of course requires cooperation between all the peasants farming a particular hillside. More permanent narrow (1-3 metres wide) grass strips are particularly cost-effective along contours on slopes up to about 8 percent (section 11.4). The use of manures or fertilizer to promote vigorous growth also helps to provide earlier cover. The closer spacing of crops such as maize can help control erosion. For example, some maize varieties can be spaced as closely as 20 cm without reducing yields, and such close spacing along contours can significantly reduce run-off volume and velocity. But closer spacing may require fertilizer, which would not be appropriate in areas where soil moisture is likely to constrain plant growth (LPC zone). There should be research on closer spacing for farming systems in the HPP and HPC zones.

The timing of cultivation and planting in relation to seasonal erosivity is important. Any measures which bring forward planting dates and/or reduce the durations and requirements of land preparation are good for conservation. Proposals are made in section 12.2. Ratooning, or the practice of cutting the crop back to ground level after harvest and allowing it to grow to produce a second crop without resowing, is arguably the simplest example of zero tillage crop production, and has great value in reducing the erosion hazard. Ratooning, however, is not applicable to all crops. Sorghum is the most widely grown crop in Ethiopia that responds well to ratooning, a fact that is currently being used to advantage in Gamo Gofa Region. Early maturing sorghum varieties that are planted in long growing-period areas, providing they respond to ratooning (there is distinct variability between varieties), could give a second crop without any cultivation. The second crop is commonly less than the first, but frequently not by much. Other crops that respond to ratooning are sugarcane, pigeon pea and perennial cotton. Annual temperate cereals such as wheat and barley do not; neither does maize.

Crop residues and mulches reduce the impact of rain and absorb and slacken run-off, but in the Highlands most residues are grazed. Possibly of greater relevance is the potential to follow main cereal crops by a fodder crop grown on residual moisture (discussed further in section 12.2). Such multiple cropping is a standard agronomic practice that is both highly productive and soil conserving. Whether it takes the form of sequential cropping that limits the bare fallow time between crops, or inter-row cropping that limits the spatial extent of bare soil within a field, the result is the same. At any given time, cover absorbs the impact of raindrop and slows run-off. Further applications of multiple cropping are proposed in section 12.2, while systems of agro-forestry farming are proposed in section 12.5. Fallowing under grass can play a major part in erosion control because of ground cover and the improvement in soil structure which results. The beneficial effect may not last for more than two years after breaking, but a system in which a period under crops alternates with a period under grass has much to commend it. Deep-rooted grasses and legumes not only improve structure but help to restore to the surface nutrients which may have been depleted by cropping or leached by rainfall.

Many of the measures mentioned above are also beneficial in building up the organic content of soil, thereby reducing its erodibility and increasing its capacity to absorb rain. The role of organic fertilizer in developing Ethiopian agriculture has been largely ignored by farmers and researchers alike - the former more from necessity of using dung for fuel, and the latter perhaps from their tendency to concentrate on high-technology packages associated with the initial green revolution (section 12.6). Soil management in Ethiopia is particularly lacking in the return of organic matter to the soil. Not only is the post-harvest stubble grazed, but even the dung of livestock is collected and removed.

The effectiveness of many of the abovementioned practices, both in increasing crop production and improving conservation, is accepted in research circles. The fact that such practices are more the exception than the rule in most farming systems of the Highlands is a major cause for concern. To redress this requires major efforts in extension and improving peasant motivation. Much more attention has to be given to these tasks with a view to providing vegetative measures of conservation on croplands. Structural measures should be seen as a means of last resort, to be applied with vegetative measures when the latter alone are insufficient.

11.4 STRUCTURAL MEASURES

11.4.1 General considerations

In some forms of land use, structural measures can provide a desirable, even a necessary, support to vegetative measures. This section reviews structural measures appropriate to different land use systems of the Highlands, taking into account the experiences so far gained in their use to date (Chapter 8). The emphasis is on overall issues and options, rather than on making recommendations concerning the details (design, dimensions, etc.) of the structures themselves; the latter being more appropriate to a conservation manual for Ethiopia. A conservation manual is currently under preparation within the SWCD. 1/ This manual will, like this strategy, need to be updated periodically in the light of accumulated experience, new data, etc. To facilitate updating, the conservation manual should be issued in loose-leaf binder, preferably small enough to be carried conveniently by development agents. Thus the whole manual need not be republished whenever a particular section is updated. Similarly, certain staff might not need all sections of the manual.

1/ Detailed recommendations on conservation techniques have been made in a series of field documents by GOE/FAO/UNDP project ETH/81/003. Many of these are listed in the bibliography (Annex 3). The SCRP under the leadership of Dr. Hurni is also preparing a comprehensive conservation manual for Ethiopia.

Most land in the Highlands is under grass and used primarily for grazing livestock (section 5.1). It was concluded in Chapter 6 that less than 20 percent of the total soil losses in the Highlands were from grasslands which were stocked in excess of their carrying capacities - this is mainly in the LPC zone (section 5.8). The solution to the degradation of grasslands has, almost exclusively, to be sought in their management - either destocking or increasing their carrying capacity - measures which are pursued further in sections 11.3 and 12.4 respectively. The role of structural conservation measures on grasslands is largely confined to gulley control and to drainage by waterways and cut-off drains (Figure 8.5). Some forage crops for cut-and-carry can generally be planted in connection with such measures.

If a gulley is old and has its sides already partly stabilized with vegetation, it should be given low priority for treatment, except to stabilize the headscarp if that is still retreating. Newer gulleys which are actively eroding valuable land should be given much higher priority for treatment. If run-off can safely be diverted from the gulley without causing problems elsewhere, the cost of control can be low and the use of temporary structures and revegetation should suffice. However, if the gulley has to continue as a watercourse, permanent structures may be needed in addition to stabilization by revegetation. With local skills for making dry stone walls, it should be possible to minimize the use of gabions, which are very expensive. If there is a dam downstream and a risk of sedimentation, then check dams must be considered a priority. However, once the check dams are filled up, sediment will continue to be carried downstream. They should therefore be considered simply as an adjunct to better land use within the catchment. Cultivation and grazing should not be carried out within a minimum of 5-10 metres around gulleys. This area should preferably be used for trees which can help to stabilize the gulley sides and discourage slumping. Where run-off can be diverted, it should be possible to use a gulley for fodder or fuelwood production. The cost of such reclamation measures can sometimes be recovered from the production of fodder, fuel or building poles.

Forestlands generally need little additional protection against erosion (Chapter 6). Land being newly reafforested in the Highlands has usually been terraced beforehand (section 8.7). But from EHRS analyses (section 11.3) it is concluded that terracing is an unnecessarily costly 1/ and uneconomic approach to reafforestation. Micro- or eyebrow-terraces in the LPC zone, and in other zones only pitting, supplemented, if necessary, by cut-off drains, fulfill the same objectives far more economically. Conservation/reclamation objectives can

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1/ Up to 830 mandays per ha with labour soil movement at $3m^3$ per day and 2m vertical intervals for terraces.

be achieved even more cheaply by closure - if necessary, supplemented by occasional enrichment planting. Only in extreme cases of severely degraded and lower rainfall areas (parts of the LPC zone) can hillside terracing be justified as a reclamation, as opposed to conservation, measure - and then for its water retention, rather than soil retention effects.

This means that structural measures should be confined largely to croplands, which account for some 30 percent of the Highlands area, but perhaps 80 percent of its current soil losses. Croplands under perennials are generally adequately protected from erosion by perennial vegetative cover and remaining shade trees and by the absence of ploughing, unless interplanted with annuals (enset may be an exception). Croplands of less than two percent slope have low vulnerability to erosion; those which need specific conservation measures have annual crops on slopes greater than 2-6 percent (around 2 percent for the most erodible luvisols and acrisols, and 6 percent for the less erodible nitosols and phaeozems, depending on erosivity, etc.). Generally, the greater the slope, the more likely that vegetative measures will need to be supplemented by structural measures.

The type of structure required to support annual cropping depends on the slope gradient, soil type, run-off characteristics, method of land preparation, crop-soil water requirements and other factors, and the selection of structure obviously has to take into account its impact, costs and acceptability to farmers. To the extent that tillage affects the structure of land, it may be considered as a structural measure, and the importance of contour ploughing needs to be stressed. Minimum and zero-tillage methods merit top priority in adaptive agricultural research in Ethiopia (section 11.4). The findings from such research could have a major bearing on conservation strategy.

The basic aim in using conservation structures on croplands should be to maximize impact in terms of reduced soil losses and minimize the productive land taken up by the structures. It has been estimated (EHRS WP 18) that over 40 percent (LPC zone) and as much as 80 percent (HPP zone) of the longer-term economic costs of bunding can be attributed to the losses arising from the land taken up by the bunds. The impact of structures obviously depends on their quality of construction and maintenance, but their general effectiveness is ranked in table 11.3.

All the structures listed in table 11.3 will, if adequately maintained, gradually build up terraces (Figure 8.4). Generally the greater the initial construction costs (grass strips or trash lines being the cheapest, and benches the most expensive), the quicker the buildup of the resulting terraces. The impressive conservation structural achievements of the past decade were only possible by standardisation and concentration on relatively simple structures - basically zero-gradient bunds on croplands (Chapter 8). The need for greater differentiation in the choice of structures as well as in their design to reflect different field conditions and requirements has been accepted.

Table 11.3

EFFECTIVENESS RATING OF STRUCTURAL MEASURES
(the more stars, the better)

	Field erosion control	Run-off retention	Sediment control from Field
Grass strips	**	*	**
Bund, graded	***	**	***
Bund, zero-gradient	***	****	****
Fanya juu terrace, graded	****	**	****
Fanya juu terrace, zero-gradient	*****	****	*****
Level bench, graded	*****	****	*****
Level bench, zero-gradient	*****	*****	*****

Source: EHRS WP 25.

A start in this direction has already been made, but substantial improvement in the number and training of field staff will be needed to lay out and construct these site-specific structures.

11.4.2 Grass strips

It is now widely accepted, though not yet widely practiced, that on croplands of up to about ten percent slope, narrow (up to 1 metre wide) contour grass strips are generally only slightly less effective than bunds in controlling erosion, but much less expensive to construct and to maintain. Grass strips are best established from splits. Establishment from seed is more difficult because seed is not readily available, it is easily washed out and seedling grasses cannot compete with weeds. Wide strips are not recommended because most of the deposition takes place at the upper edge and loss of land from cropping should be minimized. Account should be taken of the need for livestock feed. The value of the forage produced by such strips may partly offset the loss of cropland 1/. Suitable grass species include Setaria, Panicum, Brachiaria, etc. Elephant grass (Pennisetum purpureum) or Bana grass (which is similar) are very competitive with the adjacent crop and should not be used in drier areas or where strips are closely spaced. Makarikari grass (Panicum coloratum var. makarikariensis) has

1/ With strips of half a metre, spaced at 10 metres, these losses will be about five percent of the cropland.

been widely used in the drier areas of Kenya for stabilizing bunds and could be used for grass strips. Guatemala grass (Tripsacum laxum) has proved useful in wetter areas. Local research is needed to identify other suitable indigenous grasses which can be multiplied locally and transported to sites on pack animals.

Grass strips cause less interference to the farmer than other structural measures as they can easily be crossed with oxen and plough, although care (and motivation) is needed to prevent ploughing out or undercutting the strips. Economic analyses (EHRS WP 18) suggest that grass strips generally give much greater economic returns than bunds on lower slopes for which either measure may be used. But while grass strips are effective in controlling erosion through the trapping of sediment, most run-off flows through the strips and they are therefore less effective in water conservation. To the extent that water conservation is a major objective in the drier LPC zone, grass strips are less appropriate there than in the other zones.

11.4.3 Bunding 1/

Soil bunds (stone bunds in stoney areas) are the minimum necessary supporting conservation structures on all present annual cropping systems in the Highlands between 10 and 30 percent slope in the wetter areas (HPP and HPC zones) and from 2 to 30 percent in the drier areas (LPC zone). On steeper slopes bench terraces are usually considered more appropriate from the technical point of view, but are costly - particularly in their labour construction. At slopes of greater than 60 percent, the high proportion of land taken up by structures generally makes them uneconomic and such slopes are better used for perennial cropping, managed grazing and/or forest.

The effectiveness of bunds depends firstly on maintaining sufficient capacity to prevent overtopping; secondly, on proper stabilization to prevent breakage; and thirdly, on protection against run-off from higher ground, if necessary by a cutoff drain. Generally, it has been suggested that more attention in bunding should be given to the fanya juu method. The combination of throwing soil uphill and the natural process of erosion hastens the development of bench-type terraces which are forward-sloping. This may well be the best aim for conservation structures on steep land wherever level benches cannot be made, because of the labour involved, lack of soil depth, or unacceptably high loss of cultivable area. But the work of constructing a fanya juu terrace to retain or discharge water is around twice the work of making an ordinary soil bund with the same capacity. This is explained by the fact that with a bund, soil thrown downhill and the resulting channel combine to give the capacity required. With a

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1/ Parts of this section are also relevant to other structures.

fanya juu terrace soil thrown uphill creates some drainage capacity, but this cannot be added to that of the channel below. The SCRP is presently carrying out comparisons of both types of bunds on farmers' fields and it is premature to make a definite recommendation pending completion of these comparisons. If, eventually, these are found to be better than ordinary bunds, many of the latter could be converted to fanyajuu terraces by building them up with soil taken from the lower side.

There also seems to be growing concensus among conservation technicians that some bunds should be graded, and most particularly under rainfall or soil conditions where run-off exceeds the moisture-storage capacity of the soil (i.e., HPP and HPC zones) so that the gradient drains away excess run-off. There is less agreement with respect to drier areas (the LPC zone) in which some argue (EHRS WP 25) that bunds should be level to retain water, while Hurni has suggested that bunds might be graded, to discharge water into small ponds, tanks, etc. for mini-scale irrigation (see SCRP 1984). The possibilities for this, especially as the run-off concerned would be full of sediment, are thought to be very limited, but further study of the possibilities of water harvesting is required (section 12.3). It should be noted that the channel capacity needed for retention of runoff is much greater than that required for drainage of run-off. In areas requiring water conservation in situ, as opposed to drainage, cross ties may be needed if levelling is poor. But cross ties are unpopular with farmers because the channels take up more land and the cross ties themselves need frequent rebuilding. Therefore it is better to aim at more accurate levelling in the first place.

Structural measures should be seen as a long-term investment leading to permanent improvement of the land. They are not something to be repeated every few years. The quality of construction and maintenance must be emphasized. If they are properly made, they can make a major and lasting contribution to controlling erosion. In pursuit of this, it is suggested that consideration be given to relating FFW payments to areas effectively conserved rather than to quantitative targets, which sometimes result in poor quality work. This would depend on training of DA's and PA leaders.

The major problem with most structural measures is that they take up land: 2-5 percent at slopes up to 8 percent; 8-12 percent at slopes of 8-16 percent; 15-20 percent at slopes of 16-30 percent; and often over 25 percent at slopes in excess of 30 percent. This is resisted by farmers, giving rise to poor maintenance or even deliberate destruction. For this reason, structures have to be accompanied by an educational programme to explain that yields will eventually be lower without the structures, that the structures increase plant water availability in drier areas. Also, the structures themselves should be made to be productive: for example, by growing a permanent grass for cutting for forage, a measure which stabilizes bunds and reduces subsequent maintenance requirements.

There are various plants which can be used to stabilize bunds and the choice should be made after consideration of yield of fodder, its ability to cover the bank, ability to trap sediment which would otherwise be washed over the bank, persistence, speed of establishment, competition with the adjacent crop and shelter for rodents. It is unlikely that any one plant could meet all the requirements, and a case could be made for using a mixture. Some plants for bund stabilization are suggested in the box which follows.

PLANTS FOR BUND STABILIZATION

The planted grass should preferably be a stiff-stemmed species and a high-yielding fodder. A good species, except in arid areas, is Napier grass (*Pennisetum purpureum*) or bana grass. Bana grass has a thinner stalk and is more rich in leaves than Napier grass. It also has more stalks than Napier grass, producing a denser cover. As bana grass has deeper roots, it is also more drought-resistant. Guatemala grass (*Tripsacum laxum*) is very widely used for bund stabilization. Its climatic conditions are similar to those of Napier grass. Guatemala grass is tall and broad leaved, but less productive than Napier grass and has a lower nutritive value.

The present policy is to use Rhodes grass (*Chloris gayana*), Sudan grass (*Sorghum sudanense*) or Columbus grass (*Sorghum almum*), and pigeon pea is sometimes planted along the lower side of bunds. Of these, only Rhodes grass is a perennial, but it is only suitable up to about 2 200 masl. Star grass (*Cynodon* sp.) is available locally and could be used as an alternative. Other grasses which could be tried include Guinea grass (*Panicum maximum*), Donkey grass (*Panicum trichocladum*), Signal grass (*Brachiaria ruziziensis*) and Sweet-pitted grass (*Bothriochloa insculpta*). At higher elevations, Nandi setaria (*Setaria anceps*) and Molasses grass (*Melinis minutiflora*) should find a place.

Legumes are usually harder to establish, but could be tried on an experimental basis. The combination of a grass such as Rhodes grass and a legume such as *leuceana* could also be tried. The former would provide the necessary ground cover and the latter play a role in increasing both quantity and quality of fodder production and nitrogen fixation. Much more should be done to make available the necessary planting material and to use splits instead of seed. Bulking plots for suitable planting material should be established wherever possible within easy reach of farmers. Further work is required to select and multiply rapidly the plants most useful for erosion control. This is a major undertaking, and one in which useful research has already been done in ILCA, SPCRP and IAR.

Even with stabilization, most structures require some maintenance, and this in all probability is dependent on the motivation of the farmer on whose plot the structures lie. Financial analyses (EHRS WP 18) suggest that the payback period for bunds from the individual farmer's viewpoint is well over ten years - probably more than double this in the wetter farming systems. Furthermore, payback is not seen to be certain - at least by the peasant. Recalling the findings of the EHRS Sociological Survey that one in three farmers has had all or part of his holding changed since the PA redistribution of land, one can conclude that motivation to maintain structures is weak. Motivation is pursued further in section 11.6.

11.4.4 Concluding observations

Table 11.4 summarizes the tentative technical recommendations for conservation structures on croplands at present levels of technology. This table is intended to be only indicative because technical recommendations necessarily have to be site-specific. Developing such specific recommendations is a long-term and continuing exercise.

The economic costs of all structures are greatest in the HPP zone, intermediate in the HPC zone and least in the LPC zone, reflecting the value of both the land and labour used for the structures.1/ For similar reasons the economic costs of structures increase at lower altitudes. Conversely, benefits from the structures are greatest in those areas where the losses from erosion are greatest (Chapter 7). In drier areas, water conservation can increase yields (section 7.2). Generally, calculated benefits are greatest in the LPC zone, intermediate in the HPC zone, and least in the HPP zone (EHRS WP 18). In all three zones benefits tend to be smaller at the higher altitude (and lower value) farming systems. The ERR (over 50 years) from bunding in farming systems of the HPP zone was calculated at 4-6 percent, 9-10 percent in the HPC zone, and 13 percent in the LPC zone. This implies the need to pay proportionally more attention to vegetative methods of conservation in the wetter areas. Fortunately it is these (i.e., the HPP and HPC zones) which offer the greater possibilities for such measures. Whatever measures are used, they should form part of an integrated system by which the movement of run-off is controlled from the top to the bottom of a catchment. A piecemeal approach with water discharged at random could create further problems lower down.

In conclusion, structural measures used for either conservation or reclamation are likely to be ineffective, and can result in very high economic costs, unless accompanied by:

- improved land use to remove the original causes of degradation; and
- adequate maintenance.

1/ These findings are not very sensitive to changes in parameters/ assumptions (EHRS WP 18).

Both these requirements are essential, and it is not advisable to plan structural works unless there is reasonable likelihood that these conditions will be met.

Table 11.4

INDICATIVE RECOMMENDATIONS FOR CONSERVATION STRUCTURES ON ANNUAL CROPLAND IN EACH ZONE AND ALTITUDINAL BELT 1/

Slope (%)	Altitude (masl) 1 500-2 000	2 000-2 500	2 500-3 000
	LOW POTENTIAL CEREAL ZONE		
2-10	bund, level	bund, level	bund, graded
10-16	bund, level	bund, level	bund, graded
16-30	bund, graded	bund, graded	bund, graded
≥30	bench	bench	bench
	HIGH POTENTIAL CEREAL ZONE		
2-10	grass strip	grass strip	grass strip
10-16	bund, graded	bund, graded	bund, graded
16-30	bund, graded	bund, graded	bund, graded
>30	bench	bench	bench
	HIGH POTENTIAL PERENNIAL ZONE		
2-10	grass strip	grass strip	grass strip
10-16	bund, graded	bund, graded	bund, graded
16-30	bund, graded	bund, graded	bund, graded
>30	bench	bench	bench

1/ This table indicates measures most appropriate (under present farming conditions) to treat a large area of land as quickly as possible and achieve a fair degree of erosion control.

Source: Adapted from EHRS WP 25.

11.5 CONSERVATION RESEARCH, EXTENSION AND TRAINING

11.5.1 Research

It was concluded in Part II that degradation is too severe a problem for research into conservation and reclamation to be segregated from mainstream agricultural research, and that in any case the problem can only be effectively tackled through a Conservation-based Development

Strategy. The technology to support Conservation-based Development necessarily has to be generated within agricultural research. Accordingly, it has already been proposed that conservation research, now split between four separate agencies, be brought together, under the IAR (section 8.5.1). The lead in conservation research undoubtedly has been taken by the SCRP and, with its funding assured for a further three years, this project and the IAR together should seek the blending of agricultural and conservational research to the mutual advantage of both. This section concerns the narrower conservation-specific aspects of such research, and the proposals made in this section should be viewed within the context of the comprehensive agricultural research strategy proposed in section 12.6.1.

The threats to sustainable development imposed by degradation call for urgent action and cannot await findings from long-gestation research. Action on the basis of existing knowledge and known techniques has already been initiated and can be further replicated in the Highlands. But, as identified in Part II, the major weaknesses in the present conservation programme are its segregation from development and its reliance on structural measures and on eucalyptus afforestation. Research therefore needs to be given priority simultaneously with continuation of a newly-oriented conservation programme, and the main emphasis within conservation research has to be on vegetative measures and the integration of conservation and agricultural production in particular.

It has already been suggested (section 11.3) that enough is already known about some vegetative measures to merit their field verification in the context of specific farming situations in the Highlands. Apart from field verification trial plots, there is an obvious and continuing role for one or more conservation pilot projects to undertake such testing and even demonstrations on a sufficiently large scale. Such a project could give conservation research a continuing action-orientation. It would seem to be only sensible to build on the existing pilot project - the Sirinka Pilot Catchment Rehabilitation Project (SPCRP) - which encompasses broad agro-ecological variety in a severely degraded catchment especially chosen for this purpose. Specific proposals are made for the continuation and enlargement of the SPCRP in Chapter 14.

To complement the above research emphases, the orientation of conservation research has to be developed in line with that proposed for agricultural research as a whole - namely, toward adaptive research with a farming systems approach. Thus much is already known about the nature and processes of erosion, how farming practices cause erosion, and the structural solutions to the problem. Research should now address itself more to <u>why</u> people follow such practices and <u>how</u> the known solutions can be <u>profitably</u> integrated into their farming systems. This calls for much greater consideration of socio-economic factors than is evident in on-going conservation research.

Other important topics for adaptive research based on local farming systems include:

- compilation of monthly erosivity tables for the major farming systems so that the critical times for seeking more ground cover are better known;

- firmer classification of soils according to their erodibility at different slope levels so as to provide an improved basis for land capability and use assessment;

- assessment of the relative importance, in different circumstances, of splash displacement of soil particles as opposed to particle transport by run-off and the implications of this for conservation recommendations (the greater the importance of splash erosion, the more necessary it is to emphasize a quick and dense ground cover during erosive rain);

- evaluation of different land use patterns from the standpoint of degradation - particularly present cropping patterns, calendars and practices - with a view to suggesting improvements under the theme "conservation through increased production". Particular attention needs to be given to multiple-cropping systems and the integration of forage crops into farming systems (section 12.2) and agro-forestry (section 12.5);

- zero-tillage (section 12.2), especially for teff, which has not been tried in other countries, and its effect when most crop residues are grazed or used for fuel;

- the farm management aspects of various measures of inter-cropping, mixed cropping, and relay cropping need thorough study, on farm;

- the socio-economic and technical feasibility of grazing management alternatives (section 11.3).

Maximum use should be made of both the research and training facilities offered by the International Research Centres and other international organizations concerned, e.g., FAO, UNEP, UNESCO. Such organizations could be invited to assist in drawing attention to relevant research elsewhere. Major topics for more basic or original research outside Ethiopia (so that Ethiopia can concentrate its resources on more adaptive research with faster pay-off) include investigation of the relation of soil losses and yield reductions for different soil and plant types, changes in soil erodibility over time, varying applications of seed and fertilizers under different slope and erosivity conditions to provide quicker vegetative cover as well as to obtain improved crop yields.

While it has been recommended that research be carried out under the IAR, impact monitoring could usefully be carried out by both SWCD and IAR as findings should be used by the management of both agencies to improve the design and implementation of their programmes. Monitoring is largely confined to counting trees planted or kilometers of bunds. Emphases should be on plant/tree yields and on areas effectively treated. Data collected needs to be more thoroughly analysed and used. Such management-oriented monitoring should also feed into broader monitoring of changes in the Highlands ecosystem (section 15.7). Evaluation is better carried out by a completely independent agency, and it is suggested that the start made by the University Faculty of Agriculture at Alemaya (section 8.5) should be supported with appropriate international assistance, both funding and technical. Such evaluation should concentrate on the effects of conservation measures on production and their socio-economic acceptability, as opposed to limiting itself to measuring changes in soil losses.

11.5.2 Training and extension

The need for the integration of extension work in conservation with general agricultural extension has already been emphasized in section 8.5.2, and recent reorganizational changes in the MOA will facilitate such integration which, at the grassroots level, is exemplified by the multi-disciplinary development agent (DA). Among the constraints to general extension and conservation extension listed in sections 5.8 and 8.5.2 respectively, one of the most important is the lack of conservation training that reflects the aim to achieve conservation through increased production. At all levels of agricultural training in Ethiopia there is more segregation than integration of conservation and agriculture.

Thus conservation accounts for a surprisingly small percentage (only 2 percent) of the undergraduate course in agriculture offered at Alemaya, and even that relates to soil conservation "engineering". Coverage of vegetative methods of conservation is minimal. This is also true at other agricultural training institutes (see table 11.5). Conservation is regarded as a subject so separate that it tends to be taught more in special short courses outside normal agricultural training.

To some extent this segregation has been promoted by some external agencies assisting in Ethiopia's development. Thus recent missions have proposed the establishment of a separate Soil and Water Conservation Training Centre to provide conservation training at all levels and a separate conservation degree at the Alemaya College of Agriculture 1/.

1/ There is of course a need for both generalists and specialists in Conservation-based Development, and there may be merit in the proposal to establish a Master's Course in Conservation for graduates in agricultural sciences. This, however, takes second priority to the full integration of conservation into Bachelor's agricultural courses.

These proposals are not supported here because they could perpetuate the segregation of conservation and agriculture. Rather, it is proposed that conservation, and specifically Conservation-based Development, become the objective and underlying theme of all agricultural training (including forestry) in Ethiopia - at all levels in varying degress of sophistication. In this way the engineering bias of present conservation activity, the eucalyptus bias of present reafforestation, and the short-term biases of most agricultural development can be tackled.

Table 11.5

RELATIVE IMPORTANCE OF SOIL CONSERVATION IN TEACHING PROGRAMMES OF AGRICULTURAL TRAINING INSTITUTES

Institute	Soil conservation as percent of total course
Alemaya Agricultural College (University Graduates)	2
Wondo Genet (Forestry Diploma)	5
Awassa Junior Agricultural College (Certificates)	4
Agarfa Multipurpose Farmers Training Centre	8

Source: The institutions concerned.

In order to fully integrate conservation into agricultural training at all levels, it is proposed that very high priority be given to the establishment of a high level task force to formulate proposals specific to each level of training and education. Such a task force, preferably under the chairmanship of a top Ethiopian planner who understands and firmly accepts the basic principles of Conservation-based Development, should be supported by specialists in training and education for conservation. Some of these should be Ethiopian to help ensure the relevance of the proposals to Ethiopian conditions, but much could be gained from the participation of experienced international specialists in these fields. This formulation of training proposals is an obvious priority for technical assistance. Existing projects in Ethiopia (e.g., Assistance to Soil and Water Conservation: ETH/81/003) could possibly be used as a base. Care should be taken, however, to base such technical assistance in the appropriate institution (the Ministry of Education or the Training Section of the MOA), and it may even be preferable to rely more on consultants than on project staff.

Extensive use needs to be made of modern training aids, including audio-visual equipment, leaflets, pictures, slides, films, and mass media - at most levels of training. If provision of such equipment is combined with the requirements for similar equipment made for the more general promotion of the Conservation-based Development Strategy (section 11.2), a sizable investment would be required. This, together with an appropriate technical assistance component, should merit priority consideration for external assistance (Chapter 14).

Higher level training should also be provided through study tours, providing such tours are to countries from which Ethiopia can learn (from failures as well as successes), and providing more effort is made by all concerned to analyse and relate the "lessons" to Ethiopian conditions.

Motivation of extension staff could be strengthened by making regular refresher and development training both a necessity and an opportunity for career advancement. Regular refresher training is needed to keep staff ahead of their clients - the peasants. It also provides an opportunity for feedback - to enable the trainers and researchers to adapt to peasant extension requirements.

Further proposals with respect to training and extension are made within the context of general agricultural training and extension (section 12.6).

11.6 MOTIVATION AND LAND TENURE

11.6.1 Motivation

Most erosion occurs so gradually and subtly that its effects are easily overlooked until long after preventive action should have been taken. There is widespread realization that those who have to give up their resources (labour and land) to conserve soil are not the main beneficiaries of conservation. Soil conservation costs are usually immediate and obvious, whereas the benefits are often delayed, obscure and dispersed. It was concluded in Chapter 8 that motivation is at present constrained by the insecurity of land tenure (which makes it uncertain as to who benefits from conservation); by small plots; and by low crop yields (which make it necessary for farmers to cultivate their lands to the fullest extent possible). Thus, while farmers are aware of degradation, they do not always believe that they are the losers from it. Techniques of conservation may be well known, but there is as yet very little spontaneous individual conservation - either initial construction or maintenance - while farming remains essentially exploitive of the land. This is one of the main reasons for the proposals made in Part II, for a Conservation-based Development Strategy to link conservation and increased production.

Motivation to conserve the land may be enhanced by a number of factors, including improved land tenure, greater participation in decisions affecting land use, pricing, marketing and credit policies, subsidies, taxation and legislation. Motivation through FFW is the subject of proposals in section 11.6.3; land tenure is the subject of section 11.6.2. Popular participation in land use planning is important because in most cases conservation and reclamation have to be pursued simultaneously by a group of people - if not by all those living in a whole watershed, at least those farming the same slopes. Farms are usually too small and/or fragmented to allow the individual to have much impact on soil conservation. Group action is usually required and it becomes important that all members of the group concerned are involved in key decisions. The importance of peasant participation for all aspects of the Conservation-based Development Strategy is elaborated upon in section 15.6. The major role of central government is to foster such participation, provide technical guidance and generally create a socio-economic environment which encourages peasants to conserve their nation's land.

Pricing, marketing and credit considerations are reviewed and proposals made in section 12.7. Here it suffices to note that it is much easier to persuade people to participate in Conservation-based Development if it can be shown that it is in their individual as well as community interests to do so. Much therefore depends on the profitability to peasants of conservational farming systems. In the HPC and HPP zones generally, there should be scope for combining conservation and increased production in such a way that the packages are profitable to peasants. In the LPC zone it will be more difficult, basically because, with its shorter growing periods, more emphasis has to be placed on structural measures.

In such circumstances there are two general methods of "closing the incentive gap", and persuading the peasant to invest in conservation:

(i) Subsidies. The government pays all, or enough of the extra costs to reduce the cost to the farmer to the point where he considers the required measures worthwhile. The logic of this is that preservation of natural resources is in the national interest. To the extent that FFW rations for conservation exceed economic wage rates for that work, this is a kind of subsidy, but in this case paid by WFP;

(ii) Legal coercion. The policy makers introduce laws or regulations on how land can be used. Such laws can further reduce incentives to increase production and in any case are of very limited value unless they can be enforced. When enforced, they can injure the effectiveness of agricultural extension agents, who may appear as policemen, rather than friends of the farmer. More often, in other countries such laws are barely enforced, with weak penalties, inadequate enforcement budgets, and

> jurisdictional conflicts between the agencies concerned. 1/ The EHRS Sociological Survey revealed that coercion is very much resented by peasants, and it can be counter-productive in the longer term, making people apathetic or even downright antagonistic toward construction and maintenance of conservation structures.

In the longer term, the lowest-cost means of conservation is through its integration with development so that peasants incorporate conservation into their normal practices of land use.

11.6.2 Food-for-Work (FFW)

It was concluded in Chapter 8 that the FFW programme has been an important instrument in spreading structural conservation works and re-afforestation on a scale that otherwise would not have been possible. It has done so without providing any major production, labour or price disincentives (section 8.3.7). The programme should continue, on as wide a scale as possible, though by definition its relevance is limited to the food deficity areas of the Highlands, the LPC zone and drier parts of the HPC zone. In these areas it is proposed that much greater attention be given both to making the resulting conservation structures productive (section 11.4) and to accompanying them by intensified extension and other measures to increase agricultural production so that the loss of land taken up by the structures is offset by increased crop intensity (section 12.2).

The major factor limiting the scale of the FFW programme has been the amount of food available. In view of this, the fact that the standard ration is high compared with comparable rural wage rates; that it was originally intended as an emergency relief ration for people without other means of support (FFW participants have their own farms); and because the number of applicants for FFW almost invariably exceeds the rations available; it is proposed that the standard grain ration be reduced by one-third. This would enable work achievements to increase by one half, with the same quantity of food involved. It is also proposed that the oil content in the ration be reduced by 50 percent for the same reason (because oil is the less popular component in the ration, and often ends up being sold rather than consumed by the FFW participants concerned - IDR, 1984). Eighty-six percent of the peasant respondents in the IDR survey of the FFW programme indicated their preference for the wheat component in the ration.

1/ A useful discussion of the legal aspects of soil conservation based on material from selected countries is contained in FAO Soils Bulletin 15, Legislative Principles of Soil Conservation.

In section 8.3.6 it was also suggested that in some cases work norms may be too high for good quality work and that in nearly all cases they are not specific enough with respect to the height and width of bunds, diameter and depth of pits, etc. The GOE/FAO project (EHT/81/003) has produced a field document (No. 11) on work norms with proposals for changing them.

It was also concluded in section 8.3.7 (also supported by findings from the IDR Survey, 1984) that FFW rations are changing food preferences and habits in areas in which FFW activity has been intensive. This is good, to the extent that it is developing a stronger preference for wheat, which is higher yielding than teff. For the same reason - and because some known varieties of sorghum are also more drought-resistant than teff - WFP should be requested to explore the possibility of securing sorghum from its donor countries for distribution in the LPC zone.

In those areas where intensive FFW activities are taking place, local market grain prices should be recorded at weekly intervals; any sudden decreases should be subject to an on-the-spot enquiry to ascertain whether FFW supplies are providing any disincentive.

Any criticism of the FFW programme by participants is usually based on delays in payment of the ration. This most often arises because of lack of storage capacity at the PA level. Mobile and/or temporary stores have been suggested by an Evaluation Mission (WFP/UN 1982) to overcome this. On the other hand, it is hoped that the conservation works concerned - especially if integrated into an appropriate agricultural package - should increase crop production so that additional storage would be required both for inputs as well as larger harvested and marketed crops. Such considerations suggest that the WFP/FFW programme could be doubly beneficial by also subsidizing the construction of PA level stores.

It is proposed that the FFW programme be extended to other activities - particularly to road construction. The SPCRP has demonstrated the feasibility of building adequate roads using labour-intensive techniques, and the lack of simple roads or tracks is a major development constraint (section 4.6). Another area where the FFW programme could be of critical help is in stimulating agro-forestry on croplands. The importance of agroforestry (section 12.5) is likely to be recognized only slowly by peasants. Motivation (as well as education and planting material) is required in its initial development stages. It is suggested that FFW rations for agroforestry be paid not just for the initial tree planting, but also for tree maintenance (e.g., 20 percent of the ration each year for five years for surviving trees. The practicalities of this might prove difficult, but PA leaders might be entrusted to monitor tree survival rates with sample spot checks by the local DA. Other activities for FFW might include irrigation and drainage works, the construction of local infrastructure, marketing and agro-processing facilities, schools, health centres, etc. In expanding the FFW, care should be taken to expand <u>area</u> coverage, rather than expanding many activities within a confined area; otherwise production and other disincentives may be produced.

It is also proposed that the principle of FFW be extended to provide other needed commodities in exchange for work: improved seeds and fertilizers. Thus self-help programmes, motivated in these ways, can be applicable in the food surplus zones. The commodities offered as incentives could be determined in consultation with PA representatives and local DA's.

11.6.3 Land tenure

The land tenure system defines rights and obligations with respect to acquisition and use of land and is a critical determinant of the size and distribution of agricultural incomes. The ideal tenure system is one that provides adequate incentives to produce, to adopt improved technologies, and to invest. It should offer reasonable security to those who till the land and give them opportunity for effective participation in public decisions which affect their welfare. A good tenure system can also be the means to generate adequate employment opportunities and promote a more equal distribution of income. Although these several objectives frequently are complementary, especially over the long run, possibilities for conflict obviously exist. Whatever the system, an individual needs some "security of expectation" with respect to continued use of land and the returns from its use. Such security is essential if the individual is to make investments to improve current production and also to improve the land in the future. If all he can expect is to be on his land for a few years, he will try to get the greatest return in that time, even if it means cutting down all the trees or complete destruction by gulley erosion. Reflecting the findings of the EHRS Sociological Survey and field visits, it has been concluded in earlier section of this report (sections 3.5, 6.3.4, 8.8 and 8.10) as well as by others working in conservation in Ethiopia 1/ that security of tenure for most peasants is at present insufficient for them to spontaneously invest in the conservation of their land.

Most conservation investment in recent years has been undertaken through FFW, or "voluntary" participation has been mobilized by PA's (Chapter 8). The insecurity of land tenure stems from the obligation of PA's to reshuffle individual holdings, both to give every man reaching the age of 18 years a plot of land, and to give farmers establishing or joining a PC their land on contiguous holdings (section 3.6). Both

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1/ SCRP has written: "Today the farmers say that they do not know whether their land will be taken, or they fear to be forced to enter the Producer Cooperative. This is why they are not willing to organize the works by themselves ... Farmers know about the advantages of leaving land fallow. However, they do not practice it because either they do not have enough land, or they are afraid that the Peasant Association will think they have too much land and allocate part of it to other farmers." (SCRP, 1984) factors - but most particularly population growth - also result in decreasing the size of holdings which, in the most densely populated parts of the Highlands, are already small. A recent IDR Survey in the HPC zone found that 77 percent of the peasants had plots of less than 1 ha under field crops, and one-third of the peasants had plots of less than 0.5 ha; 7 percent had plots greater than 1.5 ha (IDR, 1984). Various observers (e.g., IDR, 1982) have concluded that, whereas plots are reasonably equitably distributed <u>within</u> the PA's, there are fairly large differences in average holding sizes <u>between</u> PA's. This suggests that fragmentation, and even the insecurity of land tenure resulting from population growth, could be at least partly alleviated by encouraging migration or resettlement to less densely populated areas (section 13.5).

The official solution to the problem of insecurity of land tenure is collectivisation through the establishment of PC's (section 3.5). It is understood that once land has been allocated to a PC, it cannot be reallocated and that the PC thus has full security of tenure. But the problem then becomes one of motivating PC members to produce and conserve - a problem tackled in section 12.8. Another problem relates to the slow rate of collectivisation. After nine years less than two percent of the total cultivated area is under PC's (section 3.6), and at this rate it will take many years before land is fully collectivised. Present trends with respect to population growth and fragmentation are likely to further increase insecurity of tenure for individual peasants, with resulting neglect of investment in land. Shorter-term solutions to the land security problem are therefore required.

One solution which presumably would be ideologically acceptable would be to accelerate the rate of collectivisation of land. This would probably mean abandoning the present policy of voluntary collectivisation, and extreme care would have to be taken to avoid eroding the already weak incentives for increasing agricultural production (section 12.7). One possible solution might be some kind of accommodation of the motivation associated with individual production within a collectivised system - e.g., land is collectively owned at a localised level (PA's?) but farmed individually. A variation on this would be to allocate plots not to individuals or to the PA's, but to larger groups (perhaps "land conservation groups") within the PA. Each such group (say 10 to 20 households) could be allocated one discrete plot permanently or for a very long-term lease so that, for practical purposes, it would be theirs to farm indefinitely and on the explicit understanding that any population growth within those families would have to be absorbed within that plot; there could be no increases to plots because all the land within each PA would be thus allocated. Each plot could be communally farmed (even owned?) by the group of families if they should so decide. Such a system should also increase pressures for limits on population growth. In some respects this would be similar to the recent Chinese system, where collective ownership and production is with units large enough to ensure maximum mutual support and local labour investment projects, yet small enough to preserve individual interest and initiative (FAO, 1978c).

The average PA of say 300 households might comprise, say, 20 to 30 "land conservation groups", which might be regarded as a step toward such PC's. To the extent that it would not be practicable to split up pastures between such groups, the protection of pastures from over-grazing would be the responsibility of the PA as a whole. Motivation would be enhanced by decentralization of land ownership to the PA and accompanied by reinforced extension efforts. Such proposals may warrant experiments in a pilot project, with ample provisions being made for compensation of the peasants involved, should the experiment go disastrously wrong.

Other shorter-term options may be less ideologically acceptable and/or less likely to solve the underlying problems or less practicable. These include giving greater security of tenure to those who invest most in their holdings (but what if the land adjoins a PC wanting to expand?); the payment of compensation to a peasant losing land in which he has invested (but where would the compensation funds come from?); and/or the granting of long-term leases (but then where would the required new holdings come from, and would this not result in a disincentive to join PC's?).

Complete collectivisation through Producer Cooperatives is a long-term prospect. In the meantime, certainly some means has to be sought for increasing land tenure security. Government has not suggested or favoured other expressions of collective tenure, but if some intermediate form, such as "land conservation groups" are not devised, incentive to invest in the land will remain weak. The challenge is to adapt the nature of collectivisation so that individual/family motivation and initiative are retained.

Chapter 12

AGRICULTURE

12.1 IMPORTANCE, OVERVIEW AND PRIORITIES

12.1.1 Importance, potential and objectives

Agricultural growth is indispensable for achievement of both efficiency and equity objectives - given the rapidly growing population, the low per capita intake of food, the heavy dependence on agriculture for income, employment and exports. Development apart from agriculture, particularly industrial development, is primarily dependent on agricultural growth for the supply of its inputs and for marketing its outputs. In short, agricultural production has to increase, both to alleviate hunger and sustain economic development.

Soils and climate over much of the Highlands offer generally favourable conditions for agriculture. The Highlands are recognized as a plant gene centre providing farmers with an unusually large range of plant species and varieties. The potential for agricultural growth, although varying substantially between areas, is generally high in the HPP and HPC zones (hence their names). With this potential, and the general lack of other present opportunities for sustained development, top priority in this strategy has inevitably to be given to the development of agriculture. This is recognized by the GOE, which gives top priority to agriculture in the TYPP. With the enormous variety in potential and constraints inhibiting exploitation of that potential, there can be no sudden agricultural transformation. The strategy emphasizes gradual but continuing development - where new and improved technologies are grafted to existing farming systems, where projects are phased to reflect their many inter-relationships, with the need to learn from field implementation.

The proposed strategy for agriculture includes interrelated programmes for the development of rainfed cropping, irrigated cropping, livestock and agro-forestry, differentiated by zone and farming system where appropriate (sections 12.2 to 12.5). These direct production programmes are dependent on the development of supporting measures in overall planning, research, extension, training, inputs, distribution, credit, marketing, producer pricing and incentives (sections 12.6 and 12.7). They are also dependent on an appropriate mix between peasant and state farming, and the different types of peasant farming (section 12.8). The next sub-section presents an overview of the proposed strategy

Table 12.1

SUGGESTED PRIORITY FOR AGRICULTURAL DEVELOPMENT STRATEGY 1/
(the more * the better)

Major programme	Priority zones	Major constraints	Major proposals	Potential economic impact	Peasant acceptance	Speed of implementation	Increases food availability	Conservation impact	Overall ranking
Crop area expansion (rainfed)	1. HPP(W&SE) HPC (W) HPP) val- HPC) leys 2. Depressions all zones	-Resettlement costly -Infrastructure -Tsetse -Oxen -Waterlogging & tillage of heavy soils	-Migration -Infrastructure investment -FFW bush clearing -Trade oxen from lowlands -Improve tillage and drainage	**	**	*	**	**	***
Crop intensification (rainfed)	1. HPC 2. HPP	-Extension -Seed -Motivation	-Extension -Seed	***	***	**	***	**	***
Crop yield improvement (rainfed)	1. Maize and wheat in HPC & HPP	-Extension -Seed -Fertilizer	-Extension -Seed -Fertilizer	***	***	***	***	*	***
	2. All zones	-Improved use & selection of local seeds	-Extension	**	***	**	**	*	**
Promotion of changed cropping patterns	1. LPC	-Tradition -Extension -Seed	-Sorghum, cassava, pulses -Extension/seed -Radio/legislation	*	*	***	***	***	***
	2. HPC & HPP	-Tradition -Extension -Seed/sdlings -Processing	-Maize, wheat, pulses coffee and tea -Seed, extension -Processing	***	**	**	***	***	***
Irrigation	LPC	-Skilled manpower -Capital	-Institution-building cum pilot projects -FFW -Adaptive research -Water harvesting	*	**	*	***	*	**

Table 12.1 (cont'd)

Major programme	Priority zones	Major constraints	Major proposals	Potential economic impact	Peasant acceptance	Speed of implementation	Increases food availability	Conservation impact	Overall ranking
Livestock	1.LPC 2.HPC 3.HPP	-Overstocking -Draught requirements -Alternative outlet for savings lacking	-Oversowing grassland -Grazing management -Forage cropping -Improved draught efficiency -Lowlands oxen trade -Promote destocking	*	*	*	*	**	**
		-Capital -Infrastructure -Extension	-Livestock-based industry; hides and skins; -peasant poultry and bees	***	**	*	*	*	*
Agro-forestry	ALL	-Extension -Tradition -Seeds	-Extension -Seeds	*** (long term)	*	*	*	**	**
Agricultural planning	National	-Manpower	-Tech.assist. -Training	***	-	***	***	***	***
Adaptive research	National	-Manpower -Orientation -Organization	-Integration of conservation & farming systems -Orientation -Annual evaluation	*** (long term)	-	*	**	**	*
Extension	National	-Manpower -Recurrent costs -Farmer/DA contact	-Mass media and education -Contact farmers T&V extension -More FTCs	***	**	**	***	***	***
Inputs distribution and crop marketing	1.HPC 2.HPP	-Organization -Manpower -Capital	-Marketing study -Strengthen SC and AMC/AIMC -Mobilize private sector	***	***	**	***	-	***

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Table 12.1 (cont'd)

Major programme	Priority zones	Major constraints	Major proposals	Potential economic impact	Peasant acceptance	Speed of implementation	Increases food availability	Conservation impact	Overall ranking
Producer pricing	National	-Policy -Manpower	-Establish pricing unit (tech.assist.) -Exchange rate adjustment -Improved marketing -Reduced taxation	***	***	***	***	*	***
Storage to reduce post-harvest losses	National	-Extension -Capital	-Extension -Self-help construction	***	***	**	***	-	***
Credit	HPC	-Organization -Capital	-CBE with AIDB, SC's as intermediaries, PAs as main clients	**	*	*	**	-	**
State farms improvement	HPC & HPP	-Inefficiency -High cost to economy	-Inviting collaboration foreign companies in management. Support for surrounding peasant farms	**	*	*	***	*	**

1/ Many of the proposed priorities inter-relate and overlap. They are not mutually exclusive.

and programmes in these areas. Table 12.1 summarizes the proposed major components in the strategy, major constraints and suggestions for overcoming them, and indicates their relative importance according to explicit criteria.

12.1.2 Overview of proposals for achieving conservation through increased production

12.1.2.1 Rainfed cropping

Agricultural production, if it is to contribute to improving general living standards, has to increase faster than the rate of population growth (estimated at 2.9 percent p.a.). Fortunately there is substantial potential to increase production through all three methods: expansion of cropped area; increased cropping intensity; and improved crop yields.

The major possibilities for expansion of rainfed cropping include migration and/or resettlement to sparsely populated areas of the western and southern Highlands and valleys within or adjoining the Highlands. (Such areas are found in all zones, but development of those in the LPC zone depend much more on irrigation, discussed later.) Major constraints include inadequate socio-economic infrastructure, especially roads, lack of oxen and tsetse infestation in the lower areas of the southwest. There are also substantial areas of the Highlands in all three zones which are not cropped because of periodic flooding or waterlogging. Research at ILCA is developing drainage systems and reviewing the extra draught requirements for cultivating the heavy soils (often vertisols) in these depressions and valleys.

In short, cropped area expansion opportunities are substantial, particularly in the HPP zone and the wets of the HPC zone. Though such expansion should be limited to land with slopes of less than 30 percent, there should still be ample suitable land to accommodate currently foreseen needs for resettlement from the LPC zone without reducing average farm sizes. However, land available for cropped area expansion will ultimately run out, and increasing reliance must be placed on improving cropping intensities and yields to increase production. This already holds true for must of the densely populated north and central Highlands.

Intensification of rainfed farming should be achieved by reinforcing trends stimulated by population growth and increasing land shortage, especially in the HPC and LPC zones. Intensification would include reducing the extent of fallows and making more productive use of them (e.g., by oversowing forage crops and by grazing management), reducing the incidence of crop failures (water harvesting, appropriate crop/variety selection, etc.) and the spread of various systems of multiple cropping (relay cropping, oversowing, undersowing, inter- and mixed cropping, etc.). Adaptive research, extension, and local institutional arrangements in particular should aim at encouraging early and shortened land preparation and planting; use of single oxen, cows and equines for draught; improved implements; increasing animal watering points; oxen-sharing and distribution arrangements; growing crops which require less tillage; minimal tillage techniques, etc.), and encouraging the use of quicker maturing crops (as well as seed pre-germination, dry seeding, etc.) so that plant growing periods are used more fully. Increased use could be made of the early belg rains to grow a quick-maturing forage or support crop (e.g., pulses), but these rains are particularly variable in extent and timing. Generally, it would be less risky to aim at much fuller use of the main krempt rains and residual soil moisture, which would be enhanced both by more conservational farming practices and by conservation structures. Known possibilities include appropriate use of deep-rooted food crops (e.g., sorghum, broad beans) and/or undersowing of slower maturing forage crops with a quicker maturing main cereal crop. The main constraints are not so much research (some of these techniques are already known and practiced by most progressive peasants), but extension and availability of appropriate seed. Economic analyses suggest that crop intensification efforts are likely to be economic in all zones but most particularly in the HPC zone.

Yield improvements should be obtained by switching to higher-yielding crops and varieties, by giving priority to high-potential areas and crops in the provision of inputs, extension, etc., by water harvesting (mainly in the LPC zone) and through technical improvement packages. A complete improved technical package exists not only for maize, in the HPC zone and, to a lesser extent, in the HPP zone, but even this package needs more differentiation by location. An incomplete package exists for wheat - again applicable in the HPC and, to a lesser extent, HPP zones. For the major cereals (except teff) and pulses, prospects are bright for the development of improved seeds adaptable to low technology and low inputs. Meantime, much could be done by DAs instructing peasants on local seed selection, storage, cleaning and planting rates. In the immediate future, substantial increases in food production should be sought by promoting the use of already available improved seeds of maize and wheat with fertilizers in the HPC and HPP zones. Fertilizer responses are economic at current price ratios in these zones, but not in the LPC zone (basically because of water constraints). Substantial scope exists for improving yields just by improved husbandry, especially row planting and increased plant densities.

Changes in cropping patterns to increase both production and conservation should be actively promoted - by pricing and marketing policies, initially subsidized seed distribution, extension, and even legislation. Multiple advantages could be obtained from using crops that require less tillage and permit earlier planting, and have already proved responsive to fertilizer and amenable to multiple-cropping and agro-forestry systems. Teff production, although presently preferred, will probably diminish in relative importance as food habits change. Its low yields, high weeding/

tillage requirements, low response to fertilizers and relatively poor prospects for improved seed development 1/ are negative factors. On the other hand, its short cycle and virtual immunity to post-harvest pests, and the continued strong demand for it at very high prices may continue to argue for its cultivation in the opinion of the farmer. Despite the fact that cultivation of teff results in more erosion than other cereals, it should not actively be discouraged before a thorough study on teff is undertaken on all its aspects: social, economic, agronomic and conservational.

Drought-resistant root crops should be promoted in the LPC zone. In those drought-affected areas where cassava has been determined to be an appropriate drought-insurance crop, every PA should be asked to ensure that every household has 0.1 ha under cassava. Pulses should be promoted in multiple-cropping systems in all zones because of their dietary and soil-improving values. Fruit and vegetable production (also dairying) should be encouraged near urban centres, not only as a means of dietary improvement, but to generate cash income for investment and act as local development catalysts. REWA should give particular attention to the significant potential for development of home plots. Perennials such as coffee (and tea) provide not only foreign exchange, but also effective ground cover for conservation. There is considerable scope for coffee and tea expansion in both the HPP and HPC zones, making use of hillslopes too steep for annual cropping. Export marketing should not be seen as a major constraint, but due regard has to given to quality and processing. Serious consideration should be given to peasant tea production, presently confined to state farms.

Generally, in seeking to increase rainfed agricultural production, two major simultaneous and complementary thrusts are proposed:

(a) increasing the marketed surplus of food and export crops by promoting conservational farming 2/ in maize, wheat, pulses, coffee and tea in the HPC and HPP zones through seed/seedling and fertilizer distribution; extension and infrastructure investments in processing, roads, storage, etc., and through expansion of cropped area by migrants from the LPC zone; and

(b) improving food security (simultaneously with rehabilitation) in the LPC zone by water conservation, crop intensification and promoting more drought-resistant higher-yielding crops, especially sorghum and cassava. Adaptive research should give top priority to developing technical packages appropriate

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1/ Teff is unique to Ethiopia, so Ethiopia has to finance pure as well as adaptive research.

2/ I.e., following practices consistent with the CDS.

to the semi-arid areas of the LPC zone, including water harvesting and spreading techniques, valley cultivation, etc. Even with such measures, population density and growth and agro-ecological conditions are such that both rehabilitation and food security in this zone will be dependent on migration from the most degraded and/or drought affected areas.

Concentration of capital and foreign exchange investments in the areas where returns are greatest will generate marketed surpluses required for overall economic development and at the same time reduce pressures on the use of more marginal lands (especially in the LPC zone). Because of the need to counter the threat of irreversible degradation in parts of the LPC and HPC zones through relocation of farms 1/, investments in the high potential areas will have to be balanced between investments in improving crop yields and in extending the cropped area. Basically, the dominant emphasis in the HPC zone, with its relative abundance of gentle slopes and reasonable access, should be on increasing production of maize and wheat. In the HPP zone more attention should be given to increased coffee and tea production. The very long growing periods of the HPP imply almost too much rain/cloud cover for cereals (requiring adequate sunlight for quick maturity and dry weather for harvesting, threshing).

12.1.2.2 Irrigation

The most urgent need for irrigation is to secure at least one reliable crop annually in the LPC zone. Conversely, the greatest potential for irrigation is in the HPP and HPC zones - the LPC zone lacks perennial surface water flows, while potential groundwater irrigation is limited in extent and much more costly to exploit. In circumstances of rising food deficits and pressures on land, there is no doubt that irrigation has to be developed, but not at the expense of diverting resources and attention from rainfed farming. Even if all the Highlands irrigation potential could be fully developed over the next 25 years (a very ambitious target), irrigation would be unlikely to contribute more than five percent of the country's food requirements. More than this could be achieved by substituting maize for teff in rainfed farming. Irrigation can in no way be viewed as a national panacea, but in specific localities - and most importantly in the LPC zone - it could make an important contribution to improved local food security. This consideration outweighs that of the higher costs of irrigation development in the LPC zone, reflecting greater need for investment in water storage and the contribution this can make toward increasing the production of lower value crops. In the absence of practicable alternatives, it is thus proposed to give top priority in irrigation development to the LPC zone for these social, rather than

1/ From the steepest and/or most degraded slopes.

economic reasons. Irrigation must be combined with catchment rehabilitation and promoted through FFW labour-intensive techniques, extension, etc. Emphasis should be on small-scale gravity irrigation, because of water constraints and lower economic costs. The several large investment and technical assistance projects in the pipeline should serve to increase institutional capacity for such irrigation development as well as simultaneously serve as major pilot projects.

Lower priority should be given to irrigation development in the other zones, basically because there are ample opportunities for increasing agricultural production more economically through rainfed farming. New-technology methods of irrigation, including water harvesting and spreading techniques, should be given high priority in adaptive research, again with priority reference to LPC zone farming systems, before field implementation proposals can be formulated.

12.1.2.3 Livestock

Livestock development strategy should seek to increase productivity per animal, while simultaneously reinforcing the downward trend in livestock numbers - particularly in the heavily overgrazed LPC zone. In view of the practical difficulties in seeking to reduce livestock numbers 1/, major attention should be given to improving feed availability by increasing the carrying capacities of grasslands and of those croplands using feeds more efficiently and/or using non-traditional feeds (e.g., coffee skins). 2/

In the Highlands, peasant livestock herds are viewed as the major means of investment/savings (hence the need to develop rural banking and alternative outlets for investment, particularly land improvement) and as a means of reproducing oxen for draught. Increased draught efficiency, and reduced requirements for draught, should reduce cattle numbers - relieving grazing pressures - and result in a changed herd composition, with more emphasis on meat and milk productivity (higher proportion of cows and shoats with their substantially higher offtake rates). Tractors are unlikely to be an economic solution; steep slopes and conservation structures physically limit the scope for tractorisation. Use of single ox ploughs has to be promoted as quickly as possible 3/; this offers substantial economies in numbers of oxen,

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1/ Proposals are made for livestock taxation, local PA legislation, changed grazing/land tenure arrangements, vigorous extension campaigns, improved marketing facilities, increased draught efficiency, etc.

2/ See previous section, especially forage and multiple cropping, agro-forestry, utilization of conservation structures.

3/ That is, as soon as it can be determined with confidence in which areas and under what conditions it will be satisfactory.

thereby relieving grazing pressures. (Labour inputs admittedly are increased, but labour availability is not a critical constraint.) This should also have a major conservation impact by reducing the duration of land preparation (when most erosion takes place). The construction of many more ponds would enable more effective use to be made of oxen. The purchase of oxen from the lowlands should also be promoted.

Improved animal health should be sought primarily through improved nutrition, while veterinary programmes/facilities should not be expanded. (Exceptions should be made for tsetse control to facilitate crop area expansion, and for dairying around urban markets.) Much higher priority should be given to hides and skins improvement, meat drying and the development of livestock-based industry in the LPC zone. Peasant poultry should be promoted by upgrading indigenous stock, and peasant apiculture through extension of modern hives. Because of the more limited prospects for cropping, priority in livestock development should generally be given to the LPC zone.

12.1.2.4 Agro-forestry

Agro-forestry is a most efficient form of peasant land use, permitting cropping at multiple layers and in the long dry season; it contributes to soil improvement, conservation, wood and forage needs. The fact that most agro-forestry has a long gestation period should not discourage investment, but that investment has to be balanced and intermixed with shorter gestation investments in the whole package.

Agro-forestry has to be promoted to complement Eucalyptus woodlots (peasants will not accept a substitute for them) and cropping proposals. Agro-forestry provides a means of making conservation structures both stable and productive, even of substituting for such structures on lesser cropland slopes (e.g., by contour hedges, alley cropping, etc.) and a means of facilitating grazing managements (live hedges, supplementing feed availability, etc.). The *taungya* system should be used to phase the relocation of farms with concomitant human resettlement, from steep and/or degraded slopes. The inclusion of agro-forestry as a major component in extension efforts should not await further research; enough is already known to be extended to all sub-zones. Furthermore, simultaneous adaptive research should rely more on monitoring experimental planting on PA land than on research plots. Each PA woodlot should set aside a small portion for agro-forestry.

12.1.3 Overview of proposals for supporting agricultural development

A major constraint to accelerated agricultural growth in Ethiopia is weak agricultural planning. The little planning work undertaken is segregated within four different ministries (MOA, MCTD, MSF, and ONPCC), not to mention related agencies such as RRC, WRDA, etc. It tends to be more financial than economic and piecemeal and ad hoc, rather than coherent and continuing. It ends up (or starts with) unrealistically ambitious and often internally inconsistent targets. Planning within the major ministries concerned is similarly fragmented and lacking. Much project preparation work is undertaken by different technical departments using expatriate consultants, using varying criteria, data, assumptions and techniques. Little attempt is made to interrelate, determine priority and make consistent the resulting shopping lists of projects. At best, this ad hoc, project-oriented approach to agricultural development can provide temporary remedies or benefits, possibly at the cost of sustained development. Top priority has therefore to be given to strengthening agricultural planning.

Agricultural research should make fuller use of international research centres for most pure research, to draw attention to relevant findings for adaptive research and for training. Agricultural research in Ethiopia should be adaptive in character and farming-system-oriented. Conservation should be a major research criterion. Research manpower needs strengthening, as do links with extension. Immediate priorities include field level fertilizer, planting density, variety trials for maize, wheat, sorghum and coffee, multiple cropping, agro-forestry, forage cropping, and adaptive trials on zero tillage. There should be an annual evaluation of IAR's programme to ensure its relevance to the typically low input peasant farming systems of the Highlands. (The National Crop Improvement meetings are well suited for this.)

The strengthening of extension must not await further technical findings from research. There are already sufficient known messages to pass on to farmers on conservation farming, crop intensity and yield improvement, grasslands and grazing management and agro-forestry, for extension to merit top priority to implement the Conservation-based Development Strategy. Mounting recurrent costs and the need to improve extension agent/farmer contact result in an inter-coordinated three-pronged approach to extension involving greatly expanded use of mass media, general education and literacy campaigns, contact farmers, and T & V multi-purpose development agents. Agricultural training (in which conservation should be fully integrated) should be aimed increasingly at contact farmers, PA leaders, DAs and middle level staff (Wereda/Awaraja). Farmer training at FTC's should be expanded, both by increasing the number of FTC's and by shortening the course.

Facilities, institutional and policy arrangements, staffing, equipment, etc. for input distribution, credit, marketing and storage have to be strengthened to support capacity increases and higher throughput levels commensurate with the requirements for higher production. A thorough study covering all aspects of agricultural marketing should be undertaken to provide a firmer base on which development strategy proposals can be made. This is a top technical assistance priority. In the meantime, the strategy proposals made on these subjects should be regarded very tentatively. For input distribution and marketing, it is proposed to strengthen the SC's and form unions between them at Wereda level and above in order to secure cost economies in transport, storage, etc. SC's would become multi-purpose farm service cooperatives. AMC and AIMC would be strengthened to become apex organizations in the proposed cooperative movement. Private sector capital, initiative and skills should be mobilized to complement the SC's and AMC/AIMC in their roles at the zonal level and below, but adequate provisions made to protect individual peasants - for example, by using radio and other mass media for market information, by introducing and checking uniform weights and measures.

Urgent policy action needs to be taken so that crop producer prices will provide greater motivation to peasants to expand their production for market. Consideration should be given to adjustments in rates of foreign exchange and coffee taxation and to marketing improvements which would result in higher prices being paid to peasants. Food consumers in urban areas could be cushioned from the effects of higher prices by appropriate taxation and social service policies (Chapter 13). A strong central unit for the regular production of pricing analyses and recommendations and for price monitoring, urgently needs to be established. This is another top priority for technical assistance and training.

CBE should be authorized to work in partnership with AIDB in mobilizing rural savings and providing rural credit, so as to make maximum use of scarce banking manpower, infrastructure and transport. The SC's should be credit intermediaries, deducting repayments from the proceeds of crop procurement. PA's should be authorized to receive credit and should quickly become the main target for rural credit. Priority in the provision of rural credit should be for seasonal inputs in the HPC zone, oxen and farm implements in the HPP zone and rural industry in the LPC zone.

12.1.4 Overview of proposals concerning farm types

Individual peasant farms at present are the most efficient farm types in terms of returns per unit of capital and maximizing employment per unit of land. State farms have higher yields, obtained from much greater fertilizer inputs. Because of the overriding importance of peasant farming, its potential for improvement, its efficiency in the use of capital and equity considerations, the primary focus of agricultural development strategy has to be on the peasant sector.

In the longer term, agricultural growth depends not so much on present efficiency, but on the potential to generate surpluses for investment. In this respect, the state farms are making losses while most of the individual peasants are too close to absolute poverty and starvation to generate surpluses. Thus it is mainly through cooperation that most peasants can invest their surplus labour during agricultural slack periods in land improvement works. Such works will gradually generate progressively larger surpluses, of which part should be set aside to put in motion a self-funding development process. Thus cooperation should, at least in the initial strategy period, be viewed primarily as a means of surplus generation, investment, growth and development, rather than as a means for the collectivisation of production. Attempts to force the pace of collectivisation could jeopardise achievement of the tremendous opportunity for self-perpetuating development offered by much broader cooperation among peasants.

The non-rural population is expected to grow from around 11 percent today to over 15 percent by the end of the strategy period. It is unlikely that the peasant sector, even through cooperatives, will be able to generate sufficient surpluses to feed this urban population and the state farms will therefore be required to continue their vital contribution in this respect. The alternative of importing food is more expensive than importing fertilizers, tractors and fuel for the state farms. Thus the main task of the state farms is to produce the required marketable food surplus at minimal cost to the economy. This is more likely to be achieved, almost by definition, by efficiency improvements, and improving crop yields and cropping intensity than by cropped area expansion. It is proposed that vigorous efforts be made to increase efficiency and that cropped area expansion by state farms be financed solely from surpluses generated from existing state farms, net of their capital replacement and land conservation investment requirements. It is further proposed that the state farms be much more active in promoting bordering peasant agricultural development.

12.2 CROPPING

12.2.1 The options for increased production

There are three methods of increasing crop production: expansion of the area cropped, increasing the proportion of that area which is harvested each year (cropping intensity) and increasing crop yields per unit of land area. Increased crop production from the Ethiopian Highlands is both possible and necessary by all three methods, and these are reviewed in turn in the following sections. Table 12.2 summarizes total land areas with good soils and LGP's greater than 180 days.

The areas of good soils (and with growing periods sufficient for reliable rainfed cropping) are large in the HPP and HPC zones by any standards, and even the LPC zone has some potential for the development of rainfed cropping.

While there are considerable possibilities for area expansion (section 12.2.2), increased crop production per capita must sooner or later depend on increased yields and/or crop intensity. When there is little or no land left for crop expansion, per capita production increases are

Table 12.2

HIGHER POTENTIAL LANDS FOR AGRICULTURE BY ZONE

	Land area with good soils 1/ (000 km^2)	Land area with LGP of 180 days or more 2/
HPP	80	97
HPC	60	93
LPC	30	39

1/ Includes nitosols, acrisols, vertisols and luvisols.

2/ This LGP is able to support at least one reliable crop annually.

Source: EHRS estimates. Much detailed field survey is needed to determine the extent to which the areas of good soils coincide with areas of long growing periods, and with areas where the soils are still deep enough.

dependent on annual yields per hectare increasing faster than the rate of population growth. Area expansion becomes less of an option with the passage of time. Furthermore, higher capital costs are generally required for projects of expansion of cropped areas, and economic returns are usually less than for crop intensification projects 1/. Progressively more emphasis, then, should be on intensification of land use and increased yields. Indeed, in the LPC zone these are the only major options to increasing crop production without irrigation or drainage works (section 12.3).

12.2.2 Area expansion

Much of the Highlands suitable for cropping with present techniques and cropping patterns is already being cultivated. Indeed,

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1/ Especially when, as proposed here, such area expansion is through resettlement/migration. The World Bank has calculated an average ERR of around 25 percent for area development projects and 16 percent for land settlement projects. WB: Agriculture and Land Settlement, January 1978.

population growth over the centuries has spread cultivation onto steeper slopes and more marginal lands and decreased fallow periods, all contributing to the acceleration of erosion (Chapter 6). The opportunities for opening up large new areas are therefore confined mostly to the sparsely populated areas of the western and southeastern Highlands and their associated valleys.

In the west, in particular, there is a 100 km-wide strip from Gambela, bordering The Sudan in the HPP zone, northward into Gojam in the HPC zone, which has generally fertile soils and plant growing periods of 200 days or more, but which is sparsely populated. The sparse population has been attributed to tsetse flies (trypanosomiasis), but even this problem has probably diminished with bush clearing by the resident population. Further settlement is likely to confine the problem to local valleys and depressions.

The major constraints to expanding the cultivated land in this area are labour, oxen, cultivation implements and socio-economic infrastructure, particularly road access. It is hardly surprising that this is the major area now being used in the GOE's emergency programme to resettle drought victims from the LPC zone. Both in the western Highlands (HPP and HPC zones) and in the southeastern Highlands (mainly Bale), population density is significantly lower 1/ than in the north and central Highlands (see Figure 3.4), and there is considerable scope for cropped area expansion (perhaps as much as 30 percent) by reducing fallow periods. The ownership of oxen and motivation are major constraints here. Proposals for increasing resettlement and encouraging migration to both the western and southeastern Highlands are made in section 13.5. For reasons given in section 12.8, it is proposed that the main means of expanding cropping in such areas should be through peasant farming.

Possibilities for cropped area expansion in the rest of the Highlands are more limited but nevertheless exist, even in the most densely populated areas - primarily in valleys and depressions. Valleys below 1 500 masl in and adjoining the Highlands account for 17 percent of the total area covered by the EHRS. A much smaller part of these lands are cropped, because of shorter growing periods and of the presence of malaria and tsetse. Apart from the possibilities or irrigation in such areas (section 12.3), these are areas suitable for rainfed agriculture. For example, there are over 40 000 km^2 in the HPP zone below 1 500 masl but with growing periods of 180 days or more and slopes of less than 30 percent. In the longer term, direct seeding (see section 12.2.6)

1/ That is, density per unit of arable land. Though density in this sense is certainly lower in these regions, and reduction of fallow certainly appears to be safe, it must be stressed that there is little if any data on this from field survey.

may alleviate the need for oxen, but in the shorter term (certainly within this strategy period) tsetse control and migration of people and oxen and the provision of socio-economic infrastructure will result in substantial expansion of croplands in such areas. There are no known agronomic reasons why sorghum, teff, even maize, pulses and oilseeds could not be rainfed grown in such valleys in both the HPP and HPC zones. Opportunities in the LPC zone are generally more dependent on irrigation.

There are Highland plateau plains, depressions within croplands and broad river valleys subject to periodic waterlogging in all the zones, where water management could increase the cropped areas significantly. Such areas often possess deep and fertile soils - often vertisols. The soils are heavy and difficult to cultivate with the traditional plough, and subject to waterlogging; as a result, most such depressions are not cultivated. It has been estimated that, for such reasons, 75 percent of the Highland vertisols, or some 4 million hectares, are not cropped (Jutzi, personal communication). In India, such vertisols are cropped by raised beds. Cambered beds are used successfully elsewhere in East Africa. ICRISAT has developed a double cropping package for such vertisols. This involves improved drainage by broad beds and furrow, cultivation on residual moisture immediately after the main rains crop is harvested, and dry-seeding crops before the main rains. Each of the two crops, with fertilizer and improved seeds, out-yields the traditional single crop (Virmani and Swindale, 1984). ILCA's Highlands Programme has been adapting this package to the Ethiopian Highlands with teff, wheat, horse beans, barley, oats, vetch and other crops, with encouraging results so far (Anderson, personal communcation, and Jutzi, in preparation), and experimenting with improved ploughing implements. The package would provide crop vegetative cover much earlier in the main rains and thus reduce erosion. However, the labour needs for making the cambered beds every few years, the additional draught power required, and the use of a mouldboard plough must be further investigated before firm recommendations can be made.

In light of such possibilities for cropped area expansion, it has been calculated (EHRS WP 14) that, except for the LPC zone, it should be possible to maintain present average farm sizes, even with the projected population growth in the strategy period, and still confine cropping to slopes of 30 percent or less. It has been estimated that even in the year 2010 there should be some 60 000 km^2 of under-utilized cultivable land with less than 30 percent slope in the HPP and HPC zones suitable for farming (EHRS WP 14). The precise location and evaluation of these, however, requires some detailed field survey. At an average of 1 ha per family, this would be sufficient for 6 million families and may be compared with the estimated 1.5 million families which, if present trends continue, will need to be displaced from the LPC zone as the soil on their land becomes too shallow for cropping (EHRS WP 14). However, such an expansion of the cropped area would depend on the permission, even the encouragement, of farmers to move, with their livestock, to more sparsely populated areas (section 13.5), on tsetse control (section 12.4), and on the provision of socio-economic infrastructure (sections 13.6 and 13.7), as well as on thorough field surveys precisely identifying such lands. Otherwise, the extension of the area cropped would be largely at the expense of remaining forest and grasslands.

12.2.3 Increasing cropping intensity

Cropping intensity, defined as the annually harvested area's percentage of arable land, is generally low in the Highlands, where significant areas may be under fallow 1/. However, there are indications, from some instances, that when population pressures mount, not only do follows decrease, but farmers attempt to double-crop even in lower rainfall areas such as Sirinka (section 8.4). As already indicated, there is significant scope for reducing fallow periods in western and south-eastern areas of the HPP and HPC zones. Reliable opportunities for increasing cropping intensity by double rainfed cropping are generally limited to the HPP and HPC zones, with their long growing periods, and even then to areas below 2 500 masl 2/. Only those parts of the LPC zone (around 40 percent in total) with growing periods of 180 days or more, may gain from efforts to intensify rainfed cropping. There are quicker maturing varieties of sorghum, millet and teff, especially suitable for such conditions. However, the main gains from cropping in the LPC zone could be by making it more reliable, through water harvesting and water spreading (section 12.2.4). Cropping intensity can also be increased by irrigation in all three zones below 2 500 masl (section 12.3). This section relates primarily to intensification of rainfed cropping below 2 500 masl in the HPP and HPC zones. The greatest opportunities arise from fuller utilization of the long growing periods (generally over 240 days in half the HPC zone, and three-quarters of the HPP zone - see table 2.6). The potential for greater crop intensity is probably greatest in the HPC zone as the harvesting and drying of extra crops in the HPP zone may be more inhibited by the high humidity and rainfall. Economic analyses (EHRS WP 18) also suggest that the greatest returns may come from the intensification of farming systems in the HPC zone. The means to achieve greater cropping intensity include more timely and quicker land preparation and planting, the use of quicker maturing crops and varieties, the use of fertilizer, multiple cropping and, logically, the reduction of fallow.

1/ There are, in fact, no estimates of fallow, neither its extent nor its duration, and no studies defining it in terms relevant to Ethiopia and indicating its patterns and roles.

2/ The cooler temperatures at higher altitude prolong crop maturity times.

Land preparation could be quickened by improving oxen distribution both between Highlands and lowlands and within the Highlands (section 12.4), using them more effectively with improved implements (discussed below), growing crops which require fewer passes, and by zero or minimum tillage methods (discussed below). Even measures aimed at water conservation should accelerate the softening of the ground so that it can be ploughed earlier and with subsequent less risk of moisture stress.

Crop maturity times could be shortened by practices such as the pregermination of seeds and/or dry-seeding; but field level trials are required. Quick maturing crops provide more vegetative cover during the rainy season, and speed of maturity should become a major criterion in crop breeding and selection.

With respect to the timing of two annual rainfed crops, there would appear to be several options. In the eastern and southern Highlands, where rainfall is generally bimodal, one option would be to plant at the onset of the short or belg rains, usually in February/March. However, in many areas these are particularly unreliable, both in quantity and in timing, so that there are high risks of crop failure or of the crop not maturing in time to prepare land for the main rains beginning in June/July 1/. A preferred option, which is also relevant for the western Highlands, is to make fuller use of the main or krempt rains. This could be done by sowing crops at the same time 2/ or by inter-cropping or relay cropping (i.e., planting a second crop before the first is

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1/ An exception may be the possibility of growing a quick maturing forage crop on lower lying vertisols. Vertisols are particularly susceptible to waterlogging and are usually left bare during the belg rains and the early part of the main rains, when they are planted with teff, which is tolerant of high soil moisture. Erosion in this period could be substantially reduced by planting a quick maturing forage crop for cutting before the start of the main teff planting season, about halfway through the main rains when waterlogging is less severe. ILCA has achieved inconclusive results in early planting of a local clover, *Trifolium steudneri* (Jutzi & Haque, 1985). The yield of the subsequent teff crop was lower than that on the control plot, possibly because the shortened time for land preparation resulted in a poorer seed bed or because the clover stubble inhibited germination of the teff. Another problem concerns harvesting of the clover during the main rains and in semi-waterlogged conditions. It might be better just to plough the clover as green manure. Certainly, such problems have to be resolved before specific new suggestions for better use of the belg rains can be proposed to farmers.

2/ A quick maturing small-grain crop and a slower maturing forage crop can be sown together. The forage crop (e.g., alfalfa, a clover or a slow-growing grass) becomes well established as the grain is being harvested.

harvested) at different times, with the slower and/or later planted crops growing on residual moisture/rainfall after harvest of the main cereal crop. Such options need not endanger the main cereal crop (moisture stress is limited by confining consideration to the longer growing period areas, while competition for nutrients and sunlight can be minimized by appropriate seeding rates, fertilizer use and use of crops with different rooting depths. Such options provide a second crop and more crop residues for feed or ground cover later in the year, as well as a greater return of organic material to the soil. The residual-moisture crop should preferably be deep-rooted and drought-tolerant: sorghum, chickpeas (*Cicer arietinum*) broad beans (*Vicia faba* var. *abyssinica*) are good examples of such crops which are widely grown in the Highlands but in rotation rather than as a second crop. However, the direct conservation effects of such a second crop would probably not be very great as the ground cover would be provided during the dry season. Only if this cover still remained at the onset of the short belg rains would a direct reduction in erosion result. The indirect (soil improving) effects of such second crops in reducing erosion may be greater. Crop mixtures including a legume with nitrogen-fixing properties have been proven to benefit yields of cereals in Ethiopian trials (for example, maize with beans, or wheat/teff/barley with alfalfa - Hawando, 1982). Farmers in Sirinka, Dessie and Bahir Dar are known to use an indigenous legume (*Desmodium dichtomum*) for undersowing sorghum or teff, while oats are already proving popular as a forage crop around ILCA's sub-research stations in the HPC zone. Other legumes that have proved successful in trial evaluation are *Lablab niger*, *Centrosema pubesens*, and *Stylosanthes* sps. *guyanensis* and *humilis*, both of which are heavy seeders and would ensure germination under subsequent fallowing or cropping. ILCA has obtained impressive forage yields with both indigenous and introduced *Trifolium* species at higher altitudes and *Stylosanthes* species at lower altitudes. Both of these produce enough hard seed to persist in the cropping system. Their use will improve the productivity of fallow and the quality of stubble grazing. A mixture including one or more grass species may produce even thicker cover and thus better erosion control. Crop rotations involving dense cover crops can also greatly reduce weed population. Some suggested forage crops are described in table A12.1. Perennial forage cover crops can be grown underneath trees and/or on land to be fallowed and usually last for several years without replanting (e.g., alfalfa) 1/.

The use of forage crops in these combinations need not compete with or otherwise threaten food crops and could valuably increase

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1/ Ley farming is a development of this principle, in which the grass or grass/legume mixture is used in rotation with food crops.

feed availability to livestock during the dry season, either by grazing or by cut-and-carry techniques. Undersowing could be delayed if it is found that simultaneous sowing reduces grain yields significantly. There are no hard and fast rules on the relative dates of undersowing, and these will have to emerge from local field experience. Table A12.2 indicates very roughly approximate times of undersowing in relation to cereal crops in the sub-zones.

The generally close-growing nature of forage crops provides very effective protection from rain or wind while nitrogen and organic content replenishment can benefit soil fertility for several seasons. Any of the forage crop left by the time of land preparation for the next main crop can be ploughed into the soil as green manure. Fresh organic matter decomposes rapidly, the population of soil microbes multiplies to produce cementing agents that improve soil structure while the resulting increase in organic content and soil reduces soil erodibility but increases its fertility. Green manuring can reduce the need for imported fertilizers. Apart from the few known cases already cited, and with the exception of Arsi (where ARDU has operated an intensive extension programme) the use of forage crops in the Highlands is very limited. Apart from the usual constraints of lack of knowledge and motivation, the greater use of forage crops is constrained by the availability of seed. The Sirinka project has successfully experimented with farmers collecting indigenous seed. Seed multiplication sites for forage species could be centralized, within the limits of transportation, so as to allow maximum use to be made of established nurseries. This would appear to be appropriate to supplement any production of exotic seeds by ESC. Presently ESC produces less than 500 tons of forage seeds p.a. (mainly oats and vetch), more in reflection of limited demand than of limited capacity, and has no present plans to expand production. However, the feeds and forage project would establish a special forage seed multiplication unit in ESC. The more centralized the seed production, the more uniform its quality and the easier it is to ensure high quality seeds, but the higher the costs of distribution.

From the foregoing, it may be concluded that while there is obviously a need for further local adaptive and farming systems specific research in crop intensification, sufficient is already known from both previous research and experience of isolated progressive farmers to justify vigorous extension efforts in this direction. Motivational considerations are the subject of section 12.7; suffice it here to note that population and grazing pressures may well force more and more farmers to increase crop intensity, not just be reducing fallow periods, but in the other ways proposed in this section. Intensification of land use should be accompanied by improved land, soil and water management - if only to avoid intensification of their misuse and resulting erosion - and this is another reason for reinforcing extension efforts.

12.2.4 Increasing crop yields

12.2.4.1 Technical packages

Most of the measures suggested in relation to increasing crop intensity should, if properly applied, increase crop yields in the longer term through their soil conservation and soil improvement effects. More immediate increases in crop yields should also be obtained by water conservation measures (both structural and vegetative) in those areas where yields are periodically constrained by soil moisture deficiency - i.e., mainly parts of the LPC zone. Indeed, an average yield increase of 15 percent has been guestimated for the LPC zone, arising from the spread of structures such as tied ridges and zero gradient bunds (EHRS WP 14). This average increase would largely reflect smaller downward fluctuations in yields in years of lower rainfall. The same effect would be even more pronounced from irrigation and/or water harvesting (section 12.3). But the main scope for directly increasing crop yields is through the development and spread of technical packages relevant to the rainfed farming systems of the Highlands. Such packages should preferably interrelate recommendations on improved seed, fertilizer, implements and husbandry. In all cases recommendations should be aimed at increasing production while at the same time conserving the longer term productivity of the land. Prospects and proposals with respect to each of the above components are reviewed in turn in this section. Soil and water conservation should provide a more stable environment in which to attain and sustain higher yield increases from such technical packages.

After reviewing the technical packages currently available, EHRS WP 14 concludes:

> "In summary, it is a disappointing scenario. There is no widely applicable package of improved technology that can be distributed. Maize offers the best opportunity, but, with other crops reliable improvements in production are elusive. The situation is unlikely to change in the near future. New approaches are needed."
> (EHRS WP 14.)

The recommended technical package for maize is summarized in table A12.3.

12.2.4.2 Fertilizer

The most effective single component in the technical packages currently available is the application of fertilizer on maize and wheat, and then only in the HPC and HPP zones. One would expect the application of fertilizer to produce not just an improved crop, but a quicker and denser vegetative cover over the ground, and this should therefore be beneficial for soil conservation. It is disappointing that economic responses to fertilizer are so limited. Physical responses to both phosphorous and nitrogen applied singly or together are slight for most crops in most areas, while data from some trials seem to be contradictory. Thus firm fertilizer recommendations cannot be made for sorghum, wheat, teff and barley. This suggests the need to relate fertilizer response analyses to different soil types, the timing of application (nitrogen is particularly susceptible to leaching so that timing of nitrogen applications to give maximum yield response is especially important). It also suggests the need to pay more attention to sulphur. In the absence of generally poor physical responses it is hardly surprising that economic analyses suggest that the profitability of fertilizer is very limited. From such analyses (EHRS WP 18), it is concluded that, at present prices of cereals and fertilizers and known responses:

(a) fertilizer is not profitable for any cereals in the LPC zone because of the low and erratic rainfall and the limited water holding capacity of generally shallow soils. Responses may also be limited by fertilizer being washed away with run-off. If yields are already low and unreliable, even large percentage increases in yield may not be sufficient to make fertilizer profitable;

(b) fertilizer is profitable for maize in the HPP zone and could become profitable for wheat and teff with small price changes;

(c) fertilizer is most profitable in the HPC zone, most of all for maize (especially hybrid) but also for wheat and teff. It is hardly surprising that around 80 percent of national fertilizer consumption is in the HPC zone (mainly Arsi, Shewa and Gojam). Higher physical responses than in the HPP zone may be attributed to higher natural fertility of soils in the HPP zone (deeper, less eroded and with more organic material), the greater use of dung on fields in the HPP zone (less critical fuelwood shortage) and the already higher yields in the HPP zone.

In view of the above findings, the high prices of fertilizer (and the fact that the state farms and PC's get priority delivery of fertilizers, all of which have to be imported), it is hardly surprising that few individual peasants apply fertilizer. Actions are therefore required to increase the availability (type, time and location) of fertilizer to peasants in the HPC and HPP zones, preferably as part of a package (especially for increasing maize and wheat production), to refine recommendations so that they are more specific for locations and crops, to improve the availability of credit for its purchase, and to ensure that input and output prices make its use profitable for peasants.

12.2.4.3 Seed

In the first stage of the Green Revolution the new varieties of wheat, rice and maize yielded well only with relatively large inputs of water, fertilizer and pesticides. For these and other reasons there were few of the new varieties relevant to Ethiopia (rice is hardly grown or eaten in Ethiopia). A second wave of research, now well under way at various international research centres, should produce varieties needing less of such inputs, or using them more efficiently. It should also develop high-yielding varieties of hitherto neglected subsistence crops such as barley and sorghum, legumes and root crops, especially those adapted to poor soil and water conditions. These should carry a measure of inbred resistance to pests and diseases, and thus require less pesticide, and should be more effeicient at converting inputs of water and fertilizer into those parts of the plant that are of economic value. Ideally, they should be adapted to the level of purchased inputs that is realistically likely to be available in the Highlands during the strategy period. There is a need to collect, preserve and use traditional cultivars and wild relatives which are disappearing so as to provide a base for future genetic diversity. Thus prospects are reasonably bright for the development, within the next decade, of improved seeds of maize, sorghum, wheat, barley and pulses suited to Ethiopian conditions.

This contrasts with the present situation in which not only is the use of improved seeds very low 1/, but the improved seeds themselves are sometimes inferior in some respects to the local seeds, less tolerant to drought and pests, low fertilizer use, poor husbandry (see section 5.8). Moreover, the improved seeds in use, because of their irregular availability and purchase, have in many cases become old, multiplied by farmers themselves and mixed with other varieties and weeds, so that much of the original yield potential and other improvements in the seeds has been lost (GOE/WB, 1983). This suggests the need for guidance of farmers in seed selection, cleaning and storage as well as the expansion of multiplication and distribution facilities for truly improved seeds for peasant farming. Much seed selection could be done by the farmers themselves, rather than by the IAR, providing that the improved seeds concerned have been found suitable in similar agro-ecological conditions in other countries. Development agents should assist farmers in this respect and identify the best fields in each locality for crop purchase by the MOA for use as local seed. This would alleviate the enormous difficulties of finding improved seeds suitable over large areas.

Ethiopia is well known as an important centre for diversity or origin of many of the world's major crops. This, however, plus the great agro-ecological variations that occur within small distances in the Highlands of Ethiopia, makes it very difficult to identify varieties that are both widely adaptable and higher yielding. At present, only proven improved varieties of wheat and maize are available. Generally, hybrid maizes and Romany B.C. Mamba and Enkoy wheat varieties (Boohai for duram wheat) are top yielders. These wheat varieties

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1/ It has been estimated that less than two percent of the peasant sector's seeds are improved (GOE/WB 1983).

owe their superiority to better disease resistance (leaf and stem rust, in particular). Hybrid maize 625 considerably out-yields the maize of locally produced seed of Kenyan origin and composites (Harrison, 1984). No improved barley varieties are currently available (except possibly IAR/H/485 in some HPP areas), and those for teff either give too little yield improvement or are highly location-specific. The situation with sorghum is still unresolved, particularly for the Highlands, with a large number of largely unproven varieties under recommendation.

12.2.4.4 Farm implements

Both area expansion and increased cropping intensity would, with currently practiced technology, require additional labour and draught, while yield increases would also require additional labour. Although generally labour is not a constraint (except to area expansion in the HPP and HPC zones), it may be for some activities at certain times in some areas. Inadequate draught power is already a constraint to area expansion, and it delays land preparation (section 12.4). It is important to develop more efficient farm implements (as well as improved-sequence crops) to economise on both labour and draught power and alleviate bottlenecks.

For reasons outlined in section 12.4, tractorisation is not considered appropriate technology for the kinds of peasant farming used in the Highlands. Even if tractors could be operated within the limits imposed by conservation structures, there are many inherent dangers in the use of tractors on fragile soils on steep slopes (Sanders, 1979). Furthermore, even on state farms and PC's, merely providing machines will not help at all if they end up - as has too often happened - rusting away in tractor graveyards for want of maintenance. Mechanization must be backed up by an efficient system for managing mechanization, from the training of enough drivers and mechanics to the supply of fuel, oils, and spare parts and the provision for speedy repair. The need for improving efficiency in the use of oxen is reviewed and some suggestions made in section 12.4 for improving ploughs. In particular, the development of single-ox ploughs and the use of cows and equines for draught is proposed. Economic analyses (EHRS WP 18) on the basis of preliminary studies suggest that the introduction of a single-ox plough would be attractive to farmers in all the sub-zones, but most of all to those in the HPC zone. Mention has also been made of the possible use of a mouldboard plough to reduce the number of ploughings and facilitate earlier planting. The tool-bar developed by ICRISAT needs to be considered for adaptive research in Ethiopia.

More attention also needs to be given to tools appropriate for row planting - ridgers, row seeders, etc. - as well as to improving hand tools. Threshing is often done by treading with oxen, which results in high grain losses and spoilage. There is obviously a need for greater efficiency and economy in the harvesting and marketing of the larger production likely to result from implementation of this strategy. Foot pedal and hand threshers, and ox-carts (section 13.7) are obvious priorities for adaptive research. Much has already been done by ARDU, ILCA, IAR and others and by extension campaigns. A wide range of ploughs successfully used and widely accepted in other countries has been tested, but more should be tested, also threshers. More use could be made of international organizations concerned with appropriate mechanisation. However, even if more adaptive research is likely to quickly result in low-cost technically superior implements, their adoption by farmers will still depend on credit and extension-cum-marketing campaigns - so that no rapid changes can be expected in the near future.

12.2.4.5 Improved crop husbandry

No technical improvements, whether they be seeds, fertilizers, herbicides or implements, can substitute for good crop husbandry; the latter, however, is sometimes a prerequisite to and always beneficial in increasing yields through the former measures. The use of imported fertilizers and pesticides may be minimized by good farming practices such as soil management and integrated pest control. Another priority for extension is to spread the practice of row planting, preferably along contours, for greater conservation. Row planting facilitates plant population control, weeding, fertilizer application and inter-cropping. There are many manual and animal-drawn seed drills and planters which could be tested immediately in PA's. Because of the rough broadcasting of seeds at haphazard depths, plant populations tend to be too low. Late sowing of long season varieties is another common practice likely to depress yields. Crop rotations and the use of fallow periods, however, are obvious targets for sharply focused research based on extensive survey.

Quantitative surveys on which to base estimates of crop losses due to pests and diseases have not been made, although the major pathogens and insect pests have been documented by IAR. Major cereal losses are caused by stalk borer infestation in maize and sorghum and by army worm in a wide range of crops. To the extent that mixed farming systems, crop and livestock rotations and multiple cropping are developed, the use of integrated pest control methods will be facilitated, and this would minimize dependence on imported fungicides and pesticides. (However, as cropping intensity increases and as horticultural crops are introduced on a wider scale, chemicals will be employed by an increasing number of farmers. Zero tillage would also result in greater use of herbicides (section 12.2.6.) Losses to grain-eating birds (Quelea quelea) are important in sorghum production. Since sorghum is a valuable crop in the food deficit semi-arid areas, it is essential that control measures be maintained, possibly with assistance from the East African Desert Locust Control Organization.

Crop losses, of course, continue after the harvest, during drying, storage, milling and cooking. The average level of loss has been estimated at 10 percent for grains and grain legumes and 20 percent for less easily preserved crops such as roots and vegetables. Losses can be reduced at every stage, and at every level, from the subsistence farmer to the big city warehouse. Stored grains represent an important contribution to food security. Given the large share of total grain production which never leaves the farm, even small reductions in losses could have a very great impact on supplies actually available for human consumption.

12.2.4.6 Priority areas and crops

An obvious means of increasing overall national agricultural yields is to concentrate resources and efforts in those areas and on those crops with the highest yields and the greatest potential for improvement. More productive cropping patterns are the subject of the next section. Concentration on areas with the highest potential for increased agricultural yields would alleviate pressures on more marginal lands. While this might in the shorter-term favour already relatively well-endowed and higher income areas, it appears inevitable in order to increase overall production and generate, through faster agricultural growth, the resources necessary to extend development efforts more widely. Programmes in high potential areas should however be designed to maximize the spillover of beneficial effects to other areas.

12.2.5 Changing cropping patterns

The extent to which a crop promotes erosion is undoubtedly due mostly to the way it is grown, but the nature of the crop and its habit of growth are also important (Chapter 6). Perennials can provide almost as much protection as natural vegetation. Mature tea is particularly protective. Coffee with shade trees, particularly if undersown with beans, is almost as good. Other perennials - enset, bananas, sugar, etc. - are also effective. The market (both domestic and export) prospects of major crops were reviewed in section 5.9.1. Unfortunately, without irrigation it is difficult to obtain economic yields of most perennials in drier areas, although certainly cassava (see below), and perhaps sisal, should be considered for the LPC zone. The extension of perennial fruit growing is proposed within the context of agro-forestry (section 12.5).

Because of their valuable conservation properties, as well as their role in generating foreign exchange, it is proposed that serious consideration be given to expanding coffee and tea production by peasants. There are large under-utilized areas suitable for such crops in the HPP zones and wetter areas of the HPC zone 1/. Quotas under the International Coffee Agreement are now much more flexible than in the 1960s, and there

1/ The Sirinka project is even distributing coffee seedlings, with surprisingly high establishment rates, in the LPC zone.

also is substantial scope for Ethiopia to increase both its quota and non-quota exports of coffee. Advantage should however be taken of Ethiopia's friendly relations with Eastern Europe to negotiate substantial non-quota coffee exports there. Labour for picking and the motivation of peasants are more critical constraints for coffee than marketing. The labour constraint might be alleviated by encouraging migration, even seasonal, to the coffee growing areas (section 13.5) and by abolishing the present law against hiring of labour.

Annual crops of course generally pose a problem for erosion control because of soil exposure during land preparation and crop establishment. Small grain crops such as wheat, barley and oats, however, require less tillage and provide more dense cover. Forage crops are even better. Leafy, spreading and low-growing crops (legumes) and prostrate type grasses generally protect the soil more than single-stemmed erect crops. Crops which are broad-leaved and germinate quickly, such as beans, cover the ground faster and provide more effective control of erosion than, for example, maize. In general, those annual crops that produce a thick and early ground cover are much more useful in controlling run-off and splash erosion than those which take longer for a full canopy to develop. Close spacing and use of manures or fertilizer to promote vigorous growth also help to provide the cover needed. As pointed out by Hudson (1981), most of the measures which lead to improved yields also give better erosion control, though clean weeding may often be an exception in the tropics. Although management practices are generally more important than the crop type, there is scope for changing annual cropping patterns to reduce their 'erosiveness' and to increase crop production. Thus crops and/or varieties which require less tillage, provide more and quicker ground cover, are higher yielding, responsive to fertilizers and amenable to multiple cropping and agro-forestry, would contribute more to both improved conservation and increased production.

With the precarious and generally worsening food situation in the LPC zone and the corresponding increases in both commercial food imports and food aid, the national top priority must be increasing of cereal production. The quickest increments to cereal production will be achieved in maize and wheat in the HPC and HPP zones. Some of the technical possibilities have already been reviewed, while the means (input distribution, extension and credit) and motivation are discussed in subsequent sections. In the LPC zone emphasis should be on growing drought-tolerant cereals which also produce reasonable yields. With its greater tolerance of moisture deficiency, sorghum should be promoted much more as the major crop in the LPC zone and drier areas of the HPC zone. To encourage this, "seed-for-work" could be distributed, and strategic stocks of seed of the most appropriate drought-tolerant varieties of sorghum held for distribution in drought years. The disadvantages of teff have been discussed above. Other cereals yield substantially higher and are better from the conservation viewpoint. If all the teff area were instead planted with maize, the country would have over a million more tons of cereals annually at its disposal. But there are also some advantages in its cultivation, particularly its high (unofficial) prices.

Before its replacement can be counselled, more thorough study is needed, as stressed in section 12.1.2.1. Nevertheless, there are indications that more people are increasingly using mixtures of cereals to make the injera. The scarcity of teff and the distribution of food aid are developing consumption habits away from teff 1/ - a trend which should be encouraged at every opportunity. With improved availability of high-yielding (or drought-tolerant) varieties of other cereals, together with fertilizers, teff production may well become less promising to farmers. Other measures to replace teff cultivation with wheat, maize or sorghum might also be considered, such as the distribution of free or subsidized seed, even "seed-for-work" programmes. WFP might be asked to procure and deliver sorghum as well as wheat for the FFW programme in the LPC zone in order to develop tastes for the more drought-resistant sorghum.

CASSAVA - A VALUABLE FOOD RESERVE CROP FOR DROUGHT-AFFECTED AREAS

Cassava (Manihot utilissima) is widely grown in other parts of Africa as a staple food and food reserve crop. Apart from a few house gardens (particularly around Arba Minch) it is practically unknown in Ethiopia. It will produce a crop, albeit a low yielding one, on poor soils and on low rainfall. It can be left in the ground until needed, though its quality declines after about 18 months. Once established it will stand periods of drought that kill many other plants. It does not tolerate frost, however, and for Ethiopia it is recommended only for areas below 2 000 masl.

A programme of testing cassava varieties is already being undertaken at Jimma Agricultural Research Station, and several have been dispersed around the country for evaluation.

Root crops are already important components of the diet - but in significantly varying degrees - in the HPP zone. Sweet potato, yams, the so-called Oromo potato (a species of Colen) and the Irish potato are all common in the southwest and may provide from ten to 30 percent of estimated total calories, but these are very limited in extent. Enset (section 4), is of course very important throughout most of the southwest quadrant of the country (in the Highlands), accounting for one-third to two-thirds of the calories of about 20 percent of the population. It should be emphasized that there is very little reliable data on patterns or levels of consumption in Ethiopia. Root and tuber crops should be encouraged in other parts of the country.

1/ Seventy-five percent of the respondents in an IDR survey of FFW in 1984 considered that their food habits had been changed as a result of FFW.

The two major advantages of root crops are:

(1) their ability in many situations to provide more carbohydrate per hectare than cereal crops (50 qt/ha of cassava - a not uncommon yield in fairly similar conditions elsewhere in Africa - produces as many calories as 19 qt/ha of cereal); and

(2) their contribution to food security, because they do not (within limits) deteriorate if harvest is delayed.

A disadvantage with many of the root and tuber crops (yam, taro, Irish potato) is that they require a good moisture regime, and are sensitive to moisture stress. Cassava and sweet potato, however, can withstand considerable moisture stress and still produce a reasonable crop, of reduced yield, which can remain in the ground for a considerable time. Both cassava and sweet potato are damaged by frost, and both require reasonable drainage. Promotion of cassava would also required education in its preparation, to eliminate the danger of prussic acid toxicity. In frost-free zones (mostly below 2 000 masl) consideration might be given to adopting, through the PA's, a target of 0.1-0.2 ha per family planted in cassava as a famine reserve.

Before the Revolution Ethiopia was a substantial exporter of pulses and oilseeds, and there is potential for substantially increasing the much reduced present levels of such exports. Pulses are grown in most parts of the country, often as a cash crop. They are also an important part of the diet, especially on fasting days. The range of species and types is large, and they are found in most agro-ecological conditions. An important pulse is chickpea (*Cicer arietinum L*). The crop is drought-resistant and is often grown on residual moisture on heavy black soils. Its value and potential for increased production was noted in section 11.3. The major constraint to the more widespread production of pulses, beyond local subsistence needs, is the lack of motivation. Because their inclusion in cropping rotations is highly desirable from the agronomic and conservation viewpoints, problems of motivation and marketing merit priority attention.

Ethiopia also used to obtain substantial foreign exchange from exports of oilseeds, and export market possibilities still appear bright, especially for sesame. There is growing appreciation of the value of oilseed cake for livestock. Research, in the context of farming systems, should seek replacement for the widely grown *Nerg* (niger seed), which is low yielding but preferred for cooking oil.

The proportion of fruits and vegetables in the diet is very low compared to other countries. The regular and widespread consumption of onions, peppers and a type of kale known locally as *gommen* is therefore critically valuable. Eggplant, cucumber and temperate climate vegetables have long been important in the cities and are growing in popularity, mainly near small towns along main roads. Vegetable production should be encouraged for local consumption (to improve diets), as well as urban markets, and even export. Nutritional surveys undertaken by Ethiopian Nutrition Institute indicate some widespread vitamin deficiencies, as well as overall calorie deficiency. A major constraint to the wider introduction of vegetables and fruit is lack of planting material. A programme to provide vegetable seeds and planting material for fruit trees is required, together with appropriate extension support. Large-scale canneries already exist for tomatoes and beans. There is strong potential for growing high yielding onions (both rainfed and irrigated), and therefore the construction of a pilot dehydration (for export) plant merits consideration.

Almost all farmers, even members of PCs, have their house compound. This is convenient to maintain, and being virtually a part of the house it gets the benefits of household refuse, waste water and, as animals are usually corralled or housed at the dwelling, the benefits of animal manure. Even if cattle dung is used for fuel, the manure and urine of sheep, donkeys, etc. is often available. This can give a great fertility advantage. A particular advantage of the home plot is that it can be tended by children and women, on a work-when-needed basis. Pest and predator problems are almost invariably less with close handy plots. Even in the driest areas small quantities of waste water are often available to sustain some special crops. These crops may be insufficient to provide a complete famine reserve, but can help extend limited food supplies. Assistance to this traditional and widespread activity should be a priority extension effort designed most specifically for women.

12.2.6 Zero tillage 1/

Seedbed preparation can be achieved by one of three methods: mechanical, chemical, or biological. The mechanical method of seedbed preparation is based on physical manipulation of soil (by ploughing and harrowing) and its principle advantage is weed control. Whereas this method controls weeds by turning them under the soil, it also exposes the soil to raindrop impact and can thereby accelerate soil erosion. The chemical and biological methods of seedbed preparation are designed to eliminate weed competition without attendant soil disturbance. Chemical weed control is based on the use of herbicides (such as Gramoxone or Atrazine); the biological methods are based on increasing competition for light, water, and nutrients by an easily suppressible aggressive crop (such as *Stylosanthes guianensis*, *Pueraria phaseoloides*, or *Centrosema pubescens*) or by eliminating light through the use of surface covers such as residue mulches. Neither the chemical nor the biological means of seedbed preparation involve soil disturbance and therefore are erosion preventive techniques. Seeds are sown directly in the ground by hand or by special and generally cheap implements.

1/ A detailed review of techniques, equipment, herbicides, advantages, disadvantages, extension, research and other considerations associated with zero tillage is presented in EHRS WP 14.

If weeds can be controlled by other means, the usefulness of mechanical tillage as a method of seedbed preparation is questionable at best, and unnecessary and harmful at its worst. If there is no mechanical soil disturbance and the soil is protected against raindrop impact by residue mulches, there should be no accelerated soil erosion on slopes up to 15 percent. At the International Institute of Tropical Agriculture at Ibadan, Nigeria, infiltration rates with zero tillage were more than 50 percent higher than on ploughed fields (see also table 12.3).

Table 12.3

ZERO TILLAGE EFFECTS ON RUN-OFF AND SOIL LOSS UNDER COWPEAS AT TWO WEEKS AFTER PLANTING AT IITA, NIGERIA

(rainfall = 63 mm)

Slope (%)	Run-off (%)		Soil loss (tons/ha)	
	Bare ploughed	Zero tillage	Bare ploughed	Zero tillage
1	69.8	1.3	1.0	0.0
5	71.9	1.6	2.6	0.0
10	74.0	3.2	19.6	0.0
15	87.6	2.7	33.3	0.0

In addition to its erosion prevention function, zero tillage with residue mulching helps maintain soil structure, soil organic matter content and the nutrient and water holding capacity of the soil. Benefits of maintaining an optimum soil temperature regime and a better environment for root system development and proliferation have also been derived. Crop yields comparable to those under mechanical tillage have been obtained on trials and even superior yields in a season or in areas with periodic drought stresses (see table A12.4).

Zero tillage would avoid the delays of oxen tillage (section 12.4) and overcome the constraint in expanding cultivated area imposed by the lack of oxen in tsetse areas (parts of HPP zone). Zero tillage would facilitate more timely planting and increase the opportunities for double and multiple cropping. Tillage labour inputs are also avoided. The adoption of zero tillage with the attendant reduction in the need for draught power would provide an opportunity for the farmer to change the composition and function of his herd, away from being an oxen-generating system to a more production-oriented system. The need for costly and unpopular conservation bunds would be avoided altogether on slopes up to 15 percent and reduced above that. In short, zero tillage may provide an opportunity to leap-frog the mechanical era of farming into the chemical era.

Some of the advantages of zero tillage can only be secured with surface residue mulches. Lack of the adequate amount of crop residue mulch would create problems of weed control, accelerated soil erosion, and general degradation of soil productivity. In most parts of Ethiopia, crop residues are grazed or used as fuel. The zero tillage farming system of soil management may also not work on severely degraded lands. The fertility of degraded and eroded lands may first have to be restored through the ameliorative effects of cover crops or other vegetative measures. The herbicides required for weed control would initially have to be proven in Ethiopian conditions, and, if successful, the required imports might be prohibitively expensive. Similarly, the application and planting equipment may be beyond the expenditure capacity of peasants. Animal pest problems (insects, rodents and birds) may be increased. Preliminary tentative economic analysis (EHRS WP 18) suggest that the costs of zero tillage adoption are likely to be high and beneficial only in a longer term - and in certain zones (probably the HPC). A Minimum Tillage Study Group exists within IAR, some of whose members have visited IITA in Nigeria. Some experiments have been undertaken, but the results have been inconclusive (Rezene, IAR; personal communication), and progress has been hampered by lack of suitable planting equipment and, more particularly, lack of support from research policy makers. The nucleus of interest, however, exists - though it is an inadequate base for development, being without effective full-time leadership. It is also lacking in agronomic expertise. High priority should be given to an intense, adaptive research programme in zero tillage. The research should be problem-solving and farming-systems-oriented. Consideration should be given to inviting major chemical companies to prepare proposals for collaboration with the Government in providing funding, skilled manpower, equipment and chemicals for the required research. In the longer run, if such research leads to practical recommendations on a large scale, herbicides could probably be blended and packaged locally to minimize foreign exchange costs. The spirit of cooperation built up during research and demonstration stages could be useful in subsequent large capital investments. Additionally, large commercial firms can provide opportunities for training at various levels.

12.3 IRRIGATION

12.3.1 Importance, need and benefits

The spread of degradation is rendering increasing areas of the Highlands (particularly in the LPC zone) less able to withstand the effects of irregular or abnormally low rainfall (Chapter 7). In such areas, rainfed agriculture is barely able to provide peasants with subsistence, even in years of normal rainfall; in years of abnormal rainfall, famine threatens. The development of irrigation would reduce dependence on vagaries of the weather.

The growing population, coupled with the already extensively used land area in the Highlands, inevitably implies the need to intensify agriculture (see section 12.2). On the other hand, degradation adversely affects the capacity of land to support intensification, particularly on the hillside farms typical of the Highlands. To effectively combat hillside degradation, some five to 30 percent of the land usually requires being set aside for conservation and reclamation measures. These considerations point to the need to assess the potential for intensifying and expanding agriculture in areas other than the hillsides - for example, the valleys. One means of such intensification could be irrigation and drainage, especially when it is observed that a major cause of degradation is excessive water run-off.

The potential benefits from irrigation depend on the extent, timing and severity of water deficit or stress to which crops are exposed, and the extent to which such periods can be relieved or removed by better water supply. Additional benefits are often also obtained from the greater use of inputs - the response to which can be assured by plentiful water - and from changes in cropping patterns. Improved seeds or expensive fertilizer are of little use if water is not available in the right amounts and at the right time.

The serious shortfall in precipitation in the LPC zone is even more marked in the northern and eastern areas than LGP figures suggest, and has led to catastrophic drought conditions over an increasing area in the last two years. The urgent need is to secure a satisfactory single crop in any of the basic foods. The now shallow soils in many areas of the LPC zone with LGP less than 120 days constrain yields of cereals, even teff and sorghum, possibly by as much as 30 percent below their potential (EHRS WP 26), even in normal years. In dry years, yields are affected much more and famine results.

An assessment of the potential benefit from irrigation by zone is summarized in table 12.4. In the HPC zone, as in the LPC zone, the main need is to assure a satisfactory yield from a single crop; but with longer LGPs in the HPC zone, there is greater scope for improving crop output by substitution of more suitable varieties or species, for extension of the growing period of the main crop by supplemental watering early or late in the season, and, where resources are sufficient, for the introduction of double, or perennial cropping. In the HPP zone a single main crop is already assured in at least four years out of five, and at worst the normal need would be for supplemental watering to ensure reasonable yields in the poor year. There are naturally stronger possibilities here than elsewhere for regular irrigation for both seasonal and perennial cropping, but conversely, the need is less. Generally, in areas of the HPP zone with a growing period of less than 270 days, rainfed double cropping would be only partially successful in most years. In areas with a LGP above this, double cropping could be achieved without the use of supplementary irrigation.

Table 12.4

RANK ORDER OF IRRIGATION BENEFIT

ZONE LPC	ZONE HPC	ZONE HPP	
↓	↓	↓	Assurance of one reliable crop per year (prevention of crop failure, very low yield)
↓	↓	↓	Increased output of single crop (higher yield, better variety from water availability)
↓	↓	↓	Extension of season and cropping intensity (catch cropping ——— double cropping)
↓	↓	↓	Increased output of multiple main season crops (higher output crops/varieties, better water control/practice)
	↓	↓	Enablement of some dry season cropping (high output food, root and vegetable crops)
		↓	Full perennial production, including specialist crops (food, vegetable, orchard and cash crops)

Source: EHRS WP 26.

Irrigated agriculture is less dependent on the timing and quantity of rainfall than rainfed farming, provides scope for extending both the range and duration of cropping and thus provides a less risky environment for the introduction of general improvements in agriculture than rainfed farming. In view of the inevitable continuation of the dependence of most Highlands people on agriculture for their subsistence and income, the unreliable rainfall in parts of the Highlands for cropping and the need to intensify agriculture so that it can support the growing population, the development of irrigation to complement rainfed agriculture is virtually a necessity. The main issue is not so much whether irrigation should be developed, but how quickly it should be developed, in which areas it should be given priority, what form it should take, and so on. While this conclusion is generally accepted, there is a risk that attention will be diverted from the major challenge facing Ethiopian agriculture - the development of rainfed agriculture. As will be seen in the next section, the potentially irrigable area is low compared to the area already being cropped. Irrigation can make vitally important but localized contributions to increased production, especially in the drought affected areas of the LPC zone. Irrigation cannot replace rainfed agriculture in the Highlands generally, nor would it likely contribute more than five percent of total agricultural production, even if its full potential were exploited. Rainfed agriculture will thus continue to overwhelmingly dominate crop production in this strategy period. In view of such considerations, care needs to be taken to ensure that resources allocated to irrigation development are justified in human and/or economic terms.

12.3.2 Potential

The physical potential for the development of irrigated agriculture depends on the availability of water in adequate quantities and qualities, suitable topography, soils and drainage possibilities, climate and vegetation clearance. Hydrological data are available for some 336 gauging stations operated by WRDA. Of these, 148 have water level recorders. However, few of the gauging stations are installed on small catchments and fewer still in the northern parts of Ethiopia - in Tigray and Eritrea. Here, too, the security situation has impaired data collection.

The seasonal variation in Ethiopian rivers reflects rainfall, with minimum flows occurring in February/April. Main rivers in the HPP and HPC zones generally tend to have small perennial flows. The irrigation potential of these flows also depends on ground water and the quality of the water 1/. Perennial flows are generally lacking in the LPC zone.

No national hydrogeological survey exists nor has there been any national attempt to catalogue the very many wells and springs, especially in the LPC zone, which can and in many cases are already being used for very small-scale irrigation. However, in terms of overall Highlands planning, these are thought to be insignificant in total. One thousand springs yielding, say, 5 litres/sec might irrigate a total of 3 000 ha. Over much of the Highlands, the thick volcanic cap has a very low transmissivity and thus provides poor aquifers for exploitation. Typically from one to five litres/sec yield at a depth of 45 metres might be expected from boreholes drilled into this formation, and this is generally unattractive for irrigation. Thus few areas of the Highlands appear to offer significant potential for groundwater development for irrigation, and the total potential for economic exploitation might amount - at most - to 7 000 ha over the Highlands as a whole. It is thus generally concluded that there are sufficient possibilities for the use of surface water that consideration need not be given in the immediate future to

1/ And on any constraints imposed by existing irrigation in the lowlands.

the more costly extraction of groundwater. Apart from the high and generally increasing sediment load of many surface water flows - which would obviously need to be considered in planning irrigation development - the quality of surface water generally presents no chemical problems for irrigation development.

It was estimated in section 5.7.2 that around 85 000 ha are under irrigation and most of this was in the lowlands and large-scale. Peasant irrigation in the Highlands is thought to be less than 10 000 ha. Development of irrigation in the lowlands (section 5.7.2) is mainly confined to the Awash Valley, where plans for the expansion of the existing substantial irrigation schemes are likely to make optimum use of the available water resources. In this catchment, expansion of irrigated agriculture in the Highlands, whether small- or large-scale, would have an impact on the available water downstream. It would appear therefore that no additional Highlands irrigation should be considered in the Awash Catchment. The other main catchment where water resources appear to be limiting is the Amarti Finchaa catchment, where water is primarily used for hydroelectric power generation. Again, it would appear that further irrigation diversions in the upper catchment of these rivers may prejudice the availability of water for power generation and should not, therefore, be considered.

Excluding areas with an LGP greater than 270 days or with very stony soils, but including areas with command of water and less than 8 percent slope and soil depth of at least 50 cm, and excluding existing irrigated areas and the Awash and Finchaa catchments - it is estimated that the total additional surface flow irrigable area in the Highlands is 290 000 ha 1/. The main constraint is water: there are no perennial surface flows in the LPC zone, while perennial rivers or streams in suitable areas of the other zones can only irrigate small areas.

The potential for small-scale irrigation was estimated between 165 000 ha (without storage) and 187 000 ha (with storage). Table 12.5 shows the seasonal and perennial potential by zone.

With respect to large-scale irrigation, a carefully phased approach to the development of hydro-power to match expected demand is proposed in section 13.1 Without hydro-power, development of the irrigation potential in the proposed large multi-purpose schemes in the Abay (Blue Nile) catchment will be both very costly and uneconomic, and these have been excluded from consideration in this strategy period. Of the remaining areas, on average some 70 percent of the initially surveyed irrigable areas have been proposed for irrigation in feasibility studies.

1/ This estimate was derived by a combination of initial overlay mapping at 1:2 000 000 scale, adding extra allowances by overlays at 1:50 000 for sampled areas and verifying field trips to sample areas as described in EHRS WP 26.

With such allowances, it is estimated that around 100 000 ha could be additionally irrigated on medium or large schemes in the Highlands, and much of this is in the Abay catchment (EHRS WP 26).

Table 12.5

POTENTIAL AREAS FOR SMALL-SCALE IRRIGATION

Perennial Irrigation	Without storage (ha)	With storage (ha)
HPP	16 000	32 000
HPC	11 000	36 000
LPC	-	17 000
Sub-total	27 000	85 000
Seasonal Irrigation		
HPP	44 000	32 000
HPC	52 000	40 000
LPC	42 000	30 000
Sub-total	138 000	102 000
Total	165 000	187 000

Source: EHRS WP 26.

12.3.3 Proposals and costs

Small-scale pumping is not considered appropriate to utilize the above estimated potential. Where flat land occurs reasonably close to the river bed, it is generally possible and much cheaper to command the area by gravity. The maintenance and operation of pumps, except perhaps simple low-lift animal-driven pumps, is both costly in terms of foreign exchange and skilled manpower and difficult. Thus, three major types of irrigation are proposed for priority in the strategy period. These are:

- seasonal run-of-river irrigation;
- perennial run-of-river irrigation; and
- irrigation combined with reservoir storage.

All systems would operate by gravity, and distribution systems would be either furrow or basin, and labour- rather than capital-intensive. However, this does not preclude other types of irrigation which may be appropriate in more limited localities. This also excludes water harvesting and other alternative water use systems (section 12.3.4). Except for the addition of a storage dam, all three types of irrigation systems will have essentially the same physical requirements. Common to all will be: a diversion structure, a main canal, a distribution system, access tracks, and storage requirements for crops and inputs. Unit costs will vary primarily because of differences in storage, access, and canal capacity.

On the average, the cost of large- or medium-scale irrigation development, without large storage works and using labour-intensive techniques, is estimated, nevertheless, to be over US$10 000/ha. This is very high and is partly explained by the need for the high costs of access roads, averaging US$1 500/ha. A number of multi-lateral funding agencies have already expressed reluctance to consider further investment in large-scale irrigation developments for reasons given in section 5.7. Accordingly, much more attention is now being paid to small-scale irrigation, for which estimated average costs are considerably lower - at less than US$2 000/ha without storage, but between US$6 000 and US$7 500 per hectare with storage (table 12.6). These costs exclude costs of developing access, as in many cases existing tracks are sufficient, at least for seasonal irrigation.

Table 12.6

SMALL-SCALE IRRIGATED DEVELOPMENT COSTS 1/

(US$/ha)

	HPP and HPC Zones	LPC Zone
Run-of-river		
Perennial irrigation	1 400	-
Seasonal irrigation	1 400	1 900
Reservoir Storage		
Dam cost	4 500	6 100
Irrigation cost	1 400	1 400

1/ Similar costs have been estimated by the FAO Investment Centre FAO 1983c).

Source: EHRS WP 26.

The high costs of dams has been verified in Eritrea (LPC zone) where 15 have been built in the last two years at an average unit cost of US$5 500 per ha. Observations at some of these and other small dam sites in the Highlands suggest that the dam reservoir is often on land which was at least partially cropped before, so that the resulting increment to cropped area is very small (especially in the LPC zone, where water constraints are more severe), and that there is a severe sedimentation problem arising from high rates of erosion from denuded catchments. Given the high incremental costs for storage, its justification has to be sought more in human and social terms (famine relief, etc.) than in economic terms, suggesting that storage might be most justified in the drought-susceptible areas of the LPC and HPC zones, but not in the HPP zone. In all cases, dam construction should preferably follow or be accompanied with catchment reclamation works.

The FAO Investment Centre assisted the GOE in preparing a project for ADB-funding designed to build up irrigation institutional capacity in several regions of the LPC and HPC zones. This lack of capacity limits the pace of small-scale irrigation development. The resulting analyses indicate the technical possibilities of developing irrigation. In view of the large cost differences between small- and large-scale irrigation and of the possibility of small-scale irrigation generating low to moderate ERR's (EHRS WP 18 and FAO 1983c), it is suggested that the greater emphasis now being placed on the development of small-scale irrigation be continued. To the extent that there is still considered to be a need to develop large-scale irrigation (for example, to take fuller advantage of investments already made by consolidation and farm level expansion of existing irrigation schemes, and/or to cater for the needs of resettlement), such development should be labour- rather than capital-intensive. This latter suggestion is made because Ethiopia cannot afford to replicate on a large scale developments which make continuous heavy demands on skilled manpower and foreign exchange (as is the case for large capital-intensive irrigation) when alternative methods are available and might even be necessary to support resettlement.

The present division between small-scale irrigation on the one hand, and medium- or large-scale on the other hand, is made at approximately 200 ha. This figure has been chosen as a maximum area which can reasonably be farmed by one PC or PA of up to 500 farmers. Small-scale irrigation is essentially considered as a peasant-oriented activity, while medium- and large-scale irrigation is considered to fall into the more highly mechanised farming undertaken by the Ministry of State Farms Development. The responsibilities for development of irrigation lie with MOA and WRDA for small-scale and medium- or large-scale, respectively. There is therefore a real danger that the smaller of the medium-scale schemes - particularly those with only seasonal supplies of water - may be forgotten by WRDA, whose main efforts and orientation will be concentrated on larger-scale projects. For this reason, it may well be desirable to increase the size of projects handled by the MOA to around 500 ha, with the proviso that these are for peasant rather than state farm development.

The need for irrigation is undoubtedly greatest in the LPC zone where it has been estimated that average single crop yields could be improved substantially (EHRS WP 26), and where yields could be significantly higher, even in years of low rainfall, if seasonal irrigation could be provided. In the LPC zone, with its more limited possibilities of developing rainfed agriculture (section 12.2), the opportunity costs of irrigation may be compared at least partially with the costs of resettlement and/or famine relief. In the other zones, greater benefits (relative to costs) are likely to be obtained for perennial, rather than seasonal, irrigation because there could be opportunities for double cropping and more intensive vegetable and root crop production. In view of recurring drought in much of the LPC zone, it is felt that seasonal irrigation in this zone should be developed as famine relief. Lower priority should be given to the development of perennial irrigation in the HPP and HPC zones. Seasonal irrigation in the HPC and HPP zones can then proceed as a lower priority and on the initiative of PA's. Seasonal irrigation in the LPC zone should be designed not only to increase the reliability of cropping, but should be accompanied by use of higher yielding cereals (e.g., sorghum instead of teff - see section 12.2).

The rate of exploitation of the irrigation potential identified in section 12.3.2 will depend largely on the allocation of resources to irrigation, and the capacity of the country to absorb and use those resources effectively. Absorptive capacity is constrained both by peasant inexperience of irrigation and by lack of skilled manpower. The majority of Highland farmers have no previous knowledge or experience of irrigation practice, but most of them - at least in the areas of high variability of rainfall - have experience of trying to make the most of scarce rains, or avoiding the hazards of excessive rains. Even so, extension efforts in areas to be irrigated would need to be strengthened by training on supplemental irrigation (two to three months) for local DA's and perhaps by basic one-week courses for contact farmers and PA leaders. The ratio of DA's to peasants will also need to be increased for irrigated areas - ideally there should be one DA for every 100 ha of irrigated land. Training on institutional strengthening should cover not only irrigation techniques, but the associated matters of inputs application, marketing and accounting. Similarly, at higher levels, it is not just the GOE departments directly concerned with irrigation that need to be strengthened, but also those providing inputs (AISCO) and extension (section 12.7).

Several large externally assisted projects which are already under appraisal (by ADB, IFAD and UNDP - Annex 7) should contribute to institution-building and training at both the local and national levels. It is important in early development that levelling and water management do not give rise to irregularities in water supply, and inputs are delivered on time with appropriate guidance as to their use, so that farmers' confidence and experience in irrigation is built up steadily. Despite the large size of the three projects mentioned above (totalling US$8 million) they should in many respects be regarded as institution-building-cum-pilot-projects for future irrigation development - initiating a process of learning-by-doing in the LPC and HPC zones, in particular. In light of such considerations, and assuming approval and appropriate follow-up of these major "pilot" projects, it is considered that the rate of expansion of irrigation development could gradually build up to reach 5 000 ha annually by the year 2000. The target should be to develop - within the strategy period - the whole of the identified 165 000 to 190 000 ha of potential land for small-scale irrigation. Achievement of this target will depend on a system of quick site identification, evaluation, mobilization and construction, using local labour. FFW could be very effective in mobilizing peasants.

Irrigation should contribute to Conservation-based Development by alleviating land pressures arising from expansion of rainfed farming onto more marginal areas. Most irrigation should also have some slight effect in reducing flood peaks downstream but without reservoirs the effect will be marginal. However, there may also be some small additional benefits from irrigation in prolonging water flows in drier areas by increasing groundwater recharge. Soil and water conservation in irrigated catchments is necessary, both to reduce silting and to promote retention of water in the catchment. Such measures reduce peak floods, encourage groundwater recharge and thus augment the lower water flows. Even in run-of-river schemes this gives significant, though unquantifiable, benefits. In schemes with reservoirs the benefit would be much greater, as reservoir life could perhaps be extended from a few years at worst to perhaps more than 100 years, even in degraded catchments. These mutually reinforcing advantages can only be sustained in the longer run if adequate attention is given to the risks of soil salinity build-up and rising ground water tables, both of which could eventually inhibit plant growth. These potential problems can usually be overcome by providing for adequate drainage.

12.3.4 Water harvesting and alternative water use systems

Water harvesting is best distinguished from irrigation in that the water is used in the vicinty where it falls and does not flow down rivers or streams. The objective is not primarily to hold water for supplementary irrigation, but to hold moisture within the soil profile down the catena and along the catchment, so that it becomes available to plants sooner at the beginning of the rains, and is present for a longer priod after the rains have finished. The areas of greatest potential benefit from water harvesting undoubtedly lie in the LPC zone. Simple farming to concentrate rainfall into soil close to plant root zones could, in a poor year, make the difference between a crop or nothing. Bunding with zero gradients is a form of water harvesting.

'Water spreading' techniques can be used to augment soil moisture by redistributing flood water that is otherwise discharged off the land. Different construction designs have the same basic purpose - to lead seasonal flood water out of its normal course by means of weirs and channels, and to spread it onto adjacent land by using various types of spreaders: 'dykes' (usually earth banks or small rock barriers) which hold up and spread the water, and increase its infiltration. The main problem is that construction of efficient spreader systems requires special engineering skills and often a high capital input, and this limits immediate replicability over much of the LPC zone.

ILCA have demonstrated on peasant farms the feasibility of excavating ponds using oxen-drawn metal scoops, at less cost (about EB $1/m^3$ excavated) than by using either heavy machinery or hand labour 1/. Such ponds can provide a convenient source of water for domestic and livestock use and can be used to extend crop growing periods by short times. ILCA studies have suggested that even if the main crop growing season is extended slightly, major impact on grain yields can be achieved 2/. Deeper ponds/dams capable of releasing water by gravity to lower lying fields (especially valleys) may be feasible in some areas and could also be used for fish production. Ponds on gentle slopes could also be a means of keeping run-off water from bottom-lands, thus facilitating their earlier cultivation (section 12.2).

Experiments with different systems of water harvesting and spreading are continuing, especially at ICRISAT and in Ethiopia by ILCA. It is understood that the World Bank may be organizing a workshop (late in 1985 or 1986) with the purpose of identifying possible lessons emerging from the experience of other countries in these techniques. Full feasibility study of these ideas is required before concrete recommendations can be included in the strategy.

1/ F.M. Anderson: A Strategy for smallholder water development in the Ethiopian Highlands. Unpublished paper, 1983.

2/ ILCA suggests that water stored in small ponds could be used for this purpose in three different ways, depending on location. The first would be to ensure adequate water supplies for a short-season crop in the dry season. The second would be to extend the growing season of the main rains by initiating germination two to three weeks before the onset of the main rains. Third, in areas where temperature permits, the growing season could be extended at the end of the rainy period to ensure adequate grain development. (Brumby, personal communication.)

12.4 LIVESTOCK

12.4.1 Objectives and overview

As people obtain higher incomes the demand for meat, dairy products and eggs increases faster than the demand for staple foods. This calls for livestock production to increase at a faster rate than crop production. The basic aim of livestock development is to satisfy this demand and to increase the contribution of livestock to both the national economy and to farm incomes through sustainable increase in long-run productivity. Conservation-based Development of livestock in essence amounts to increasing productivity per animal, while reducing grazing pressure on fragile land resources. Only the HPP zone can absorb more livestock, but even here the emphasis should be on increasing livestock production, wealth and income through increased animal efficiency rather than through more animals. To the extent that livestock numbers per capita have already fallen in the last decade (section 5.6) this sub-strategy would merely reinforce current trends 1/. While efforts are being made to reduce livstock numbers, simultaneous action needs to be take to improve feed availability so that, despite steadily declining areas of grazing (because of cropping expansion - section 12.2), ample provision is made for dry season feed supplies. Improved feed supplies and changes in herd structure, prompted by greater draught efficiency and other factors (section 12.4.3) will improve meat and milk productivity.

Achievement of these objectives would result in a smaller but more productive livestock herd in the Highlands, more complementary to that in the lowlands, and - most importantly - supporting the Conservation-based Development Strategy. Conversely, livestock development through increased numbers would tend to further reduce productivity and undermine longer-term Highlands development. The aim is increased productivity per animal and this is much more consistent with sustainable long-run increase in livestock production per hectare than short-term increases per hectare associated with increased numbers.

Principal components in the strategy for livestock development are improved draught efficiency, reduced livestock numbers, more productive herd composition, and improved livestock feeding. Supporting components include the strengthening of marketing facilities and incentives, more trade in animals between the Highlands and lowlands, a carefully phased and localized approach to improving animal health, and measures to increase farm income through non-ruminants, especially poultry and bees.

1/ Analysis suggests that this downward trend is likely to accelerate in the future, especially in areas of high population pressure. (See EHRS WP 16.)

12.4.2 Draught efficiency

As the area under cropping increases with population, largely at the expense of grasslands, the feed base for livestock will continue to decline 1/ . It therefore becomes increasingly important to use livestock more efficiently, particularly in their major use: draught.

With steadily increasing demand for draught power, peasant cattle breeding practice serves to increase the proportion of oxen in the herd, with the result that about 30 percent of the Highlands herd are oxen; the rest are viewed primarily as the necessary means for the reproduction of oxen. Only about 30 percent of the herd are milking cows, and meat offtake is low at 6-7 percent. Offtakes from sheep and goats are much higher (30 and 36 percent, respectively, estimated by the LSR) because of their higher fertility and, being smaller units, they are more often sold to supply cash requirements. But their proportion in the total herd is limited by the need for oxen and by local carrying capacity 2/. Thus any increase in mechanization (see below) or of zero tillage (section 12.2) - given the limited possibilities of increasing holdings in most PA's - would be likely to result in fewer oxen. Improved efficiency in draught and transport are means to change herd composition toward more productive (meat/milk) animals with greater offtake rates.

It can be argued that draught power requirements could be met by mechanisation - most specifically by tractorisation, which at least superficially appears to offer some attractions: avoiding the need for grazing areas, fodder crops, etc. However, Ethiopia's experience with tractors are on state farms and settlements which, despite their large components of skilled management, do not succeed in keeping a high proportion of their tractors working. This failure often reflects lack of spares and skilled mechanics. The difficulties lead to high cost operations. In any case, tractors are less suitable for the steeper Highland slopes and for bunded lands. Tractors replace more labour-intensive methods and are very demanding, both of skilled manpower and of foreign exchange. Tractorisation requires substantial investment and operating capital. Average tillage costs by tractor are calculated at over EB 150 per ha, compared with oxen tillage costs of around EB 90 per ha. (Table A12.6.) Thus for the foreseeable future, tractorisation is unlikely to present an economic option of meeting draught power requirements for the majority of peasant farmers, even on cooperatives. They will thus remain dependent on animal draught.

1/ Feed yields from croplands residues are less than those from grasslands. Forage cropping could change this.

2/ Again, trend data suggest the increasing relative importance of small stock in the Highlands herd (section 5.6).

Less than half the Highland farmers own the pair of oxen required for traditional ploughing 1/, and this lack of draught power has been identified as a major factor limiting production (GOE/WB 1983). These farmers must either hire oxen or make some exchange arrangement each ploughing season. The season is short, and in many areas cannot begin before the start of the rains because of the difficulty of tilling dry soil. Any arrangements reduce the extent to which the short ploughing season can be fully utilized. Farmers frequently complain about delayed planting - which increases erosion hazards and reduces crop yields. Such considerations led to research into use of single oxen, and in 1983 ILCA developed a modified version of the local plough, the maresha (Figure 5.2) suitable for use by a single ox of the local (zebu) breed. (Gryseels, et. al. 1984.) Trials on test farms established that the time taken for cultivation by single oxen averaged around 30 percent more than by a pair. The plough can be modified at home or by a local blacksmith, and retraining oxen to work as singles took only two days, at most. Oxen worked as singles require more feed per head than paired oxen, but total feed requirements for a given area are less. The single-ox ploughing was shallower, but depth could be increased by more ploughing. The main problems still to be overcome concern the stability of the plough; farmers' traditional scepticism of new practices; and the 30 percent addition to labour inputs required. The continued expansion of croplands and shrinkage of grasslands will inevitably increase pressures for more efficient draught and increase labour availability per hectare. The single-ox plough would call for fewer oxen (relieving grazing pressures and increasing feed availability per animal) and/or shorter durations of land preparation. As most erosion takes place during land preparation (Chapter 6), use of the single ox plough could contribute significantly to reducing erosion hazards. The ILCA plough is now being tried by many more farmers, and if accepted on an increased scale, large-scale production, distribution and extension efforts should begin. ARDU, too, has progressed in spreading an improved plough.

Other possibilities to improve draught efficiency include the construction of many more ponds (oxen commonly work only a 4-hour day or less because of long distances to watering places), the use of cows, equines and camels, and other improved implements 2/. Improved draught efficiency not only contributes to increased agricultural productivity but also to conservation of the feed resources base and may even facilitate the cultivation of seasonally flooded valleys. Improved efficiency in animal draught should remain a top priority for adaptive farming systems research.

1/ A 1980 MOA survey found that 29 percent of peasants had no oxen; 34 percent had one.

2/ ILCA are also experimenting with a zig-zag harrow. Initial indications are that it provides a more uniform seedbed in less time with less draught power than the maresha, but costs at least twice as much to make locally. (Gryseels & GOE, 1984.)

Another possibility to meet Highland draught requirements more efficiently would be through an increase in the trade of oxen and grain with the lowlands, instead of so much reliance on the breeding of oxen in situ. The proportion of males in lowland herds would be reduced by selling young oxen to Highland farmers. This would reduce the reproductive component in Highland herds. Sale may be effected in cash or kind, in particular grain - which would help reduce the pastoralists' critical dependence on livestock subsistence. Such trading is not uncommon in Hararghe, but is rare in other Highland areas bordering the lowlands. It has been calculated (EHRS WP 16) that for each ox acquired in the lowlands and used in the Highlands, 1.6 TLU could be released from the total herd. The PA's could be instrumental in encouraging such trade as well as schemes for sharing oxen for cultivation. In parallel, efforts can be made to increase the utilization rate of work animals, especially outside the main ploughing season. Apart from possibilities of double cropping (sections 12.2 and 12.3) oxen could be used for earth movement (for ponds, dams, conservation works, etc.) and for transport through expanded use of ox-carts (section 13.7).

12.4.3 Reducing livestock numbers and changing composition

More direct measures to reduce livestock numbers should be taken simultaneously with efforts to improve draught efficiency. These include improvements in marketing, legal limits to livestock ownership (corresponding to the present limits on sizes of farms) and/or taxation of livestock. Veterinary projects (likely to decrease stock death rates and therefore increase livestock population) should only be given priority in areas such as most of the HPP zone where the stocking rates are low relative to carrying capacities. This might even be another incentive for migration to such areas (section 13.5).

Livestock marketing is constrained (see section 5.6) by lack of infrastructure, management capacity in the parastatals concerned, lack of support for exporters and, most importantly, lack of outlets for rural savings and investment. Livestock traditionally fulfill the role of an emergency bank, especially in the drought susceptible areas of the LPC zone, to be sold off in years of low crop production for purchase of grains. But overgrazing in the LPC zone is worsened by continued encroachment of croplands. This, and overcropping, further increase vulnerability to drought and thus further increase the emergency savings value of livestock. Breaking this vicious circle requires improved food security (section 12.1), for otherwise a reduction in the importance of animal wealth for food security (which is a concomitance of the willingness of owners to move from a number/subsistence consumption/survival outlook to a quality/production/rising income/diversified consumption expectation) is delayed or prevented if the value of crop production is not increasing. In the Highlands farming systems livestock and crops are integrated with the socio-economy of the Household, even if their technical/physical interaction is largely confined at present to draught.

Marketing infrastructure could be developed by establishing collection facilities equipped to permit the stress-free holding of cattle during veterinary examination and the assembly of uniform market lots of suitable size. Sales would be encouraged by improved incentives including greater availability of consumer goods and improving crop-livestock terms of trade. Other measures would be the expansion of slaughter facilities and the promotion of export of live animals rather than meat. Exporters also need assistance in export documentation and in the interpretation of importing country regulations, lower export levies and credit.

PA's should be given authority to define maximum livestock numbers in relation to their grazing lands' carrying capacity, with assistance from the local DA's. PA's already have rights to plan the use of land, and these could be extended to the allocation of grazing rights to groups within the PA's (section 11.6), also extended to grazing management powers to relieve pressure in critical areas at critical times. Livestock numbers within and between years might be influenced by progressive taxation with rates being assessed during every rainy season. Such taxation should be regarded as a local fee for the use of the PA communal grazing areas. A baseline, consistent with the carrying capacity of the grazing area may be defined in terms of a livestock holding per family that continues to go tax-free or which would be subjected to a nominal tax only. DA's (or location-specific radio programmes) could give guideline tax rates during the rains. Generally the tax could be inversely related to the amount of rainfall, both over time and by geographic location. Allowance would be made for family size. Above the baseline additional animals would be taxed at a heavily progressive rate. This would imply an element of penalty for excessive numbers. The inducement thus provided to destock would be greater in low rainfall years/areas, i.e., when/where grassland carrying capacities are lower. The funds thus provided could be used by the PA to buy up stock offered for sale (to pay the tax) and trek it to markets for sale. Acceptability to the community as a whole would be further enhanced if any surplus funds collected would be exclusively used locally for development activity including improvements of livestock infrastructures mentioned above. Livestock taxation could also be used to encourage changes in herd composition toward animals more productive of meat and milk. The main problem with such taxation proposals - as well as with most other measures proposed to reduce livestock numbers - is that so far they generally have not succeeded in other countries. For this reason, and because equity considerations question imposing tax burdens on peasants who are amongst the poorest in the world, greater priority has to be given to improving feed availability and utilization.

12.4.4 Improving feed availability and utilization

Notwithstanding the policies aimed at decreasing livestock numbers as described in section 12.4.3, continuation of the downward trend in livestock numbers is likely to be resisted by peasants at least until alternative outlets for savings and investment have been developed, as well as more 'social' attitudes with respect to land conservation. Continued expansion of croplands will further reduce grazing areas per TLU and thus put further pressures on grasslands. Livestock feed policies have to minimize these pressures, and full use should be made of non-conventional feed resources. 1/ The policies, compared in table 12.7, include those for:

(a) improving the livestock carrying capacities of grasslands and their management along the lines already suggested in section 11.3.3;

(b) increasing feed availability from croplands - for example, by fodder cropping on fallows, undersowing main cereal crops and/or following these with a crop grown on residual moisture, and the use of the increased crop residues becoming available (section 12.2);

(c) increasing feed availability from forest lands, closed hillsides and even waste lands, by systems of agro-forestry (section 12.5), rotational grazing and/or cut-and-carry systems (section 11.3.2);

(d) improving feeding techniques, including fodder conservation, cut-and-carry systems, seasonal supplementation, improved use of crop residues and agro-industrial by-products, and the synchronization of cattle breeding cycles with the seasonal fluctuations in feed supply.

The increased use of more intensive livestock feeding by cut fodders should be encouraged by the spread of closure, and of rotation and deferred grazing (section 11.3.2). The traditional grazing system of the farmers will change toward a more confined one where animals are tethered or stall-fed. This practice is already widespread in the Amhar mountains and around Harar and should be encouraged in other areas. In terms of nutritional requirements, confined feeding is more efficient since less energy is required for walking and thus more energy can go into production. This would result in greater draught power, more milk, greater weight at final sale for slaughter.

Dry season supplementation with protein-rich feeds would help reduce seasonal weight losses. Improved use of crop residues by supplementing them with legumes would be the preferred method of improving the efficiency of utilization of the residues rather than chemical treatment, which would be difficult to apply in Ethiopia. Recent work

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1/ A useful survey of non-conventional feed resources for the Highlands is given by Chadhokar (1984b).

Table 12.7

ASSESSMENT OF PRIORITY OPTIONS FOR IMPROVING FEED AVAILABILITY AND UTILIZATION
(the more * the better)

Policy Option	Potential economic impact	Technical prospects Short term	Technical prospects Longer term	Priority locations (zones)	Major constraints	Acceptability to peasants	Possible speed of implementation
Fodder in croplands (fallows, conservation structures)	***	***	***	ALL	seed/plants extension	***	***
Undersowing cereal crops	**	*	**	1. HPC 2. HPP	screening extension research	*	*
Oversowing/residual moisture crops and/or belg fodder crop	**	*	**	1. HPC 2. HPP 3. LPC	screening research extension	**	*
Agro-forestry	***	**	***	ALL	extension plants motivation/organization	**	*
Oversowing pastures	***	**	***	LPC	seed extension motivation	**	**
Grazing management	***	***	***	LPC & HPC	extension motivation organization	*	*
Cut-and-carry systems	**	**	***	ALL	extension scythes	*	**
Other improved feeding management	***	**	***	LPC & HPP	extension	***	**

at ILCA has indicated high potential gains in feed value by supplementing crop residues with oilseed cake. Some agro-industrial by-products such as cane tops, coffee pulp, oilseed meals and molasses are currently under-utilized or wasted (section 5.6), and scope exists for improving their utilization, especially in the HPP zone - especially for poultry. Prepared feeds could also be improved by upgrading the existing feed milling facilities.

The livestock feed policies suggested in this section will counter malnutrition and under-nutrition and thus contribute to improved livestock health, production and productivity while at the same time contributing to the Conservation-based Development of Highlands resources.

12.4.5 Supporting livestock policies

In developing livestock there has emerged an almost traditional emphasis on veterinary services to improve animal health; but despite this almost universal emphasis, livestock productivity in tropical Africa has scarcely increased in the last 20 years, and the few increases that have taken place can be attributed more to increased herd sizes than to any increases in productivity per animal (Jahnke, 1982). As already explained, larger livestock herds will threaten sustainable development in the Highlands. Animal health measures, especially general veterinary measures in all zones, bear some inherent dangers. They would result in increasing livestock numbers, a regression from the basic aim. This is not to say that animal disease is desirable or that nothing should be done about it. It is recognized that poor animal health, high mortality and low reproductivity add to motives for keeping larger numbers of livestock and inhibit animal productivity. But there is the question of sequence and coordination with complementary measures. There has to be a proven institutional framework to contain animal numbers <u>before</u> general and national level animal health measures are embarked upon and/or the measures chosen should be those that do not increase livestock density (e.g., concentration on exotic breeds, facilitating exports, facilitating land settlement through tsetse eradication).

One aspect of disease control which might merit priority is the control of tsetse flies, since this can be complementary with the Conservation-based Development Strategy. It is estimated that there are some 60 000 km^2 of valleys within or adjacent to the Highlands which may be infested with tsetse (EHRS WP 7), many of which are in the western and southwestern parts of the HPC and HPP zones. These areas are very thinly populated and virtually void of livestock. Potentially they could hold some 2.2 million TLU, or 15 percent of the present livestock population, assuming stocking rates similar to present averages. The danger in opening up these areas is that an uncontrolled influx of people, haphazard settlement and spread of the traditional land use techniques would within a short time reproduce the degradation problems of the overstocked LPC zone. Organized settlement schemes, on the other hand, tend to be expensive and difficult to manage (Chapter 9). Compromise solutions have to be sought (section 13.4). A programme for the control of tsetse flies and livestock development in the Didesa and Angar river valleys traversing Welega and Illubabor and Kefa is under preparation (FAO, 1983).

For the reasons stated above, it is suggested that measures to improve animal health be confined, at least until the feed improvement policies outlined in section 12.4.4 are having successful results, to:

(a) improving nutrition and thus reducing susceptibility to disease and drought;

(b) improving livestock management, e.g., not grazing swampy land at times of high risk of exposure to liver fluke, etc.;

(c) maintaining existing levels of veterinary services (but not expanding them) and concentrating them on exotic breeds and facilitating exports; and

(d) tsetse control.

Similar to the traditional emphasis on animal health noted in other countries, there has been a tendency for many concerned with Ethiopian development to focus primarily on higher technology developments such as dairying, large-scale ranching, upbreeding. This distracts attention and resources from the essential task of developing the much larger traditional sector for which high technology options are largely irrelevant - hence the relative neglect of improving the livestock feed base, improving grazing management, etc. For such reasons it is proposed that these other traditionally 'favoured' livestock policies including ranching, cattle upbreeding, as well as animal health, now be given lower priority than the essential tasks of reducing livestock numbers, changing herd composition, improving draught efficiency, improving the feed base and grazing management. A possible exception is dairying. Small-scale dairying in India has been a successful development catalyst in raising rural incomes in areas around towns, thereby increasing expenditure on crop inputs and fertilizers (Ashworth, World Bank, personal communication, March 1985). The priority attached to dairying should be related to proximity to urban markets. It should not distract from the major tasks indicated above.

Also of relevance is the potential for hides and skins improvement. If increasing attention is paid to improving the quality of hides and skins (primarily by better flaying and processing techniques) there should be very favourable opportunities for increasing exports. Hides and skins are already Ethiopia's second largest export income earner. The livestock sector generally would stand to gain from a broad-based approach to upgrading the hides and skins industry.

Two other components of the livestock sector - poultry and apiculture - deserve more attention because of the opprtunities they provide for the kind of development which increases incomes and production without threatening the Highlands resource base. Development in these sub-sectors of course cannot substitute for the major tasks already metnioned, and it is realized that both poultry and apiculture are very small parts of the whole livestock sector. Poultry development should be peasant-based and be sought primarily by upgrading indigenous stock using imported improved breeds capable of growing in the agro-ecological conditions of the Highlands. The main constraint to increased honey/wax production is the lack of knowledge about modern hives (the Longstrom and Kenyan topbar hives are almost certainly much more productive than traditional local hives). Training and extension would appear to be the main tasks in apiculture, which could be usefully linked to eucalyptus woodlots and agro-forestry with acacia and citrus trees.

Proposals with respect to other livestock support services, such as extension, training and research are made in section 5.6.

12.5 AGRO-FORESTRY

The need to increase agricultural production while conserving the longer-term productivity implies the need to improve the efficiency with which land resrouces are used. One of the ways to achieve this is through agro-forestry. This is defined as "a sustainable land management system which increases the overall yield of the land, combines the product of crops, including tree crops and forest plants and animals, simultaneously and sequentially on the same unit of land, and applies management practices that are compatible with the cultural practices of the local population." (King and Chandler, 1978.). Agroforestry is not so much a new science as a synthesis of the existing sciences relating to cropping, livestock, forestry and conservation. Agro-forestry is efficient in the use of land because it provides the means for cropping (food, forage, wood and other products such as fruit, gum, honey, etc.) not just at ground level but at successive layers or storeys, and not just during the rainy season but also during the Highlands' long dry season (tree growth via residual soil moisture). It also provides a means of improving crop and forage yields by its potential soil-enriching properties: nutrient recycling; nitrogen fixation; buildup of soil organic matter; shade from sun, rain and wind - and thus conservation. Greater reliance on trees to provide organic fertilizer substitutes for potential imports and supplements actual imports. Because of its accepted efficiency in land use, agro-forestry development was ranked as the nation's top priority by a recent UNDP/WB energy assessment mission (section 13.2) - a recommendation generally endorsed in this Strategy for the same reasons.

Some forms of agro-forestry are already practiced in the Highlands, as evidenced by the tree species that are left on arable land when forest or woodland is cleared for cultivation. In the HPP zone, shade is left over coffee plantations, and a spice (Aframomum korerima, false cardamon) is often grown below coffee, giving a three-tier system. The other perennial crop in the HPP zone, enset, is often grown around the homestead with other trees. In the HPC and LPC zones, many acacias are retained on arable lands. However, in this rudimentary agro-forestry, tree density per hectare is very low relative to needs and the potential for forest products and for conservation and soil improvement. This basically reflects:

(a) ignorance of the potential role of agro-forestry, so there is little or no effort to prevent natural seedlings being eaten by grazing livestock after crop harvesting;

(b) critical fuel and land needs resulting in cutting down too many trees; and/or

(c) insufficient peasant motivation to invest in and/or conserve their land.

The sub-strategy for agro-forestry is basically to expand, intensify and improve the already present agro-forestry as quickly as possible. Because of the critical demand for wood, agro-forestry should be conveyed initially not as a substitute for woodlots but as a complement to them, as well as to cropping and grazing. Woodlots are the subject of proposals in section 13.2.1.

The existing rudimentary agro-forestry systems described above have to be sustained and extended to other areas, primarily by the use of already proven indigenous multi-purpose trees. There is much to gain and little to lose by encouraging peasants to plant recommended local multi-purpose species on their lands. From this simple approach the targets and complexity of the programme should gradually be increased in light of peasant field experience and findings from research (discussed later). Suggested species, with their properties for each zone and altitudinal belt, are shown in table A12.7.

The selection of species, their spacing and management depends on local agro-ecological micro-conditions, farming systems and peasant preferences and requirements. Selection may often be reduced to a balancing of conflicting demands such as for fuelwood and forage. Not all trees are beneficial for soil conservation or reclamation. Indeed, trees supporting little undergrowth may enhance erosion. Splash erosion may increase from the large rain drops falling from leaves onto the bare ground. Tree stem erosion (the concentration of run-off down the tree trunk) can be another cause of erosion. Trees often have deep root systems and therefore a high ability to extract water and nutrients from the soil. But this ability can only be utilized if some of the basic requirements of the trees are satisfied.

For example, on denuded land leguminous trees might do better than others because they fix their own nitrogen. On very shallow soils on top of hard bedrock it might be more beneficial to grow grasses and leguminous herbs or shrubs instead of trees until enough soil has been accumulated for tree planting.

Desirable properties of trees for conservation purposes include:

- good survival rates and fast growth on impoverished sites;
- production of large amounts of litter;
- strong and wide-spreading fibrous root system;
- ease of establishment and need for little maintenance;
- ability to readily establish from vegetative material;
- capacity to form a dense crown and retain foliage at least through rainy seasons;
- resistance to insects, disease and browsing;
- capacity for soil enrichment, such as through nitrification by legumes.

Notwithstanding the difficulties of generalization, the box on the following page briefly reviews the characteristics of two indigenous species (Acacia albida and A. Abyssinica) and three exotic species (Leucaena leucocophala, Acacia saligna, and Sesbania grandiflora) which are likely to be useful in promoting agro-forestry over large areas of the Highlands. Enough research has been done in similar environments to warrant the large-scale use of these trees. As more areas are found to be suitable for faster growing species, then they may replace or complement these. Generally, these multi-purpose trees can be planted at up to 60/ha on cropland (or grasslands) suitably spaced to allow ox ploughing, without any significant reduction in cropped area - and probably significant increases in average yields.

In this respect, all these trees are preferable to the much quicker growing Eucalyptus species, the shallow and vigorous roots of which compete with crops for soil moisture and which do not provide forage or fruit nor fix nitrogen. The place for eucalyptus in agro-forestry is in "non-competitive" planting places where their moisture greed will cause least damage to crops (for example, along tracks, roadsides, riverbanks, around houses, schools, PA offices, etc.). Widely spaced on grasslands, and/or what the Chinese call "four side" planting using field/plot borders and every other available under-used space. The Acacia and Leucaena species are more suitable for planting on cropland bunds, in drainage or 'fanya juu' ditches, and for cropland windbreaks. Leucaena (or Sesbania) is more suitable for planting along contours and/or to make "live fences" for conservation, protection of croplands from animals and to facilitate improved grazing management (section 11.3). Leucaena hedges can be browsed from the second year onwards and if planted all around the croplands, would, within two years, alleviate the problem of protecting newly planted acacia and other palatable seedlings from grazing. Obviously not all croplands could be closed

FIVE VALUABLE MULTI-PURPOSE TREES FOR THE HIGHLANDS

Acacia albida. Indigenous in HPC and LPC zones, 1 500 to 2 500 masl. Grows (slowly) up to 20 m high. Drought tolerant. Bears leaves in dry season. Palatable to stock and can be used for cut-and-carry. Palatable pods. Deep rooted and nitrogen-fixing. Nutrient recycling by its dropping quickly decomposing leaves at ideal time for cropping - i.e., just before rains. Surveys have shown substantial cereal yield increases under the trees (e.g., Poschon, 1984). Moderate shade in hot season and thinner shade in rainy season tend to even out extremes in soil temperature. Seed produced annually from three to five years of age.

Acacia saligna. Exotic but well established in all zones up to 2 500 masl. Drought resistant. Nitrogen-fixing. Fodder from leaves, pods and branches. Fuelwood. Effective in reforestation of degraded hillsides and gulleys.

Leucaena leucocephala. An exotic fast growing tree legume for forage and fuelwood. Five to six metres high. All zones up to 1 700 masl. Not so drought tolerant as Acacia above. Deep rooted and nitrogen-fixing. Wood hard and makes excellent charcoal. Useful for planting on soil bunds but needs care so that it does not invade cultivated land. Fodder cut every few months. Very palatable and protein rich. The plant contains mimosin, which can be toxic to livestock if it constitutes too large a proportion of the total diet.

Sesbania grandiflora. Exotic, above 1 700 masl. All zones. Nitrogen-fixing. Fast growth; can be managed for forage and green manure, or for wood. Poles and leaves contain high amount of protein and it makes excellent food for humans and livestock. Wood used for fuel and pulp-paper making.

Acacia abyssinica. All zones, indigenous above 2 500 masl and up to 3 500 masl. Fuel, nitrogen-fixing. Thorny branches for fencing.

Source: EHRS WP 27.

to residual grazing simultaneously - but this is neither likely nor necessary - the spread of agro-forestry will be gradual. If establishment of Leucaena hedges is difficult because of premature browsing, non-palatable species should be used. Two species widely used in Ethiopia for live fences are Euphorbia candelabrum and E. Tirucalli. Both are very easily established by cuttings in situ, and both are unpalatable to livestock. E. canadelabrum can also be used for fuel and in house building. Species to be used as live fences should exhibit relatively rapid growth and be easily propagated and established. The Silvicultural Research Centre is starting trials on 13 species including the two Euphorbia mentioned above.

Fruit trees also need to be emphasized more for planting on crop lands. Fruit could become a significant source of improving both incomes and diets. There are many species of useful trees, some of which are already grown in different eco-zones:

2 000 to 3 000 masl:	apples, pears, cherries, almonds.
1 500 to 2 000 masl:	avocado, grape, loquat, mulberry.
below 1 500 masl:	bananas, papaya, guava, castor, mango, oranges (irrigated).

In the HPP zone, coffee and/or enset could be used in an agroforestry system for conservation by planting the trees along contours. Pereira (1973) found in Kenya that such tree belts occupied only about six percent of the area (i.e., less than bunds), but were still effective in halving the run-off on lower slopes.

Agro-forestry can, in addition to all benefits other than wood, supplement wood supplies, thereby reducing the amount of land required for woodlots (section 13.2).

To maximize land cultivation while at the same time preserving the valuable role of trees in hilly areas, agri-silviculture (the taungya system - King, 1968) has been used in some developing countries, including Ethiopia. In one form, the forest is felled and cleared by a group of farmers who then plant crops in the area. Trees are planted among the crops by forestry department personnel, and the seedlings are tended by farmers, along with their crops, for approximately two years. Subsequently, shade from the trees prevents further crop growth and the farmers are assigned new locations in the nearby forest. However, the farmers return to the old location to tend the tree crop until it can survive without care.

The taungya system can also be used for newly afforested areas such as woodlots. Trees are planted, generally in rows for convenience, along with an agricultural crop; when the crop is harvested the trees are left to grow on. This continues until the tree canopy becomes too dense to permit undercropping. This method could be used when establishing multi-purpose trees on arable land. The advantages of the taungya method are that weeding is done automatically by virtue of the agricultural crop; there is double use of the land for a few years; work load is reduced because jobs are done concurrently. If the method is used in the annual reforestation of logged areas, it could become a controlled form of shifting or rotational cultivation in that use is made of the soil fertility in a newly-cleared natural forest, and by the time the fertility for crops of one site is exhausted, there are other sites opened up. Taungya could be an appropriate means for re-afforestation (for both wood and reclamation) on already cropped steep hillsides. A farmer, in advance of being moved from a hillside to the lowlands, could plant trees or pasture species with his arable crops in the last two or three years before moving. This is pursued further in section 13.4.3.

Another form of agro-forestry is alley cropping, in which fast growing woody species, often leguminous, are interplanted with food crops and periodically cut to provide forage, fuel, organic matter and nutrients, while the cutting also facilitates food crop cultivation by minimizing competition for light and/or moisture during the cropping season. A typical example is leucaena/maize intercropping in which the leucaena is usually established at four-metre intervals in the maize crop; once established (i.e., after 18 or more months), the leucaena is then periodically cut back for forage or green mulch and allowed to grow during the dry season, often reaching three to four metres high and resulting in firewood and staking material. The land thus lost to leucaena is insignificant, while crop yields and soil fertility build-up are high. Furthermore, costs of land preparation and weeding are greatly reduced and, if the "alleys" are along the contours, conservation enhanced. Other woody species useful in alley cropping include Gliricidia sepium, Sesbania grandiflora, Tephrosia candida, Acioa barterii, and to a lesser extent Cajanus cajan and Flamingia congesta. The system is better suited to wetter areas where competition for moisture would not be serious. Whether legume roots would interfere with ox-ploughing, and whether higher crop yields compensate for the small reduction in cropland, are matters for investigation. Results from this system in West Africa and Malawi are encouraging, and if it works in Ethiopia it could make a major contribution to erosion control on steep slopes.

Agro-forestry on croplands and grasslands or sylvo-pastoralism is somewhat more difficult to establish because of the need to protect newly planted trees. Its establishment would be greatly facilitated by rotational closure of selected areas or hillsides (section 11.3) and/or the gradual planting of live fences as already suggested. An alternative means of protecting newly planted palatable trees is to surround them by twigs and sticks, but these may not be available in major fuel deficit areas such as most of the LPC zone. The main species being investigated for sylvo-pasture are Leucaena leucocephala, Sesbania grandiflora and Cajanus cajan. The latter (pigeon pea) is a valuable multi-purpose shrub described in table A11.1. Characteristics of the first two species were summarized in the box on page 115.

Another constraint in pursuing this indigenous-based start to agro-forestry is the availability of seed. The trees concerned are so severly pruned and pollarded that they remain in a vegetative rather than reproductive phase. Seed collection would be a very widespread operation until such time as seed orchards had been established or sufficient mother trees had been located. Actual nursery and planting techniques are generally well known, although the comments made in section 13.2 are also applicable here. In all cases, in order to encourage agro-forestry, seedlings should be distributed to farmers free of charge.

The abovementioned proposals are primarily constrained by ignorance and lack of peasant motivation. Proposals relating to a mass educational campaign for Conservation-based Development would include the rationale for and practical advice on agro-forestry, backed up by appropriate extension and contact farmers (section 12.6). Agro-forestry involves forestry intimately interwoven with, rather than on the fringes of, crop production, hence it is appropriate that the concept be delivered through the familiar agency of the agriculture extension service. Nevertheless, MOA's forestry department should provide subject specialists at the Wereda level and above. Similarly, the proposals made in section 11.6 to stimulate peasant motivation to invest in land conservation and reclamation are also applicable, as agro-forestry is the major means for such investment.

The proposed agro-forestry sub-strategy, being based on already proven species, should not wait for findings from a prior research programme. There is not time for such an approach. However, a research programme should be included in the strategy - not as its leading or most important component, but as a supporting component for the future development of agro-forestry. Similarly, within the agro-forestry research programme, there is no time for pure long-gestation research such as breeding. The programme should be mostly adaptive research within each major farming system; trouble-shooting (problems coming up from the peasants, not 'down' from the particular preferences of the researchers), with emphasis on quick returns. Research should cover spacing and management trials for already proposed species as well as comparisons with other species (both indigenous and exotic) for wood and forage yields, conservation and soil effects, competition with crops, etc.

Much of the required research should be informal - learning from monitored experience on peasant fields, rather than on special research plots. Statistical design, layout and accuracy (with its implied high manpower requirements) should take second place to a quicker approach involving the extension service as much as forestry researchers. Each PA woodlot could have a small testing area. Different spacings could be tested and direct sowing techniques demonstrated; weeding protection, and management operations would follow as the woodlot developed. Thus local farmers would be exposed to a variety of tree species and management techniques that they could possibly adapt to their own land. Over a period of time the woodlot should be able to supply seed and cutting material to the local community and could possibly establish its own small nursery if there were sufficient local interest. This approach calls for an adequate monitoring feedback and analysis system, preferably decentralised to at least the Awraja level with DA's and/or contact farmers in each PA providing the regular feedback. Early consideration should be given to the design of simple experimental and recording procedures at the PA level linked to higher-level experimentation as part of a nationwide research-cum-management information component of the proposed substrategy for agro-forestry.

ILCA, the Alemaya College of Agriculture and IAR might assist the Silvicultural Research Centre (SRC) in such research efforts. Finance would be complemented by the funds becoming available to the SRC from the Canadian International Development Research Centre as a result of an agreement reached in January 1985 for a three-year programme on multipurpose tree species, including collaboration with ICRAF. Similarly, the peri-urban forestry project recently prepared by the FAO Investment Centre for World Bank funding includes a component for applied research into agro-forestry (FAO 1985).

Most of the proposals made in this section relate to agro-forestry on croplands, grasslands, and wastelands farmed by individual peasants. The proposals are also relevant to PC farms cultivated by tractors, because the trees are widely spaced. Forestry on state farms and some PC's is the subject of proposals made in section 13.2.

12.6 RESEARCH, TRAINING AND EXTENSION

12.6.1 Research

Attaining increased agricultural production while sustaining land productivity depends on the continued development of technological improvements by research. There are three main levels of research: basic research, with long-term and uncertain pay-offs - which is better left to richer countries and the network of International Agricultural Research Centres; original research, with medium-term pay-offs - which could be afforded by more prosperous developing countries, and should not be left entirely aside, even in Ethiopia; and adaptive research, applying the results of the first two to local needs - which offers an immediate pay-off. Adaptive research has to be done within each farming system. It was concluded from the review of Ethiopian agricultural research in section 5.8 that not only have inadequate resources been allocated to agricultural research, but their use has been over-focused on original and basic research, and has paid too little attention to the priority needs of peasant farming. Because of its potential for quick pay-off, and the limited resources available for agricultural research, most attention in the strategy period should be concentrated on adaptive research. Most basic and original research requirements (excepting on crops such as teff and enset which are found only in Ethiopia) should be left to national or international research institutes in other countries.

IAR's preoccupation with breeding research has taken a disproportionate amount of resources without substantial benefit to peasant farming (EHRS WP 14). It is therefore particularly important that IAR develop and sustain strong links with international institutes such as the International Institute for Tropical Agriculture (IITA) at Ibadan, the International Centre for Research in the Semi-Arid Tropics (ICRISAT) at its sub-station in Upper Volta, the International Centre for Maize and Wheat (CYMMET) in Zaire and Tanzania, and the International Centre for Insect Physiology and Ecology (ICIPE) in Kenya. These institutes will continue to undertake and expand the more basic, long-term research required on African agricultural problems, and will provide IAR with promising new technology for subsequent location-specific testing and validation.

Both the International research centres and the International Service for National Agricultural Research also offer training facilities. The latter has been created specifically to assist governments to develop and strengthen their research organizations. Such assistance can take the form of preparing investment proposals for funding by international or bilateral agencies, together with providing top research administrators for national programmes. ILCA is steadily expanding its Highlands Programme to directly assist national research institutes such as IAR in farming systems research and also in training. Ethiopia stands to gain significantly from ILCA's training and research facilities, e.g., the current research into water management, drainage and cultivation of vertisols being undertaken in collaboration with ICRISAT (section 12.2), and IAR should maintain close contact with ILCA.

IAR's adaptive research should concentrate on the most urgent issues with the greatest chances of high pay-off. This suggests that attention should be focused primarily on:

(a) priority crops - the major higher yielding food crops (for food security) and coffee (for foreign exchange);

(b) priority areas - the HPP and HPC zones, where conditions are most suitable for large production increase; and

(c) priority farm types - i.e., peasant farming, accounting for 95 percent of Ethiopia's agricultural production.

The inherent character of adaptive research should inevitably relate it to farming systems (which, in turn, relate to agro-ecological as well as socio-economic conditions). Adaptive research within the context of farming systems (FS) should aim to develop relevant technology for sustainable increases in agricultural production. This means that adequate attention is given to conservation as well as production criteria, particularly improvement of land use so as to protect its longer-term productivity, and to other normal FS research criteria of farmer profitability, risk assessment, etc. Thus adaptive and properly prioritised research would focus more on annual yields of all farm crops sustainable in the longer term rather than on short-term yields per individual harvested crop (e.g., quicker maturing crops may provide lower yields per harvest, but they may increase cropping intensity, reduce erosion and be less affected by droughts - thus resulting in greater average farm production in the longer-term). Adaptive and FS-oriented research should reduce IAR's present bias toward higher technology (state) farming, irrigation and single-commodity-oriented flat land farming in which erosion is relatively unimportant (typified by the Holeta site receiving more than 50 percent of IAR's staff and budget). The proposed orientation will inevitably require major strengthening in IAR's staffing and in particular by the addition of general agronomists (as opposed to more specialized plant breeders, etc.), socio-economists and biometric specialists. The latter are needed to sift through the vast backlog of the IAR findings which still have to be related to the Highlands farming patterns, and as they become identified with confidence by field study, to the farming systems. They are also needed to monitor original and basic research in other countries for the same purpose and generally to give an overall orientation in IAR's programme toward the Conservation-based Development Strategy for Ethiopia's farming systems. Much could be learned from farming systems in other East African countries. IAR's departments of conservation, socio-economy and agricultural engineering need strengthening, especially, while in other departments - apart from the already stated need for more general agronomists - the requirement may be more for diploma level staff (section 5.8).

It is hoped that the recently approved WB credit for agricultural research will effectively assist IAR in these new directions. In implementing the GOE/WB project, in addition to the above suggestions, particular attention should be given to the evolving relations of extension and research and to emphasizing peasant field level trials and demonstrations.

Adaptive research has necessarily to be loosely linked or even answerable to and guided by extension. Extension should be seen not only as a means of dissemination of research findings, but also as a way of learning of peasant and extension problems, needs, preferences, etc. It has proved very difficult in many countries, including Ethiopia, to establish a continuing and effective close link between extension and research. Probable reasons are that those engaged in research often possess advanced academic qualifications, that their work is often difficult for outsiders to understand, and that research stations are usually physically separate, and sometimes distant from the major concentration of offices and staff. Therefore research programmes are often only partially relevant to the immediate problems and aims of a Conservation-based Development Strategy; their direction and content may tend to reflect the interests and professional goals of the researchers, while results are not published or distributed in very appropriate form. Both IAR and MOA must be closely involved at all steps - from early adaptive research through to farm demonstrations. IAR research workers should realize that their research work is not complete until farmers have accepted and adopted the new practices derived therefrom. Extension workers must visit research stations to learn about new developments and understand their implications. They should also make recommendations and have a say in deciding research priorities. The annual national crop improvement meetings are indispensable in the relations of MOA and IAR, but they are insufficiently frequent and comprehensive.

Much closer collaboration between the MOA and IAR is important to achieve the desired emphasis on adaptive research. This will inevitably require much more emphasis on local field level verification trials in typical farming situations and in farming systems as these become identified. IAR does not have the staff to adequately conduct the trials on the proper scale, especially for the many new locations required. MOA, however, does not have the quality of staff trained in field trial methods. On-farm evaluation of new technology provides the need for, as well as an excellent opportunity of, cooperation between research and extension. The MOA should have the prime responsibility for surveying and demarcating the homogenous farming systems in each agroecological zone.

In addition to the specific conservation research topics proposed in section 11.5, initial priorities within the research orientation needed under the Conservation-based Development Strategy might include peasant field level verification trials on the following:

- the latest high yielding varieties of maize produced in comparable Highland conditions in other countries, especially for the HPC and HPP zones;

- time of planting, plant density and spacing for sorghum, especially for the LPC and HPC zones;

- fertilizer for all major cereals and coffee, using different times of application and different fertilizers, including sulphur;

- intercropping, multiple cropping, forage cropping and agroforestry systems;

- cereal plant density with a view to providing quicker and fuller vegetative cover while maintaining or improving yields.

IAR's research programme should be evaluated every year (preferably prior to approval of its annual budget) to ensure its continued relevance to the needs and priorities of the Conservation-based Development Strategy. Such evaluation should be by persons not employed within IAR and should preferably include representatives of extension staff, a conservationist and an authority on current international research.

12.6.2 Extension and training

Extension strategy should aim to disseminate information on improved farming to peasants as cheaply as possible, and as soon as it can be extended with confidence. Views on the role and value of government extension services in rural development range from the views of those who question the need for field extension services as they usually exist today, and who are sceptical about the availability of appropriate information - to the views of those who see an efficient advisory service as the main agency from which all else will follow. There are many shades of opinion between the two extremes. A large and growing volume of literature questions the impact, hence the justification, of "orthodox" agricultural extension services (e.g., Woods 1984). Specific questions relate to the degree of farmer contact achieved by extension workers and of adoption of innovations; the appropriateness of the advice imparted, and the cost-effectiveness of extension.

Achieving and maintaining adequate agent-farmer contact is an inherent difficulty in extension, particularly in Ethiopia with its prevailing transportation constraints and where peasants outnumber DA's by 4 000 to one. Adequate communication is further restricted by the reliance of the field extension service on the least educated, lowest-status, and least mobile of its staff to achieve this critical contact. In addition, most extension agents are men, while around half the peasants are women and social norms result in the latter having very little contact with male agents.

Considerations on the appropriateness of extension advice have already been reviewed: the need to promote the message of the Conservation-based Development Strategy (section 11.2); the need to integrate conservation into agricultural research, extension and training (section 11.5); and the fact that there are already known basic messages for the Conservation-based Development of cropping, livestock and agro-forestry which are not being adequately recognized or disseminated (sections 12.2, 12.3, and 12.5).

The expansion of the extension services in recent years is stretching both the budgetary and manpower resources of the Government. A joint GOE/WB mission concluded:

> "The capacity of the extension service has been seriously eroded by a diffusion of responsibilities across regions and among objectives, and the resources available to extension workers (operational and capital budgets) have declined in most regions we have visited. Thus the capacity and the incentives of extension agents to deliver the technology messages to farmers have declined, while the demands placed upon them to support cooperative development have increased." (GOE/WB 1983.)

The strategy proposed here combines some of the old with some of the new in a three-pronged approach involving respectively much fuller use of mass media and education (sections 13.7 and 13.6, respectively), direct farmer training of contact farmers and development of the Training and Visit (T and V) extension system 1/.

Direct farmer training through both mass media and special courses is intended to increase the capacity of rural people to help themselves and thus provide a means for more widely replicable and ultimately more sustainable development. To induce farmers to change traditional methods of using land which are harmful to its longer-term productivity requires gaining the confidence of at least a small nucleus of those who are willing to become innovators and to persuade others to follow them - more by the example of their farms than by local talk - in adopting development-based conservation measures and conservation-based development measures. These "contact farmers" are given a basic training in one of the FTC's (section 5.8), to be followed by periodic refresher training. Gradually the task of contact farmer may be rotated to provide broader exposure.

The course provided by the FTC's is considered too long (six months) and to have too high a proportion of non-technical subjects (see table A12.8). Non-technical subjects - now absorbing about 20 percent of the time - could be covered in general educational programmes and the FTC's left to concentrate basically on productivity-raising conservation-based farming, preventive medicine, and family planning - with emphasis on farming. This should integrate conservation and agriculture and should include subjects such as agro-forestry, forage cropping, and grazing management, which are relatively neglected at present. Courses should be related as specifically as possible to what is known about the local farming systems. Three, instead of the present two, annual intakes of four months each would increase the number of newly trained contact farmers by 50 percent. Shorter courses would be less likely to interfere with farming operations. The one-third reduction in course length should not reduce its impact and relevance for rural development because a 19 percent reduction could be obtained by cutting out the non-technical subjects, if necessary by making prior participation in such classes as literacy an entry requirement. A further 14 percent reduction would be obtained by reducing the relative importance of cooperative training (special courses on cooperatives should be conducted for those directly concerned, rather than for all farmers). The number of FTC's should be increased. Particular attention should be given to offering courses for women farmers - perhaps by alternating courses for the two if social norms make it difficult to obtain high female participation in mixed courses.

International experience suggests that contact farmers need to receive regularly scheduled visits from extension staff to sustain and

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1/ The T & V system is well described in "Agricultural Extension - The Training and Visit System", by D. Benor, et. al., World Bank, 1984.

enhance the benefits from their initial training. The contact farms should serve as demonstration farms and be points of assembly for meeting the DA on his scheduled visit to the PA. The DA's themselves are supported by subject matter specialists at Wereda levels and above. Such a training and visit extension system was tried on a pilot basis in Shewa and Arsi Regions. A WB evaluation team concluded (November 1984) that "the T and V system can be highly effective in stimulating agricultural growth with improvements in farm incomes" 1/. Accordingly, it is now being proposed to extend the T and V approach within the context of the PADEP (section 5.8). One DA would be allocated to each SC area, covering an average of around 2 000 farmers, and live in a house provided by the SC. The DA would be trained monthly in the appropriate messages. The DA would spend less time travelling, thus being able to focus more attention on the three to five PAs which are members of each SC.

Before and during the main cropping season, the DA visits would be regular and would deal with the message appropriate for that part of the season, for example, land preparation, application of fertilizer, etc. The message would be focused largely on conservation through increased crop production. It would also include aspects of forage production, grazing management, agro-forestry, seed selection, etc. Outside the main crop season, the visit schedule may not be so regular, being interrupted by the need for annual in-service training or special programmes. During this period the DA is likely to focus attention on livestock production, structural conservation activities, hides and skins improvement, etc. At all times the message should be aggressively backed up by the massive use of appropriately timed radio programmes, the distribution of posters, manuals, charts, leaflets, PA level meetings with audio-visual aids, field days, etc. The message should also be, insofar as possible, specific to the local farming systems and must be presented in simple terms so that all peasants receive the impact of the message.

Considerable efforts will have to be made to improve the quality of DAs, as well as to increase their number so that there is one DA for every four or five PAs throughout the Highlands. The pressing need is for large numbers of competent lower-level and middle-level people with technical skills, willing and able to carry out practical work in the field. It is often cheaper and more effective to set up within-country training courses (perhaps using contracted instructors) and to send the locally trained staff on short, organized mind-broadening tours or to attend specialist courses abroad at intervals during their service.

The DAs would be appropriately supervised at the Wereda level (where supervisors should be equipped with motorcyles), while subject

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1/ Interim Evaluation of the T & V Pilot Project, World Bank, November 1984.

matter specialists (SMS's) would be stationed at the Awraja level and above - where there should be a four-wheel drive vehicle for extension work. The SMS's at the Awraja would also receive regular refresher training sessions, in addition to the annual in-service training. Such sessions would be held approximately every three months at the Zonal Office, organized and taught by the Zonal departmental staff. The technical content of these sessions, which would last for about two days, would be determined by the Zonal Research/Extension Standing Committee and would be focused on the technical recommendations for that cropping season. The sessions would be held before, during and after the crop season, emphasizing crop production, with one additional session in the off-crop season to focus on livestock and conservation messages.

12.7 INPUTS, CREDIT, MARKETING AND PRICING

12.7.1 Inputs distribution

To support the required increases in crop yields, cropping intensity and, to a lesser extent, cropped area expansion, input procurement and distribution systems will be called upon to handle much more business 1/. Generally, inadequacies in total supplies of inputs are compounded by inadequacies in their distribution (section 5.8.5). AIMC has a virtual monopoly in both input procurement and distribution, but like many other government agencies it is hampered by a number of problems including scarce management, poor worker incentives, bureaucratic procedures, limited transport, storage and funding. These constraints, together with the absence of competition and incentives, increase the risks that the required inputs will not arrive at the right place at the right time. A three-pronged strategy is proposed to support the required expansion in input procurement and distribution, involving the strengthening of AIMC and the Service Cooperatives. AIMC would increasingly concentrate on procurement and distribution to major outlets only, leaving the SC's to gradually take over responsibility for distribution to PA's, PC's and individuals. Meanwhile, there should be a campaign to mobilize private sector capital, initiative and skills to play a complementary role in both procurement and distribution.

Some of the constraints faced by AIMC could be alleviated by capital and technical assistance - the former to build up AIMC's storage and transport capacity and to establish a revolving fund for fertilizer

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1/ Inputs here refers primarily to improved seeds and fertilizer, but much of this section is also relevant to other inputs including farm equipment, pesticides and other chemicals.

credit, and the latter to assist in both the policy and logistics of procurement and distribution and in the management of the proposed fund. All fertilizers at present have to be imported (see section 13.3 for a review of possibilities for local manufacture). Imports will have to be increased rapidly to support the production programme. Assistance might be sought from the FAO Fertilizer Programme in the establishment and initial operation of the fund, but local currency replenishments to the fund would need to be converted to foreign exchange so long as fertilizers are imported. Because of the high foreign exchange costs, it is all the more important to use fertilizers for those crops and on those areas which will give the greatest returns: maize and wheat production in theHPC and HPP zones (section 12.2). The whole issue of whether fertilizers should be subsidized (at present they are not for PA's) needs to be reviewed in the context of crop pricing policy 1/. This is beyond the scope of this report, and is noted only in passing that, whereas subsidies can provide incentives to use fertilizer (especially when the incentives provided by crop prices are minimal), the necessarily limited budget allocations for the subsidies can impose a ceiling on fertilizer procurement, and the availability of funds for subsidies - being tied to budget years - can result in delayed procurement and untimely distribution.

It is already GOE policy that the SC's become the central point for distributing inputs and credit to farmers in PA's and PC's (GOE/WB 1983). It will be some time before the SC's are able to carry out these tasks, however. Thus, in the next few years the major task will be improvement in the coordination and efficiency of the existing national agencies and regional development units to carry out the tasks they already perform. But as the skilled manpower (especially management, bookkeeping and audit), storage, and transport capacity of the SC's is built up, they should gradually take over from AIMC the distribution to farmers. A recently approved GOE/IFAD project is assisting by providing credit for construction of SC stores.

Further consideration should be given to the proposal (made in GOE/WB 1983) that the SC's form Wereda, Awraja and Regional level cooperative unions, so as to simplify and streamline the tasks of distribution from AIMC. Developing this proposal further, AIMC could gradually become the apex cooperative organization, with its zonal branches merging with or forming the basis for SC unions at that level. A strong cooperative movement could greatly reduce the heavy demands being placed on government when it is involved in agricultural marketing. Governmental resources then would be concentrated more on supporting peasant production.

1/ A preliminary review is contained in GOE/WB 1983, which also makes more detailed recommendations for improving efficiency in fertilizer distribution.

Because of the interdependence of input distribution, extension, and adaptive reserach, these activities should be centered on the SC's, which should eventually be established throughout the Highlands. A further important function of the SC's would be to provide feedback through the decentralized MOA offices to IAR concerning the kind of research-derived solutions most urgently required, thus helping to ensure that research in general is oriented more toward farmers' priority needs. The proposed hierarchical organization is shown in Figure 12.1.

Consideration should also be given to the proposal that such SC unions at various levels assist the AMC in crop procurement, storage and transport. Cooperative unions at Regional or Awraja level would be reasonably close to the farmers concerned and at the same time they would be large enough to secure economies in transport and storage. Such a combination of the marketing and input distribution functions would also enable SC's to ensure that farmers pay promptly for their inputs. The combining of these two functions should also allow for more efficient use of existing transport and storage facilities.

When fully functioning, an SC should thus provide:

(a) crop production inputs such as seeds and fertilizers, on time and in convenient packages. It is further proposed that SC's in drought susceptible areas keep emergency reserve stocks of suitable quick maturing cereals (usually short-cycle sorghums) for distribution if rains are delayed;

(b) livestock production inputs such as forage seeds and medicines;

(c) draught animal implements and hand tools, and demonstration of the use of improved implements;

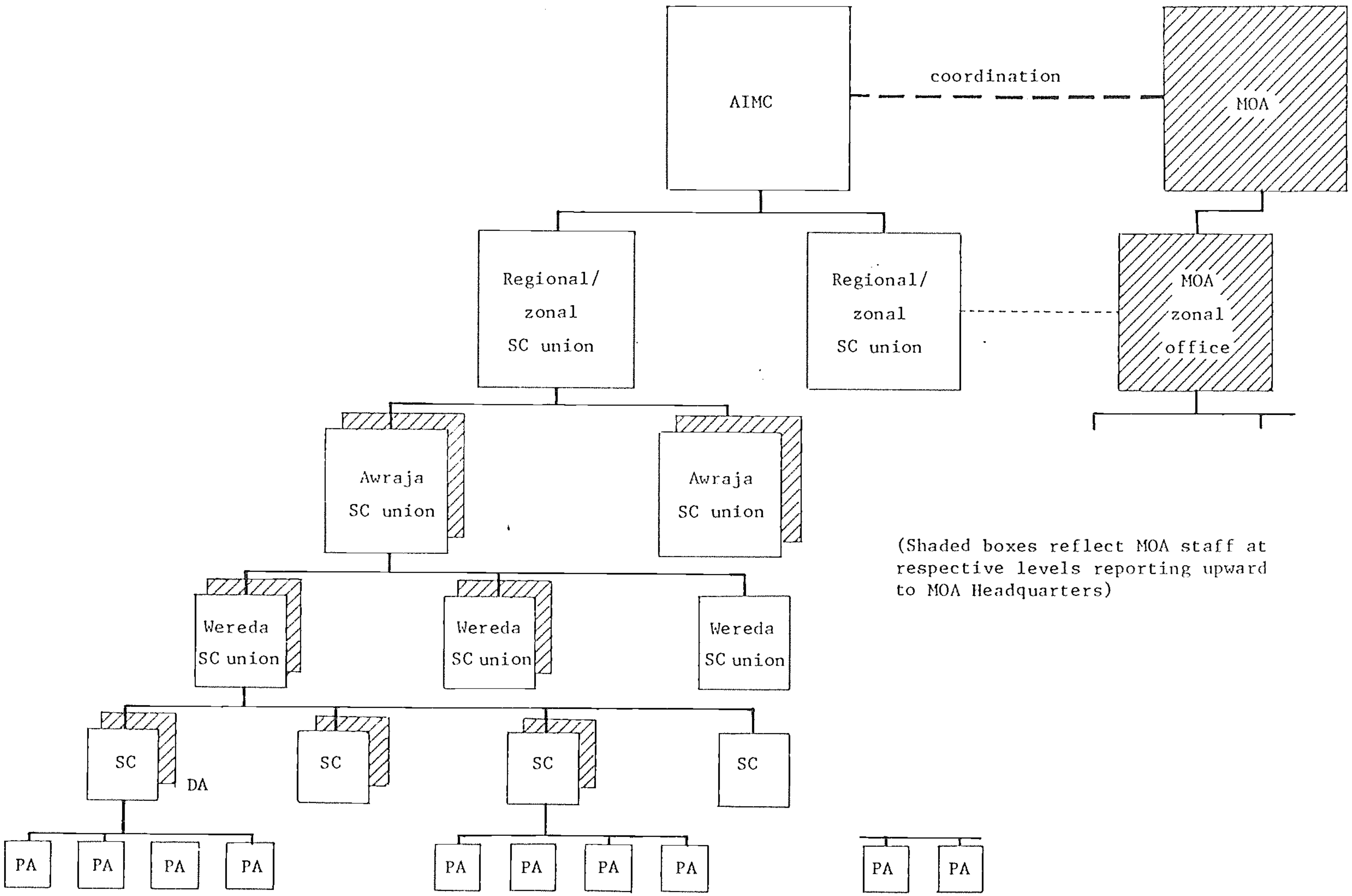
(d) ready access to credit through a programme coordinated with AIDB and CBE (see section 12.7.2); and

(e) technical information, adaptive research and demonstration services with the DA's based at the SC (see section 12.6).

Eventually SCs might also have workshop facilities for the repair and manufacture of farm equipment from local materials.

Resources of both AIMC and the SC's, even with the proposed strengthening, are unlikely to be sufficient, at least in the early part of the strategy period. It is therefore proposed that the private sector be encouraged to share in the complementary activities of input procurement and distribution services, at the zonal levels and below. Consideration might even be given to inviting a leading multinational fertilizer company to participate with AIMC in this task (and possibly with IAR and the SC's in zero tillage trials - see section 12.2). The participation of private sector capital, skills and initiative need

Figure 12.1 PROPOSED INPUTS PROCUREMENT AND DISTRIBUTION SYSTEM



not involve competition; it could be in partnership with the AIMC and the SC's (each with clearly defined roles) until such time as the AIMC and SC's were able to fully meet requirements for procurement and distribution. Another option, however, would be to encourage some competition with a view to providing inputs at minimal costs and maximum efficiency. Such competition would inevitably lead to abandonment of the present policy whereby fertilizers and seed are sold at the same price all over the Highlands, irrespective of transport and other marketing costs. It is considered that this would be advantageous in that it would remove the distortions in crop fertilizer economy caused by inter-regional subsidies of transport costs. Such distortions are already high and likely to increase further with costs of transportation. Pan-territorial pricing for crops also inhibits the growth of crop production in areas, according to their comparative advantages. If public and private agencies compete in a context of pan-territorial pricing, private trade will tend to be confined to the most profitable areas so that official trade would be pushed toward the more distant areas, thereby increasing the unit costs of AIMC relative to those of private traders. It is suggested that the equity goals which provide the rationale for pan-territorial pricing would be achieved at a lower trade-off cost in terms of agricultural production, through appropriate taxation policy (section 13.6).

12.7.2 Credit

To achieve and sustain the required increases in agricultural production, commensurate increases in rural expenditures are required for seasonal inputs, oxen and implements, primary processing and storage facilities, and for small-scale rural industries such as grain and oil mills. Such expenditures and investments will depend to a very large extent on the availability of substantially increased flow of rural credit.

As indicated in section 5.8.6, rural credit is provided solely by the AIDB. In view of the limited capital and skills at the disposal of AIDB and the need to economize on infrastructure, it is proposed that the CBE also be authorized to both mobilize rural savings and provide rural credit, with the aim that eventually all towns at Wereda HQ level and above would have a branch of either the CBE or AIDB, even if this would be open only for one or two days a week - or would take the form of a mobile bank. The need for expanded roles of both CBE and AIDB will obviously require expanded capacity in both banks in terms of trained staff, equipment and funds for credit.

It is further proposed that the SC's gradually serve as intermediaries between the major lending banks and the PA's and PC's. Since credit is often only a component in a package, multi-purpose institutional arrangements such as the SC's are generally to be preferred at the primary level dealing with farmers. Such institutions facilitate the provision of credit in kind (and on time) and (if, as has been proposed, they act as agents for AMC) the collection of repayments by deductions from the proceeds of marketed produce. They are also better able to supervise its purposeful use. This arrangement would allow the availability of credit to be tied more effectively with the government extension services and to become a vital catalyst in the process of technological innovation. It is also proposed that the present restrictions on extending loans to PA's, even though they are legal entities, be lifted. Prospects for repayment are considerably enhanced by group responsibility for individual credit repayments, and this is another reason for proposing that credit be provided to SC's, PA's, and PC's rather than directly to individuals.

In the early years of the strategy, priority should be given to the provision of seasonal credit for inputs, especially for maize and wheat, in the HPC zone, with more attention to longer-term credit in the HPP zone for the purchase of oxen and farm equipment, and in the LPC zone for small-scale rural industry (section 13.3), at least until an appropriate extension package is available for the LPC zone.

12.7.3 Marketing

For increased production to reach the markets for which it is destined, attention has also to be given to commensurate improvements in marketing and in particular to investments in transport, storage and marketing infrastructure and equipment, and to the strengthening of motivational, institutional and policy arrangements on marketing. The agricultural marketing system is divided between government agencies (mainly the AMC) and private traders, as described in section 5.9, but there are ceilings officially imposed on the extent of private grain trade. A joint GOE/WB mission reviewing marketing arrangements concluded that:

> "The capacity of AMC would appear to be stretched to the limit. This point was made to us by virtually everyone we talked to, and was evident in the field. Grain is stored in the open under canvass. Trucks are not available. Collection stations are not manned full time. And communications between central, regional and branch offices are limited". (GOE/WB 1983.)

Section 5.9.2 proposed an in-depth review of agricultural marketing and the related issues of input distribution and pricing, producer pricing and the availability of consumer goods in order to provide a firmer basis for strategy proposals for its development. (A preliminary but partial review is provided by GOE/WB 1983. A more comprehensive review could probably best be undertaken by a joint GOE/international expert team stationed within the Planning Department of the MOA. Such a review, if it were to cover adequately all fields suggested, would require at least 50 man-months and could well form the basis of a technical assistance request.)

Pending such review, the suggestions below should be viewed very tentatively.

In view of the capacity and other constraints already faced by AMC and other government marketing agencies (section 5.9), it is proposed that efforts be made to mobilize capital, skills and initiative of the private sector so that it plays a bigger and more complementary role in agricultural marketing, at least until AMC (in conjunction with the SC's, as proposed in section 12.7.1) is able to efficiently meet the requirements for greatly expanded marketing facilities. At present private traders are tolerated tacitly as indispensable partners but are not allowed to work in an economic environment that would enable them to realize their full potential. The uncertainties associated with the ambiguous position of private trade and traders discourage full-time involvement in food marketing, investment in transport and storage, and a systematic approach to developing an adequate supply network. In the more remote rural areas in particular, efforts should be made to capitalize on the indigenous trading system, a proven asset, and let it play a bigger role in the distribution system. The private sector, with its small-scale, decentralized and flexible structure, is particularly well suited for this task. The government role would be to improve market functioning: by easing market access through rural road development and maintenance; by providing better market information on crop sizes and prices, via radio and other means; and by gradually introducing uniform weights and measures, a task so far neglected. Such measures could provide peasants with adequate protection from exploitation by private traders. AMC should concentrate on its other major functions: the management of grain imports; buying and selling in the open market for special purposes (e.g., localized production crises, and the substitution of sorghum for imported wheat in the FFW programme - section 11.6); operation of the food reserve stock of cereals as a first line defense against drought and other food emergencies; and providing for the needs of large collective consuming units, such as the army. If trained and supported, small traders could be enlisted to extend the network of input distribution as well as of crop procurement. Rural markets could be transformed into development and innovation centres with trained inspectors taking advantage of small farmers' frequent visits to markets to offer advice, access to inputs and information on new technologies. Various options concerning the inter-mixing of government and private marketing are outlined in GOE/WB 1983. The importance of traditional local marketing systems and other suggestions for their development were made in section 5.9.2.

Storage is important not only for providing a collection point for crops, but also to reduce wastage from post-harvest losses and to contribute to food security by permitting the carry-over of stocks from one year to another. Estimates of post-harvest losses in the Highlands vary from five to 20 percent of production. Where it is known that post-harvest losses are substantial because of poor storage, handling and processing facilities, priority should be given to their improvement, since returns are quick and costs low in terms of the increases in lost production that would otherwise accompany a programme successfully increasing production. Ideally new godowns should be constructed on a self-help basis, with the cooperating PA's or SC's providing labour and readily available building materials such as bricks and wood, and the government - possibly assisted by donors - providing items such as cement and roofing. The aim should be for each PA to have an appropriate godown well before the end of the strategy period.

Incentives can be considerably affected by the availability of consumer goods. In this context, it has been proposed earlier that consideration be given to making available specifically agreed items required by PA's in return for agreed increases in marketed crop production. EDDC could play a major role in strengthening rural incentives by expanding its activities to enable SC's to handle a larger amount and wider range of goods, but it remains constrained by shortage of funds, transport and staff. Such problems have to be tackled while rural purchasing power is increased - the latter primarily through producer pricing policy.

12.7.4 Producer pricing

It is widely accepted from common observation, and invariably confirmed in micro-level farm studies, that peasants are responsive to price changes. Producer and consumer prices for basic foodstuffs are legally controlled. The government has dual policy objectives in setting and regulating prices. It wants to provide adequate incentives to increase food production, and it seeks to protect the interests of consumers at the same time. In practice, the objective of ensuring a regular supply of staples at "affordable" prices for consumers has been the dominant criterion in Ethiopia as in most countries. This is accomplished in various ways. AMC procurement prices have been fixed at below market levels and imported foods have been given an implicit subsidy by currency overvaluation. Prices in parallel markets are often substantially higher than the official prices. As peasants have been able to sell part of their marketings at the free market prices, many consumers have been forced to buy at free market prices. While the direct price effects on production of low AMC procurement prices are thus diluted, the policy of setting low AMC producer prices undoubtedly has net negative effects on farmer incentives to produce and to sell basic foods.

Similarly, high taxation of export crops (mainly coffee) and marketing levies, excessive marketing costs, and overvalued exchange rates have kept export production below what it could have been. Overvalued exchange rates mean that the foreign currency obtained from exports is converted into a relatively small amount of domestic currency, making it difficult to pay higher producer prices. Domestic marketing margins also absorb large shares of total proceeds, reducing the share available to producers. Government revenue preservation should take second place to the need for maintaining or increasing the pace of export production. Furthermore, reduced taxes should raise export levels, so that higher volumes would to some extent compensate for the reduced rates, and higher producer prices should still leave scope for taxing some of the "rent" elements prevailing for coffee. An adjusted exchange rate would allow better incentives for export crop production and would, if the resulting increase in import prices were passed on to consumers, curtail demand for imported cereals. Empirical evidence from other countries does not support the hypothesis that expanding export production leads to declines in food production. On the contrary, countries that have been most successful in cash crop production have also been among the most successful in expanding food production. (Examples are sited in World Bank 1981.)

In light of such considerations, a joint GOE/WB mission has concluded that official producer prices for most crops are currently at levels which provide little if any incentive to increase production (GOE/WB 1983). Improving producer prices would help to release the tremendous potential for raising agricultural productivity which exists in much of the Highlands. To cushion the effect of higher producer prices on the urban poor, so as to prevent their nutritional status from deteriorating, requires a different set of social measures - including taxation and social services (Chapter 13). It is thus proposed that consideration be given to reducing export tax rates and changing exchange rates so as to substantially increase coffee producer prices. Producer prices for cereals would be increased by liberalisation of marketing arrangements as proposed in the previous section.

The capacity to analyse price policy issues should be rapidly built up and coordination improved. At present there are at least four agencies involved: ONPCC, MOA, MCTD and AMC. The formulation of an effective price policy is constrained primarily by the lack of trained staff. This is another obvious area for top priority technical assistance. There are a variety of pricing policies that could be consistent with Ethiopia's socialist objectives, and FAO projects are assisting in producer pricing analysis and recommendations in other African countries, including socialist ones such as Tanzania.

12.8 EFFICIENCY, CAPITAL ACCUMULATION AND MARKETABLE SURPLUS THROUGH DIFFERENT FARMING TYPES 1/

12.8.1 Efficiency of different modes of production

There are three main farm types in the Highlands: individual peasant farms (by far the most important, accounting for around 95 percent

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1/ Some parts of this section draw heavily but not exclusively on ILO/JASPA, 1982.

of total agricultural production), state farms and producer cooperatives, each accounting for just over two percent of total agricultural production. These were described in Part I. A fourth type is the resettlement farms - usually a transitional type to producer cooperatives (Chapter 9).

Table 12.8

RANKING MAIN FARM TYPES BY VARIOUS CRITERIA
(1 = highest; 2 = intermediate; 3 = lowest)

	Peasant farms	Producers cooperatives	State farms
1. Capacity to absorb labour	1	2	3
2. Rate of profit on capital	1	2	3
3. Crop yields	1 or 2	3	1 or 2
4. Potential for accumulation	2	1	3
5. Marketable surplus	3	2	1

Source: ILO/JASPA 1982.

A recent mission systematically compared the advantages of each farming type (ILO/JASPA 1982). It found that peasant farming is by far the most intensive in employment per unit of land and per unit of output (see table 12.8). Returns on capital are lowest (even negative) on the state farms but high for peasant farms (with relatively little capital). Crop yields per unit land area vary according to crop - the state farm yields are better for cereals (high fertilizer applications) and individual peasants for coffee and pulses. The PC's generally have lower yields in all crops. The mission concluded that:

> "as a whole, however, it is evident that the peasant mode of production uses resources most efficiently. Next probably comes the producer cooperatives, followed by the state farms. In this respect Ethiopia is similar to other countries..." (ILO/JASPA 1982.)

The process of development, however, depends not only on how efficiently existing resources are used but also on how rapidly capital can be accumulated and slack resources brought into productive use. That is, in the long run, average standards of living depend more on the rate of growth than they do on present allocative efficiency. It is therefore necessary to consider the potential for capital accumulation and growth in each farm type.

12.8.2 Rural capital accumulation

The state farms are making no contribution to capital accumulation and growth at present. On the contrary, their deficits represent negative savings and, far from generating a surplus, they are absorbing surpluses generated elsewhere. The individual peasant farming sector, for the most part living close to starvation and in high absolute poverty is unable to set aside much resources for capital accumulation. Indeed, if present degradation trends continue, agricultural output per capita will continue to fall. By working together, however, peasants could use the slack season to undertake land improvement works to increase incomes (especially if conservation is sought through increased production). Equally, peasants could work together to expand the area under cultivation, especially in the HPP zone, by bush clearing, etc., but also in the other zones by small-scale drainage, and irrigation works, etc. In such cases, the advantages of cooperation are obvious (see Figure 3.7).

The development of such cooperative activity has, however, to be carefully phased. Initially cooperation should take the form of mobilizing under-employed labour in the slack season essentially for earth moving projects and similar labour-intensive construction schemes, such as is already being achieved through the FFW programme and voluntary PA campaigns. This has the advantage that such capital accumulation (i.e., land investment) occurs at no cost to the peasants in terms of current consumption and at no cost to the government's central funds. Such land investments, especially if based on the principles of the Conservation-based Development Strategy, should generate increased production, and it is proposed that part of this be retained by the cooperative and used to establish security stocks (e.g., of seed, cassava planting, etc.). Gradually, further surplus accumulation could be used for other investments - e.g., improved implements and fertilizers, road and storage construction, water schemes. As the size of the accumulation fund increases and the peasants acquire experience in managing their cooperative, more ambitious projects could be undertaken - e.g., grain and oilseed mills and workshops for making and repairing tools and implements, the purchase of vehicles. The elements of a construction industry could be created based on local needs: a small quarry, a brick kiln or a sawmill. This could lead to further investments in socio-economic infrastructure roads, bridges, schools, clinics, etc. In such ways cooperation could lead to cumulative development in rural areas, not only in agriculture but in small-scale rural industry, construction and the social services.

Thus cooperation is seen more as a vehicle of capital accumulation, investment, growth and development than as collective agricultural production. Collectivisation of production should be allowed to grow spontaneously without being a precondition for the establishment of cooperation in these other more important areas. Cooperatives should be built around anything the peasants are willing to support together and which can generate a surplus for further accumulation. The drive for cooperative activities need not wait for the extension of producers' cooperatives. The fact that PA's now cover virtually the total rural population and SC's have been formed covering about 70 percent of the PA's is a major achievement in the right direction and provides a sufficient institutional framwork for a rapid increase in cooperative effort. The key to more cooperation is to move boldly but not to force the pace and thereby create resistance. Change should be designed so that the benefits to the majority of rural people are clear and immediate and hence accepted voluntarily. As much freedom as possible should be given to local cummunities and to local leaders to decide the nature and extent of local cooperative activity. Those persons performing best in local literacy classes, local schools, FTC's, etc. should be taken on 'study tours' to other parts of the Highlands in which cooperation is obviously feeding development.

12.8.3 Marketable surplus and state farms

The production of a marketable surplus from farming is required to feed the non-farming population of the Highlands - which is expected to grow from 12 percent today to over 15 percent by the end of the strategy period. PC's, with their usually more favourable land:man and capital: labour ratios produce more output per worker and thus contribute relatively more to marketed production, even though their yields per ha are often lower than on individual peasant farms. However, the PC share of production is still very small. Much reliance for a marketable surplus from farming has to be placed on the state farms at this stage in Ethiopia's development. Even the alternative of importing food is more expensive - it is less costly in foreign exchange to import the fertilizers, tractors and other equipment required to operate the state farms. The main task facing the state farms is to fulfil this vital role of producing a marketable surplus at minimal cost to the economy. Section 5.7.1 recognized that the valuable performance in producing a large marketable food surplus was being achieved at high costs in terms of scarce management resources, foreign exchange and government revenues. The farms suffer from many difficulties, including:

- high overhead costs;
- excessive mechanisation;
- poor capital equipment, high machine operating costs, inadequate maintenance and consequently low capacity utilization;
- shortages of labour;
- insufficient worker incentives;
- poor choice of location, partly resulting from excessively rapid expansion;
- over-centralized management structure; and
- an apparent disregard of financial considerations when making decisions.

Until such difficulties have been overcome and the state farm sector has been reorganized and put on a profitable basis, it would be unnecessarily costly and uneconomic to expand further the area of their activities. As indicated in 5.7.1 and 12.8.3, the top priority with respect to state farms is to increase their production at minimal cost to the economy. This is much more likely to be achieved through improvements in efficiency, yield improvement and greater cropping intensities than by further area expansion. It is further proposed that any further area expansion of state farms be financed from financial surpluses net of requirements for capital replacement and conservation generated by present state farms.

State farms should also be more active in promoting the development of peasant farming in surrounding areas. Such a role was originally envisaged and has been recently emphasized (section 5.7.1). This again suggests that emphasis should be put on increased efficiency and increased land productivity, rather than area expansion, so that the state farms set a good example. State farms could be active in other ways, including contributing to local stocks of improved planting materials and seed, input delivery to local PA's, providing facilities for farm equipment repairs, vaccination, storage, bulking for market, transport, credit, and augmenting fuelwood supplies by tree planting all around their boundaries. State farms could also assist in extension and even research efforts by setting aside a very small part of their land for trials and demonstrations and organizing local open field days. Such policies to promote surrounding peasant agriculture need to be prepared in more detail as a high priority; pay-offs from these could be quick and high. The state farm infrastructure is already there, and it is a question of utilizing it more effectively for the benefit of surrounding peasant agriculture, as well as for the state farm itself.

In implementing such a strategy for state farm development, consideration should be given to the Hungarian example of inviting foreign agricultural companies to manage selected state farms, in partnership with the Government. This has proved very successful in Hungary, and the state farms there are now making significant profits (Ashworth, personal communication, March 1985).

12.8.4 Producer cooperatives

Cooperative action as a means of capital accumulation, investment and development was the subject of proposals in section 12.8.2. This section is concerned with the collectivisation of production through the formation of Producer Cooperatives (PC's), and it builds on the description already presented together with suggestions for their development made in section 3.6.4. The latter section emphasized in particular the importance of training for cooperatives and made some proposals for its strengthening, not so much of FTC's (training in FTC's should be aimed at farming; cooperative training involves more bookkeeping, management, procurement, etc.).

Attention was also drawn in section 3.6.4 to the need for continuation of the present voluntary and participatory approach to the collectivisation of agricultural production. Cooperation in production needs to be seen as a rational method of resource utilization and problem solving (Figure 3.7) rather than as a directive imposed from above. There is the inherent risk in the TYPP's target that around half of the rural households and cultivated land should be in PC's by 1993/94 (compared to around two percent now), that the present policy of voluntary collectivisation will be abandoned, and/or the individual peasant farming sector will be penalized even more than at present by restricted access to inputs, credit, extension, etc. A policy of coercion would build resentment and weaken the cooperative movement, damaging its development prospects for many years; it would also severely limit production increases in the peasant sector and thus in overall economic growth.

CHINA'S COLLECTIVISATION WITH INCREASED PRODUCTION

"In China, the individual peasant is an integral part of a small viable functional unit, the production team. The team owns and runs the previous individually-held land units as one collective unit. This basic collective is, in effect, an extended family (the production team). Several important consequences flow from this. A peasant's labour cannot be sold or bought by another. The peasant can no more be hired and fired than he can be in his own "natural" family. Also, as in work for his "natural" family, the surplus value or profit from his work accrues to his extended family (the production team). It returns through the team directly and tangibly to him in increased social amenities, and gradually increased income as collective productivity increases. The peasant also participates directly in the assessment of his work points by his peers; through this, the value of his work is determined and translated into income in cash or kind. Part of the collectives' surplus is retained for generating local capital investment: roads, reservoirs, channels, soil conservation, small rural agro-industries, etc. These offer constantly increasing job opportunities to a growing rural population. The system has the flexibility to absorb youth, women, children and even old people in employment as required....

The production teams form part of a commune which is a unit of both self-government and self-development. The role of the State vis-a-vis each commune is to enable and facilitate rather than to direct." (Extract from FAO, 1978c.)

(Extract from FAO, 1978c.)

On the other hand, thought needs to be given to the problem of the present insecurity of land tenure experienced by most peasants - in part attributable to the formation of PC's (section 11.6). All land in Ethiopia is already collectively owned - but by the state. Collective ownership at this level does not yet provide sufficient motivation to most individuals to conserve and protect the land, to invest in the land by planting and tending trees suitable for agro-forestry. Some device consistent with the PA structure is needed, so long as PC's are not pervasive; otherwise the land tenure arrangements will serve to inhibit the development of appropriate farm technology for Conservation-based Development. At the least, PA's should be encouraged to work out ways in which re-allocation of plots is kept to the minimum. Much could be learned from China's achievements in such collectivisation (see box).

Some type of collective land tenure, or local responsibility for land must be devised to provide motivation to invest in the land if the PA's do not choose the voluntary collectivisation of production.

Chapter 13

RURAL DEVELOPMENT

13.1 ENERGY 1/

There are five essential issues to be addressed by energy strategy: the fuelwood crisis, the high foreign exchange cost of petroleum, the need to improve efficiency in energy use, exploitation of Ethiopia's comparative advantages in hydropower and the development of alternative energy sources.

> "The most important issue in the energy sector, and arguably in the future of Ethiopia, is the supply of household fuels, the related massive deforestation, and the resultant and insidious depletion of agricultural resources on which so much economic activity depends (nearly 50 percent of GDP, 80 percent of employment and 90 percent of exports). The increasing scarcity and cost of household fuels, particularly firewood, threatens the ability of the country even to maintain its already low incomes and the quality of life of the people, particularly in the rural areas. The Ethiopian landscape has changed dramatically over this century....To compensate for the worsening firewood scarcity, growing amounts of natural fertilizers in dung and crop residues are being diverted to household fireplaces, reducing crop yields by more than one million tons of grain a year. If no more than the present level of replanting is undertaken, in 20 to 30 years all but the least accessible pockets of forest will have gone, large parts of the north will be uninhabitable, and much of the center will be like Eritrea and Tigray today: subject to persistent drought, crop failure, famine and outmigration." (UNDP/WB 1984.)

The other major energy problem, though with much less profound long-term implications, is the fact that around half of Ethiopia's foreign exchange earnings has to be spent on petroleum imports, which

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1/ A separate energy study was not undertaken as part of the EHRS because it was considered that use could be made of the detailed 1983/84 review by the UNDP/World Bank: Ethiopia, Issues and Options in the Energy Sector (Report No. 4741-ET of July 1984) on which this section draws heavily. Use is also made of the TYPP and other relevant material.

contribute only about seven percent of the country's total energy consumption (section 4.7). This seriously retards economic growth by limiting the foreign exchange needed to relieve constraints and promote development in both the agricultural and industrial sectors.

Notwithstanding these two major problems, Ethiopia's energy resources have the long-run potential to make the country not only energy self-sufficient, but a substantial net-exporter, particularly of hydroelectric power and possibly also of geothermal energy. Commercially exploitable resources of natural gas have already been identified and there is evidence of petroleum. The challenge is to harness these resources to energy requirements. It is estimated that household requirements will still account for well over three-quarters of Ethiopia's total energy requirements by the end of the strategy period, compared to around 92 percent in 1985.

The major objective of energy strategy in the period up to 2010 must be to overcome the immediate threat to sustainable development posed by the fuelwood crisis and, to a much lesser extent, petroleum imports; and, if possible, simultaneously exploit on an increasingly large scale the nation's comparative advantage in hydro-power and other indigenous energy resources. The strategy has to tackle the fuelwood crisis both by massive reafforestation to augment supplies and by simultaneous efforts to economize in rural energy use, primarily by improved cooking techniques and stoves. The reafforestation sub-strategy is the subject of section 13.2. It suffices to indicate here that reafforestation, and in particular agro-forestry, has to become one of the nation's top priorities in the allocation of its finance, skill, effort and land. This section provides the general energy context within which reafforestation has to be viewed, proposes additional measures for increasing fuel supplies including exploitation of hydro-power and other energy sources, and proposes measures for economizing in energy consumption. The strategy has three main thrusts on the supply side: reafforestation (section 13.2), electrification and petroleum.

The relative importance of electricity is likely to at least triple in the strategy period, but even so it is unlikely that it will then account for more than three to four percent of Ethiopia's energy consumption. The main rationale for expanding electricity production is that Ethiopia's comparative advantage in hydro-power resources provides an opportunity for economic electrification of urban and industrial areas, thus improving living standards and possibilities for industrial growth while substituting for other fuel inputs, particularly wood. Despite the obvious advantages of rural electrification, it is considered that its costs will be prohibitive, at least in the early part of the strategy period. The terrain of the Highlands, while favouring hydro-power development, does not reduce its initial high investment and adds to the high costs of distribution. The lack of infrastructure, the dispersed nature of most Ethiopian villages, the likely low rural load factors, and the high costs of transformers and distribution lines will limit progress of rural electrification from the national grid circuit, even among those areas through which the grid circuit passes. Meeting rural energy needs requires a different level of technology more appropriate to local resources and demand. Notwithstanding this conclusion, there may be technological developments in other countries which might make economic the small-scale auto-generation of electricity for small areas using mini-hydro-power techniques, bio-gas, wind or solar power, etc. Otherwise, rural energy needs are likely to rely almost exclusively on fuelwood and its derivatives (charcoal, briquettes, etc.). It is likely that the use of small diesel-electric generators will spread (for village grain mills, lighting and rural industry), their main disadvantage being the costs and availability of fuel for their operation.

Rural electrification (and diesel generation) should be given greater priority in the most degraded areas (mainly within the LPC zone and especially at higher altitudes) in which, if they have not been depopulated by then, people and their economy will increasingly need to be sustained by non-agricultural (especially non-cropping) development. Small-scale industry offers one of the possible options (section 13.3). These areas generally also have favourable small-scale hydro-power potential and in the case of Eritrea and Tigray more concentrated villages and a longer tradition of small-scale rural industry. Villagisation is also proposed as a priority for the LPC zone (section 13.5). Reafforestation in the north is more constrained by lower and more unreliable rainfall, and that area is already the most seriously deforested part of the country. For these reasons, further exploration of geothermal and coal resources (already identified in Gondar) should be given priority in the north.

The main constraints to hydro-power development, even on a small scale, are the initial high investment costs and the technical know-how involved in site-selection (topography, geology, water flow, seasonal variations, siltation, etc.) which require sound engineering evaluation and design - even for the smallest of schemes. Once built, however, hydro-power turbine maintenance is limited mainly to an annual lubrication of the main bearings. This, and the possibilities that such projects provide for irrigation downstream (section 12.3) as well as capitalizing on conservation works upstream (Chapter 7) explain the obvious attractions of hydro-power. It has been estimated that the potential of the Blue Nile basin alone could meet Ethiopia's total projected electricity needs well into the 21st century. However, the high capital costs and competing uses for resources which can supply energy economically in the strategy period, imply that investment in hydro-power should be carefully phased to match projected electricity demand from the appraised lowest-cost projects. Priority should be given to those projects which can expand through gradual incremental investments in line with growth in power demand. To provide an adequate planning framework for energy project appraisal, studies on energy supply, demand, options and issues need to be updated at regular intervals, as electric power projections are notoriously unreliable in many countries. As time progresses such studies should review the scope for exporting hydro-generated power to neighbouring countries poorly endowed with power resources - for example, Djibouti and Sudan.

Policies to alleviate the cost of petroleum imports should concentrate on reducing losses caused by its inefficient refining, distribution and use, while domestic exploration (mainly in the Ogaden) obviously should continue. Measures include full feasibility studies on replenishing, expanding or replacing the Aseb refinery, and on the construction of an 850 km petrol pipeline (estimated cost US$270 million UNDP/WB 1984) from Aseb to Addis with intermittent outlets at strategic points. Both these developments are mentioned in the TYPP (WPE 1984). Measures to increase efficiency in the use of petroleum basically relate to industry and transport. Industrial measures include improved combustion control, water treatment, and new heat recovery systems. Proposals for the more efficient use of petrol and diesel in the transport sector are made in section 13.7. Finally, there are longer-term possibilities for the development of a number of substitutes, including ethanol for petrol and natural gas for diesel, for transport, and bio-gas and natural gas for fuel oil, for heat and steam-raising.

Compared to the need for increased fuelwood production, electrification and petroleum supply, most other energy sources are of minor importance and should not absorb valuable skilled labour, management or financial resources out of proportion to their potential to contribute economically to future energy supplies. A few exceptions are mentioned in the following paragraphs to supplement the review presented in section 5.6.

One exception concerns the recovery of crop residues from state farms (those generated by the peasant sector have greater value as animal feed and organic fertilizer), for the manufacture of briquetted fuels for urban areas. This potential for replacing urban demand for fuelwood is significant, but consumer acceptance has first to be established. The crop residues concerned are coffee skins, cereal straw and stover and cotton, while use could also be made of wastes from sawmills and charcoal kilns. A pilot briquetting press should be established as soon as possible in the Addis Ababa washed coffee clearing depot, to test the techniques involved, different crop residue inputs, economic feasibility, and consumer acceptability. Other possible exceptions for priority attention include the production of ethanol from molasses; solar heating of water, especially for hotels and other large outlets now using electricity; natural gas exploitation, depending on the outcome of studies being done on the Red Sea, the Danakil and the Ogaden, with possible priority for use to supply the substantial industrial market and a possible future fertilizer industry (section 13.3); and geothermal and coal resource exploration leading to exploitation, especially in the north for reasons already given, and particularly because known coal deposits coincide with areas of acute fuelwood shortage in Gondar and Eritrea.

Bio-gas plants, by digesting human and animal dung - sometimes with a mixture of other farm and household wastes - theoretically offer great potential for meeting energy requirements for cooking and lighting and leaving a nitrogen-rich residue for farming. Their problems in the context of the rural peasant setting of the Highlands are that:

(a) a cheap, efficient and low maintenance/management design operating from small input levels has still to be adapted for Ethiopia. A Chinese model, reportedly only costing US$25, may offer possibilities (FAO, 1981e);

(b) they require a lot (more than one head or back load) of water daily to dilute the inputs; and

(c) they are very slow to operate at cool temperatures.

The potential benefits of bio-gas in providing both fuel and fertilizer, and alleviating ecological pressures associated with deforestation and burning of dung and crop residues are considerable, but still elsuive, so that further adaptive and farming-systems-oriented research is justified, possibly under the auspices of and funded by ILCA 1/. A study tour to China, where millions of bio-gas plants are already in operation, might be a good starting point. The Ethiopian National Energy Commission and other energy personnel in the Government should concentrate on the major energy policies already proposed.

This section has thus far been concerned primarily with augmenting supplies of energy as well as using more efficiently the petroleum. Energy strategy must also seek to economize in the major energy consumption sector: the use of household fuel, where demand is estimated at 2 kg of drywood (or its equivalent) per person per day in the Highlands (WB 1984). FAO has estimated that if fuelwood were used in more fuel-efficient but cheap stoves instead of inefficient traditional open fires, a family of six would need only one quarter of a hectare under fast-growing trees to meet its fuel needs (FAO 1981e).

> "There appear to be good prospects for improving the efficiency of existing charcoal stoves and electric injera cookers, and for introducing new portable metal woodstoves for urban use, warranting immediate trial and development work for each. Huge improvements in cooking efficiency occur from using aluminum pots, thus population-wide acceptance of cooking with aluminum instead of clay pots should be evaluated immediately." (UNDP/WB 1984.)

A portable metal stove recently introduced in Upper Volta (which is compatible with Ethiopian cooking methods) has been verified as being

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1/ ILCA has also undertaken research on windmills, which are adversely affected by decreasing density of air at higher altitudes.

substantially more fuel-efficient, as is also the addition of a tubular sleeve to the traditional Ethiopian stove, bringing its sides up around the pot. These possibilities, as well as that of substituting aluminum pots for the traditional clay pots, all merit high priority for immediate investigation. This adaptive research, review and follow-up should first be a pilot project work; then, hopefully, large-scale production and marketing should be done - preferably all by one initially small but enterprising organization, possibly under female management (because women are its potential customers) and working through REWA.

Other energy sector recommendations include the strengthening of energy sector planning and policy analysis capability, review of pricing policies 1/ and the mobilization of private enterprise, management and capital to support implementation of the proposed energy strategy. For example, there could be a complementary role for the private sector to play in the development, production and distribution of more efficient stoves.

To start implementation of this recommended energy strategy, UNDP/WB 1984 proposed a ten-year investment programme of some US$1 700 million, of which electric power (mainly hydro-power) would consume half, reafforestation and household energy investment about a quarter, and petroleum exploration, refining, distribution and improved efficiency, the rest. Ideally, much more should be allocated to reafforestation and to household energy, but implementation capacity in this sub-sector is seriously constrained by shortage of trained manpower and capacity to sustain much higher annual operating costs (section 13.2). In any case, reafforestation and improvements in cooking efficiency are the top priorities in the strategy.

> "Energy and agro-forestry will have to be placed among the nation's top priorities for there to be any chance of success. Although in the short-term the problem will be further aggravated due to long lead times for forest development and high population growth, there are good prospects of lessening the rate of deforestation, provided there is a major increase in the mobilization of resources to meet the problem." (UNDP/WB 1984.)

The proposed strategy, if followed, should go a long way to help close the presently widening energy deficit in Ethiopia.

1/ If the price of energy in its various uses reflects its real costs, energy pricing can stimulate increased energy efficiency. The UNDP/World Bank Energy Review suggests that diesel and electricity are underpriced.

13.2 FORESTRY AND OTHER NON-AGRICULTURAL PRIMARY PRODUCTION

13.2.1 Forestry

The massive and accelerating rate of deforestation was estimated in section 5.10. Wood deficits by zone are estimated in table A13.1. It is estimated that over 2 million hectares need to be planted, just to meet current demand. Requirements of course will grow as the population increases. The wood deficit is greatest in the LPC zone and least in the HPP zone. The LPC zone has already been virtually stripped of its tree cover. Accessible remaining tree cover in other zones would be similarly depleted well within a generation if present trends continue. The use of dung and crop residues as a fuel is increasing rapidly as wood becomes unavailable. The resulting losses of soil and its fertility are so great that irreversible damage threatens: it has been estimated (Chapter 6) that large areas of the LPC zone can no longer sustain cropping and that the spread of such wastelands will be rapid if present trends continue.

The major means of tackling the nation's fuelwood crisis has to be through rural reafforestation (section 13.1). In addition to providing badly needed wood, trees can fulfill valuable roles in soil and water conservation and reclamation and improve the storage and flows of water for human consumption as well as plant growth (see box in section 8.7). Trees can help in building up soil fertility and in complementing agriculture (section 12.5 on agro-forestry). As a resource base, the country's forests are not only a source of timber and fibre for industry but also of a wealth of other materials and of artisanal activities. Forests also comprise an important habitat of another resource: wildlife - part of the country's heritage and a base for tourism (section 13.2.2). Because of its multi-purpose role and the lack of alternatives to overcome the fuelwood crisis, afforestation has to be given very high priority. It is in effect the only way to ensure sustainable energy supplies in rural areas and will remain a necessary concomitant to energy supply in urban areas in this strategy period.

There are two major components to the proposed reafforestation strategy:

(a) the massive development of multi-purpose agro-forestry; and

(b) the planting and management of woodlots in both peri-urban and rural areas.

Smaller, but still important, components are the management of remaining natural forests (mainly in the HPP zone) and forestry on state farms and mechanized PCs. Because of increasing pressures on scarce land in many areas, forestry on potential crop lands of less than 30 percent slope would basically be confined to agro-forestry as proposed in section 12.5.

Plantation of species other than for agro-forestry (for example, eucalyptus) would be confined to waste and less productive lands where its competition with crops is minimized. Woodlots for both rural and urban use should generally be planted on steep land (above 30 percent) which is less suited for arable cropping (which includes one-third of the area of the Highlands - see Annex 4, table 1). The use of this land for arable cropping with present techniques and farming systems is not efficient because of the large percentage of land required for conservation structures.

A woodlot on steep land in each PA, together with the development of agro-forestry in croplands, would ensure - with other energy-saving measures described in section 13.1 - rural energy self-sufficiency and leave dung and crop residues for other more productive uses. Peri-urban woodlots should be of sufficient size and yield, together with electrification and energy-saving measures as described in section 13.1, to meet projected urban demand for wood, and the drain of natural fuels from rural areas would close. The UNDP/WB energy mission estimated the need for forestry of all kinds to be 3.2 million ha planted by 1992, but this is probably beyond the capabilities of the country in this period because of shortages of manpower and management resources and the massive organizational and logistical efforts that would be involved. The mission concluded that a balance between supply and demand could be achieved, however, between 2010 and 2020, depending on the long-term population growth and the future of alternative fuels. (UNDP/World Bank 1984.)

Estimated wood requirements per capita total 1.1 m^3/year, based on 1.09 m^3/person/year for fuel and 0.1 m^3 for poles, agricultural implements, etc. For a PA of 250 families, or 1 250 persons, the annual need would be 1 375 m^3. The area needed for this on a ten-year eucalyptus rotation would be 138 ha at a yield of 10 m^3/ha/year, reducing to 68 ha at a yield of 20 m^3/ha/year. The lower yield would represent woodlot requirements in the LPC zone, the higher yield reflects the potential with good management in the HPP zone. When estimating rates of growth it must also be assumed that woodlots will be mainly on marginal land. Also, the area of land actually put under a woodlot would be reduced correspondingly by the fuel and poles that would be obtained from agro-forestry. Eventually, it is envisaged that a substantial portion of rural wood requirements should be met from agro-forestry (section 12.5). But as agro-forestry development will be slow, initially most wood will have to come from woodlots. The target should be to establish woodlots in every PA on its steeper lands and initially averaging around 80 ha. In the Highlands as a whole this would imply some 1.6 m ha of rural woodlots. The UNDP/WB energy mission proposed a ten-year investment of US$175 million to plant one million ha. A project recently prepared by the FAO Investment Centre for WB funding would contribute to this (FAO 1985).

Every urban settlement of 5 000 inhabitants or more should have a peri-urban wood plantation eventually capable of producing 6 000 m^3 p.a., which would require around 400 ha depending on eucalyptus yields. With a total projected urban population of over 20 million by 2010, this target would require a total of over 1 million ha of peri-urban forestry - even if a quarter of energy requirements were met from other sources. This compares with a present total of around 80 000 ha - about 20 000 ha of which is around Addis Ababa. Thus even with an ambitious planting programme, it will take many years before urban demand would be met from peri-urban woodlots. The largest deficits will continue to be in the LPC zone, and in Addis Ababa. The UNDP/WB mission proposed investments of US$212 million for both new and maintenance plantations 1/.

As noted earlier, eucalyptus is the most popular species and is the most efficient converter of energy into biomass for fuel and poles (EHRS WP 27). With its agronomic suitability to the Highlands, eucalyptus species, especially globulus, are best for both rural and peri-urban woodlots. Certainly the availability of seed and popular demand for seedlings make it easier to pursue the woodlot component of the strategy with this species. Some of the characteristics of the E. globulus and other popular species are described in the box below. To get the same volume of wood from other species would require more land in woodlots. As land is scarce and fuel in critically short supply, it is most economic to use the most efficient species. When ciritical fuelwood needs are being met, however, and there is still land available (as there might well be if cropping is eventually banned from the steepest slopes in all zones), then other slower growing species, more desirable from the conservation viewpoint, may be planted (particularly acacias in the LPC zone). To prepare for this longer term option, to avoid the dangers inherent in monoculture (section 8.7.2), and to encourage local peasant experimentation (section 12.5), it is suggested that at least 5 to 10 percent of the area of each woodlot be planted with other species - for example, some of the agro-forestry species listed in section 12.5.

Nurseries should be widely dispersed so that they are near the planting sites - the eventual aim being to have a nursery in each PA at no cost to central government. This reduces the time between lifting and planting and reduces the risk of plants drying out. Nursery costs are much lower and operations less vulnerable to supply fluctuations if bare root seedlings are produced, but pots may be justified in the drier areas of the LPC zone (EHRS WP 27). Terracing is generally not justified economically (section 11.4). Even in the drier areas of the LPC zone sufficient control of run-off should be sought by using micro-eyebrow terraces with cut-off drains. Spacing depends on land availability, end

1/ An ADB-funded project is planting at the rate of 3 000 ha p.a. around Addis Ababa and about 700 ha p.a. for other towns, up to 1990. The project recently prepared by the FAO Investment Centre would add substantially to the peri-urban forestry programme with major new plantations around Addis Ababa (18 000 ha), Bahir Dar (7 000 ha) and Gondar (5 000 ha). (FAO 1985.)

THE PEASANTS' FAVOURITE - EUCALYPTUS

E. globulus is the fastest growing tree species in the Highlands up to 3 000 masl. It is easy to establish, raises its canopy rapidly, has straight stems and is windfirm. Plantations do not need protection from livestock and wildlife because its foliage is unpalatable. The wood burns freely, leaves little ash and carbonizes to produce good charcoal. The calorific value of air-dry wood is about 4 800 kcal/kg. The wood is useful for poles and building because its oil makes it resistant to termites. It is one of the best eucalyptus for pulp and paper making. The flowers produce good honey. The trees coppice vigorously at least twice, with yields falling off in the third coppice.

E. camaldulensis is used in Ethiopia for sites at lower elevations (i.e., below 2 000 masl). Selection of the right provenance for a given site is the crucial factor since yields can vary 2-3 times between provenances. Disadvantages of eucalyptus species are that their wood burns fast and produces much smoke. When used in a farming system, it can be harmful to the growth of crops. *E. globulus* can be established at elevations above 3 000 masl if the site is frost-free. Otherwise related species such as *E. viminalis*, *E. nitens*, and *E. dalympleana* can be used; these are already established in Ethiopia up to 3 500 masl.

products, etc. The very close spacing adopted by peasants provides them with a high proportion of the small-diameter pieces that form the framework of their adobe houses, and for the small pieces used as fuel. Less energy is needed to prepare these for cooking and heating than to chop a small log. Such close spacing probably does not produce maximum volume per ha, but to plant the trees at wider spacing to get the maximum volume would not produce the material needed by the peasants. A combination could be used: close spacing for a maximum number of small pieces in one part; wider spacing for maximum volume of fuel and large poles in the other. Observations indicate that too close spacing in the dry areas of the LPC zone, where sub-soil moisture is a limiting factor, has often led to large-scale failures due to severe root competition. Close spacing on steep slopes also has a detrimental effect on the soil due to the complete absence of undergrowth after closure of the canopy, leading to erosion. Spacing should be the subject of local experimentation, e.g., to permit grazing or cash cropping between rows of trees (section 12.5). The standard method of management of eucalyptus woodlot is clear-felling with regrowth of the coppice and thinning of coppice shoots. Alternatively, if there is demand for large-size industrial timber (such as in peri-urban woodlots), at the first felling a certain percentage of trees are left to grow on while the regular coppicing system is used for the rest of the plantation. Generally insufficient attention is given to clearing fire lines around woodlots annually.

It is not difficult to establish the economic attractiveness of reafforestation along the lines proposed. The UNDP/WB 1984 energy report concludes:

> "The value of grain production foregone each year by using cow dung as a cooking fuel is about US$500 million; and this can only be reduced substantially by increasing the supply of woodfuel, given the extremely high cost and foreign exchange requirements of chemical fertilizers. Economic rates of return for rural afforestation investments are estimated to range between 25 percent and 80 percent, depending on the local circumstances, making this the highest value investment in the energy sector. Typical economic returns for peri-urban plantations are estimated to be 20-25 percent."

The same mission estimated that more than 90 percent of the cattle dung produced in Eritrea, and more than 60 percent of that in Tigray and Gondar is used as fuel. Basically, reafforestation is a means of not only producing fuel at a cost much less than the value of dung when used as fertilizer, but also of producing a higher quality fuel and, most importantly, is a means toward more sustained agricultural development.

The major means of achieving the required reafforestation has to be by self-help organized through the PAs under the 1980 Proclamation No.192 which states that "each PA shall develop and conserve its own forest." Much progress has already been achieved by the Community Forest Development Programme (section 5.10), but this is small in relation to the above estimated requirements. It is proposed that much more extensive use be made of the taungya system (section 12.5) for land destined for woodlots. State management of such forests (as well as planted conservation and natural forests in rural areas) is severely constrained by the lack of skilled staff, staff motivation, recurrent funds, vehicles, and the problems of acquiring land from the PAs (section 5.10). It is therefore proposed to phase out direct state forestry in favour of peasant and community (including both PA and UDA) forestry, confining the role of state forestry to one of initial establishment, support and monitoring of planted forests and management of remaining natural forests (even the latter might, after necessary training, be handed over to adjoining PAs). Obviously such change in organizational responsibility should be carefully phased over time to ensure that the PAs (and/or UDAs) have the manpower to take over the mantenance, harvesting and marketing functions now carried out as part of state forestry. In other developing countries such local community management - even of forests to supply industry - has been both successful and highly profitable for the peasants concerned. Popular participation in forestry (both peri-urban and rural) needs to be promoted by educational campaigns designed to show the need for, importance of and methods of reafforestation. Motivation to invest in land is the subject of section 11.6, and of 12.8.5. Here it is also noted that motivation for peri-urban forestry might be provided to PAs and PCs by allowing them to sell wood in the urban markets concerned. The UNDP/WB mission proposed the allocation of plantation blocks to peasant families under the general supervision of local authorities, and within guidelines established by the forestry department with appropriate stumpage fees, enabling the forestry department to profitably recover investment costs and to reinvest quickly in new plantations. As many of the peri-urban plantations required for small towns will be 500 ha or less, the establishment of mobile extension and support units should be seriously considered. Plantations could also be designed and established in standard 500 ha packages tailored to the needs of particular regions, facilitating budgeting, procurement arrangements, and management information services.

Notwithstanding such organizational and motivational arrangements, skilled manpower in forestry is likely to remain a critical constraint limiting progress in implementation of the proposed strategy. At the higher levels, the constraint can be alleviated by recourse to technical assistance concurrent with high level (graduate and diplomate) training. Both technical assistance and training at this level need to focus particular attention in forestry sector planning, monitoring and management information (section 12.5). Considerable improvements can be made in the present organization of diploma and certificate training in order to expand its output. Apart from SIDA funding for the Community Forestry Centre (EB 3.7 million), it is not so much additional capital outlay as improved organization and use of resources and additional technical assistance, especially with the agro-forestry component which is required to implement this programme. At lower levels practical field-oriented training courses need to be given on a vastly increased scale to DAs, PA and UDA leaders and contact farmers on nursery, planting and harvesting techniques, agro-forestry and seed collection, multiplication and even trials (section 12.5). Teachers could be selected from the 200 or so forestry workers to be trained annually at the Gojam National Centre for Community Forestry, and they can be provided with the appropriate audio-visual aids, backed up by radio, leaflets, etc. Training centres for PAs/UDAs should gradually be established in all Weredas. The training period should be extended to one month to adequately cover agro-forestry and visits to field and demonstration centres; none of the costs for such training should be borne by PAs/UDAs themselves, but should be funded by central government.

Two supporting components in forestry relate to the remaining natural forests and the state farms. The natural forests should continue to be managed by the state forestry authorities so as to maximize their exploitation for productive use while simultaneously promoting both natural regeneration and enrichment planting to sustain their productivity. Natural forests should not be protected as an objective in itself; they are only useful if they can be productively used by man. Inefficiencies in such use by GOE authorities will only encourage private deforestation.

Special mention is warranted of the need to reforest state farms, the establishment of which has caused the same "urban shadow" of deforestation and fuelwood shortages as described for towns. State farms are almost entirely void of tree cover as a result of wholesale clearing during their establishment. Apart from causing locally acute firewood shortages, the removal of this tree cover has allowed severely eroding and dessicating winds to lower productivity. In the UNDP/WB mission's view, some ten percent of state farm areas, or 20 000 to 30 000 ha, should be afforested (between blocks, along roads and surrounding compounds). Higher yields resulting from increased soil moisture and crop production should more than repay the cost of establishing plantations and any reduction in crop land, quite apart from the value of the timber produced for fuel and construction.

The twin-programmed approach, i.e., agro-forestry and eucalyptus woodlots, proposed in this strategy is generally suitable for all areas of the Highlands. Whenever possible, emphasis should be given to agro-forestry as in the longer term it is both the more efficient and more conservation-oriented system. In all the major fuelwood deficit areas (all the LPC zone and most of the HPC zone) agro-forestry cannot be expected to progress rapidly until the problem of local fuel shortages is handled. However, even in these latter areas agro-forestry should not be totally ignored - the twin programmes should be universal.

If priority has to be given between zones, then despite the lower ERR from reafforestation in the LPC zone (because of the much greater threat to irreversible degradation and because of the more limited prospects for Conservation-based Development through cropping), top priority in the forestry strategy should be given to this zone. The drier the climate, the more essential it is to have trees. There is a need for trees in the semi-arid areas to provide cattle with fodder, expecially during droughts. Trees are also needed in semi-arid areas for other purposes: to reduce wind and raindrop erosion; to increase soil fertility; to preserve vegetation cover through shade, which will help maintain a better micro-climate, thus permitting humus generation; to restore hydrological conditions; and to provide fuel, wood and timber. A proviso is that peri-urban plantations, already receiving much externally assisted investment for the largest towns, should be established around smaller towns and villages in all zones to alleviate the drain of wood from surrounding rural areas. In all areas, the twin reafforestation programmes should be accompanied by rotational hillside closure and grazing management to encourage natural revegetation, for reafforestation other than cropland agro-forestry is an unnecessarily costly means of catchment protection and reclamation (section 13.3).

13.2.2 Other non-agricultural primary production

Wildlife resources and major problems affecting their conservation were summarized in section 2.9. Section 4.3 drew attention to the related potential for the development of tourism. Wildlife should be conserved as a national resource for its own sake, but to finance this, it is desirable to further develop a tourist-oriented National Park system to supplement foreign exchange earnings. Development of the National Parks in this manner should be supported by:

- appropriate legislation (e.g., gazetting of other Parks in addition to the Simien and Awash parks, and with respect to the hunting of and trade in wildlife resources);

- strengthening of mobile anti-poaching units (overall planning, manpower, training, transport and recurrent budgeting are the main problems);

- harmonizing policy with Sudan and Kenya along mutual borders rich in wildlife; and

- including wildlife conservation as a subject in general primary education, especially in those areas in which it is of local importance.

More detailed proposals for wildlife conservation and development in Ethiopia are made by FAO (1978), and detailed proposals for improving wildlife (and forestry) legislation are made by FAO (1982). Consideration should be given to extending the boundaries of the Simien National Park and resettling the farming community there (also desirable from the viewpoint of soil and water conservation) so that its rapidly diminishing wildlife resources are conserved as part of the national heritage and as a major tourist attraction. A management plan for the Simien Mountains has recently been prepared by Hurni (1985). Policy action by the GOE in these areas may well be a means of attracting resources from international agencies such as WWF, IUCN, UNESCO, for overcoming the abovementioned constraints.

The current situation, potential and constraints with respect to fisheries development were reviewed in section 4.3.2. It was stressed that efforts to increase production should be carefully phased with improvements in capacity and organization of marketing and processing, because of the highly perishable nature of fish. This is another area in which attempts should be made to attract private sector capital and initiative as well as cooperative endeavours to develop fisheries. FAO is also providing assistance for fisheries development. Aquaculture techniques to complement cropping and livestock farming systems are well known internationally, but scarcely practised in Ethiopia. As indicated in section 4.3.2 the Ethiopian demand for fish (though nearly the lowest in the world) is increasing rapidly and the constraints are more on the supply side: extension and fish stock. The need for aquaculture is greatest in the LPC zone (to improve diets and purchasing power and take pressure off land), but its potential is least in this zone. High rates of evaporation in the LPC zone render small ponds useless, but small dams can be valuable. In the high potential zones evaporation rates are low and construction is easier. Fishponds could become a significant means of supplementing income and of intensifying rural production. Priority in aquaculture should generally be given in those areas capable of supplying nearby urban markets, as well as in using dam reservoirs, combining with irrigation.

13.3 INDUSTRY AND PUBLIC WORKS

13.3.1 Priorities for industrial development

The contribution of industrialization to rural development is multiple. Rural industries can give direct support to agricultural advancement through the manufacture and supply of productivity - raising inputs (e.g., implements and fertilizers). They can provide additional employment in craft and artisan activities, the processing of agricultural produce, service activities and manufacturing linked to other industrial or urban markets. The manufacture of goods to meet basic needs for rural markets makes an important contribution to raising living standards. Industrial development can provide for such basic needs as clothing, footwear, housing and construction materials, soaps, domestic utensils, basic furniture and paper. The availability of consumer goods can be an important incentive to peasants. Industrialization can also make a significant social contribution by improving the human resource base. Wider opportunities for entrepreneurial initiative, knowledge and awareness of broader horizons, upgraded skills, and additional means of realizing increased expectations should follow from the enlarged range of economic activities within the economy. Finally, industrial development has to provide for a large, widely dispersed and efficient construction industry to provide for the physical construction required for social and economic development. A large part of investment for development involves expenditure on construction, and without the commensurate development of construction industry, serious bottlenecks and/or unnecessary expenditures of foreign exchange arise. Thus industrial development should proceed in step with increases in rural incomes - i.e., with agricultural growth.

Present industrial development in Ethiopia was summarized in section 4.5.1. Attention was drawn to growing capacity constraints, the obsolescence of large amounts of machinery and equipment which will soon need replacement, and critical foreign exchange, skilled manpower and management shortages. These constraints particularly affect large- and medium-scale industry. There is thus an obvious need to develop industry less intensive in its use of scarce capital, foreign exchange and skilled manpower, but more intensive in its use of abundant labour resources. Furthermore, industrial development has to generate its own surpluses for further investment for it would be both wasteful of resources and impose severe disincentives if agricultural surpluses have to be used to finance deficits in the industrial sector. In recognition of this, the TYPP gives top priority in industrial strategy to the development of small-scale industries to redress the imbalances of previous industrial development - the large-scale, capital-intensive and urban biases, which have themselves been a cause of urban migration, unemployment and poverty (section 4.5.1). In order to avoid costly misallocations of investment in uneconomic industrial ventures, all major prospects will need to be carefully appraised by the Development Projects Studies Agency.

A particularly important role is foreseen for rural cottage industries to supply simple consumer goods, agricultural implements and for basic agricultural processing using labour-intensive techniques and spreading capital thinly. In addition to these functions, rural industrialization should create non-farm employment for under-employed rural people, adding substantially to purchasing power in such areas, and thereby curbing the need for migration to other rural areas or to urban centres.

Industrial development, encouraged by the government, may eventually become spontaneous and self-financing in the areas of highest agricultural surplus potential (HPP and HPC zones). The generation of surpluses will be more difficult and more delayed in the LPC zone. Indeed, in the most seriously degraded areas of the LPC zone there is already a downward spiral of degradation and poverty threatening the future feasibility of cropping over ever-increasing areas. At best, cropping in such areas (with currently known levels of technology) may be able to sustain present population levels. It is hardly foreseeable that cropping will be able either to sustain larger populations or provide a means of sustained improvements on living standards in such areas. Therefore, if such areas are to avoid indefinite and increasing dependence on food aid, massive population exodus, and/or increasing famine, alternative means of improving living standards have to be found. This means that more attention has to be paid to the development of economic non-cropping activities in the LPC zone. Because other non-cropping activities such as livestock and forestry are unlikely to provide the means for sustained development, industrial development should be promoted. Industrialization in the LPC zone is far more dependent on government assistance because of the low potential for the primary sector to generate sufficient surpluses for investment.

13.3.2 Options and strategy for small-scale industry

It is beyond the scope of the EHRS, and the competence of the team, to propose an industrial strategy in comparable detail to the proposals relating to the agricultural sector. Furthermore, in the absence of a thorough study on which to rationally formulate a coherent industrial development strategy, the proposals made in this section should be regarded as being very tentative. 1/ Such a study should look at the institutional and policy issues and relationships with agricultural development in proposing an industrial development strategy. As such a study should provide the context within which pre-feasibility and feasibility studies are prepared, its preparation should have top priority. This is another obvious area in which technical assistance combined with appropriate training in industrial planning should be valuable, and an international (e.g., UNIDO), as opposed to bilateral, team should be preferred. For reasons explained in section 13.3.1, many of the proposals made in this section relate primarily, but not exclusively, to the LPC zone.

Some of the major constraints to the development of small-scale rural industry, including provision of energy, transport, communications, labour availability, fragmented market, equipment repair facilities, storage, etc., could be alleviated, and potential economies of scale achieved by the development of concentrated villages and towns. Resettlement in local villages (reviewed in detail in section 13.4) and in local towns within the LPC zone may in the longer term offer an alternative to longer distance resettlement, with its greater concomitant sociological problems (Chapter 9), in the HPC and HPP zones. The achievement of such an alternative depends essentially on concomitant industrial development. Neither increased villagisation nor urbanisation are preconditions for the development of rural industry in the LPC zone, but both would greatly facilitate its development. Efforts to promote villagisation, likely to be constrained because of skilled manpower and other resources, could be concentrated in selected villages and towns (growth focal points) in the LPC zone. The selection of such growth points would depend on a number of criteria including the availability, transport, communications and other social services, infrastructure, water supply/waste disposal, energy, etc. Villagisation and urbanisation might also be a means of improving security in the LPC zone. For these and other reasons it is proposed that urgent consideration be given to launching a carefully phased villagisation and urbanisation programme in the LPC zone. This is further reviewed in section 13.4.

Other measures to promote rural industry would probably include:

(a) industrial extension/advisory information (even management consultancy) maintenance and repair, marketing, information, and assistance services based at appropriate levels (Awraja or Wereda). In this respect HASIDA has to rapidly expand its coverage (now largely confined to urban handicrafts) to a

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1/ This also holds for coverage of energy, education and other social services, transport and communications and taxation in sections 13.1, 13.6, 13.7 and 13.8 respectively. As already indicated, section 13.1 drew heavily on development strategy proposals made by a joint UNDP/WB mission. Up-to-date studies of comparable depth are not available for these other sectors.

much broader range of small-scale industry, at levels below Regional capital towns; otherwise a more appropriate small-scale industrial development organization should be established, along the lines of those operating successfully in Zambia and Tanzania. A system of training and extension analogous to that proposed for agriculture (section 12.6) might be developed with industrial training centres being sited in the Awraja capitals to develop common industrial skills (blacksmiths, metal workers, etc.);

(b) the importation and/or local manufacture and distribution of appropriate technology machinery and equipment, and training in its operation, maintenance and repair, with adequate provision being made for costs of these and of spare parts. Appropriate technology would imply initially low raw material inputs, high labour intensity, low skill, low operating costs, low initial capital outlays;

(c) strengthened credit services for the purchase of equipment, tools and raw materials. Most of the proposals made for agricultural credit in section 12.7 are relevant also here;

(d) encouragement of cooperative activity, even on a seasonal basis (agricultural slack periods). The conclusions reached on cooperation as a means of investment (section 12.8) apply here;

(e) encouragement of private sector initiative, capital and skills, by the removal of present ambiguous legislation and local uncertainties. The 1983 COPWE statement to this effect (section 4.5.2) needs to be followed up quickly by concrete actions. Failure to take action could result in the worst of both worlds - a continuing but inefficient private sector;

(f) a deliberate policy of seeking to link small- and large-scale industry in major urban centres (initially Asmara, but gradually also Mekele, Gondar and others). Linkages could be for parts and inputs.

Possibilities for initial small-scale industrial development in the LPC zone might include:

(a) <u>livestock-based industries</u> (tanneries - leading to local shoe and bag manufacture; cheese, butter and milk for developing urban centres; meat drying; meat processing; utilization of by-products);

(b) <u>cloth industries</u> (spinning, weaving, tailoring) using locally produced wool and cotton for clothes, material fabrics, mats, bags and carpets - even for export (the LPC zone proximity to the Red Sea ports can be advantageous);

(c) crop-based industries, including grain and oilseed crushing mills and various hand or animal powered equipment to relieve female labour wastage in pounding, threshing and winnowing; canning and dehydration of vegetables (from irrigation development; high-yielding and low water requirement onions are already available) and even citrus fruits for jams, etc/;

(d) forest-based industries, including sawmills, building timber, production of furniture for homes, schools and offices; eucalyptus oil extraction, silk production (mulberry trees); honey and wax production; candles, pencils, sawdust briquettes, etc.;

(e) manufacture of glass, bricks and tiles (using small kilns) and ceramics for industrial and handicraft use. Perhaps even small-scale cement production;

(f) artisan and handicrafts for small farm implements, pottery, cooking utensils and improved stoves, ornaments, etc.; and

(g) mineral-based industries using local copper, potassium, sulphur, precious stones, etc.

13.3.3 Some options for large-scale industry

There is already susbstantial large-scale industry in Addis Ababa, Asmara and Dire Dawa and some suggestions for its development were made in section 4.5.1. Possibilities for development in these and other locatities are constrained by lack of capital, especially foreign exchange and skilled manpower (both technicians and managers), lack of motivation in both the state and private sectors, and - in some cases - energy supplies.

Because of the need and potential for increasing cereal and coffee production in the HPC and HPP zones by fertilizer application, and the expected rapid growth in fertilizer application in these zones (if the agricultural strategy proposed in Chapter 12 is implemented), early consideration should be given to inviting a major chemical/fertilizer company or an agency such as UNIDO to take a fresh look at the feasibility of fertilizer production. A pre-feasibility study has suggested a break-even production level somewhat higher than 300 000 tons annually, compared to recent consumption levels of around 100 000 tons p.a. (Norsk-Hydro, 1982). A second professional opinion should take account of the latest developments with respect to exploitation of the natural gas found in the Ogaden and proposals concerning oil refining at Aseb (section 13.1), as well as any discovery of phosphorous-containing raw materials .

The following possibilities would all seem to indicate the feasibility of fertilizer industry development in the LPC zone or at Aseb:

- of obtaining nitrogen as a by-product from oil refining;
- of ammonia production (possibly also at Aseb by piping liuqified natural gas from the Ogaden primarily for export);
- of obtaining sulphuric acid as a by-product from pyrite/ copper production in Asmara to apply to phosphate rocks (possibly imported from Uganda, if local supplies cannot be identified);
- of utilizing known substantial potash deposits in the Danakil depression; and
- of substantial hydro-electric power potential.

Former proposals, however, must await feasibility study.

13.3.4 Public works

In concluding this section attention must be drawn to the substantial non-farm employment which could and should be provided by public works programmes. A start has already been made in land conservation, with the assistance of FFW. Conservation works have to be massively and rapidly extended to preserve whatever limited capacity for agricultural production still remains in the LPC zone (Chapter 11). Such conservation works, despite their necessity, cannot increase the general potential for agriculture in the LPC zone - climate and soils will continue to limit its potential compared to the other zones. Public works, therefore, need to be undertaken simultaneously to provide foundations for more rapid sustainable development. The range of public works which should be completed through labour-intensive techniques, includes:

- irrigation development;
- road construction;
- storage construction;
- market facilities; and
- social infrastructure including schools, health clinics and water supplies for domestic use.

Such public works should be timed to take place in the agricultural slack season to absorb under-employed labour and not interfere with crop production.

Such works could provide the basis for accelerated industrialisation as well as agricultural rehabilitation. Food aid has already been an important catalyst in initiating conservation works; it now also needs to be used (especially in the LPC zone) to simultaneously initiate public works in these other areas. Because of the massive requirements and the substantial surplus of under-employed labour, it has already been proposed (section 11.6) that the FFW current ration be reduced by a third, increasing the FFW programme by 50 percent. Even larger increases should be sought by increased flows of food aid, taking care to avoid disincentives.

13.4 RESETTLEMENT, MIGRATION AND VILLAGISATION

13.4.1 The need for population relocation

It is difficult to reliably quantify the need for resettlement and/or migration because estimates depend on a wide range of factors. Some tentative indications are useful, however, to give some idea of the magnitude of the problem. In Chapter 7 of WP 19 it is estimated that by 2010, if present degradation trends continue, almost 10 million rural people would be unable to derive their income and food from cropping. Sixty percent of these would be in the LPC zone. Chapter 6 concluded that half of the land area of the LPC zone is already seriously eroded; half again (25 percent) is so seriously eroded that it is likely to become irreversibly degraded if present trends continue. Similarly, 13 percent of the HPC zone and 4 percent of the HPP zone are threated by irreversible degradation (table 6.2). Applying these percentages to the estimated zonal population in 1984 would suggest that 6 million (LPC), 3.3 million (HPC) and 0.5 million (HPP) persons were living in the very seriously degraded areas of these zones. If it is assumed that the reclamation and conservation of such areas can only progress effectively if cropping is confined to slopes of less than 30 percent, and if rural population density in these high-risk areas increases by not more than one percent p.a. (while population growth remains at 2.9 percent p.a.), then it can be inferred 1/ that over 110 thousand families - 500 thousand persons - would need to be resettled (LPCZ - 67 000; HPCZ 40 000: HPPZ - 4 000 families) and that a further 47 000 families would need to be resettled annually (LPCZ - 29 000; HPCZ - 16 000; HPPZ - 2 000).

This calculation makes no allowance for other areas which will become seriously threatened (especially in the LPC zone), if present trends of degradation and population growth continue. The annual "requirement" figure could be lowered substantially if population growth could be reduced; also to the extent that agricultural technology and alternative income opportunities could be developed.

The estimate of 47 000 families a year is considerably higher than the September 1984 RRC pronouncement of the "new approach to resettlement" (section 13.4.3 below), which totals about 25 000 families per year.

1/ This "guess-timate" assumes that only 5 percent of the population are cropping on slopes greater than 30 percent (around one-third of the land area). It is also assumed that the population most seriously threatened by degradation coincides with that threatened by periodic drought.

13.4.2 Relevance of past and recent experience

It is in the above context that future resettlement strategy has to be viewed. Resettlement in this context is taken to include both the planned and the spontaneous movement of people to areas of under-utilized agricultural potential, both rainfed and irrigated. It was pointed out in section 3.4 that spontaneous rural/rural migration, significant over the centuries, has virtually ceased in recent years as a result of procedural rigidities within the PA system. This means that rural resettlement in the past decade has been more or less confined to organized resettlement by the RRC 1/. RRC's resettlement programme was accelerated at the end of the 1970s but gradually declined until the November 1984 emergency resettlement programme. At that time a total of 46 000 families had been settled, but most were not self-sufficient, even in the oldest settlements. Since the 1984 emergency resettlement programme has been underway, RRC's achievements of having resettled almost 300 000 families can be compared with the hypothesized need calculated above to resettle at least another 47 000 families a year until 2010. Even if the logistics of such a resettlement programme could continue to be handled, the costs of "establishment" would be very burdensome: over US$18 million annually, at a past average cost of US$400 per person settled in a low-cost scheme (Chapter 9) 2/ Furthermore, despite the high costs involved, fewer than half of the settlers are self-sufficient in food after the targeted three years. A new approach is clearly needed.

In September 1984 the RRC announced a new four-point approach to resettlement. New settlements in the future would be one of four types or a mixture of these as appropriate. About 25 000 families a year are assumed as a target. The types listed by RRC were:

(1) spontaneous low-cost settlement, in areas with low clearing requirements. RRC would provide information in such areas, basic land use surveys and plans, and transport the settler family and their belongings to the site. Target: 13 000 families annually;

(2) continuation of present "high-cost" or "special" settlement types. An effort would be made to reduce costs by limiting mechanisation to the first two years. Target: 6 000 families p.a.;

1/ Resettlement by local villagisation, such as that undertaken in Bale, is not considered in this context because it does not reduce local land use pressures; if anything, it increases them. This is reviewed later in this section.

2/ The "special" settlements cost estimate is three times as expensive. As there would be different kinds of "settlements" at different costs, the total cost of such a programme is estimated here at between US$25-and 30-million per year. (See WP 28; Chapter 9.)

(3) villagisation within degraded but not overpopulated catchments. Villagisation is seen as a means of achieving better control over cropping and grazing, and mobilizing manpower for conservation works. Target: 5 000 families p.a.

(4) expanding PAs by immigration in areas where population pressure is lower (i.e., below the RRC planning norm of 2.5 ha per family). RRC would identify the PAs and provide transport for the settler's family and their belongings. Target: 1 000 fmilies p.a.

In November 1984 the GOE announced the start of the emergency programme of resettling 300 000 families (about 1.5 million people) from the drought-affected areas of Tigray, Welo and Northern Shewa to the western and southwestern parts of the country. It has been estimated that by the end of August 1985 a total of almost 400 000 families had already been resettled (EHRS WP 28). This is a truly remarkable achievement. The emergency threatening the livelihood of millions of people in the north, the massive and prompt response of the GOE in mobilizing its own manpower, transport and financial resources to respond to the emergency, and significant assistance from the international community have all contributed to this resettlement achievement. The resettlement itself took the form of both absorption within existing PAs (type 4 above) and new "special" settlements (type 2 above), where possible adjacent to existing special settlements. Thus in both cases, cost, manpower and equipment economies are being sought by making use of existing infrastructure and facilities. The cost-economising approach is considerably reducing average costs per settler. However, the extent to which the programme has succeeded in premanently resettling these people and in enabling them to become self-sufficient in their new locations remains to be determined. It is also doubtful whether such a massive programme could be sustained for long, but hopefully it would not need to be, because the backlog of required resettlement (as estimated in 13.4.1) should be met by this programme, even if a large proportion of the settlers return to the north.

The experience of Ethiopia, in both its recent emergency and longer term resettlement programmes, together with relevant experience gained in other countries, suggest the need for a strategy with three major components: assisted migration; more organized resettlement; and villagisation.

13.4.3 Migration

Because of the high costs and poor results in attaining self-sufficiency associated with the more organized resettlement in Ethiopia, it is proposed that migration be promoted as the major means of relocating people. This proposal is in fact already implicit in the announced new approach of RRC (outlined in section 13.4.2); the target for spontaneous migration is over twice as many families as for more organized settlement on especially prepared sites. It is proposed that this policy be developed even further so that "special settlement" becomes regarded as an option of last resort.

While there may be considerable scope for migration into the lowlands for irrigated farming in the future, the costs of irrigated agricultural development, even on small-scale schemes, are high. As there are still abundant opportunities for the expansion of rainfed cropping, it is proposed that, at least for the initial years of this strategy, most migration be directed toward the west and southeast Highlands (and associated valleys) where land is still relatively abundant. For reasons already mentioned, most migration in recent years has been from rural to urban areas, and rural/rural migration has practically been confined to RRC's resettlement. Rural/urban migration has also prompted some resettlement by RRC of urban unemployed. Resettlement from urban areas is considered neither necessary nor desirable; it is better to reinforce controls over rural/urban migration at the PA level, helping the development of population policy within PAs (section 11.6) as well as facilitating urban development (section 14.3). To the extent that unwanted rural/urban migration still continues, this should be countered by returning the migrants to the PAs of origin rather than establishing special resettlements which have generally been costly and unsuccessful. However, it should be noted that the rate of urban population growth, at four to five percent p.a., is not high by the standards of many other Third World countries. Furthermore, this growth includes many urban areas with less than 2 000 persons. In many countries such towns would be considered large villages, and their expansion would hardly be a matter of concern. On the contrary, the growth of small and medium-sized towns would be viewed as a positive factor contributing to rural development by providing small centres for industrialization, public services and marketing outlets. Only Addis Ababa and Asmara have populations of over half a million. To promote the development of non-farm activities in the LPC zone, it is proposed that both urbanisation and villagisation be encouraged (section 13.3). It is thus, perhaps, only in Addis Ababa where action needs to be taken to reduce rural/urban migration. Rural/urban migration to Addis would be stemmed even further by strengthening the system of residence permits; making membership of a kebele a prerequisite for access to rationed food, employment or social services.

There are grounds for expecting urban population growth to fall, both because of the already continuing spread of family planning services in urban areas (section 14), and because rural/urban migration, except in the LPC zone, is expected to fall further. Rural/urban migration outside the LPCZ should fall as land pressures in rural areas will encourage PAs to take earlier action wherever land is left unattended by migrants (i.e., the risks of losing their claim to land will increase). If the strategy proposed in the report is implemented, the <u>rate</u> of improvement in rural living standards should keep pace with, if not rise faster than, urban living standards, so the motivation for rural/urban migration would be reduced (again, except in the LPC zone). Also, if the proposed rural-based industrialization strategy is implemented, this would increase both non-farm income and employment opportunities in rural areas. (Urban development is reviewed in section 14.3.) The rest of this section is concerned with rural/rural migration.

It is further proposed that whenever possible migration be organized through the PAs. The AEPA could act as a clearing house, putting labour-surplus PAs in contact with land-surplus PAs, etc. The RRC can assist by providing films and other publicity and by organizing transport and logistics of movement between the PAs. These latter functions might gradually be taken over by the AEPA so that RRC could concentrate on preparing settlement sites (for the creation of new PAs by settlers) and on its relief operations, while AEPA becomes the organization responsible for promoting migration between PAs. Another reason for proposing this is that migration between existing PAs is very dependent on development within the individual PAs concerned. For example, it has been proposed that the taungya system of agro-forestry could be used, both to move people from the steepest slopes in over-populated PAs, and to clear forestlands or woodlands in the under-populated PAs.

Migration between PAs need not be confined to permanent migration. Attention has already been drawn to seasonal shortages of labour for picking coffee in the HPP zone. Prior to the establishment of the PA structure, people from northern areas (LPC zone) used to migrate seasonally for picking coffee and cotton (section 3.4). Such temporary migration would not only offer benefits to both of the PAs concerned but would encourage more permanent migration as the temporary migrants become more acquainted with prospects and potential in the new areas. Such migration, fairly common before 1975, has been a unifying factor in the emergence of the Ethiopian national culture and society in the past, and migration should be encouraged. To facilitate temporary migration, restrictions on peasants hiring seasonal workers should be abolished.

Migration might be slow initially, but as the success stories of migrants become known, the momentum could soon build up. A slow start would enable more time to prepare for new settlers in recipient PAs. As a result of past spontaneous migration, many people in the north already have relatives in the southern areas, and such linkages should be exploited wherever possible in supporting migration. It is further suggested that in potential recipient PAs without any such linkages with the LPC zone, migration from the LPC zone should be organized on the basis of groups of at least five families, to reduce initial isolation, homesickness, etc.

Proposals for the classification of all PAs according to their capacity to absorb more people or their need to reduce their memberships are made in section 15.2. The AEPA would obviously need to be strengthened to undertake the proposed tasks, and a simultaneous widespread publicity campaign would be needed. Specific investment and technical assistance proposals are made in Chapter 14.

In addition to migration through absorption within existing PAs, migration should be promoted to areas which are much more sparsely populated and only nominally under an existing PA. In such areas, migration should provide the means to establish a new PA for fuller utilization of the land resources concerned. Although this kind of migration would almost inevitably involve bush clearing and probably tsetse control, this need not be undertaken by a big government agency, as evidenced by previous settlement in Ethiopia and the experience of other countries. Such migration should be encouraged by the provision of information and by direct incentives (subsidized travel and food for six months) and the construction of infrastructure, particularly access roads. The major potential for this kind of migration is in the western and southeastern areas of the HPP and HPC zones. The expansion of cropped areas is further discussed in section 12.2.

13.4.4 Resettlement

Further resettlement policy needs to be aimed not just at moving people from degraded and drought-susceptible areas, but doing so at minimal cost to the economy and with minimal social disruptions to the people concerned. This means reducing costs and, most importantly, making the newly settled people self-reliant much more quickly than in the past. Resettlement should be voluntary. Self-selection, based on information, publicity and incentives provided by RRC, rather than RRC selection, is more likely to ensure that a large proportion of the settlers are sufficiently motivated to put more efforts into achieving self-sufficiency in their new locations. Self-selected persons would have less incentive to return to their origins. Experience in Ethiopia and elsewhere demonstrates that it is the settlers actively seeking settlement opportunities because of economic need who develop most affinity to the new locations, and who are most committed to the success of their move. To promote such voluntary resettlement, mobile RRC teams would need to tour the most severely degraded areas, suitably equipped with films, etc., backed up by local radio, publicising resettlement opportunities and needs and recruiting volunteers. Representatives of PAs in each area should be taken on inspection visits to the resettlement sites to verify the publicity.

Wherever possible, resettlement would be through migration and absorption into a PA or through formation of a new PA in relatively underutilized land areas, as proposed in the previous section. If such migration is encouraged and assisted along the lines already proposed, most of the needs for resettlement should be met at far less cost to the economy and to the persons concerned than under the policy of special settlement sites. The "special settlements" have proven very expensive, have experienced major management problems, are skill- and capital-intensive, and have been relatively slow in both moving number of people and in making them self-sufficient in the new locations. Accordingly, much lower priority should be given to the establishment of "special settlements" in the future: they should be seen as an option of last resort to be used when assisted migration is insufficient and/or for emergencies.

To the extent that more "special settlements" are required, preference should be given to expanding existing settlements, to economize on infrastructure and management overheads. (There are already 83 settlements, although only two - Asosa and Harawa - accounted for 85 percent of the settlers before the November 1984 emergency operation.) For similar reasons, if any new sites are required, consideration should be given to converting some of the most inefficient state farms into settlements. Fewer but larger settlements offer considerable opportunities for economies of scale and disproportional increases in non-farm employment. The size of non-agricultural employment depends on possibilities for forward and backward linkages and income levels. Besides the wider range of secondary and tertiary activities and employment, larger settlements are able to support a greater array of social services. Costs of infrastructure and social services per family tend to decline as the size and concentration of settlements increase. Cost economies should be sought by relating the provision of infrastructure and social services to standards prevailing in the origin areas, and by adopting designs which would minimize recurrent costs and allow for gradual upgrading as development progresses. These considerations lead to the conclusion that such "special" settlement should be planned within an integrated regional framework that includes development of related agro-industrial and service sectors.

Special settlement sites should, with the declassification of existing settlements as they become self-sufficient, be reduced drastically in number. Any such settlements which are not self-sufficient within two years of the time that 75 percent of the settlers had first reached the site should be the subject of a special enquiry and appropriate remedial actions taken. As many settlers as practicable, destined to special sites, should be transported together, to facilitate logistic arrangements. Whole families with their belongings should travel together to promote social stability within the settlement and accelerate integration with the local community - and because the family is the important source of farm labour and necessary non-farm labour. The previous practice of initially moving only household heads should be discontinued.

Special settlement sites should be planned with the participation of the newly recruited volunteers as well as the existing local PAs, to increase responsibility and commitment by the people concerned. The plans should provide for the gradual conversion of the settlements to self-sustaining PAs in their own right. As much scope and flexibility as possible should be left for local initiative and decision-making by the settlers, to encourage participation and commitment. It should not be obligatory for settlers to farm communally from the outset (as on all the present special settlements). Target income levels of a special site should be no higher than those already prevailing in the locality, and land per settler and farming system planned accordingly. Wherever possible, the local population already living in or around the settlement site should be adequately compensated for any land losses incurred and should have equal access to socio-economic facilities to be provided to the settlers. Special settlements are in areas where there was previously only a sparse population with little agricultural production and the plans have to provide for the expansion of extension and related services. More adequate financial records are indispensable for the planning and management of settlements.

The establishment of any new special sites for settlement should be more carefully planned technically than in the past. Some settlements have failed because of poor site selection. If there is a sparse population, a priori reasoning suggests that the land has low productive potential. At the very least, there should be a soil survey to assess the suitability of the land for continuous cultivation and an assessment of the rainfall regime - annual amount, seasonal incidence, and reliability. The need for resettlement arises, at least in part, because of the misuse of land over previous centuries. Resettlement procedures have to be consistent with the principles of the Conservation-based Development Strategy to avoid extending the misuse and degradation of land. Productivity-raising conservation practices must be key components of resettlement. The development of a new settlement site should be phased to provide quick access to land at low initial cost for a significant number of rural families, while establishing a solid base for continuing productivity and income gains in the future. Food and income requirements in the early months of the establishment phase could be met by hiring settlers to do essential self-help development work such as road building and land clearing - possibly organized on a FFW basis. As of the Spring of 1985 fewer than two-thirds of the tractors on RRC settlements were operational. This and the high costs of running and repairing tractors has no doubt promoted RRC's change of policy on tractorisation. As much initial land clearing and other establishment works as possible should be done using labour-intensive methods.

Various proposals have been made to reorganize the RRC (Chapter 9). Management is highly centralized in Addis Ababa. Relief activities require strong, centrally controlled direction with an emphasis on pragmatism rather than economics. Resettlement on the other hand involves longer-term activities which should be much more firmly based on economics. Relief activities should therefore be completely separated from the resettlement functions of RRC. The present consolidation of the RRC, with greater stress on monitoring and accountability, decentralization of management and the moves to attract outside donor support for large-scale settlement schemes are steps in the right direction.

"The major problem has been the concentration of cultivation in a much more confined area surrounding the villages. The increasingly intensive use of land within village boundaries without corresponding increases in inputs and/or improvements in practices threatens the longer-term maintenance of agricultural production. For security reasons livestock are kept in or alongside homes at night and manure thus is lost from the fields. This implies that villagisation should be accompanied by certain agricultural changes including:

(a) the continuous adoption by the majority of villagers of a package of technical improvements, which itself depends on adequate research to produce a flow of such technical improvements for the future;

(b) the increasing use of inputs such as improved seeds and fertilizers;

(c) increased efforts to conserve land resources.

Even allowing for greatly increased research and inputs distribution efforts (which to be adopted would have to accompanied by adequate producer incentives), sooner or later consideration might have to be given to some decentralization of villages - perhaps a system of satellite villages." (FAO 1983c)

Notwithstanding these high risks, it is proposed specifically for the LPC zone that serious consideration be given to promoting more rapid villagisation because:

(a) in the longer term cropping can at best only provide a means of maintaining living standards - it cannot provide the means for sustaining improvements in living standards for the bulk of the population in the foreseeable future (section 12.2). This means that improved living standards in the LPC zone will have to depend primarily on livestock, forestry and rural industry as well as peripheral activities including aquaculture, apiculture, poultry, tourism, etc. Neither livestock nor forestry are labour-intensive activities so that employment and income in the longer term will have to depend increasingly on rural industry. The provision of supporting services (electrification/diesel power, mechanics, carpentry, etc.) is much easier in concentrated villages than in widely dispersed settlements. Also the disadvantages of villagisation in terms of cropping would be less in the LPC zone because:

(i) there are no tree crops (often the first to be neglected or to suffer from villagisation: witness cashew in southern Tanzania - FAO 1983c);

(ii) cropping will become relatively less important to the rural economy for reasons already stated;

(iii) cropping is less intensive.

(b) traditional culture and society in the north strongly emphasize collective responsibilities and action (EHRS WP 28); and

(c) it could provide the means to promote much more quickly required changes in social norms and attitudes toward Conservation-based Development. Examples are the need for smaller families, the need for grazing management, control on cutting of newly forested lands, etc.

Obviously coercion would conflict with the participatory principle, and care should be taken to minimize the risks already mentioned; this would call for a voluntary, carefully phased, selective and closely monitored approach to villagisation. In any event, villagisation can command priority consideration only if and when it is an important part of a larger priority programme. Many people would necessarily have to continue to depend on cropping for their livelihood, and those living farthest from the center should not be villagised or should be placed in smaller satellite villages. With the villagisation of their neighbours for small-scale rural industry, farms of those remaning might even be enlarged; they may thus have the opportunity to improve their living standards by selling food surpluses in the village markets. Similarly, livestock farmers should not be villagized, nor forest guards, etc. But farming and these latter occupations in the longer run can provide sustained development for only part of the population - the other part might just as well live in villages to facilitate the development of non-farm sources of livelihood.

13.5 EDUCATION AND OTHER SOCIAL SERVICES

13.5.1 Social services

The comprehensive strategy should effectively coordinate development of the social services with the development of the productive sector. Rural people and government are interdependent for their basic needs. Rural people necessarily depend on government for the provision of basic social services such as safe water supply, health and educational services. Government depends on rural people for the production of surplus food and for the production of export crops. It was in this context, considering the contrast between the outstanding achievements of the Government in providing social services to the rural population with the disappointing growth of peasant agriculture, that section 4.8.1 suggested relating the provision of further social services to increases in officially marketed agricultural production.

Specifically, it is proposed that priority in social service investments be given to those PAs achieving the largest increases in marketed agricultural production at least in the HPP and HPC zones. This criterion obviously should not be applied in the LPC zone as the potential for production increases is much more limited, and in that zone a massive FFW programme for both social and economic public works has been proposed (section 13.3).

Sectoral analyses and planning are remarkably lacking in Ethiopia. For example, there are no up-to-date sector analyses for education or health; nor is there a master plan for water resources. High priority, with appropriate technical assistance and training, needs to be given to the strengthening of such sectoral planning, so that the inter-sectoral links - both with the productive sectors and with the social services - can be developed for greater benefit and economy, and a framework provided for more rational determination of priority policies and projects. In the absence of such analyses, recommendations have to be viewed tentatively.

Generally, in view of the emphasis which the Conservation-based Development Strategy puts on accelerating economic growth, it is suggested that the total investment on social services not be increased as a proportion of GDP (it should remain at around 14 percent - section 4.8.1). Rather the emphasis should be in mobilizing resources available in the non-governmental sector (e.g., traditional healers, the NGO's, religious missions, even the private sector) to complement government provided services. The peasant sector itself should contribute slack season labour for the construction of schools, health posts, improved water supply systems with the government providing items not available locally. Gradually the PAs should play an increasing role in supporting the local teacher and health worker (by providing them with houses and feeding them from within the PA). Every community must have such personnel for its social well-being, but it will be many years before central government can afford to pay the numbers required. Already the high and rising recurrent costs of extension, health agents and teachers are causing severe national budgetary problems. This is another reason for proposals made (in several sections of this report) to make much fuller use of mass media, both radio and rural newspapers or news sheets - to pass simple message on Conservation-based Development, agriculture, family planning, etc. to the growing literate population.

Because of budgetary constraints, full use must be made of existing infrastructure (e.g., further development of shift systems in schools) and the avoidance of capital- and skill-intensive approaches, by simplifying design standards of dispensaries, providing only very basic training for part-time paramedical staff, etc. More specific but tentative suggestions are made for education, health, and water supply in the following sub-sections. Related suggestions are made for social services in section 4.8. Suggestions for birth control and for housing are made in Chapter 14.

13.5.2 Education

Faster economic growth is dependent on accelerated development of human resources. Education is an investment for development, both for the individual and society. Education is not only a means of providing skills necessary for productive activity, but even more importantly is a means of building human capacity to develop, absorb and adapt new knowledge for the improvement of living conditions. Education can contribute significantly to the rate at which farmers adopt new farm practices, although research is still needed on what kind of education would be most cost-effective in this respect. International discussion continues on the relative values of literacy, numeracy, allocative ability, etc. and on the content of appropriate education. In the Ethiopian context, it is proposed that especially primary education and the literacy campaign have a substantially higher content directly related to the future activities of most of the students: farming.

The spread of primary education and the adult literacy campaign provide opportunities for spreading the messages of the Conservation-based Development Strategy on productivity-raising conservational measures in cropping, agro-forestry, etc. 1/ This should be the major function of primary schooling - not the preparation of children for secondary schools and so on, by which education tends to become a segregated goal in itself. The present biases in the national MOE primary school syllabus against rural life and manual work have to be removed. Technical subjects, including agriculture (at present only 5% of primary school time), home economics (5%), handicrafts (7%) should rapidly be increased in importance relative to the teaching of English (11%), general science (8%), and physical education, art and music (18%). It is suggested that in changing primary school and literacy campaign curricula, some effort be made to ask rural people, through surveys, which subjects they think are most relevant for their illiterate neighbours and/or children.

It has been estimated that secondary education costs around five times as much per student year as primary education (WB 1981). In view of this, the already rising numbers of unemployed secondary school leavers and the fact that farmers with primary education generally produce more and are more receptive to extension efforts than those without schooling, it is suggested that higher priority be given to increasing the coverage as well as quality of primary education and the adult literacy campaign. This would involve increasing the number and training of primary school teachers, expanding the use of audio-visual aids and radio, improving and increasing the number of textbooks, etc. Particular efforts should be made to increase enrollment of girls (still below 35 percent of total intake) because of their subsequent farming

1/ The literacy campaign is much more relevant in these respects than the syllabus of primary education. This campaign has already won worldwide acclaim; in 1980 the UNESCO-affiliated International Reading Association gave its annual award to Ethiopia. However, the syllabus has to be oriented even more toward Conservation-based Development.

Table 13.1

PRIMARY SCHOOL SUBJECTS BY RELATIVE IMPORTANCE
(periods of 45 minutes per week)

Subject	Grades					
	1	2	3	4	5	6
Amharic	10	10	7	4	4	4
English	-	-	4	5	5	5
Mathematics	6	6	5	5	5	5
Science	2	2	2	3	3	3
Agriculture	1	1	1	2	2	2
Political education	1	1	2	3	3	3
Handicrafts	2	2	2	2	2	2
Home economics	1	1	1	2	2	2
Physical education	3	3	2	2	2	2
Art	2	2	2	1	1	1
Music	2	2	2	1	1	1
Total	30	30	30	30	30	30

Source: Ministry of Education.

contribution, their potential impact on economic and social development through lower birth rates, improved health and nutrition, and increased household and home plot production.

Both primary school education and adult literacy courses have to be followed up by practice of the acquired skills. The scarcity of reading materials threatens to negate progress, and urgent consideration should be given to producing for the peasant communities all sorts of periodicals, posters, etc. which would include simple message on Conservation-based Development, etc.

Secondary and higher education should also have more technical content, and again more attention should be given to quality. For educational as well as budgetary reasons, increased efforts should be made to include field or on-job practical experience - learning about brick laying and carpentry while helping to construct a school extension, for example. All educational institutes should be encouraged to explore ways of supplementing their income by practicing the lessons in practical community activities.

13.5.3 Health

There is need to be less preoccupied with disease and concentrate more on nutrition, water supply, sanitation and other factors which determine the incidence of disease and which at the same time are amenable to measures that the community can undertake. Only health programmes aimed at reducing the incidence of disease can improve the quality of rural life. Curative services only have the capacity to influence the effects of disease but have virtually no impact on its incidence except when they are applied to eradicate the reservoir of a disease in a community.

Three basic components are suggested for preventative health services:

(a) education/information (mass media, etc.) on nutrition, sanitation, etc.;

(b) self-help programmes on water supply, health centres, pit latrines, etc.;

(c) short basic training of part-time peasant paramedics (with particular emphasis on birth control techniques), backed up by adequate supplies of drugs and an appropriate referral system. Traditional medical healers might be incorporated in this effort and be provided with medical kits (section 4.8.3).

The preparation of a nutritional development strategy has already been proposed in section 4.8.4, as well as introduction of a nutrition base line and monitoring system (see also section 15.7). These proposals should involve the strengthening of ENI by technical assistance and training.

13.5.4 Water supply

Only four in every 100 rural Ethiopians have access to safe potable water supplies, and it is not uncommon in many parts of the Highlands for women to have to spend up to four hours daily collecting water. The improvement of water supplies invariably emerges as a top priority when rural people are questioned about development priorities. Improvement is particularly difficult in the Highlands with its widely dispersed settlements, its rugged topography and low water table. More use of FFW for providing rural water supplies is strongly recommended.

Conservation activities should generally emphasize reactivating springs where possible. Major emphasis has been on the drilling of bore holes, but pump maintenance and repair remain common problems. It has been estimated that in Africa generally, over 60 percent of pumps are inoperative within a few months of their installation (WB 1981). Clearly more attention should be given to spring development, wells, surface water development and surely roof-top collection techniques. Fuller use should be made of locally available materials (clay and bamboo) for piping.

13.6 TRANSPORT AND COMMUNICATIONS

13.6.1 Transport

Ethiopia's road network is one of the least developed in eastern Africa, with a density of only 10 km per 1 000 km^2 nationally, and less than 0.4 km per 1 000 people in the Highlands. Road density is lowest in the LPC zone and highest in the HPC zone (Table A13.3). Despite the rapid increase in the length of paved roads in recent years, the network still basically extends radially from Addis Ababa, with few interconnecting links; large areas, especially in the west, lack all-weather access. In the course of preparing the PADEP it was found that over 40 percent of the highest potential Weredas in Welega, Illubabor and Kefa would have to be excluded because of their inaccessibility (M. Wales, Unpublished paper, 1984). Vehicle density at 2 per 1 000 people is the lowest in Africa (World Bank, 1983e). The provision of transport services in the Highlands is made difficult and more expensive by the large geographical area, rugged topography and widely dispersed population. These and other problems of transport sector development were reviewed in section 5.6. The restrictions on input and output marketing and extension imposed by distance, and the costs of overcoming them, serve to reduce incentives of the rural population and are a major factor limiting the extent of peasant participation in the market economy. There is clearly a need for the rapid and systematic development of transportation facilities to support agricultural growth. Transport strategy has therefore to increase accessibility over a wide area of the Highlands for both passengers and freight and thus provide some of the means by which rural people can participate more fully in the monetary economy and in the social, economic and political development of their country. Three major thrusts are proposed in transport strategy for the Highlands concerned respectively with the development of traditional cum intermediate transport systems, the expansion of the road network, and fuller and more efficient utilization of the nation's vehicle fleet as well as its road network.

"Modern" transport in the Highlands is based on imported vehicles, fuel, lubricants, spare parts and often road construction equipment. It is intensive in its use of critically scarce resources: foreign exchange, skilled manpower and recurrent funding. Such considerations and the physical difficulties and high costs of developing modern transport inevitably imply that it will be many years before the Highlands have an adequate road network. In the meantime, much greater attention should be given to the development of traditional transport and "intermediate transport", so that it can help bridge the gap by meeting certain growing transportation demands in rural areas.

Development of traditional transport should be pursued through a simultaneous action programme which would seek to:

(a) improve equine nutrition (section 12.4) - thus tending to reduce the pressure to sell equines for lack of grazing;

(b) encourage and facilitate the use of wheeled carts with equines.

(c) provide more bicycles and load-carrying tricycles in flatter areas;

(d) improve animal harnessing, including leather or canvas saddles with wooden frames;

(e) mobilize local labour to construct tracks and trails, leading to rural roads and suitable for human and equine wheeled transport;

(f) construct storage/shelter facilities at appropriate collection points on the rural roads at which timetables indicate bus and truck schedules. Such collection centres might be located at Service Cooperatives.

Such measures would expand the areas effectively covered by feeder roads, which would greatly increase the benefits of road development.

The WB recently (1984) approved a US$70 million road project to improve and expand the road network by constructing about 3 670 km of feeder and rural roads, by paving about 360 km of gravel secondary roads, and by rehabilitating about 430 km of paved roads. Road maintenance operations will be strengthened by providing equipment and technical assistance, and sector planning will be improved by the project. Most new road construction in the Highlands is under ETCA, which currently insists on minimum standards (RR30), even for expected low-traffic roads, which are too high. Much lower standards for rural/feeder roads are used effectively in Kenya. Generally lower standards result not only in substantial cost savings (so that more kilometres of roads can be built with a given budget), but increase possibilities for labour-intensive construction methods. Here Ethiopia has obvious comparative advantage. Both the Sirinka project and an ETCA/ILO study have established the physical viability and economic feasibility of more labour-intensive road construction (1 000 to 5 000 mandays per km are required, depending on terrain, etc.). The FFW programme has demonstrated that large amounts of labour can be mobilized through the PAs. Accordingly, it is proposed that much lower minimum standards be adopted for both tracks and feeder roads (say RR10 as an upper limit); that more labour-intensive construction and maintenance methods be used; and that fuller use be made of FFW to mobilize the required labour.

Responsibility for the maintenance of such roads should be decentralized as much as practicable to minimize central government costs. It is further proposed that the authorities concerned (and presumably

MOA should collaborate with ETCA and local authorities) apply criteria that can be objectively quantified (such as people/km, crop volume per km and crop value per km) to select priority tracks that should be upgraded to rural road standards. Priority human/equine tracks should gradually be upgraded by treating selected bad patches of such tracks rather than the whole length. Routine maintenance over time will result in the gradual widening and upgrading. Only when traffic volumes justify it should the roads be upgraded to ETCA's minimum RR30 standard.

Because of the need to increase labour-intensive road and track construction at the PA level, and to initiate it at the SC level, priority attention needs to be given to making available appropriate technical support services which SCs or PAs can call upon (e.g., to advise them on site location, drainage, stream crossings, etc.).

Priority areas for track and road development should be the western and southeastern high potential farming areas of the HPP and HPC zones (Welega, Bale, Kefa, Illubabor) and in association with proposed villagisation in the LPC zone. Adequate attention should be given throughout the Highlands to the improvement of local capacity to maintain roads.

Increasing capacity utilization of vehicles (and thus the road network) should be pursued through substantial investments in additional vehicle servicing, maintenance and economy facilities. Investments by government could be complemented valuably by encouraging a carefully defined and regulated role for the private sector in owning and operating passenger and freight transport services. As measured by the proportion of vehicles in working condition and capacity utilization rates, private transport operations are usually more efficient than those of the public sector. An efficiently operating private sector transport system could gradually lead into cooperative-owned and managed transport systems and would enable public sector funds to be spent in those areas less amenable to private investment (e.g., roads).

The Government has made concerted efforts to mobilize financial resources to cover a large share of its expenditures on roads. Road user charges generally cover all recurrent expenditures (road maintenance, administration and engineering services) plus a substantial portion of capital expenditures.

13.6.2 Communications

The large population of the Highlands, its dispersed settlement and the rugged topography imply that standard methods of education and extension, however well coordinated, are likely to be very expensive. Indeed, both the attainment and maintenance of satisfactory standards for traditional education and extension are likely to be beyond the manpower and budgetary capacity of the GOE in the foreseeable future.

Other media have to be used in addition to the traditional approaches, as has already been suggested in other sections of this report. Mass media and non-formal communications channels have proven very important information sources in the process of rural change in other countries.

The cost of farmer contact by radio is substantially less expensive than by traditional extension (while recognizing that neither can totally substitute for the other), and media in various forms have shown themselves capable of reaching women and the more deprived elements of rural communities and remote villages on a large-scale sustainable basis. The radio is a cheap and powerful means of passing information, advice and education, of alerting and stimulating people into seeking additional information. This was recognized by the MOE when it established its Educational Mass Media Programme to transmit programmes in political, agricultural and health education. Programmes are prepared centrally in Addis Ababa in Amharic and translated into three additional languages (Oromo, Tigrigna and Welayita) for transmission over Ethiopia's eleven stations covering 95 percent of the country 1/. The programmes are coordinated with the post-literacy programme. In addition, a non-governmental non-profit making voluntary organization, Agri-Service Ethiopia (ASE) provides non-formal radio-booklet education in agriculture, health and home economics. ASE began activities in 1969 as a NGO registered in the Ministry of Interior and sponsored by the MOA, aid agencies (especially the Netherlands, Canada and France), and churches. ASE trains group leaders who are expected to form groups of farmers to listen to radio programmes at certain times and discuss them with the aid of books and leaflets provided by ASE. There are over 450 groups, mainly in the central and southern Highlands. ASE's scale of operations and budget has increased rapidly in recent years and has averaged around EB one million p.a. recently.

Much greater use could and should be made of the radio - both for direct education of the rural population, and in training and supporting paraprofessionals for field level activities as follow-up for mass media programmes. Given that adequate investments have already been made in transmitting stations, and the low costs of radios and batteries compared to costs of remunerating and transporting field staff - and in view of the growing need for communication in all aspects of development - much more manpower and budgetary resources should be allocated to the radio as a means to development. This would include the importation and distribution of radios and batteries as well as the development of programmes 2/. Its potential role in complementing T and V extension

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1/ Stations are located in Addis Ababa, Legedadi and Sodo in Shewa, Gore (Illubabor), Gimbi (Welega), Debre Marcos and Bahir Dar in Gojam, Alemaya (Hararghe), Dessie (Welo) Asmara (Eritrea) and Mekele (Tigray).

2/ It was estimated in section 4.6 that less than ten percent of the rural population have access to a radio.

and rural education has already been emphasized. As experience and skills become greater, programmes more specific to the needs and potential of each area should be prepared locally. Local success stories and question-and-answer sessions could be included. Especially designed programmes could be broadcast over loudspeakers at public meeting places. Much more use should also be made of recorded cassette tapes for the same purpose and by extension staff. Cassette recorders are cheap and portable. Gradually the capacity for making and showing relevant films in local languages should also be built up.

The audio-visual communication media should be accompanied by much greater use of posters, leaflets, newspapers, fact sheets, etc. The lack of reading material in rural areas threatens to negate achievements of the literacy campaign. ASE presently distributes some 50 000 copies of a quarterly newspaper. The target should be at least 50 times this level, and such news letters should be more frequent and differentiated by farming system. In addition to giving simple messages, such peasant newspapers should also give dates, times and locations of extension visits under the T and V system, times of radio programmes, sources of furhter information.

Because of the sparsity of communications below Regional Headquarters, the flow of information upwards from the rural areas is severely constrained; excessive personnel time and transport resources are committed to merely transferring information within each Region. Decentralized and planned development is dependent on a widespread and efficient communication system. Telecommunications should play a key role in transmitting information, news, proposals and reports to and from the different parts of the Highlands. It is therefore suggested that:

(a) all Regional/Awraja/Wereda headquarters should have both land-line or radio telephones and post offices as soon as possible. The possibility of setting up microwave and/or satellite telecommunication facilities in the Highlands to link all such headquarters should be examined;

(b) eventually all SCs, even PAs should have a telephone, and immediately key SCs should be identified which - when provided a telephone - would decrease the average distance to such a facility within the Wereda to an acceptable level; and

(c) the radio network facilities available at some Awraja headquarters should continue to be used for urgent official communications with the Awraja and with Regional headquarters until more permanent public facilities have been installed.

The World Bank telecommunications project should help in these respects, even though the emphasis is on expanding the long distance network and installations for international telecommunications.

In short, the need is for both a greatly expanded and much more interrelated and appropriately differentiated approach to the development of rural communications as a major means of stimulating development. In developing communications, priority should be given to those areas which are most inaccessible to vehicles, and likely to remain so because of required costs of road construction.

13.7 TAXATION

The broader aspects of government fund raising and expenditure have been reviewed in section 4.9, while subsequent sections have made proposals to raise user charges for some of the services provided by Government. As was seen in section 13.7, road users already contribute substantially to both the capital and recurrent costs of roads. Consideration should be given to asking PAs to contribute more directly to the costs of extension, health and education, for example by contributing labour for the buildings required. As irrigation becomes more important, consideration should also be given to charging the more fortunate peasants who benefit from the water provided by expensive Government investments in irrigation. Yugoslavia has successfully adopted such a "community must pay" policy for all its rural development infrastructure projects funded through World Bank credits (Ashworth, personal communication, 1985).

From the review of present rural taxes given in section 4.9.2, it may be concluded that:

(a) the present flat rate land use fee is overtly regressive, and

(b) the present income tax system, because of the practical difficulties of ascertaining incomes, is almost invariably levied at the lowest rate (thus yielding virtually the same in total as the land tax - each generating about EB 50 million) and is thus also regressive (Bekele Haile Selassie, Inland Revenue Administration, GOE, personal communication, 1985).

These regressive taxes are neither consistent with socialism nor with the pursuit of economic growth through the more efficient use of resources. It has thus been concluded that "a rationalisation of rural taxation is overdue, in the interests of both equity and efficiency objectives" (EHRS, Report of the Advisory Mission, December 1984).

It is proposed that central government deal in matters of taxation with the PAs rather than with individual peasants, recognizing the reality that it is only the PAs which have the capacity to deal with individuals in rural areas. Both the present land and income taxes should be abolished and replaced by a single all-inclusive graduated "service fee" charged to each PA for the service provided to it by central government. All PAs are provided with some services, ranging from education, health, roads, agricultural extension, to national defence and foreign relations. The more the fee is related to physical services provided within the PA, the greater will be its likely acceptance and payment. This is also suggested by considerations of equity and the absolute poverty of peasants - the poorest should not be subsidizing services to be provided to others. It is further proposed that the services fee be steeply progressive, reflecting as closely as practicable the income and wealth of the PA. An inventory of the resources of each PA has already been proposed as an essential preliminary to meaningful peasant participation in the micro-planning of rural development. Already the land area, population and very approximate livestock numbers of each PA are known, as is the general pattern of farming system. This basic knowledge already provides a sufficient basis on which to graduate the services fee - increasing sharply with the land/peasant ratio and decreasing in those areas where farming systems are known to provide lower and/or more volatile incomes (i.e., the LPCZ and at the higher altitudes). As more information on the income and wealth of PAs becomes available, the services fee base could be revised, but not in such a way as to provide a disincentive to the collection and provision of such information. In areas of greatest absolute poverty, some system might be developed for levying the services fee in terms of labour man-days of work in agricultural slack periods rather than cash payments. The work involved would be in land investment or other public works (road construction, school buildings, etc.). Such 'labour taxation' would avoid any fall in absolute consumption levels of the poorest but would still generate resources for investment.

Obviously, to pay such a services fee in cash to central government, the PA would have to raise revenue from its members - the individual peasants. It is suggested that central government set broad and very well publicised guidelines for this (e.g., relating revenue collection to size of holdings, numbers of livestock, relative wealth - tin roof, shoes, etc.), so that the risks of exploitation and misappropriation by PA leaders, who in many cases will be among the most educated and wealthier of the peasants, are reduced. For the same reason, fully receipted accounts should be kept, recording revenues collected from each individual and payments made to central government and others. These accounts should be open to inspection by any peasant, by government auditors and cooperative personnel. Any PA leaders found to be misappropriating funds or taking unfair advantage of his position should be severely and publicly fined. Fines for late payments of charges should also be determined. Consideration might be given to raising the proposed service charges where the PAs or peasants are not adequately maintaining infrastructure already built (conservation bunds, local roads, etc.).

The risk inherent in using the PAs as tax collectors is that it may make them unpopular with peasants and may jeopardize their role as development agents. This risk may be partly countered by the appointment of Government tax collectors at the SC level (eventually at the PA level). It is further suggested that PAs keep a far higher proportion of revenues thus collected than the present two percent - say at least 20 percent - for investment in priorities selected by the peasants themselves. This will not only promote understanding of the need to pay taxes, but also involve peasant participation in development planning and implementation.

In section 12.4, proposals were made for the use of taxation as a means of encouraging destocking. The practical difficulties of livestock taxation are well known, but it is suggested that at least pilot feasibility trials be established in a sample of PAs - the revenues thus obtained being retained within the PAs.

13.8 SUMMARY OF PRIORITIES

This section summarizes priorities within each sector. Priorities between sectors are derived in Chapter 14.

Energy: Strategy has to be balanced between exploiting Ethiopia's long-term potential for energy self-sufficiency, even exports, and immediate critical fuel deficits which threaten to undermine sustainable development. Because of the latter threat, top priority has to be given to massive reafforestation: both eucalyptus for immediate fuel and pole requirements, and agro-forestry to sow the seeds of more efficient and sustainable longer-term land use. Simultaneously, efforts need to be made to use fuel more efficiently: in the traditional sector by the use of improved hearths, stoves and cooking utensils; in the modern sector by economizing on petroleum. The former requires an urgent pilot project adapting much more efficient stoves available elsewhere in Africa and aluminum cooking pots. Considerable savings in petroleum could be achieved by more efficient refining, distribution and use in transport and industry. Investments to exploit Ethiopia's comparative advantage in hydro-power have to be carefully phased to match growth in electricity demand. Priority in hydro-power development should be given to projects in which capacity can gradually be expanded. The LPC zone, with its most critical energy deficits, its need for industrialization, and its reafforestation more constrained by climate and soils, should be given top priority in hydro-power development. Where possible, this development should be combined with irrigation and capitalizing on upstream conservation investments. Similarly, geo-thermal and coal exploration in the LPC zone, and further petroleum and natural gas exploitation generally requires continued priority attention.

Reafforestation: On croppable lands below 30 percent slope, reafforestation should be integrated into agro-forestry and promoted as a priority for the medium or longer term (all zones, but most early attention in HPP zone). Slopes above 30 percent should either be revegetated naturally or reafforested where demand for wood merits it. Reafforestation should be with eucalyptus. Each PA should have at least 70 ha reafforested with eucalyptus and a further 10 ha with other species, especially agro-forestry species, totalling 1.6 m ha by 2010. There should also be an appropriately sized peri-urban eucalyptus plantation for every urban area, totalling 1 m ha by 2010. Terracing is generally unnecessary for such reafforestation and without it ERR's are very high. The above targets can only be achieved by massive self-help programmes organized through the PAs and, for peri-urban plantations, both the UDAs and PAs (the latter via taungya). State forestry is expensive and constrained by skilled manpower, recurrent funding and capital. Accordingly it should gradually be superceded by community (PA and/or UDA) forestry - except for support in initial plantation establishment, monitoring, extension and productive use of remaining natural forests. Training, especially at the DA/PA level has to be vastly expanded, while middle level training needs to be reorganized to produce manpower more quickly.

Other non-agricultural primary production: In the development of fisheries (sea, lake, river and aquaculture), adequate attention should be given to improving marketing and processing infrastructure commensurate with any increases in production. Near towns, aquaculture merits priority (extension and provision of fish stock). Further mineral surveys should be given priority to ascertain the quality and quantity of already identified deposits. GOE policy action in key wildlife areas could be a catalyst in attracting significant external resources for larger-scale investment in tourist-oriented wildlife development.

Industry: Because of the many interlinkages concerned, industrial growth should be phased with agricultural development. Large-scale industry with its urban and capital-intensive biases and constrained by skilled manpower and capacity shortages, should take second place to the development of small-scale labour-intensive industry. Such industry is likely to develop spontaneously in the HPC and HPP zones, but needs to be supported by Government more actively in the LPC zone where alternative opportunities for improving living standards are limited. Industrialization in the LPC zone would be facilitated by villagisation/urbanisation and these could be promoted through vastly increased and broader FFW programmes - taking care to avoid location concentrations which could give rise to disincentives for food producers. Other actions to promote rural industrialization, especially in the LPCZ, include improved industrial extension, support and training services, the provision of appropriate technology equipment, credit, the development of links between small- and large-scale industry and the promotion of cooperatives and the private sector. Possibilities in the LPCZ include small-scale industries, mainly based on livestock, cereal processing, and forestry.

Resettlement, migration and villagisation: Resettling people cannot in the long-run solve many degradation problems for ultimately there will not be enough land left in which to resettle people. But resettlement can - indeed has to - provide a vital breathing space in the shorter term for reclamation and even conservation to be effective. Well over 150 000 persons annually will need to move from the most degraded and drought-susceptible areas of the LPC and HPC zones, if present population growth and degradation trends continue. Prior to the current emergency resettlement campaign, over a whole decade 150 000 persons were resettled, at an average cost of around US$1 100 per person. Even if the logistics of a tenfold increase in the resettlement programme could be managed, the costs of continuing past policies would be prohibitve at over US$170 million annually 1/. A new approach is clearly needed.

Rural/rural migration, especially from the LPC zone to the west and southeast Highlands has to become the major means of relocating people from the over-populated LPC zone. The AEPA should be strengthened to become a clearing house, putting labour-surplus PAs in contact with land-surplus PAs. Both temporary (seasonal for coffee picking) and permanent migration should be promoted by changing PA authorisation procedures, by massive campaigns on opportunities in the under-utilized lands, by subsidizing transport and removal costs, by providing FFW for one year after the move for constructing basic infrastructure using labour-intensive methods, and by other incentives. Rural/urban migration should be encouraged only in the LPC zone to reduce land pressure and facilitate industrialization, food trade and aid, but discouraged in Addis Ababa. The latter should not be done by resettlement, but by returning migrants to the PAs of their origin and by depending on the conventional restriction of access to food, jobs and social services to UDA-registered residents of Addis.

Organized resettlement to special settlement sites should be viewed as a last resort. It is very expensive in capital, skills and recurrent funds, raises many management and sociological problems, and is slow in settling people and making them self-reliant. To the extent that special sites are still required, existing sites should be expanded with plans being prepared with the participation of settlers. All settlement should be voluntary and whole families should be moved together. RRC's settlement functions should be clearly separated from its relief activities.

In order to minimize the need for long distance relocation of people, through both migration and resettlement, priority in the LPC zone should be given to villagisation and urbanisation. This should, apart from the above stated effects, provide an environment more conducive to slower population growth. Villagisation has to be carefully

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1/ Costs would be even higher if resettlement is to the lowlands, which would also require irrigation development.

monitored and phased with industrialization to minimize the risks of aggravating degradation on land immediately surrounding the village. People continuing to depend on cropping, livestock and forestry should not be villagised. But the majority of the LPCZ population cannot improve their living standards from agriculture, and the sooner this is recognized, the better.

Transport and communications: Three major components to transport strategy are proposed with the aim of providing improved and cheaper transport for both people and freight. Because of the high costs of road construction and motor vehicle transport, much greater immediate attention should be given to the development of intermediate/traditional transport systmes. This would include improvement of tracks and trails to facilitate greater use of carts and carriages; bicycles; improved saddles; and the construction of stores/shelters at nodal points on linking feeder roads. Priority in road construction should be on low stardard (RR10) roads in the west and southeast Highlands, and in the LPC zone, to facilitate villagisation, using labour-intensive FFW techniques. Whenever possible, the worst sections of existing tracks/roads should be improved (even to RR10 standard) by upgrading selective patches. Fuller and more efficient use of the nation's vehicles and roads should be sought by encouraging the private sector, improved co-ordination of the public sector, limiting the range of vehicles/models imported, increasing imports of spare parts, and increased investment (with training) in vehicle maintenance and repairs.

Three major components are proposed for the development of communications, generally giving priority to those areas least served by transport facilities and the highest potential areas. Much fuller use should be made of the radio and cassette tape recorders as a means of education, extension and training. Capital assistance is required for the massive importation of radio, cassette recorders and batteries, and technical assistance for the development of farming systems specific programmes. Similarly, much greater and coordinated use should be made of rural newspapers, leaflets and posters, with radio. Radio-phone links should serve all Wereda-level and above towns, and should gradually be extended to SCs and PAs.

Social Services: In the HPP and HPC zones priority in the provision of further social services should be given to those PAs showing the biggest increases in marketed agricultural production, except in the LPC zone where it should be related to the proposed villagisation/urbanisation programme. The users should gradually take more responsibility for partially financing such services. Education, especially primary, needs to be related much more to the main future activity of the students: farming; with technical and practical content increased accordingly. Improvements in primary education and adult literacy should take priority over secondary education. Improvements should be sought by raising the teacher/student ratio, increasing the supply of textbooks and making fuller use of the radio, posters and other audio-visual aids. In health, priority should be on preventive community health through improved sanitation, water supply and nutrition. Large numbers of paramedical staff, including traditional healers, should be trained (partly by radio) in the above subjects and birth control and backed up by a streamlined referral system. Because of the difficulties of maintaining and repairing pumps, emphasis in domestic water supply should be on the development of springs and wells and using surface water through clay and/or bamboo pipes. Plastic buckets and water carriers should be much more widely distributed.

Taxation: Present land and income taxes, regressive in practice, should be replaced by a single progressive "services fee" charged to PAs by central government for services provided - including social service, extension, roads, etc. The rates of fee should relate to the income and wealth of PAs, and in those areas of absolute poverty, the fee could be levied in the form of labour for public works during the agricultural slack season. PAs would raise the funds required for the payment of these fees by taxing their members within broad but much publicised guidelines set by central government, supported by adequate audit and control. PA tax rates should be set at levels which would allow the PAs to keep at least one quarter of the collections to finance local self-determined priority development projects.

Chapter 14

NATIONAL DEVELOPMENT, STRATEGY OVERVIEW AND PRIORITIES

14.1 INTRODUCTION

This chapter is intended to present an overall view of the proposed development strategy and to identify priority activities and areas (between, as well as within sectors), according to explicit criteria and the basic objectives of the Ethiopian Government (Chapter 10).

Development is for and by the people. The interdependencies between the rate of development and population growth have not yet been explicitly covered. Given the high and accelerating rate of population growth, a population control programme has to be considered as a major priority. The following sections briefly review some of the linkages between: development and population growth and policy (section 14.2); rural and urban development (section 14.3); Highlands and lowlands development (section 14.4). The rest of the chapter is concerned with criteria for selecting priorities (section 14.5) and presenting the priorities. A final section tentatively proposes income and growth targets.

14.2 POPULATION, FAMINE AND POVERTY

14.2.1 The population time bomb

Ethiopia's population - with its present average growth rate of around 2.9 percent per annum - will more than double by the end of the strategy period to reach approximately 90 million; around 90 percent (80 million) of these are expected to be living in the EHRS area 1/.

1/ Part I was completed before the results of the 1984 census became known. Preliminary census results have now been released, indicating a total 1984 population of 42 million and stating an average growth rate of 2.9 percent p.a. The census figure is some 27 percent higher than that previously estimated by the GOE, and some 13 percent higher than that estimated by the EHRS team in section 3.4. Figures quoted here relate to the latest census estimates. Fuller details of the census have not yet been officially released.

With the GOE's continued achievements in providing greater access to better health services, there is the ominous likelihood that population growth will increase rapidly to 3.5 percent or more (as in neighbouring Kenya), a rate at which the population would double in only 23 years. The present population growth rate will add, on average, more than 1.5 million people to the Highlands every year.

Doubling of the popoulation will have serious effects on the Highlands as well as the economy and overall living conditions. It will more than halve the average arable area per family, pushing cultivation even more onto increasingly steep slopes and other marginal areas unsuited to agricultural production. There are less densely populated areas of the Highlands suitable for more intensive cropping, but such areas are limited and average population density in the Highlands is already high compared to the rest of Africa. Those familiar with the Highlands are confident that most croppable lands are already being cultivated without much fallow 1/, and that qualitatively, at least, there is not much of an extensive margin left. For how many more years can the Highlands absorb an extra 1.5 million people annually? Just to avoid any fall in average food availability will require agricultural production to increse by about 3 percent p.a. in the next 25 years. This compares with an annual rate, estimated very roughly, of around 2 percent over the past 10 years. A joint GOE/WB mission assessing the 1972/74 drought found that:

> "a greater and greater proportion of the total human population is attempting to survive in fundamentally unsuitable areas; and when a drought strikes, a much greater number of people are affected than would be the case if land use was soundly planned and such undesirable (non-conservation) practices controlled....the most important element is the steady increase in human population which starts the chain reaction leading to denudation and soil erosion, and which will in time render more and more people liable to such diaster." (GOE/WB 1974)

Ten years later, Ethiopia now has an even more severe famine; the underlying causes for its severity remain those correctly diagnosed by the 1972/74 GOE/WB mission. Improved technology, improved cropping patterns, conservation, irrigation and other measures should make it possible to stave off for a time the otherwise almost inevitable Malthusian checks on rapid population growth. But even at high levels of agricultural productivity, there are predictable limits to the number of human beings that can be supported from any given area of land. Agricultural labour

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1/ Land use statistics in Ethiopia do not permit precise estimates of cultivated, cultivable and fallow land, though several (inconsistent) estimates can be found. To remedy the information weakness should be a high priority of follow-up action.

productivity in Ethiopia is not high, nor has it risen in the last decade. The situation in the Highlands is further aggravated by the present distribution of population: the carrying capacity of much of the LPC zone has been exceeded and there is a clear need for people to move from the steepest slopes and shallowest soils. Resettlement possibilities within this zone are extremely limited, even if feasible irrigation could be developed. By far most of the potential for resettlement lies in the western areas of the HPC zone and even more in the west and southeast of the HPP zone (section 13.5). But resettlement - even to urban areas (section 14.1) - is only a temporary palliative: the problems of human over-population will constantly recur if effective steps are not take to reduce or stop its increase.

Apart the dramatic human and ecological implications of continued rapid population growth, there are also direct negative economic and social effects. The economy will have to grow by three percent p.a. in real terms just to maintain current average living standards. Investment in education, health and other social services will have to more than double in the strategy period - just to maintain current standards. It is difficult to see how either such social investment or the investment required to increase sustainable economic growth can be secured from this economy if such a rapid increase in population persists.

Generally the most disadvantaged people in society suffer most from the absence of population policy. High fertility adversely affects the health and welfare of individuals and families, especially among the poor, and seriously impedes social and economic progress. Women and children are the main victims of unregulated fertility. Too many, too close, too early and too late pregnancies are a major cause of maternal, infant and childhood mortality and morbidity. To penalize the weakest members of society is not consistent with Ethiopia's socialist objectives.

The socio-economic history of most, if not all, countries suggests that a desire for smaller families normally accompanies socio-economic development. Reductions in infant and child mortality, the expansion of education and health services, the raising social, economic and political status of women, the spread of labour-saving technology in farming, the development of water and energy sources near homesteads, improved food and income security, and urbanisation are among the major factors which generally reduce both the need and desire for large families. But history also testifies to the usual slow rate of birth reductions, and Ethiopia's population growth threatens to negate socio-economic development so that such attitudes may not come to prevail.

The process of rapid population growth - resulting in ecological degradation, increasingly severe famine, and economic stagnation - cannot be sustained for much longer; the threats to human survival, social stability and political order are too great. This, in essence is the population time bomb. It is essential that effective means for defusing the poplation bomb are included as a major integral component in Ethiopia's future development. Population control is a prerequisite for and an integral part of the Conservation-based Development Strategy. This essentially implies the need for a very extensive and effective programme of birth control. The rest of this section is therefore concerned with policy options to limit population growth. The other major aspect of population policy - changes in spatial distribution through resettlement and migration - is the subject of section 13.4.

14.2.2 Population control policy

> "This area (Africa) has a unique set of problems. It has the highest population growth rate of any region in the world, the lowest capability for absorbing such growth, and the weakest programmes for limiting it." (McNamara 1984.)

Acceptance of the need for family planning, both as a human right and as a means for social and economic development, has grown in sub-saharan Africa from only nine countries in 1973 to around 20 by the end of the 1970s; however, only five of these countries had explicit policies to reduce population growth (WB 1981). This contrasts with Asia, where 'the strength in numbers thinking' was rejected by many countries in the 1960s and as a result there is now two decades of experience in such policies 1/. Some of this experience can be adapted to Ethiopian conditions. In Ethiopian society there is already a traditional desire for child-spacing and efforts to achieve this traditioanlly are through prolonged breast feeding and abstinence. Such traditions provide a launching pad for population control policy. When people are using new and more effective techniques to achieve traditional goals, it becomes relatively easy to adapt the use of the new techniques to newer goals: specifically, fewer births.

As already indicated in section 4.8.6, the GOE does not presently have an explicit population policy (apart from the spatial policy implied by resettlement), and there seems to be widespread ignorance of the negative effects rapid population growth will have on the country's future development. Actions on this front are left to a non-governmental organization, the Family Guidance Association of Ethiopia (FGAE) whose financial and staff resources restrict it to an urban-based and urban-biased approach. Perhaps the findings of the first-ever population census have provided a jolt; the current famine another. These jolts will, it is to be hoped, draw the attention of decision-makers at the

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1/ The spectacular example is China, where an initially voluntary family-planning programme was rapidly accelerated by increasing compulsion and coercion. The central objective of current Chinese population policy is the achievement of the one-child family. Around 22 percent of the world's population live in China today.

highest levels to the population time bomb on which the nation is sitting. Certainly the general picture conveyed by the mass media is evolving. Ethiopian newspapers no longer always favour pro-natalist attitudes and, on occasion, publish news items or comments drawing attention to the need for family planning and its difussion; increasingly, the relationship between drought problems and the rapidly increasing population are also mentioned.

There are essentially two major components in the required population control policy:

(a) to create the socio-economic environment in which people desire smaller families, and

(b) to provide the technical services and physical means for achieving this desire.

Both components are necessary and complementary; the former creates the demand and the latter provides the supplies for birth control. The first prerequisite for both components is total commitment by the Government. A priority objective has to be to reduce the rate of population growth, and GOE needs to commit resources (skilled manpower, financial and institutional) to achieve this objective; it cannot be left solely to a non-governmental organization. If the Government is not committed in this respect, there can be no hope of creating a social consensus in favour of small families, let alone providing the means. UN countries, including Ethiopia, adopted a World Population Plan of Action in Mexico in 1984 which recognizes family planning as a basic human right and an integral component of development. 1/

> "Family planning advice should be recognized as the right of every couple, and providing such advice to all who desire it should be a basic goal of every government. Major efforts must be made now to ensure that all couples and individuals can exercise their basic human right to decide freely and responsibly the number and spacing of their children and to have the information, education and means to do so. In exercising this right, the best interests of their living and future children as well as the responsibility towards the community should be taken into account."
>
> World Population Plan of Action
> 1984

1/ Effective contraception liberates women from unwanted pregnancies and induced abortions. Illegal abortions performed under unsafe medical conditions represent a very serious health hazard.

A campaign is therefore required to increase the support and involvement of policy makers, planners and policy advisers at top levels of Government, both central and local, in the formulation and implementation of a population control policy. This campaign should preferably be mounted as a central component of the Conservation-based Development Strategy which is proposed in this report. Population control policy proposed as a crucial part of the nation's general strategy for development and better living would reduce the risk that population control policy will be viewed as a negative and restrictive imposition conflicting with local values. The campaign could be mounted through the mass media and meetings, seminars, conferences, etc., which would highlight the consequences of continued rapid population growth on basic goals including economic growth, food self-sufficiency, employment, literacy, security, etc. With and after the commitment of Government, the campaign should be broadened and extended in its aims and coverage to the mass of the population. At this stage use also should be made of formal and informal education channels, including the literacy campaign, Farmers' Training Centres, Community Skill Training Centres and other media. Investment of skilled manpower and funds will be required to develop appropriate programmes and aids for the different media and audiences and for training specialized staff to develop, replicate and sustain the programme. The programme should emphasize the benefits of child spacing and smaller families - to the individuals concerned, as well as to the nation. The "costs" of having children would increase significantly if primary education was made compulsory (section 13.6) and if the status of women were improved (section 13.4.3).

Simultaneously with promoting the demand for smaller families, the Government should provide the means for meeting this demand, through the provision of family planning services, ensuring an adequate supply of contraceptives, and by a programme of incentives/disincentives for compliance/non-compliance with population control policy.

Education, information and advice on birth control should be provided through formal and informal education, mass media (especially radio, newspapers, leaflets), meetings and the health service. This will require the development of special programmes and curricula at different levels for each area and group. A start has already been made in some areas. For example, the Agarfa FTC gives four days' training in family planning at each of its six-month courses to 'contact farmers', and some secondary schools in Addis Ababa have already invited FGAE personnel for sessions. Such experience will be valuable in formulating the mass-programme now required. Birth control should be considered an integral part of health care and therefore feature prominently in training for all health workers. Although FGAE at present works almost exclusively through health workers, a small proportion of health, even MCH, workers are active in providing family planning services. This will require the much expanded training of lower levels of medical staff and perhaps even REWA leaders or PA "contact women" in birth control techniques, including the insertion and inspection of control devices. After the initial training of REWA leaders and PA 'contact women', every PA or REWA should be asked to assume responsibility for organizing local family planning programmes, integrating them, where appropriate, with other programmes such as health and literacy. In time, consideration should be given to a target: the 1- or 2-child family.

The GOE has to ensure a readily available and sufficient supply of accepted contraceptives, and particularly in rural areas - where the population mass resides and where fertility rates are higher than in urban areas. While there has never been a ban on sale of contraceptives (and prescriptions are not required to buy them), they are generally only available at pharmacies and at Regional and Awraja level hospitals and health centres. Apart from sales through private pharmacies in major towns, contraceptives are available without charge, but supplies are sometimes limited. Contraceptives are not at present readily available to the rural population, reflecting the urban bias in present policy. Foreign exchange should be made available - possibly with additional assistance of agencies such as IPPA (already donating a large proportion of Ethiopia's contraceptives) and UNFPA - to increase supplies of contraceptives as demand grows. They should be available at all rural health centres/posts, and other focal points in both rural and urban areas, including the homes of 'contact women' 1/ in each PA, kebele markets (local REWA leaders could supervise a special market stall on market days), Kebele and Service Cooperative shops, even local village stores.

The law (Penal Code Art. 802) forbidding the advertisement or public display of contraceptives should be repealed and consideration given to subsidizing or issuing contraceptives freely. Other recommended measures include the liberalization of laws with respect to abortion and sterilization. Abortion is presently allowed for medical reasons only, "where it is done to save the pregnant woman from grave and permanent danger to life or health which it is impossible to avert in any other way". No other reason - social, economic, or humanitarian - is accepted. Sterilization is a criminal offence, although some voluntary sterilization is permitted on a small scale with the support of the FGAE. 2/

Much could be achieved in promoting both the desire for smaller families and in improving knowledge of how to achieve this purpose,

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1/ In India, in every village of 1 000 persons or more, one person (preferably a woman) receives basic training in family planning and a supply of contraceptives, backed by a referral chain operating through MCH services.

2/ A patient requesting sterilization must have the following:
(a) at least 35 years of age;
(b) at least five children;
(c) proof that pregnancy is dangerous to the health of the mother;
(d) agreement of the other spouse; and
(e) socio-economic need.

through educational and other types of programmes, aimed most specifically at women, and through generally improving their education and socio-economic status (section 13.4.3). Such programmes could provide the means for the development of more coherent community opinions at grass roots levels. This hasbeen an important element in the striking successes in family planning achieved in recent years in China, Indonesia and Thailand (McNamara, 1984).

Consideration should be given to the introduction of a programme of incentives/disincentives following the Chinese successes (see box), and building on the experience of other countries. Some countries give cash payments for birth control measures: Egypt gives cash for IUD insertions; Bangladesh gives a new sari to newly sterilized women; Sri Lanka gives cash to both sterilized men and women; some Indian states reward women who leave 3 or 4 years between births; South Korea gives priority medical care and schooling to one-child families; Indonesia gives substantial cash funds to villages with the best family planning record; and the Phillipines rewards late marriages.

In carrying out a population policy the Government, at least initially, would have to rely heavily on the FGAE. It is therefore recommended that assistance be sought from UNFPA and others to strengthen and improve FGAE's training and educational capacities and skills in the field of family guidance so that it can promote and support the proposed Government population control policy. The other main institutions in population policy will be the PAs and REWAs which, as in other policy areas, provide an effective means through which the GOE can reach the mass of the people.

The population time bomb problem is not just a matter of size, it is also a matter or urgency. Even small differencesin growth rates, when compounded over a number of years and applied to as large a base as Ethiopia's 42 million people, result in very large absolute numbers. But it will take many years to achieve even small percentage reductions in growth rates, and time is running out for Conservation-based Development. A start has to be made soon; otherwise the extent of irreversible damage to ecology and economy will spread beyond those areas of the LPC zone already thus affected.

14.2.3 Women

The excessive burden of work on women (children, farm and home) acts as a stimulus to have many children. Children represent desperately needed extra hands. The limitation of family size advocated in the previous section has to be linked to agricultural development aimed specifically at women. Despite the major role of women in agriculture, they are discriminated against in many ways. Education for women has not focused on the major issues affecting their status, position and potential in development, but has instead concentrated on home economics

THE CHINESE POPULATION SUCCESS STORY

The Government of China has given top priority to implementation of a population policy aimed at zero population growth by 2000. During the last decade, China has halved its birth rate from 34 per 1 000 in 1970 to 17 in 1980. This was achieved by introducing a number of mutually reinforcing policies. Massive population education, stressing maternal and child health benefits and the economic and ecological advantages of birth control, was backed up by a nationwide network of community-based free contraceptive services.

Strict limitation of rural-urban migration, introduced in the mid-1950s, was combined with agricultural collectivization to make it easier for the Government to drive home these arguments to the peasants. The message was got across that continuing population increase, in the face of fixed arable land and in the absence of outmigration, means steady reduction in arable land per head, making it more difficult to raise output per head and living standards.

Each community is assigned - and expected not to exceed - a quota of births. In distributing the birth quota among individual couples, first priority goes to childless couples who got married late in compliance with the late marriage norm, while second priority is given to one-child couples whose first child is three or four years of age. An individual couple must first obtain a birth authorization before proceeding to have a birth. Compliance meets with official praise and is rewarded economically, and non-compliance with ideological education and sometimes penalties. Incentives for compliance include the allocation of extra work points (which determine individuals' share of the income of Chinese cooperatives), subsidized food, higher wages in paid employment, priority in health, housing, and pension services, and the "single" child is favoured in access to education and employment. If a second child is born these benefits stop or even have to be returned. A third child brings penalties. In recognition of the traditional peasant view that children are a source of security in old age, rural communes are obliged to guarantee the childless aged person a living standard equal to or greater than the local average.

Source: People, Volume 9, November 4, 1982.

and the like, and tends to reinforce their traditional domestic and suppressed roles. Women's educational attainments are far below those of men and are concentrated in a far narrower range of fields 1/. This is

1/ About half as many girls enroll for primary education as boys. Fewer than 20 percent of those attending higher education are women.

a disadvantage in competing for 'modern' sector jobs; many of such jobs available to women are lower paid and unskilled. It is thus not surprising that many women become prostitutes 1/. Because of their lack of education, of contacts with new ideas and of experience in making key decisions affecting their position - as well as because of overwork and their relative seclusion, - women tend to be more conservative than men. In such circumstances, women draw their main status from child-bearing and rearing.

In general, the fuller integration of women into the development process is likely to lead to fertility declines. The greater participation of women in educational, social, political, or economic activities, along with employment in the modern sector, is likely to be reflected in increased costs of children and in conscious efforts to regulate fertility. In development, education and work status gradually assumes greater importance in the earlier life of women. High literacy rates among teenage women increase the probability of their participation in secondary and higher education. With later marriages and the avoidance of early child-bearing, women have the opportunity to develop interests alternative to maternal roles. They may develop new skills enabling them to acquire and maintain more fulfilling jobs in the economy. When a woman begins to move toward economic independence and equality with men and ceases to be associated only with reproduction, she will be more likely to consider having fewer children, since there are other activities competing for her time.

The economic, social and political status of women is closely interrelated. Generally, women's social status is lower than men's, both within households and outside them. This is reinforced by a range of legal and cultural practices, such as the lower age of marriage of women, women's lower educational attainments, men's status as 'head of household', etc. Although membership of PAs is open to all adults, actual membership is generally of 'heads of households' who are predominently men. Decision-making within households is generally men's prerogative. As these practices have operated for a long time, it is not surprising that women's dependence and subordination is usually subjectively accepted by women, and that their participation in political institutions established since the Revolution has been more limited than that of men.

> "To achieve equitable development, the activities and needs of women should be an organic part of all rural development programmes. Almost every change made in rural society affects women - for better or worse." (FAO, WCARRD: "Turning Point for Rural Women", May 1980.)

1/ A good survey of prostitution in Ethiopia is contained in ILO 1982.

It is generally accepted that most Ethiopian women are still in a disadvantageous position in most spheres of life, despite Ethiopia's objectives of equity and socialism 1/. Considering the significant role which women could and should fill in furthering the Conservation-based Development Strategy, it is desirable that development activities (whenever feasible) should also have a positive orientation toward women. The gap between women and men should be closed, as well as that between poor and rich, rural and urban. A start should be made through REWA (Revolutionary Ethiopian Women's Association, set up in 1980), where 5 million women are members of 19 000 associations. However, REWA, in common with women's organizations in other African countries, is constrained by the following:

- low productivity in the traditional female tasks of fuel and water collection and food processing. 2/

  It is proposed that priority be given to reafforestation (section 13.2); more efficient cooking stoves and cooking utensils (section 13.1); easier access to and collection of water (section 13.5); and lessening the burden and wastes of food processing (section 13.3). REWA should campaign to make the collection of wood and water the responsibility of the stronger sex.

- sexually-discriminating laws and customs.

  It is proposed that the legal age of marriage for women be raised to that of men; that alimony be paid by law; that the discriminatory features of inheritance laws be eliminated, etc.

- limited access to family planning facilities.

  Proposals are made in section 14.2.1.

- limited access to extension and credit.

  It is proposed that each REWA be allocated a plot of land to be used for demonstration and as a DA contact point for women farmers; and that REWAs be authorized to take loans.

1/ Ethiopia adopted the "Declaration on the Elimination of Discrimination against Women" proclaimed by the General Assembly of the UN on 7 November 1967 (res. 2263-XXII) which advocates all necessary measures to guarantee equality of men and women in civil law, education, economic and social life, political life, nationality of married women, right to privacy, freedom of expression, etc.

2/ It is not unusual for women to spend up to five hours daily in the collection of water and fuelwood and in food processing.

- non-participation of women in PAs, PCs or Kebele's because of their lack of status as head of household. (This is equivalent to denying most married women the right to vote and participate in their democratic government.

  It is proposed that, irrespective of their marital status, women be given full voting and other rights along with men - e.g., by amending PA representation and voting to relate not to heads of households but to all adults. REWA should campaign for this. Consideration should also be given to stipulating that a certain proportion (say 30 percent, initially) of the seats on the governing and executive bodies of PAs, Kebele's, etc. should be held by women and that the quorum for meetings should reflect this "positive discrimination". This should also hold true at higher levels of government.

- subject-biased and generally weaker education for women.

  Education for women should be broadened from the traditional concentration on home economics 1/, handicrafts, vegetable gardening, etc., to include the main subjects relevant to the Conservation-based Development Strategy. All institutions of higher education should adopt "positive discriminatory" practices until at least 40 percent of their enrollment is female. Mass media should campaign for higher female participation in primary education. Consideration should be given to enacting legislation to make primary education compulsory for both sexes.

- the tasks of childbearing and rearing.

  REWA should establish child care groups on a rotating mother basis. This will be more practicable in urban areas than in rural areas, obviously.

- lower wage rates and sexual discrimination in employment in urban areas, in state farms, and even in the FFW programme 2/.

  Sexual discrimination in wage rates for the same job should be outlawed. REWA should campaign for this and against other labour practices which are sex discriminatory.

1/ The 1982 WCARRD mission recognized that: "Home economics programmes, if used as the main channel for reaching rural women, may provide too narrow a frame and focus to meet the wider needs of women in development, and may in themselves become over-burdened and ineffective" (FAO 1982).

2/ About one-third of the participants in the FFW programme are women. Moreover, one-third of these complained in a recent survey that they receive lower payments than men (IDR 1984).

- only minor or even token attention paid to the issue of women's participation in development. (If women are designated as specific participants or beneficiaries of projects, such projects tend to be small; they usually concern knitting, sewing, pottery, vegetables, etc. The impact of such projects is also relatively small.

  It is proposed that, in the selection of major projects, explicit attention be paid to those likely to have notably beneficial impact on reducing burdens normally undertaken by women, such as collection of water and fuelwood, grain milling and weeding, and that design and implementation of projects focus on achieving effective participation of women, both as project actors and as project beneficiaries.

The Revolution has provided Ethiopian women with the opportunity to organize themselves and, through this channel, to campaign for equal rights and equal participation in the government and development of their nation. This section has proposed ways to more fully utilize this channel and achieve fuller equality and development. Many of these proposals are dependent on initiatives being taken by the REWA's and much therefore depends on their leaders. The training and motivation of women leaders should itself by a subject for priority attention. Progress in these directions is likely to contribute to the achievement of other objectives of the Conservation-based Development Strategy, including population control.

14.3. URBAN DEVELOPMENT AND LINKAGES WITH RURAL DEVELOPMENT

Because more than 85 percent of the Highlands population live in rural areas, and because rural development is the main means to economic growth, the development strategy proposed in this report has been related primarily to rural development. Primarily, but not exclusively related. Many of the proposals (i.e., energy, industry, population, migration, women, communications, social services and institutions) are equally applicable to urban development. Urban areas cannot and should not be excluded from Highlands development strategy because:

(a) important interrelationships exist between urban and rural development; and

(b) a large and rapidly growing proportion of the Highlands population lives in urban areas: it could be around 25 percent, or over 20 million, by 2010 if present trends continue (urban population has grown by around 5 percent p.a. in recent years, reflecting natural growth of around 2 percent p.a., plus migration from rural areas. Controls to reduce rural-urban migration were proposed in section 13.4).

Rapid urbanisation is creating immediate problems as well as pressing longer-term concerns. Much of the urban population does not have access to adequate basic services. A large proportion live in slums or squatter settlements, very few households have interior water supplies and large numbers have no access to running water. Sanitation services for most are minimal. Day-to-day problems have preoccupied whatever planning and implementation agencies that exist for urban development. As a result, Ethiopia lacks any coherent urban development strategy.

> "The majority of these towns have no master plans to guide their overall development morphologies and dynamics. This structural problem has led to the evolution of an urban land use pattern that is largely devoid of order and a social and economic environment that is beset by complex problems. The housing and infrastructure conditions of our urban centers clearly reflect this physical and socio-economic environment." (WPE 1984.)

Unless the new, sprawling urban population is integrated into the economy and its needs addressed, the situation is likely to be politically disruptive and stunt economic progress. Further, the towns - which now account for between 35 and 40 percent of national output - will become less efficient, as labour productivity and economic growth decline.

Accordingly the TYPP states that:

> "The government will also elaborate a national urban development and housing policy to guide the overall pattern and tempo of the development of the nation's urban centers." (WPE 1984.)

Over the past ten years the Government has established a cohesive and potentially participatory organizational structure for urban development, paralleling PAs in the rural sector. Urban dwellers' associations (the "Kebeles") are established at successive levels throughout the urban areas to administer and manage urban affairs, along with the appropriate municipal authorities. This institutional framework needs to be used more effectively to promote urban development consistent with the nation's overall development strategy. The first requirement is an urban development strategy. A full urban development strategy is beyond the scope of this report (proposals for its formulation are made in section 15.1), but it is tentatively proposed in rather general terms that major components should include the development of town planning and financing with the participation of the Kebele's, the provision of basic social, communications and transport services, housing, employment, energy, and the special role of small towns in providing an important link between urban and rural development. Such a strategy should be prepared within the context of and with a view to integrating it with the nation's approved rural development strategy so that, taken together, they provide a national development strategy.

In providing social and economic services to urban dwellers the general aim should be to match prevailing standards (using both quality and quantity criteria) in rural areas, with appropriate deviations to reflect the far higher urban population density. This is not only desirable in itself from the viewpoint of Ethiopia's socialist objectives (section 10.1) but would also help reduce inherent urban biases in development 1/ and reduce rural motivation to migrate to towns. It would stretch limited funds and resources over a greater human coverage (i.e., the theme: less luxury for some and more minimal services for the majority). To the extent practicable such services should be associated with cost-recovery schemes, since surveys in many countries have shown that, even in the poorest areas, many can afford minimal charges and are ready to pay for basic services (World Bank 1981). However, unless these services are set at minimum standards, government cannot afford to supply them nor can low-income groups afford to pay for them. User-charges are important to enable the government to generate funds needed to provide additional services to the ever-increasing population. Also, when populations are aware that they will be charged for water, electricity, and sanitation, they often reduce their expectations to the level provided.

Particular attention needs to be given to the acute housing problem in Addis Ababa and other major towns, and the TYPP proposes "to build affordable housing units in greater numbers through public government and private participation" (WPE 1984). It is suggested that consideration also be given to liberalising present rules and procedures inhibiting the construction of private houses and their leasing. This is another area to which the capital and initiative of the private sector should be attracted to help remedy acute shortages. With respect to employment, efforts should be made to encourage the informal sector and labour-intensive activities. This should involve promotion of construction and other small-scale industry (section 13.3).

Many of the suggestions in this section apply particularly to the larger urban centres. It is important to support the vital development role played by secondary centres. Small towns serve as a link between urban and rural development; they are natural distribution centres for agricultural goods produced in the rural areas and manufactured goods

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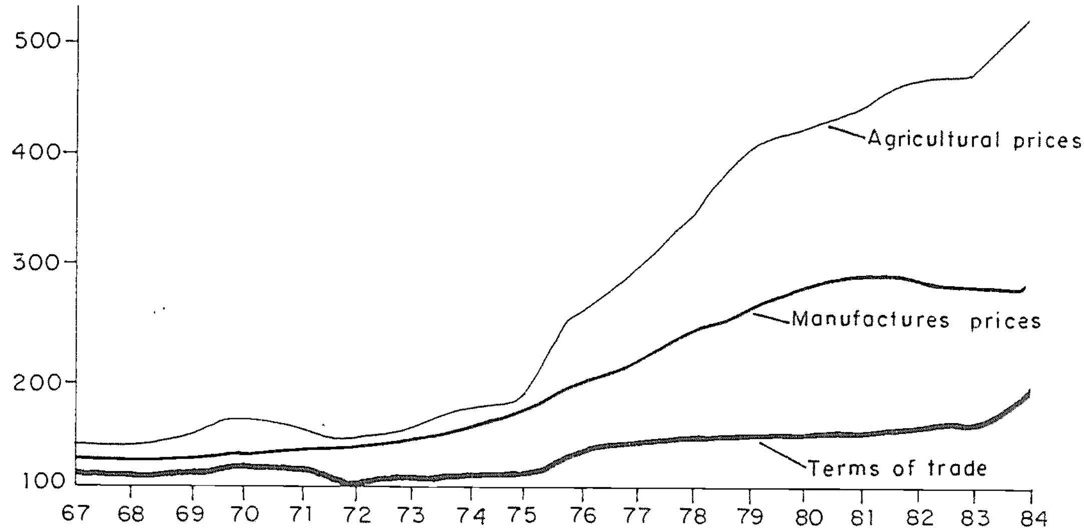
1/ See, for example: Lipton, M. "Why poor people stay poor; a study of urban bias in world development". Temple Smith, 1977. Streeten, P: Balanced versus unbalanced growth." The Economic Weekly, April 1963; Rondinelli, D.A. and Puddle, K.: "Urbanisation and urban development for equitable growth", Praeger, N.Y. 1978; ILO "Rural-urban gap and income distribution - a comparative sub-regional study synthesis of 17 African countries", Addis Ababa, 1984. It should be noted, however, that there is less urban bias in Ethiopia than in many other countries, as will be seen later in this section.

from the cities. When agriculture prospers, these towns become major providers of off-farm employment opportunities for rural people. The balancing of priorities in urban development can only be logically determined within a comprehensive strategy. Both growth and equity considerations tentatively suggest that smaller towns should come near the top of the priorities in some sectors (education, health, transport, communications, industry, marketing infrastructure); priority in the larger towns obviously needs to be given to housing and mobilization of the private sector to help remove resource constraints. Urban development needs to receive greatest priority in the LPC zone (where the potential for rural development is more limited), and secondly in the HPP zone (especially the smaller towns). Here urban development now lags behind the other zones, but it is required urgently to provide the necessary social and economic infrastructure to support the much larger population (boosted by migration) foreseen in the HPP zone.

The mutually reinforcing and complementing linkages between industrial and agricultural development were summarized in section 13.3. It was concluded that these linkages require the inter-coordinated development of both sectors for faster economic growth overall and the more equitable distribution of costs and benefits associated with growth. Most industrial growth takes place in urban areas which, because of their concentrated populations, easier communcations and proximity to central government, generally have more political influence. Rural areas are often seen primarily as the source of food and raw materials. Many of the relations between urban and rural areas are epitomized in the terms of trade between agricultural and industrial products. A tentative approximation of these is given in Figure 14.1. It can be seen that the terms of trade have generally moved in favour of agriculture in the 1970s and early 1980s. The 1982 ILO mission and other observers familiar with Ethiopia in the 1960s as well as the 1980s have concluded that living standards in rural areas have improved relative to those in urban areas - the former being boosted most by the land reform, while the latter have been most affected by sharply increasing food prices. However, care is required in drawing inferences from this. Firstly, some (e.g. ILO 1982) argue that the improvement in the relative position of rural areas has taken the form of a lower fall in per capita incomes than that in urban areas (the latter being more affected by the general squeeze on consumption and higher food prices). Secondly, the extent of trade in industrial goods is very limited in rural areas, not only because of the absolute poverty, but particularly because the availability of industrial products has declined significantly. Maintaining favourable terms of trade for agriculture is beneficial but is not a sufficient condition for motivation in rural areas. Action is also required to break the vicious circle of absolute poverty and to supply more of the needed consumer goods, especially new goods instrumental for conservation (aluminum cooking pots, improved stoves, plastic baskets, water cans, radios, etc.).

Figure 14.1 TERMS OF TRADE BETWEEN AGRICULTURE AND MANUFACTURING (Index: 1963=100)



14.4 LOWLANDS DEVELOPMENT AND LINKAGES WITH HIGHLANDS DEVELOPMENT

Just over half of the land of Ethiopia is not covered by this study because it is classified as 'lowland': below 1 500 masl. These lands are sparsely populated, mainly by nomadic peoples, their population (including that of lowland towns) accounting for only 12 percent of the total population of Ethiopia. A major study of lowland rural development potential recently undertaken by a joint GOE/UNDP team concluded that:

> "(i) Rainfed agriculture potentials are very limited and in view of the fact that such development effort is to be made for and by the nomads it could even be concluded that such potential is non-existent.
>
> (ii) There is some potential to implement irrigation agriculture. There are different development constraints facing the pastoral livestock production system. The main constraints, however, are contraction and depletion of the resource base, low herd productivity, widespread animal disease, poor socio-economic services, lack of extension and development services specifically designed for the nomads and other socio-economic constraints arising from the nature and level of development" (RRC/UNDP, 1983).

The potential for developing rainfed agriculture is basically constrained by inadequate rainfall. There are known possibilities for developing irrigation although such development is dependent on irrigation development in the Highlands. Already it was noted (in section 12.3) that Highland irrigation development in the Awash watershed would have to be very restricted to leave sufficient water for current or planned lowlands irrigation. Many of the proposals made for irrigation development in section 12.3 are applicable to the lower areas. Resettlement of the primarily nomadic people for irrigation development has so far proven difficult, for various social reasons. In view of this and the high costs of irrigation development, the RRC/UNDP study concluded that irrigation should not play a primary role in lowland rural development. Instead, the study team concluded that top priority should be given to rationalisation and improvement of the existing pastoral system.

> "The physical resource base, and generally the social framework as well, favour to a great extent pastorialism over other agricultural systems. It is also very obvious that there is lots of room to improve the physical as well as the social base of the ongoing pastoral system to increase production to a level where the continued well being of the people and the resources will be assured." (RRC/UNDP, 1983.)

The study also concluded that "the livestock population seems to have already exceeded the carrying capacity of the rangelands". Many of the proposals for livestock development made in section 12.4 are also applicable to the lowland areas, and in that section it was proposed that livestock trade between neighbouring Highland and lowland areas be much further developed. Generally, because of the difficulties of reducing livestock numbers, the main emphasis in livestock development should be on increasing feed availability and efficiency in its utilization.

In view of the generally limited prospects for lowland rural development in the foreseeable future, it is likely that there will continue to be spontaneous migration both to lowland towns and to Highland areas. This will further reinforce the need for a strong population policy, as proposed in the previous section.

14.5 CRITERIA FOR THE SELECTION OF PRIORITIES

This section describes the criteria used to select priorities - both activities (including policies) and areas. The criteria themselves have been derived from the review of Ethiopia's objectives (Chapter 10), technical considerations relating to degradation, and practical considerations as indicated in this section. In some cases the criteria are crude, and their application inevitably implies elements of subjectivity and opinion rather than assessment of hard data. Nevertheless, the criteria should present an inclusive framework for the selection of priorities. The presence of more than one criterion raises the problem of weighting - to decide which criteria are more important. Weightings can differ and are usually debatable; ideally the GOE would explicitly weight the various criteria. In the absence of such weighting, the rankings given here have to be viewed as tentative and to some degree subjective. The final selection of priorities will be made by the GOE, and this analysis is intended to facilitate GOE selection, not substitute for it.

14.5.1 Potential economic impact

In view of the need for sustained economic growth (Chapter 10), high priority should be attached to activities/areas which will generate high economic returns. Economic growth is in general seriously constrained by a number of factors including foreign exchange, capital, skilled manpower and shortages of recurrent finance. Activities/areas which give the greatest return per unit of these scarce resources should be preferred, as should activities/areas contributing to economic growth by using those relatively abundant resources - primarily labour - which are otherwise underemployed. Labour-intensive activities should be preferred to capital-intensive ones, in comparable circumstances. In some cases attempts have been made to calculate economic rates of returns for major activities (EHRS WP 18), but weaknesses in the data on which such analyses are necessarily based, conceptual problems (Chapter 7), and time constraints have confined ERR analyses.

In the most general terms, it can be expected that the highest economic returns to investments in conservation/reclamation might be found under the following conditions:

- Areas in which some investments have already been made, and in which high marginal returns might be expected from small investments; for instance, areas in which erosion control structures had been built, but where agricultural production needs to be increased on the reclaimed land.

- Areas where it is possible to claim both on-farm and downstream benefits. Among such would be the catchment areas of existing or proposed reservoirs, the useful life of which would be lengthened by conservation works that reduce silting.

- Areas with potentially high responses to low-input conservation measures, especially those which generally coincide with good farming practices. These would tend to be highly populated, intensively cultivated areas of the HPC zone with incipient erosion which could soon become serious. The aim in such areas would be to promote vegetative conservation measures through improved farming practices, more than to carry out structural works as the main means of controlling erosion.

Conversely, there is likely to be less economic justification for investments to reclaim seriously degraded land in low rainfall areas except in catchments where downstream benefits can be claimed. In such areas reclamation works would cost more, and their impact on agricultural production would be restricted by moisture limitations which, though possibly reducible by appropriate conservation measures, should still prevent crops attaining high yields. In certain extreme cases, where the least-cost alternative to erosion control would be resettlement, substantial expenditures on reclamation might be justified.

Generally, total economic impact will be highest in those areas/activities for which specific technical recommendations can be made to improve land use, raise yields or increase the land use intensity. Economic returns will be lower for those areas/activities for which such technology is lacking.

14.5.2 Irreversibility of degradation

In many cases the effects of activities in combatting degradation can be assessed at least roughly in terms of their total economic impact, and may thus be included under the former criterion. This generally holds for the extent, significance and speed of degradation. A major exception concerns the threat of irreversible damage if action is not taken. It is conceptually difficult to assess this in economic terms, but the threat is important because no country can afford to permanently write off appreciable parts of its land. The irreversibility of degradation is therefore considered as a separate criterion. Generally, its application would emphasize those areas with shallow (below 50 cm) soils and/or very rapid rates of erosion. Such areas are more likely to need reclamation than conservation and are most commonly found in the LPC zone.

14.5.3 Social criteria

Separate from the criteria already reviewed, is the need to meet basic human needs and reduce absolute poverty and inequality. Most important in the present Ethiopian context is the need to increase food production. This does not mean that priority has necessarily to be given to the drought susceptible areas (mainly the LPC zone), although few would disagree that effort has to be made to increase food security in these areas. Nationally, however, the potential for increasing food production is greater, by definition, in the HPC and HPP zones, and therefore it is generally preferable to allocate most of the effort to increase food production in these latter zones, while in the LPC zone priority should be given to the development of other activities - those that would increase purchasing power. Action in the LPC zone would be most important for equity considerations, i.e., increasing per capita income compared to the other zones 1/. (See table 14.1.)

Table 14.1

TENTATIVE CRUDE INDICATORS OF RELATIVE RESOURCE ENDOWMENT

	LPCZ	HPCZ	HPPZ	Highlands Average 1/
Per capita farm income 2/ EB/year	66	122	113	100
Grain production 3/ per capita, kg/yr	236	326	193	245
Livestock feed surplus (+) or deficit (-) relative to actual stocking (%) 4/	-18	-1	+77	+13

1/ Between 1 500 and 3 000 masl.

2/ Net of crop costs and fixed costs (see Annex 4 farm models). EHRS population estimates are pre-census.

3/ Cereals and pulses. (See Annex 4 farm models.) Includes the cereal-equivalent of enset and root crops, etc. Net of 10% post-harvest losses.

4/ See Table 5.10 (Part I)

Source: EHRS estimates.

Political as well as technical considerations probably dictate that actions should be dispersed over several regions and not concentrated exclusively in one zone. The same argument might be used against adoption of an integrated approach to watershed development through multi-component rural development projects requiring heavy concentrations of manpower and finance over a sustained period at one location. It is also important to cover as large a population as possible. This too is a social criterion in assigning priorities.

1/ The 1982 ILO Report concluded: "There is clear evidence of a powerful concentration of resources, output, marketed surplus and incomes in a few provinces (mainly in the HPCZ) which also form the industrial backbone of Ethiopia. A similar pattern of regional concentration is evident if one looks at indicators of nutrition, health and education."

14.5.4 Farmer receptivity

The EHRS sociological study showed that there was considerable variation in the extent of interest expressed by farmers and PA leaders in soil conservation. Conservation projects can be expected to be most effective where they respond to felt needs, and so it would seem that priority in the allocation of resources should be given to areas (with economic conservation possibilities) in which farmer interest is expected to be strong. The farm models (Annex 4) provide a means of assessing under what conditions and where conservation would generate the highest financial returns to farmers and hence provide an indicator of where responses might be greatest at the farm level. Such analyses were undertaken in the preparation of EHRS WP 12 and 18. Farmer receptivity, however, is by no means static and may, of course, be stimulated by publicity, demonstrations and the provision of incentives.

14.5.5 Linkages and complementarities

In some cases the external effects of activities may be included and assessed as part of the economic impact criteria, e.g.: (1) supplementing the FFW structural conservation programme; (2) follow-up of previous activities that were not completed but are still relevant; (3) the possible need for resettlement to accompany reclamation; (4) the addition of a conservation component to an existing area-based project such as ARDU, or to a national project such as PADEP. In some cases, however, the potential linkages and complementarities between activities may need to be taken into account separately. Action in one area/activity may be dependent on simultaneous or prior action in another area, although technical considerations might require that some areas/activities be undertaken together (e.g., structural conservation measures are best tackled on a watershed basis; agricultural research on zonation based on farming systems; and agricultural extension on an administrative basis (Regional/Awraja/Wereda).

14.5.6 Replicability

To the extent that activities to implement the strategy will be means to gather experience and induce similar activities elsewhere, then replicability should be a separate criterion. Low technology and/or investment costs per beneficiary would enhance replicability.

14.5.7 Accessibility

Although activities can be designed to improve accessibility, it is clearly more practical to focus initial effort in areas which are reasonably accessible. Accessibility here relates to both the presence of physical infrastructure, in particular, roads - and to security for work and travel. Detailed planning, project preparation, implementation and monitoring are all greatly facilitated by accessibility. The less accessible areas in these respects should merit lower priority.

14.5.8 Data availability

The speed of implementation of the strategy would be accelerated by concentrating initially on those areas/activities for which reliable basic information exists. For example, several months of project preparation time can be saved if there are recent high quality aerial photographs and good base maps and soil surveys already available for an area.

14.6 STRATEGY OVERVIEW AND PRIORITIES

Part I of this report outlined existing development, the potential for further development and major constraints. Part II focused on the land degradation problem and evaluated actions already underway to combat the problem. The problem stems basically from misuse of land beyond its capacity. Although effects are insidious, degradation is seriously undermining the sustainability of development in Ethipia, and more immediately it is rendering increasing numbers of people more vulnerable to drought. The degradation processes are accelerating and spreading over more of the country. Urgent action is required over and above efforts already being made to counter this major threat to the survival of Ethiopians and their country. The required actions have to be broad-based, replicated on a large scale and sustained over a long period. A separate conservation strategy or programme is unlikely to be successful: the degradation problem is too widespread and persistent. Rather, conservation has to be fully integrated into the nation's main development programme; it has to become an inherent feature of every-day land use. The development strategy has to be a Conservation-based Development Strategy.

By far the most urgent and important priority emerging from this study is to make widely understood the implications of and the need for the Conservation-based Development Strategy. A nationwide educational and publicity programme needs to be aimed at all the agencies concerned with rural land use as well as at the rural people to explain the essential links between sustained development and conservation, and the need to act accordingly. The publicity should begin as soon as the specific actions to be taken by all concerned have been determined. Conservation has to be fully integrated with all levels of agricultural and forestry training, and productivity-raising conservation-farming has to be emphasized much more in general education. The messages have to be differentiated where appropriate to the patterns of land use and farming. Mass media specialists should be consulted to design appropriate sub-programmes and delivery methods. The programme will need substantial capital equipment and should be launched from the highest level of government to give it the weight it merits. A parallel campaign has to be mounted outside Ethiopia so that all externally assisted projects concerned with the use of rural land are conservation-based.

The Conservation-based Development Strategy implies an integrated approach in which the social, technical, economic, institutional and even ideological components of development are brought together in the overall strategy. As was concluded in Part II, the causes of degradation and rural poverty are interrelated and tackling one will inevitably have repercussions on the other. This does not mean that all the facets of poverty and degradation have to be or can be tackled simultaneously. On the contrary, resources have to be concentrated, to maximize impact, on priority sectors and activities; otherwise they will be spread too thinly, with inadequate impact. This emphasizes the importance on strategy planning, phased programming and project identification.

The government has achieved much in providing the population with access to education and, to a lesser extent, improved health services, and in establishing a solid rural institutional base on which people can participate more meaningfully in their development and through which the gains from future development can be distributed equitably. These achievements can now be upheld and used to full advantage only by a period of more rapid and sustained economic development. The major objective in Ethiopia must now be sustainable economic growth. This does not imply any abandonment of principle or fundamental shift in policy. The benefits from economic growth can be distributed equitably in accordance with Ethiopia's expression of socialist ideology. The preceding chapters have made detailed proposals on priority requirements in each sector of the economy; this section derives and interrelates priorities between sectors and by zone, and proposes a phasing to maximize impact with the limited resources available. The proposed package or programme is an indicated starting point for implementing the Conservation-based Development Strategy. It should be modified as a matter of course as more data and resources become available and in light of changed circumstances. The programme should have a rolling character. This again emphasizes the critical importance of strengthening planning in Ethiopia. This means that central planning capacity in key sectors such as agriculture, forestry, energy, transport, industry, etc. must be built up prior to the decentralization of such services. This should be a top priority for technical assistance and in-service training of Ethiopian professionals. The provision of such technical assistance and training should, together with the proposed education/publicity campaign, be viewed as top priorities for the immediate future.

Conservation-based Development has to be sought through the appropriate use of land - both its selected use and its management in that use. The land use commonly contributing most to both social well-being and economic growth is 'cropping'; but this can also give rise to the most erosion when carried out on sloping lands. Perennial crops cover the soil association with land preparation for annual crops. Thus, whereas perennials can generally be grown on steep slopes without ill effects, most annual cropping on slopes of five percent or more will require some form of structure for soil and/or water conservation. The required structures themselves take up proportionately more of the land as slope gradient increases, and although some products can be grown on the structures, annual cropping generally becomes uneconomic on slopes in excess of 30 percent. Fortunately, well over 60 percent of the land area in each zone has slopes of less than 30 percent and such lands are generally most productively used for cropping. Lands above 30 percent slope (one-third of the total study area) should generally be used for providing wood and grass requirements, i.e., for forestry and/or livestock, but in any case with appropriate management practices for both land and stock. Such practices should seek to ensure that the soil is adequately covered with vegetation during periods of erosive rain. Conservation structures other than for drainage and gulley stabilization are generally neither necessary nor economic on forest or grasslands. Land below 30 percent slope which is unsuitable for cropping should be used as grassland or forest.

Ethiopia's land resources have been judged to be generally sufficient to permit social and economic requirements from land use to be met within these generalized land use guidelines, at least in the strategy period. The problem, however, is that in the most densely populated areas, slopes steeper than 30 percent are already being cropped with consequent high erosion rates. Annual cropping on such slopes will eventually cease as soil depth comes to be reduced below the minimum required, but at that stage the land is less productive for other uses, and heavy run-off from the land increases erosion on other lower-lying, more productive lands. It is thus better to stop annual cropping on such slopes before too much damage is done. This will usually require relocation of the farmers to less steep land suitable for cropping and/or providing the peasants with alternative means of livelihood. Both measures are integral components of this strategy, but these measures will need very careful study and preparation before the cropping on such slopes can be stopped. The study and preparation should start soon, especially the survey of the scope of the programme.

In the long run, resettlement cannot be an option because there will not be sufficient land suitable for resettlement. In the shorter term, some selective resettlement is necessary, to provide breathing space for reclamation and even conservation to be effective in the most densely populated and degraded areas, especially the LPC zone. It is estimated that around 150 000 persons annually will need to be resettled or preferably migrate, if present population growth and degradation trends continue (section 13.3; 13.4). Such rural/rural resettlement/migration also provides a means of extending the land cropped, and thus production, in areas now underused (mainly in the west and southeast) of the HPP and HPC zones. The possibilities for extension of the cropped area will become progressively fewer, and agricultural production growth will increasingly depend on higher yields and increased cropping intensities. This prospect serves to emphasize the critical role of extension and appropriate systems of input delivery and credit. In these fields, priority should be given to the high potential zones, especially for maize and wheat, where effective extension, improved seeds and fertilizers could result soon in a substantially increased production of maize and wheat. In the LPC zone, much more emphasis should be put on increasing production of drought-resistant crops such as sorghum (and, where proved, cassava) and to conservation of water (water harvesting and spreading). A special, though thorough, study of teff - its social and agronomic/economic characteristics - should be undertaken before its proper rôle in Conservation-based Development can be determined. Coffee and tea production should be encouraged in the HPP zone, and even in the HPC zone.

The agricultural sector has to be given top priority in any development programme, as has already been recognized by the GOE in its TYPP. In the LPC zone, though there is much less potential for production increases, agriculture remains the chief way to improve food security. For this reason irrigation development in this zone should be given much higher priority than in the other zones, but such development should not divert attention from the main agricultural task of improving rainfed cropping. In both cases, peasant farming has proved the most efficient in terms of productivity per unit of (scarce) capital, and because of the prevalence of peasant farming, this should receive priority attention. Conservation-based Development will thus depend primarily on an agriculture-led, peasant-based programme to increase the marketed production of cereals and perennials in the HPC and HPP zones and to improve food security in the LPC zone. The methods for attaining such targets are broadly known; what is required is incentive, guidance, appropriate inputs and improved access. These are the priorities for the short and medium term.

Peasant incentives have to be enhanced by increased crop prices, more convenient crop marketing arrangements, greatly increased availability of consumer goods and meaningful participation in development - all of which have been addressed in previous sections. There still remains the problem of improving security of tenure of individual holdings 1/. Cooperation has to be promoted more as a means of mobilizing slack season labour for public investment works (to build the foundations

1/ Intermittent reallocation of land use rights within the PAs continues to reduce peasants' security of tenure. This inhibits their investing in conservation. There are no accepted policy remedies yet for this problem, under the assumption that ultimately the PAs will voluntarily transform themselves into PCs. Meantime, it can only be hoped that some means can be found to eliminate the intermittent reallocation.

for subsequent self-feeding development) rather than as a means of collective production. The latter should remain a voluntary process. The FFW programme needs to be substantially broadened in its range of activities in food deficit areas while comparable fertilizer or seed for work programmes should be used to motivate massive participation in agricultural slack season public works in food surplus areas. Taxation policy could also be used to promote such labour investment.

Notwithstanding the moisture retention effects of bunds, the LPC zone still has considerably lower potential for the development of cropping than the other zones. It is suggested that, relative to the other zones, more attention be given to livestock development and reafforestation, to increase purchasing power, provide inputs for local small-scale industry and to alleviate the severe rural energy crisis in the LPC zone. Even so, it is unlikely that agriculture will be able to provide the means for sustained improvements in living standards in the most seriously degraded areas of the LPC zone. In the longer term these will almost certainly have to become more dependent on increasing purchasing power from non-farm activities, in particular from the development of small-scale industry. In order to facilitate such industrial development, as well as food trade and food aid, to instigate preference for smaller families, it is proposed to launch a carefully phased programme of villagisation in the most seriously degraded areas of the LPC zone. Those who could continue to sustain reasonable livelihood from agriculture should be encouraged to remain in their present rural areas, but these are likely to be a declining proportion of the population. If present trends continue, increasing numbers of people will have to seek improvements in their living standards outside agriculture, and this will be much easier in towns or villages. Villagisation/urbanization in the LPC zone will have to be phased with industrial development and growth of other non-farm activities, and this will require substantial injections of both capital and skilled manpower to provide appropriate training and support services. The very long-term nature of these suggestions on villagisation/industrialization is emphasized. A crash programme could do more harm than good, and the emphasis in the shorter term should be on pilot projects.

Both urbanization/villigisation in the most seriously degraded areas of the LPC zone and the opening up of new areas in the high potential zones for migrants are partially dependent on improved infrastructure, and especially means of access. The lack of transport and communications continue to limit severely the extent to which peasants can participate in the market economy and the extent to which government can mobilize, advise and assist peasants. Priority in the western and southeastern areas of the HPP and HPC zones, and more generally in the LPC zone, therefore, has to be given to improved communications for the penetration of development into more remote areas. The scale of improvements required and the terrain of the Highlands indicate that the correct approach should feature simple technology and peasant replicability. Much more emphasis, at least in the first instance, has to be placed on the construction of dry season feeder tracks than on gravel roads - to encourage the use of the wheel, for animal drawn carts and carriages (and bicycles in the flatter areas). Such tracks and rural roads generally should be steadily improved by the gravelling of selected bad patches. Much fuller use should be made of the radio and cassette recorder as means of education, extension and training. Capital assistance is required for the massive importation of radios and batteries, and technical assistance to Conservation-based Development programmes which are "farming-system specific." Rural newspapers and radio phone facilities should also be top priorities for development in the short term.

Long-term economic growth per capita depends not only on increasing productivity in the abovementioned sectors of the economy, but also on reducing population growth. Without counteraction, rural population growth is likely to accelerate from its present level of around 2.8 percent annually so that investments in education, health, roads, etc. would have to double in the strategy period just to maintain existing standards. Population carrying capacities of certain areas of the Highlands are already exceeded (especially in the LPC zone). While carrying capacities can be increased by improved technology, the processes are slow - almost certainly slower than the present rate of population growth, with the result that carrying capacities are falling over much of the LPC zone. Continued rapid population growth threatens to nullify development efforts. It is essential that a population control policy be adopted as a priority by the Government. Capital and technical assistance would be required to support a two-pronged programme in population policy: creation of the desire for smaller families and provision of technical services and devices to attain this result. Much could be achieved both in population control as well as in development generally by improving the relative status of women. REWA needs to be much more active in seeking appropriate policy changes in this respect than in pursuing the token-like mini-projects in home economics, etc.

Another major area for policy development concerns incentives generally - not just peasant motivation, already covered - but incentives of trained manpower in both the state sector (by higher salaries, career development opportunities, etc.) and just as importantly in the private sector. Ethiopia cannot afford not to use the reservoirs of skills, capital and initiative within the private community. Policies can be designed to use these to greater efficiency and impact. This need not be anti-socialist; on the contrary, an inefficient private sector results in a waste of resources and the worst of both worlds. An efficient private sector, with adequate protection against exploitation of the poorest, could valuably complement the state sector in crop marketing, transport, input distribution, industry and even some of the social services. Specific recommendations on incentives and pricing for efficiency, exchange rate adjustments, etc., have been made in sections 4.12.3 to 4.12.5.

The major priorities among and within sectors are ranked, according to the criteria derived in section 14.5, in table 14.2. The major priorities relate to agriculture, energy, industry, transport and population policy. Fuller details in each sector have been given in the appropriate sections of the text. Policy priorities are summarized in table 14.3, and priorities for development assistance in table 14.4. In each case, indications for suggested phasing are given by reference to three different time spans:

- priority before 1986/87;
- medium-term priorities: up to 1993/94; and
- longer term priorities: up to 2010.

Major priorities by zone are summarized in table 14.5.

Table 14.2

MAJOR PRIORITIES BETWEEN AND AMONG FACTORS RANKED ACCORDING TO IMPORTANT CRITERIA, ZONE AND TYPE OF ACTION - SUMMARY

(priority: 1=top; 2=intermediate; 3=low; -=very low or not applicable)

	Energy			Industry	Population				Transport				Soc. Serv.			Agriculture					
	Hydro-power	Fuel efficiency	Reafforestation	Small-scale	Control growth	Resettlement	Migration	Villagisation	Traditional	Roads	Vehicles	Communications	Education	Health	Water supply	Crop area expans.	Crop intensity	Crop yields	Irrigation	Livestock	Agro-forestry
Economic criteria																					
Economy in:																					
- foreign exch/capital	3	2	1	2	-	3	1	3	1	2	2	2	-	-	-	2	1	2	3	1	2
- skilled manpower	3	2	1	2	-	3	1	3	1	2	2	1	2	3	-	2	2	2	3	2	3
- recurrent costs	2	1	1	3	-	3	1	-	1	3	2	2	-	-	-	2	2	2	3	1	2
Labour-intensity	3	3	2	1	-	3	1	3	2	1	-	-	-	-	-	1	1	2	2	3	3
Quick payback	3	2	3	1	3	3	2	3	1	2	1	1	3	-	3	2	1	1	2	2	3
Linkages	1	2	1	1	1	2	1	1	1	2	3	1	2	3	2	1	1	1	3	1	1
Availability proven	1	3	1	2	2	-	3	3	1	1	1	1	-	-	-	-	1	1	1	1	1
technology	1	3	1	2	2	-	3	3	1	1	1	1	-	-	-	-	1	1	1	1	1
Overall economic impact																					
- food	-	-	-	-	-	3	2	3	3	3	3	2	-	-	-	1	1	1	2	3	3
- foreign exchange	-	-	-	1	-	-	-	1	3	-	1	2	-	-	-	1	2	2	3	2	3
- other	3	1	1	1	1	3	1	2	1	2	1	1	2	-	3	-	-	-	-	2	2
Social criteria																					
Minimal food security	-	-	-	-	1	3	2	2	-	-	-	3	-	-	3	2	2	1	1	3	-
Raise relative incomes	3	-	2	1	2	2	2	1	1	2	-	3	3	-	-	2	1	1	2	2	-
No. of beneficiaries	3	2	1	2	1	3	1	3	1	2	-	1	1	1	2	2	1	1	3	2	-
Degradation irrversibility	-	-	3	-	-	3	2	3	-	-	-	3	-	-	-	2	2	2	-	2	1
Peasant receptivity	-	1	2	2	3	3	2	3	2	-	-	1	2	1	1	1	2	1	2	2	2
Replicability	3	2	2	2	2	3	1	3	1	3	-	-	3	2	3	2	1	1	3	2	2
Overall priority - by zone:																					
- LPC	1	1	1	1	1	1	1	1	2	2	2	3	3	1	1	3	3	1	1	1	2
- HPC	2	2	2	3	2	2	2	2	3	3	1	2	1	2	2	2	1	1	2	2	3
- HPP	3	3	3	2	3	1	1	-	1	1	3	1	2	3	3	1	2	3	3	3	1
by time:																					
- 1987/88	-	2	2	3	1	-	1	2	2	2	1	1	3	3	3	1	2	1	2	1	2
- 1993/94	3	2	1	1	1	3	1	1	1	2	2	2	1	3	2	1	1	1	1	1	1
- 2010	2	2	1	1	1	-	1	2	1	1	3	2	2	3	2	1	1	1	3	3	3
Food assistance (FFW)	-	-	2	1	-	3	1	2	1	1	-	-	-	-	2	1	-	-	2	-	3
Technical assistance	2	1	2	1	1	-	1	3	-	2	1	2	3	3	3	3	3	3	1	3	2
Capital assistance	2	3	1	1	1	-	1	2	3	2	1	1	2	3	3	1	2	2	1	3	3
Policy development	3	3	2	2	1	2	2	1	1	3	2	1	1	3	2	2	2	2	3	1	1

Table 14.3

POLICY PRIORITIES - A SUMMARY

(1=top priority; 2=intermediate; 3=lower priority; -=not applicable)

Priority ranking and sequencing			Policy
Urgent: before 1986/87	Medium term: to 1993/94	Longer term: to 2010	
1	1	2	- General emphasis on economic growth through Conservation-based Development. This requires institutional stability and consolidating and maintaining social services at present levels (and relating provision of such services to production performance). It requires increased emphasis on the directly productive sectors: agriculture in the high potential zones and industry in LPCZ.
1	1	1	- Peasant motivation: minimizing reallocation of individual lands, pricing, marketing, consumer goods, participation.
1	1	1	- Full integration of conservation into agricultural planning, training, education, research and extension.
-	2	1	- Proclamation on global land use guidelines possible accompanied by zonal land use and water master plans and legislation 1/.
2	1	1	- Increased emphasis on vegetative measures for conservation.
1	2	3	- Irrigation: Recognition that it is not a panacea; and correspondingly more attention on improving rainfed agriculture.
1	1	1	- Emphasize migration as opposed to resettlement in relocation of farm families.
1	1	1	- Campaign for women's participation. REWA to concentrate on major policy issues rather than mini-projects.
2	1	1	- Population control programme.
2	1	1	- Livestock: Attempt to reduce numbers; de-emphasize veterinary programme. Limit livestock ownership in critical areas: licensed access to grazing of closed areas.
2	1	1	- Promote PA participation in planning at Wereda level and above by training and special planning meetings, etc.
2	1	1	- Mobilization of private sector skills, initiative and capital.
2	1	1	- Agricultural research: Fuller use of international centres.
1	1	1	- Annual evaluation IAR to ensure its relevance to peasant farming systems.
2	1	2	- Agricultural training: Emphasize at farmer PA/DA levels. Shorten courses at FTC's. Greater use of mass media.
2	1	1	- Agricultural Credit: Authorize CBE to collaborate or compete with AIDB. Make PAs main clients and SCs intermediaries.
1	1	2	- Cooperation: View as means to invest slack season labour for self-feeding development rather than as means of collective production.
1	1	2	- State farms: Initiate an efficeincy drive.
3	2	1	- Phase out state forestry in favour of community (PA/UDA) forestry.
-	3	2	- Carefully phase the development of small-scale industry in the most seriously degraded areas of the LPC zone.
1	1	2	- FFW: Broaden scope and reduce size of rations.
2	1	2	- Emphasize traditional/intermediate transport development and modern communications.
2	1	-	- Overhaul taxation.
1	2	-	- Foreign exchange rates: Devalue Ethiopian Birr.

1/ This might include assignment to PAs and farmers of primary responsibility for on-farm conservation measures, and concentration of public funding of FFW on infrastructure.

Table 14.4

PRIORITIES FOR DEVELOPMENT ASSISTANCE - SUMMARY

Rank	Capital/Technical	Food (FFW)	Priority Zone	Time sequence 1/ to 1986/87	to 1993/94	to 2010
1	Promote understanding and acceptance of Conservation-based Development Strategy		National	1	2	3
		Reclamation/ Conservation of land threatened by irreversible degradation.	LPC HPC	1(?)	1	2
2	Strengthening marketing analysis, pricing, institutional efficiency.		National	1	2	-
2	Strengthening central planning in key sectors		National	1	2	-
2	Strengthening agricultural extension, training, input distribution, credit		HPC	-	1	2
3	Population control programme		National	-	1	2
3	Migration/resettlement programme (develop from on-going)		LPC	1	2	3
4		Tracks, roads and traditional transport.	LPC	-	1	2
5	Urbanization/villagisation carefully phased with small-scale industrial development in the most seriously degraded areas		LPC	-	2	1
6		Reafforestation (Eucalyptus woodlots and agro-forestry	National	1	1	2
7	Irrigation and agricultural research: (already receiving adequate assistance but some re-orientation desirable)		LPC	1	2	3
			National	2	1	3

1/ 1=top priority; 2=intermediate; 3=low; -=very low or inapplicable.

Table 14.5

MAJOR PRIORITIES BY ZONE - SUMMARY

Major objectives (and constraints)	Priority sectors and activities
Low Potential Cereal Zone Improved food security (low and erratic rainfall). Combat threat of irreversible degradation (already widespread and vicious circle). Increase non-farm purchasing power by diversification development from cropping. (Lack of infrastructure and skills.) Enhance social-political stability and security.	- Agricultural extension and seeds for rainfed sorghum; cassava trials; thorough study on proper role for teff. - Water conservation and irrigation (small-scale labour-intensive(. Soil conservation on croplands. - Natural revegetation, grass/legume oversowing and reafforestation on steep and degraded slopes. Taungya to phase out-migration. Promote temporary as well as permanent out-migration and resettlement. - Live fences/stone walls to facilitate grazing management. Promote destocking and residual moisture forage - cropping and destocking. Ponds, single-ox plough and lowlands trade in oxen. - Adaptive research - drought-tolerant crops, water harvesting and valley cultivation. - Carefully phased/monitored villagisation/urbanisation in most degraded areas. - Increase scale and broaden range of FFW for socio-economic infrastructure: roads, tracks and communications development, village social services. - Phased development of mini-hydro-power; explore coal and geothermal energy.
High Potential Cereal Zone Increase marketed food production (motivation, inputs, extension). Land conservation. Overall development emphasis on increased cereal production reflecting high potential	- Crop intensification and improved yields by conservation farming, especially maize and wheat. Agricultural extension, education, training, seed, fertilizers, credit, marketing, storage and motivation. - "Fertilizer and/or seeds for work." - Multiple cropping systems. Encourage selected pulses, oilseeds, vegetables, fruit, peri-urban dairying, aquaculture. Study on proper role for teff. - Increase capacity of grasslands by oversowing and management. - Live fences, rotational grazing, etc. - Eucalyptus woodlots, natural revegetation and taungya; agro-forestry on steep slopes.
High Potential Perennial Zone Increase marketed food, coffee and tea production. Land development and conservation. Overall development emphasis on utilizing high potential for increased perennial cropping and food production.	- Expansion of croplands (especially western and southeastern) by in-migration. - Bush clearing, tracks, roads, communications and infrastructure development through labour-intensive FFW. - Coffee seedlings, maize and wheat seeds, fertilizers. - Also other cropping measures as in HPCZ. - Special efforts to develop agro-forestry as well as eucalyptus woodlots.

14.7 TENTATIVE INDICATORS OF PROJECT PRIORITIES

The identification of priority project proposals was undertaken (April-May 1985) in collaboration with a mission from FAO's Investment Centre which continued through 1985. The mission's report may be viewed as the logical follow-up to this report. This section is intended as an input into the mission's work; it should in no way be construed as pre-empting mission outputs and proposals. Thus the proposals made in this section are very tentative and likely to be superceded by the mission's proposals.

An initial basic issue to be addressed concerns the area coverage of priority projects - and in particular whether coverage should be national or concentrated in selected catchments. Stemming from the strategy proposals already made, the former approach would probably concentrate resources on relatively few activities while the latter would probably cover a much broader range of activities in a confined area. Both approaches have already been pursued in Ethiopia (e.g., MPP vs. ARDU and WADU - Chapter 5; and FFW vs. Sirinka - Chapter 8) and the pro's and con's of the alternative approaches reviewed previously. The national approach is usually considered more replicable while the specific-area approach provides for greater inter-sectoral integration and impact. It is further claimed that the latter can serve as pilot projects, while opponents suggest that the projects are necessarily site-specific, atypical and "islands" of resource concentration of little relevance elsewhere. Fortunately, the two approaches are not mutually exclusive. The proposed strategy has identified the need for inter-related (in time, space, and nature) actions at many levels and in different sectors. Many of the proposed actions relate to policies, while others relate to changing orientations of already on-going activities and projects. Such proposals may not require additional resources for implementation. It is only those actions which require additional resources for implementation that may be competing. But even here, major resources, such as peasant labour and land, are available throughout the Highlands, and much can be achieved by labour-intensive investment. Labour in the HPP zone is not competing with labour in the LPC zone. However, there is competition for scarce resources including capital, foreign exchange, trained manpower and government recurrent funding, and this necessitates selection between project priorities.

The initial new projects will be important because - along with the proposed changes in policy and on-going projects - they will provide the means to start implementation of the Conservation-based Development Strategy. They will be triggers of further development, and as such they have to provide a clear sense of positive direction; to trigger action in the wrong direction would do more harm than good. The initial projects should be replicable and sustainable. They have to demonstrate the social, technical and economic feasibility of Conservation-based Development to both individual land users and to the nation as a whole. In addition to the initial area projects, there should be a project at the national level which should strengthen planning - sectoral and national - and training and technical assistance.

In considering a national project, and following the priority strategy proposals summarized in section 14.6, it is suggested that priority components might include some or all of the following five major areas of activity:

(1) provision of capital and technical assistance to launch the proposed campaign for Conservation-based Development, including the integration of conservation into all training, research and extension in agriculture. Inputs might include the use of media specialists, the massive importation of radios, cassette tape recorders, loud-speakers, video recorders, batteries, cassettes, duplicating machines, typewriters, stencils, etc. Outputs would include radio and television programmes, films, cassettes, rural newspapers, leaflets, posters, etc. The campaign should promote farmers/Pas to take more responsibility for conservation of their lands. All these activities obviously would not begin until specific actions had been determined and funded; otherwise such publicity would become mere exhortation.

(2) strengthening agricultural extension and training for dissemination of the already known messages of conservation-based development. This component should be closely related to the PADEP and might even take the form of orienting the substance of the message to be conveyed by PADEP so that it reflects the Conservation-based Development Strategy. There is a close link with (1) in this. Other inputs might include assistance to the FTC programme and transport and cassette/tape recorders for extension staff.

(3) the establishment of a Conservation-based Development planning and monitoring unit to periodically update and improve overall strategy planning (including this report), to provide for monitoring of Conservation-based Development into sectoral and project planning, to prepare area-specific plans and detailed project feasibility studies and to monitor degradation. This would require the training of Ethiopian professionals (in-service plus formal courses) and internationally recruited (possibly technical assistance) planners in key areas including population, agriculture, energy, industry, transport, forestry, etc. It would also require substantial budgetary provision for specialist consultants, aerial photography, mapping, and an inventory of land for resettlement.

(4) increasing availability of essential inputs for productivity-increasing conservation farming, including seeds (especially maize and wheat in the HPC and HPP zones; sorghum and cassava

in the LPC zone), seedlings (coffee in the HPPZ and for agro-forestry generally), fertilizer (especially for maize, wheat and coffee) and tools and materials (especially those required for the FFW programme) 1/ but also other farm implements. Credit, storage and transport might also be included.

(5) provision of both capital and technical assistance for a population control programme including both overall growth and internal migration/resettlement. The educational/publicity aspects would blend with (1) and the planning aspects with (3), but capital assistance would also be required for the importation and/or local manufacture of birth control devices and their distribution while technical assistance and training (including study tours to Asian countries) would be required for agencies such as AEPA (for migration), RRC (for resettlement), FGAE and Ministry of Health and REWA (for birth control). Assistance on migration may require vehicles, prefabricated transit shelters and food aid, preferably FFW.

Agricultural research is not included in this list, even though it has emerged as a medium-term priority in the strategy, because a major project (both investment and technical assistance) has recently been agreed by GOE and the World Bank. The aim becomes more one of orienting both this project and the on-going research programmes in the required directions (top priority for improving food security in the LPCZ) than proposing additional resources for research. Similar reasoning applies to irrigation development, which is attracting substantial capital and technical assistance in the wake of the current famine.

With respect to area-specific projects, it is considered that there are again essential interrelations between necessary simultaneous activities in two or more zones. Thus, for example, reclamation and even conservation in the LPCZ will be partially dependent on out-migration/resettlement to the HPPZ or HPCZ. Similarly, improved food security in the LPCZ is possibly most likely to be sustainable by increasing marketed food surpluses in the HPPZ and HPCZ for trade (or aid) arising from development of non-farm activities in the LPCZ. The combatting of the threat of irreversible degradation in the LPCZ, although a top priority, is unlikely to yield high economic returns (Chapter 11), and to enhance the overall "bankability" of the project; LPCZ activities might need to be combined with actions to increase production in the

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1/ The EHRS sociological survey identified lack of education and tools/materials as major constraints. Education is covered by components (1) and (3). WFP/GOE evaluation missions have concluded that small investments on tools and essential supplies could improve the quantity and quality of work significantly.

high potential areas. In view of such interrelations, as well as for the need for simultaneous catalytic actions in all three zones, it is proposed that the initial area-specific project cover three selected areas in the three respective zones, as follows:

(a) LPCZ: to improve food security and counter the threat of irreversible degradation both by conservation farming (including livestock) within the zone and non-farming activities and out-migration to the HPPZ. The suggested site should cover a range of altitudes;

(b) HPCZ: to secure rapid increases in marketed food production, especially maize and wheat through Conservation-based Development farming. The suggested site should cover high potential maize/wheat areas; and

(c) HPPZ: to increase the marketed production of both coffee (to alleviate critical foreign exchange constraints) and food and to provide for in-migration from the LPCZ. The suggested site should be suitable for expansion of the area of coffee and of maize.

It is suggested that the three sites be selected primarily as representative of the three zones, but care should be taken not to select particularly "difficult" sites as one of the puposes of this initial project is to encourage replication by its successful results. The criteria suggested in section 14.5 should be relevant for site selection.

Among the major causes of delay in starting any new project is the recruitment of staff, construction of buildings, ordering equipment, etc. Given the urgency to start Conservation-based Development, serious consideration might be given to selecting one or more project areas to coincide with the sites of related on-going or former projects. 1/ Most relevant would appear to be the Sirinka (SPCRP) project which covers parts of the HPC and LPC zones. This on-going pilot conservation project (partially World Bank funded) with its site especially chosen to represent a range of agro-ecological conditions in the northeastern Highlands, has already amassed a considerable amount of useful data and has a core of experienced staff, buildings, etc., but lacks funding from 1986. At the time of the project's conception in the late 1970s, it was envisaged by both the GOE and World Bank that it would pave the way for a much larger rehabilitation project on the northeastern escarpment (WB 1974). The Sirinka project site could be extended to cover a larger area of the LPCZ. Accessibility (security) considerations would preclude the selection of a project site further

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1/ Shortened gestation periods and the existence of appropriate infrastructure would also increase the economic returns of the project.

to the north, while a site in Hararghe, though still in the LPCZ, would not be so representative of the major LPCZ areas in the north. Some staff and buildings also remain from the former World Bank funded WADU project, but while this project site is within the coffee growing belt of the HPPZ, it is very densely populated, and opportunities for resettlement for rainfed farming are limited. A potential resettlement site further west in Kefa or Illubabor might be preferred. Another practical consideration relates to the availability of data, and in this respect consideration might be given to sites for which substantial data have already been collected by the LUPRD - i.e., the Borkena area and the Bichena site in Gojam as a typical high potential maize/ wheat area in the HPCZ.

Priority activities for possible inclusion in an area-specific project might include those listed in table 14.6. It is unlikely that resources will permit action in all these activities in each area immediately. The mission, in consultation with Government, would propose an appropriate phasing of both activities and area coverage (i.e., gradually extending the coverage of both in line with experience gained, resource availability and accessibility) with a view to maximizing replicability and beneficial chain reactions/multiplier effects.

It would also seem desirable to provide for considerable flexibility to be built into the projects so that they can be reoriented as experience is gained during their implementation. It is considered better to start new projects on a modest scale, giving particular attention to the definition of broad strategy and managerial arrangements, but leaving substantial unallocated resources to meet unforeseen needs. This assigns a much more important role to identification and supervision than to preparation and appraisal. For such an approach there has to be an effective built-in monitoring and evaluation system operating from the outset of projects so as to permit rational corrective managerial action during their implementation. Both flexibility in strategy design and an effective monitoring and evaluation system are necessary to achieve full and effective popular participation in the strategy and its implementing projects. The monitoring and evaluation of these initial projects should also feed into the preparation of subsequent projects and the rolling nature of this strategy. Finally, in formulating an area-specific project, much could be learned from the Sirinka project (Chapter 8). A major lesson concerns the need to involve local government offices as well as the local population in project design and implementation.

In concluding this section, the tentative nature of the proposals and their likely superceding by the report of the FAO Investment Centre mission is again emphasized. In particular, the suggested continuation of representative areas from all three zones, while strategically desirable, may in practice be difficult for both logistic and administrative reasons. An alternative may be to have separate but related projects for each zone.

Table 14.6

PRIORITY ACTIVITIES FOR POSSIBLE INCLUSION IN AN INITIAL AREA-SPECIFIC PROJECT FOR CONSERVATION-BASED DEVELOPMENT

Activity	LPCZ	HPCZ	HPPZ
(a) Cropping for Conservation-based Development: extension, training, input distribution. Complements national project by more intensive efforts.	Sorghum, cassava trials (?) forage crops. Water conservation	Maize and wheat intensification Forage crops Fertilizers credit	Maize, wheat, coffee (tea?) Area expansion Fertilizers
(b) Grasslands - oversowing and management	Yes	Yes	Lower priority
(c) Reafforestation - eucalyptus woodlots and agroforestry.	Yes	Yes	Yes
(d) Search for ways to improve land tenure security.	Yes	Yes	Yes
(e) Out-migration assistance In-migration assistance	Yes No	? ?	No Yes
(f) Pilot population control activities (complementing national project)	Yes	Yes	Yes
(g) Communications and education for Conservation-based Development (complementing national project)	Yes	Yes	Yes
(h) Track and road improvement (FFW)	Yes	Lower	Yes
(i) Adaptive research: Use and drainage of valley soils, zero tillage, single-ox ploughing, improved cooking efficiency, water harvesting, etc.	Yes	Yes	Yes
(j) Pilot phased village and small-scale industrial development	Yes	No	No

14.8 TARGET INCOMES AND ECONOMIC GROWTH

Targeting incomes and growth over long periods is notoriously unreliable. Notwithstanding this, section 4.12 presented two alternative macro-economic scenarios with annual growth of GDP averaging 2.5 and 4 percent respectively. It is considered that implementation of the proposed strategy should enable the higher GDP growth rate to be achieved. Bearing in mind present per capita GDP averaging substantially less than US$140, at the very least, the strategy should aim to provide an average GDP of US$300 per capita in real terms by 2010 (average total GDP growth around 3.5 percent p.a.). Furthermore, it is considered that implementation of the strategy should also aim at securing a minimum per capita income of EB500 for all by the year 2010. This compares to present rural per capita income averaging possibly less than EB100 in the LPCZ, but probably something over EB200 in the other zones. (See section 14.5, table 14.1.) Only in the LPCZ is this minimal per capita income target considered particularly ambitious, and its achievement there will depend on simultaneous measures to increase economic growth and stem population growth.

Chapter 15

PLANNING AND IMPLEMENTATION

15.1 FOLLOW-UP PLANNING

The themes developed in the preceding chapters of this Strategy Report need not be repeated in their entirety. The thrust of the argument has been that the present crisis in Ethiopia, as manifested by increasing food shortages, excessive population growth and increasing dependency on food aid and other support from outside, is a crisis of policy and of inadequate attention to conserve resources, most especially the soil, on which agricultural development is based. The joint GOE/World Bank mission surveying the effects of the 1972-74 drought concluded that:

> "Long-term planning is, however, necessary to ensure that avoidable disasters do not again occur on such a scale. It is not, of course, possible to guard against actual droughts, which will recur in response to cyclic worldwide climatic variations. However, it should be possible by soundly planned agricultural and other development to ensure that, when such disasters occur in the future, as they will, their effects on the population who suffer from them (and who will continue to suffer because they live in areas where cyclic droughts are inevitable) can not only be mitigated in their severity but dealt with from Ethiopian resources without such heavy dependence on emergency foreign aid." (GOE/WB 1974.)

This finding remains true today, amidst the even more severe 1984/85 drought. Part II of this report has presented an appalling scenario of further deterioration if present trends continue. To change such trends will require concerted actions on many fronts. The scale of needs is such that a planned approach is a prerequisite to success.

This report has suggested the major options with respect to directions and phasing of the broad actions which need to be undertaken. More detailed and shorter-term planning, at various levels ranging from local and/or sub-sectoral to national, is required to establish the detailed implications, feasibility and costs and benefits of those options selected by Government for further consideration. This requires not just detailed project planning, for which some initial provision has already been made with the assistance of the FAO Investment Centre, but also planning at the macro- and policy levels. The development strategy presented in this volume is intended to provide the context or planning framework for such follow-up planning. 1/ Furthermore, the rolling and continuous nature of planning has been stressed previously.

Such considerations, as well as the obvious need to complement this strategy by more detailed planning with respect to urban development, industry and the social services, underlines the importance of the proposal to strengthen planning activities in Ethiopia. Top priority has to be given to strengthening planning of the agricultural sector, both through training and appropriate internationally recruited expertise, in at least three areas:

(1) sectoral planning; viewing the sector in its totality and prioritising and sequencing shorter-term objects to be achieved through policies, programmes and projects; thus providing a rational context for decisions on policies and projects;

(2) policy analyses; reviewing the implications of proposed and on-going policies and making recommendations (e.g., input and output pricing, marketing, institutions, mechanisation, etc.);

(3) project preparation.

A major project on strengthening agricultural planning has been proposed by the MOA and is included in FAO's proposed development assistance programme (FAO 1985). However, funding has still to be secured for the US$5.4 million project.

Land use planning has to be integrated much more fully with overall agricultural sector planning, and together they should provide the continually evolving guidelines for the rational use and management of resources to implement the Conservation-based Development Strategy. Such planning, to the fullest extent possible, should involve grass roots participation, and to facilitate this the socio-economic survey section of the LUPRD needs appropriate strengthening. Decentralisation also aims to increase local participation.

Before planning can be decentralised, there has to be an adequate core or centre from which to decentralise and through which decentralised plans can be rationally aggregated and synthesized. Decentralisation without such a core can only add to "*ad hoc*-ery". Decentralised planning

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1/ There is a useful discussion on the distinctions between development strategy planning and shorter-term planning within the context of the EHRS in FAO (1984): Report of the Advisory Mission - Annex 3.

is obviously necessary in order to relate planning to the great diversity in farming systems and agro-ecological conditions, but its pace has to be carefully phased with the general strengthening of central planning.

At the local level, it has been argued by FAO and others that area development should be carried out through comprehensive and integrated multi-disciplinary programmes within the natural boundaries of watersheds. 1/ Detailed procedures for such planning have been described by John and Styczen (1984). Such planning is being attempted at present with base maps of between 1:50 000 and 1:250 000 scale and aerial photos of 1:50 000 scale. These photos were taken some 15 to 25 years ago. Such maps and photos will probably be inadequate for most tasks, and therefore up-to-date photos of 1:10 000 to 1:20 000 scale will often be badly needed if planning is to be of good standard and progress at the necessary rate. At the same time, however, efforts should be made to pursue a data-economising and rapid rural appraisal approach to planning, as stressed in Chapter 1, reducing the risks of the proliferation of redundant/obsolete information. Thus much more emphasis in the LUPRD has now to be placed on utilizing rather than collecting data.

Much data collection could be undertaken by the PAs themselves. The spread of literacy provides the means for collecting and recording much more basic data at the local level, and this should facilitate local participation in planning. In view of the need to pursue a lower-cost resettlement/migration policy (section 13.4), the GOE should, with meaningful participation from the AEPA, classify each PA according to its capacity to absorb more people (and livestock) or its need to reduce or stabilize its population. This will be a major task which should involve various levels of the Government as well as the PAs themselves and could be coordinated at the operational level by the LUPRD of the MOA. Criteria for classification as well as general policy guidelines should be drawn up by an inter-ministerial committee (probably including MOA vice-ministries and departments, RRC, and others as considered appropriate) to whom the H/LUPRD should report. Criteria might include area of croplands, grasslands and forestlands per family (differentiated by farming system/zone), state and speed of land degradation and opportunities for non-agricultural development.

The first projects to start implementing the proposed strategy should themselves be designed to generate data to feed into the continuous process of further evolving the overall strategy. The initial projects

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1/ For example, FAO (1977); Guidelines for the Development of Less Favourable Environment Areas: A Comprehensive Integrated Watershed Development Approach. AGS/MISC/77/2.

should also directly increase Ethiopia's capacity to continue both its planning and implementation of the Conservation-based Development Strategy.

15.2 RESOURCES FOR IMPLEMENTATION

The resource requirements for implementing the proposed strategy will clearly be enormous 1/ and will almost inevitably exceed several times over the resources likely to be made available for a special conservation programme. This was a major consideration in advocating the full integration of conservation into rural development and provides a major rationale for adopting the Conservation-based Development Strategy. The concept of Conservation-based Development should serve to orient all the resources being allocated for Ethiopia's development to achieve maximum sustainable impact - the sustainability relates to the need for conservation, as elaborated in previous chapters. Notwithstanding the call for Conservation-based Development, considerable effort will have to be made to mobilize a vastly increased flow of resources, both domestic and external, to implement the Strategy.

Ethiopia's main resource available for development is labour in the agricultural slack season. The availability of such labour all over the Highlands means that at least some resources for development can be mobilized locally and at least some development is not dependent on the provision of resources from the centre. This in turn implies that there is at least a labour resource base for widely dispersed and replicable development. The Government has already initiated actions to mobilize this resources base. The FFW programme has been an important catalyst in this respect (Chapter 8), while the extent of voluntary public works organized by the PAs themselves is increasing. In previous chapters, the need has been stressed for greatly expanding such public works through the voluntary but organized cooperation of peasants during the agricultural slack season. Cooperation viewed as a means of mobilising surplus labour (rather than as collective production), should provide the means for a local self-feeding development process if that surplus labour is invested in activities which will increase production (e.g., bringing more land under cultivation, land improvement projects, irrigation works, improving the quantity and quality of farm implements, local construction and, eventually, the establishment of small workshops and small-scale agricultural-based or related rural industry.

1/ Preliminary cost estimates should be a primary output of the proposed follow-up planning. The nature of this strategy planning exercise and the wide range of options proposed for initial Government consideration does not justify cost estimation at this stage.

The mobilisation of labour resources should not result in any reduction from current peasant consumption levels - an important consideration, given the level of absolute poverty in Ethiopia. Rather, the initial investments are based on more labour inputs during the slack season. As production per head begins to rise, part of it can be siphoned off as savings to finance further investment. This labour- or people-oriented strategy provides the means for a more widely replicable, sustainable and self-reliant approach to rural development. For maximum impact it requires a participatory approach (section 15.3).

Although much has already been - and can still be - achieved by mobilising labour resources, the productivity of labour can be substantially raised by capital and other resources. The generally critical constraints of capital, foreign exchange, skilled manpower and government recurrent funding were elaborated on with some suggestions for overcoming them in Chapter 4. These constraints will become even more critical as the implementation of the proposed Conservation-based Development Strategy gathers momentum, and the need for external resources to supplement those available within Ethiopia becomes all the greater. When the Strategy has been finalized and adopted by the Government, it is suggested that a conference of potential donors and assistance agencies be convened in order to elicit interest and commitments in the funding of the Strategy's implementation. Such a conference could also provide the launching of the first phases of the proposed external publicity/educational campaign for Conservation-based Development of the Highlands (section 11.2). In organizing such a conference, it is suggested that the government utilize the United Nations and its agencies to secure maximum publicity and hopefully resource commitments. Such agencies, in addition to providing appropriate forums for the expression of international concern over the appalling degradation trends in Ethiopia, could promote dialogue and cooperation between nations wishing to assist Ethiopia in changing the trends.

There are natural hesitations about increased donor coordination on both sides. Each donor agency with its different objectives, resources and constraints, views the requirements and issues differently, and many may resist the principle of coordination. Similarly, there may be opinions within the GOE against such coordination, on the grounds that it may result in disproportionate pressures being raised. Nevertheless, much informal consultation already takes place, and it is considered that, on balance, Ethiopia has more to gain than lose from the fuller exchange of information and harmonization of activities between donor agencies. It is therefore suggested that the GOE encourage such coordination. A central agency such as UNDP might offer to provide practical assistance (for example, by developing the format, and periodically updating the contents of Annex 6 of this report; by organizing regular donors' meetings; acting as a clearing house for funding proposals; etc.).

Some of the UN agencies such as FAO (TCP), UNDP, UNCDF, etc., have resources of their own which might be used to provide direct assistance to implementation of the strategy. Some of the agencies also provide services to support monitoring, further studies, research, training and technical assistance.

Although most Ethiopians are among the poorest and most vulnerable people in the world by almost any relative poverty indicator (income, life expectancy, food security, etc.), before the current famine period the country received less aid per capita than almost any of the developing countries. Furthermore, the needs for which resources should be sought (conservation), have not generally been given high priority by international funding agencies. This is partly because some of the benefits of investments in conservation are difficult to quantify in economic terms, if only because they tend to materialize slowly and result from a reduction of losses, rather than an increase in output. Another reason is that the funding of conservation and reclamation often requires commitments of substantial resources over long (15 to 20 years) periods while international funding agencies usually favour projects with disbursement periods limited to 8 years or less. It is hoped that the involvement of the FAO Investment Centre, with its repute in project preparation and its well-established links with international financing agencies, will facilitate the processes of attracting possible donor interest in the proposed strategy. The fact that the World Bank is financing the strategy's preparation, and is involved in other major and related projects in Ethiopia, raises expectations that World Bank funding might be secured for at least one of the initially prepared projects. The World Bank might also be asked to encourage the collaboration of other international funding agencies such as IFAD, ADB and the Arab funds.

Donor assistance can take many forms: project lending and non-project lending; foreign exchange cost financing; local-cost financing; and recurrent-cost financing. All of these have roles to play, and donors should be prepared to be flexible and use the mechanism most likely to increase the contribution of their aid to the implementation of the development strategy. The need for more experimentation with new technical packages and new forms of social organization has been emphasized in previous chapters. There is substantial scope for more experimentation through many more pilot projects. The need for the financing of recurrent costs for many years and for prolonged (over 10 to 15 years) disbursement periods needs to be recognized. Non-project lending may have a particularly important role to play, especially if linked to complementary project lending in a comprehensive programme to assist the start of implementation of the Conservation-based Development Strategy and to address the major policy issues concerned. Non-project lending is usually more flexible in the provision of foreign exchange and could be extended to provide for the requirements for short-term technical assistance (e.g., specialist consultants), and for overcoming unforeseen bottlenecks in projects or other parts of the whole programme.

There is a risk that increased aid activity, injected into a situation of scarce manpower and weak administration, will compound administrative problems and contribute to distortions in project execution. To bypass local administrative inefficiencies, donors sometimes are able to insist that recipient governments set up autonomous project authorities in one form or another. These may compete for scarce skills by bidding up salaries and fringe benefits. Such attempts to bypass the existing structures do not, in the longer run, reduce problems of wage disparities and incentives; often they exacerbate them. A general result of the competition between donors for people and for projects is to raise the economic or opportunity cost of new projects; as scarce factors are made more costly, coordination is rendered more burdensome, and accumulating commitments tie up fiscal resources with little consideration of the costs in terms of sacrificed financing for existing activities. Thus, whenever feasible, new projects should seek to fit into existing GOE organizations and follow Government staffing and other policies. All projects should also seek to strengthen capacity in planning, policy analyses and project preparation. Section 15.1 calls for a considerably expanded programme of technical assistance, preferably related to both capital and food aid. Technical assistance should always be accompanied by appropriate provision for training Ethiopian professionals, both formal and on-the-job. Short-term technical assistance should be relied on more heavily to complement an increasing reliance on local staff, systems, and institutions. Recruitment and logistic problems are often reduced in this way, and the injection of outside advice and help can, in some instances, be more effective. Local professionals should be employed more frequently as consultants and staff for externally financed projects.

Despite the importance of outside capital and technical resources, these are likely - in the present world political and economic climate - to fall far short of requirements. This consideration, plus Ethiopia's limited absorptive capacity, plus the risk that a strategy relying too much on external resources will become excessively import-intensive, skill-intensive and capital-intensive (thus limiting replicability and sustainability), underline the need for a strategy based primarily on domestic resources. In addition to the labour resources already mentioned, efforts must be made to increase domestic savings. There are a number of ways to do this. They include the following: reformed savings and banking facilities (section 12.7); policy changes with respect to taxes and to user charges for the provision of certain government-provided services (section 13.7); and the generation of surpluses by both the public and private sectors. 1/

1/ Solution of Ethiopia's problems necessitating continuing heavy military expenditures could also free resources for increased economic investment.

As long as the agricultural sector accounts for over 45 percent of GDP, and as long as it is extremely poor, technologically backward and organized in the form of small peasant producers, it is unrealistic to expect that the peasantry, despite its importance, will make a major contribution to total savings. The private urban sector is very small, and the major savings effort must come from the public sector. Despite the large number and size of state-owned industrial establishments (section 4.5), the size of the surplus generated by them is small. Also, over three-quarters of the State Farms operate at a loss and thereby make a negative contribution to national savings. This again emphasizes the importance of increased efficiency of state enterprises in all sectors. Some East European countries have dealt with this problem by using private companies as sub-contractors to state enterprises, as already cited. Similarly, several references have already been made to the need to mobilise the capital, skills and initiative of the private sector, including not only private businesses and traders, but also NGO's. The Government should seek to create an environment in which all those who have skills and/or capital are motivated to use them in such ways that they contribute much more to the development of the nation.

Appropriate policy development in this and in the many other respects already cited (e.g., incentives for agricultural producers and civil servants, exchange rates, etc. - see table 14.3) is needed, both to increase the flow of domestic resources into productive activities, and to increase efficiency in their use. Such policies could also stimulate increased flows of external resources as well as increase efficiency in their use. In view of the inevitable scarcity of resources, efficiency in resource use has to become a major policy objective.

15.3 INSTITUTIONS, PARTICIPATION, MOTIVATION AND MANPOWER

15.3.1 Institutions

Institutional arrangements and responsibilities for development have been the subject of considerable changes since the Revolution (sections 3.3 and 3.6), and a period of consolidation and stability is now required in order to take maximum advantage of the basically sound institutional structure for development. Consolidation should eliminate duplication and wastage of scarce technical and managerial resources and provide for improved overall coordination. This is most of all required at the central ministry level, most particularly in agriculture where there is still overlap between four different ministries: MOA, MCTD, MSFD and RRC. The MOA is essentially concerned with peasant agriculture. A separate Ministry for State Farm Development exaggerates its importance and tends to result in disproportionate manpower and capital resources being allocated to it. The State Farms, in any case, should be self financing (section 12.8) and should preferably be accountable to a vice-minister within the MOA rather than to a separate Ministry. The need for closer coordination between IAR and the MOA extension services, and the WRDA and the MOA in irrigation development has already been emphasized in sections 12.6 and 12.3 respectively, as also has the need for the integration of conservation and agricultural research (section 11.5).

Generally, the following principles should form the basis of any further organizational improvements within government in order to achieve the aims of the Conservation-based Development Strategy:

(a) The different agencies with responsibilities concerning natural resources and their use should have clear mandates, and such mandates should specifically relate to the Conservation-based Development Strategy;

(b) There should be a permanent mechanism for joint consultation on and coordination of both the formulation and the implementation of major policies;

(c) Each agency should be required by statute to disclose and explain actions on Conservation-based Development periodically (e.g., before approval of its annual budget estimates).

With respect to institutional arrangements for implementation of this strategy, it is proposed to build on the arrangements already made for coordination of EHRS itself (Chapter 1). Basically it is proposed that the present EHRS coordinating committee be expanded to include representatives of other concerned Ministries not presently represented. The proposed Conservation-based Development Strategy inevitably cuts across sectors, so ministerial responsibilities and inter-ministerial coordination is essential. Inter-ministerial coordination within the GOE is a major responsibility of OPNCC. In view of this, and because of the overriding national importance of the Conservation-based Development Strategy, it is proposed that the major responsibility for coordination be transferred from the MOA to the OPNCC. This implies that the chairperson of the coordinating committee be a representative of the OPNCC, reporting directly to the Permanent Secretary of the OPNCC. The proposed coordinating committee should:

(i) combine all the necessary expertise;
(ii) be small enough to take rapid decisions;
(iii) have permanent access to sufficient authority.

The members of the committee not only contribute to technical discussions, but also represent their parent departments. In order to be able to do this they must keep them fully informed, and will need to discuss points on the agenda with their departments before meetings so that they are aware how far they can commit them to policies and programmes. The committee must be able to call on additional expertise

CHINA'S RAPID RURAL DEVELOPMENT THROUGH COMMUNITY SELF-RELIANCE

"The Chinese regard the people's commune as the basic organization of social power. In the circumstances of the small farmer, self-reliance must necessarily be conceived in community or organizational terms. Individually, the small farmer is too weak to respond to the increasingly urgent calls for self-reliance and participation. The small farmer needs solidarity and strength, through organization, in a peer group. Only through organization can the small farmer acquire both responsibility and power ... The Chinese experience provides two points:

(1) that transfer of power and responsibility to the peasantry, through peasant organizations, is not necessarily a zero-sum transaction, i.e., what the people gain, the leadership loses. On the contrary, the transfer can be mutually reinforcing.

(2) that leadership which claims to represent the majority of its people (the peasants) should be responsive to the needs of that majority for power, responsibility, self-reliance and participation. It is this identity of interests between leadership and people that is one of the most striking characteristics of Maoist China."

Source: FAO 1978c.

as required, and will set up sub-committees charged with specific tasks from time to time. The terms of reference of the committee should be to make recommendations:

(i) on priorities in updating, revising, coordinating, implementing, supervising and monitoring the Conservation-based Development Strategy;

(ii) as to the creation and allocation of resources for projects and programmes within the Strategy; and

(iii) monitor other development activities, programmes and policies for their impact on conservation.

Regional committees can also be set up, under the guidance of the national committee. These Regional Committees, if not the National Committee, should preferably include representatives of AEPA and REWA.

Institutional arrangements are just as important at the grass roots level. While the GOE's achievements in establishing the PAs all over Ethiopia have been remarkable (section 3.6), it remains essential to capitalize on this institutional structure by supporting the strengthening of the PAs and their significant and effective involvement in government and to resist the ever-present temptation of authoritarianism. Education and training are essential elements in the strengthening and operation of the PA network. It was concluded in Part II that the involvement of the PAs has resulted in replication of conservation works on a much wider scale than would otherwise have been possible. The PAs have provided the means for massive peasant mobilisation, but this has so far been largely confined to the construction of conservation works. The PA institutional structure provides an exceptional opportunity for much fuller peasant participation in their development.

15.3.2 Participation

The ultimate definition of development relates to development of the capacity of people to improve their lives. Development essentially relates to people, and the more people participate in development, the more replicable and more sustained it can become. Participation in decisions affecting one's own welfare is increasingly recognized as a human right. But it can also make an enormous contribution to the effectiveness and equity of rural development and agricultural programmes. Administration has too frequently been excessively urban-based and insensitive to the needs of the rural poor. Local administrators often have little scope for initiative in adapting centrally decided programmes to local circumstances, are reluctant to report problems to superiors, and adopt paternalistic attitudes toward the peasants. As a result, development programmes often go wrong because they are based on inadequate information and have little local support, and there is no effective mechanism for feedback, to indicate whether they are in fact benefitting the supposed beneficiaries. A plan that has been put before the people is less likely to contain hidden pitfalls, and with local cooperation project implementation should run much more smoothly and effectively. Participation tends to build public confidence and improve the public's understanding of development objectives. It provides additional data for planners and policy makers. Public participation is particularly important in rural development, for without the active involvement of the people - including identification by them of the problems that most need tackling and how to deal with them - little can be achieved. (See box for a list of the advantages of popular participation in rural areas.) Without participation there is too great a danger that the strategy will remain a paper plan - possible leading to coerced efforts at development - of marginal benefit to the people of the Highlands. The major themes of this Strategy have to be discussed with the people so that they can be developed further and implemented by them and for them. A participatory approach is fundamental to sustain real development in the Highlands.

ADVANTAGES OF PEASANT PARTICIPATION

More information is required about local needs, problems, capabilities and experience; effective planning and implementation require specific information of the sort that only local people can provide efficiently. Resulting plans are more realistic. Local people who have been involved in planning are more likely to contribute labour, land and materials for implementation, which will be smoother and quicker. Skills for planning, management and monitoring can be developed in the rural sector to complement those of central government. Integration of activities and services will be more effective and complete. Maintenance of investments in roads, terraces, buildings and other facilities is usually better where local people have been consulted and involved in their construction. Giving a meaningful role to peasants should build local confidence and capacity for self-help. By demonstrating that the central government is interested in discovering and meeting needs which rural people feel, not simply in imposing decisions on them, it can enhance political support and cohesion.

Source: Adapted from: "Review and analysis of agrarian reform and rural development in the developing countries since the mid-1960s." WCARRD/INF3, 1979, FAO, Rome.

The importance of increased popular participation in the planning, implementation and reviewing of development has been recognized by the GOE:

> "As has been reiterated time and again, the prerequisite for meeting the social needs of our society is economic development. And to achieve this it is essential, as I have indicated earlier, to strengthen in particular the participation of the masses." (COPWE, p. 65.)

> "The building of a socialist society requires the conscious participation of the masses in the country's economic, political and social activities." (WPE 1984.)

The importance of popular participation is also recognized, albeit more implicitly, by peasants themselves. The EHRS Sociological Survey found that the peasants appreciated much more those activities which they themselves had helped to plan and in which they had participated voluntarily. The occasional - but generally infrequent - resort to coercion is very much resented by peasants (Chapter 8). Much more common is the confinement of participation to the implementation of projects, as opposed to their planning and monitoring. In a survey carried out by the IDR, nearly 75 percent of the peasants indicated that they were rarely or never asked to participate in planning the activities of their PAs (IDR 1983). Much more needs to be done to increase the genuine and effective participation of peasants in development processes. Government planning and procedures generally remain rather hierarchical even though a potentially participatory institutional base has been successfully established. It takes time, patience, and a lot of effort to change hierarchical procedures which have developed over past centuries. But having successfully established an appropriate institutional base, much more vigorous efforts are now required to utilize that base to give development a truly participatory character.

It is recognized that many basic decisions have ultimately to be taken by central government, but in order to collect the information required for much basic decision making, as well as to provide for the effective implementation of decisions, there has to be some delegation of government and planning. This, and the desire for more significant popular participation, and the need to align plans, policies and projects more closely with the specific potential, constraints and priorities of the diverse areas of the Highlands, provides the rationale for the GOE's policy of decentralisation. 1/

Decentralisation of governmental functions down to Wereda level should aim:

(1) to provide support for local UDA/PA planning initiatives by incorporating such initiatives into decision-making at the Wereda level; and

(2) to develop ways of monitoring plan performance, especially by the PAs/UDAs, REWAs, etc., perhaps through the establishment of Wereda development committees.

A major constraint to such decentralisation is the availability of sufficiently trained staff and funds, but much could be done with existing resources to establish systems for regular consultation between PAs and government at the Wereda level.

There is some truth in the observation that peasants are too weak to become effective partners in participatory planning. For this reason the Government already emphasizes peasant training and education aimed at making them relevant and effective partners in participatory

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1/ It also provides the rationale for disaggregation of the Highlands according to major agro-ecological zones and farming patterns as used in this report.

development. There is the need to train PA and UDA leaders in the human and managerial skills required for true participation. Education was cited by peasants in the EHRS Sociological Survey as being by far the most important means to increase participation. Training should be aimed at equipping peasants with the means of understanding more fully the technicalities of their problems and possible solutions. For example, in conservation and reclamation, while it may be possible to draw up a generalized strategy at the national level (the purposes of this report), it is much less likely that detailed recommendations for each area or each zone will be appropriate. These have to be site-specific and the sites concerned have to be visited. It is not possible even for those at the center who are responsible for the implementation of this Strategy to visit all such sites. Instead, detailed planning has to be decentralized to as low a level as practicable, and training is required to support this decentralisation. The WPE should become a strong and growing force for these efforts. Effective and meaningful participation is one of the pillars on which Ethiopian socialism can be built.

An early practical step which could be taken to promote both peasant participation and also the detailed planning for implementation of this Strategy is to ask all PAs to prepare an inventory of both the physical and human resources within their boundaries (using some prepared guidelines and format), and to draw up a list identifying their own needs and priorities. 1/ This list and inventory could subsequently be used for drawing up local action plans by the PA leaders in consultation with special meetings of all the peasants and with required assistance from Government. They could also assist in the development of local monitoring systems. The data generated by such surveys should be very valuable for successively higher levels of planning. A pilot project should first be started to work out a model for replication in the rest of the Highlands.

15.3.3 Motivation

The importance of providing adequate motivation to the primary "implementors" of development, i.e., the peasants, is emphasized in the GOE's TYPP:

> "The expanding and strengthening of socialist production relations will be further aided by the gradual articulation and implementation of a system of rewards in all sectors of the economy in accordance with the socialist principle 'from each

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1/ It has been shown in many African countries that persons with basic primary education (and preferably at least some secondary education) are able to conduct such surveys without undue difficulty, provided they have guidance (EHRS WP 4).

"'according to his ability and to each according to his work'. A system of moral and material incentives would be worked out to encourage socialist emulation and to release the creative potential of workers." (WPE 1984.)

Several proposals for increasing motivation have already been made in earlier sections of this report, including those concerned with land tenure (section 11.6), marketing and pricing (section 12.7), and improved popular participation. One of the basic purposes of seeking to integrate conservation and development through Conservation-based Development is to strenghthen the motivation to conserve land (section 10.4). It has also been suggested that priority in the provision of social services and scarce consumer goods be given to those PAs who perform best in increasing their marketed agricultural production.

It has been suggested in section 13.3 that much more could be achieved throughout the Highlands by labour-intensive public works during agricultural slack seasons. Section 12.8 has emphasized the importance of labour mobilisation through cooperation for such works. One means of giving incentive to such works is FFW, but this is generally only relevant in food deficit areas (LPCZ and parts of the HPCZ). Furthermore, the FFW programme has been largely confined to conservation and reclamation works. Accordingly, it has been suggested (section 13.3) that both the range of activities undertaken by FFW be greatly expanded in food deficit areas (taking care to avoid creating disincentives to local food production by minimizing geographical location), and that analogous programmes (e.g., fertilizers or improved seeds for work) be launched in food surplus areas. "Voluntary" public works also need further encouragement but again they have been largely confined to conservation works. To encourage both the scale and range of self-help community works, consideration should be given to rewarding participating peasants according to the quantity and quality of their labour. Rewards may take the form of work points analogous to those given in the PCs or even credits for taxation (section 13.7).

15.3.4 Manpower

The rate of implementation of the Strategy will depend to a large extent on the competence and devotion of staff in government service. This is especially true of Ethiopia, where the public sector is particularly prominent in the country's development activities. The general problems associated with shortages of skilled manpower and weak incentives have been addressed in Part I, which also made some suggestions for overcoming them (section 4.10). The boosting of staff morale and competence is an essential component of the Conservation-based Development Strategy. Specific proposals for training and career development have been made for various sectors in the preceding chapters of this volume, and attention has already been drawn to the important potential role of technical assistance in this area.

As with cost estimation, it is considered premature at this broad level of strategy planning to attempt any quantitative aggregation of total manpower and training requirements for all the alternative strategy options presented. This should be attempted after the range of options for further study has been narrowed by Government decisions and in light of reactions to the proposed Strategy. Such an exercise should form an essential ingredient of follow-up planning. Any such estimates of manpower and training requirements should be carefully compared with already existing estimates for different sectors - e.g., requirements for soil and water conservation have been estimated by Gugral (1984).

In line with the proposals made in section 14.2, it is suggested that special attention be paid to the training of women in each sector as well as in general leadership and management. The training and motivation of women leaders and woman power is important in mobilising rural and urban women to participate more fully, both as actors and beneficiaries in the development of their nation.

15.4 MONITORING AND EVALUATION

The ultimate purpose - and thus, test - of the proposed strategy will be its impact in accelerating development while conserving the nation's resource base. It is important, both for overseeing or managing implementation of the strategy, as well as for maintaining its rolling character, that progress is regularly and systematically reviewed against the programme (monitoring), and that all the actions to implement the strategy are periodically assessed (evaluation). Both monitoring and evaluation (M&E) are means of linking and mutually reinforcing plans, programmes, projects and policies. Monitoring should be viewed as an integral component of management and closely and continuously associated with it. M&E can suggest the need for changes in design, implementation and even short-run objectives. Those in charge of implementing the strategy and its components should have the authority and the capacity to respond to the needs for change in light of the changing priorities and preferences of the participants. Popular participation in monitoring and evaluation, both through formal representation and specially designed surveys, are important means for giving the strategy programmes a truely participatory character and making the institutions responsible for implementing the strategy more accountable to the populations they serve. Evaluation is necessary whenever monitoring reveals discrepancies, to periodically review the continued relevance of the original objectives and design of the strategy and its components to ascertain the need for updating them, to compare the cost-effectiveness of different components and adjust their relative importance accordingly.

In addition to the monitoring of direct input and output indicators (both quantity and quality), under the Conservation-based Development Stragegy, the following should be monitored:

(a) the wealth and income of the people concerned;
(b) their health and nutrition;
(c) the environment, including such degradation trends as soil depth, deforestation, livestock feed base; and
(d) community participation.

Indicators should be selected for each of these, keeping the implied work loads to the minimum necessary to achieve effective monitoring. Indicators should be simple, measurable, accurate, timely, cost-effective, appropriate to the objectives and feasible in the particular practical circumstances. Rapid rural appraisal methods should be used whenever feasible (e.g., upper arm circumference measurements for child nutrition, tin roofs for wealth, etc.).

Monitoring of the ecosystem is particularly important in the Ethiopian Highlands, increasingly threated by severe, sometimes irreversible degradation. Such monitoring should draw attention to measures or circumstances likely to give rise to degradation and should track the rate, extent, causes and effects of degradation. In addition to the soil's water-holding capacity, vegetative cover, etc., the water sources, forests and the like could be included in a comprehensive environmental monitoring system. Technical aspects of the monitoring of actual and potential land degradation have recently been studied by FAO, UNEP, WHO and UNESCO (see FAO/UNEP 1983a and b). These studies are concerned with the methods of assessing both present and potential degradation. The term "monitoring" implies not only inspection, but inspection at frequent intervals. In some places, severe damage can be caused by single storms of exceptional intensity, or a single rainfall season. With remote sensing methods, complementary measures such as those employed on the ground by the SCRP on its sites, and/or river sediment loads, should be used in conjunction. Specific proposals and costings should be formulated by a specialist consultant in this field, once the need for such a monitoring system has been accepted in principle by the Government.

Environmental monitoring systems may usefully be combined with an improved drought/famine early-warning system. Simple models are available to predict the moisture available for plant growth using standard meteorological data. Since moisture availability is directly related to crop production, such models may make it possible ultimately to give precise and reliable early warning of crop shortfalls. Henricksen and Durkon's recent analyses based on existing meteorological data for the Ethiopian Highlands suggest that short length-of-growing-periods correlate well with the recorded incidence of drought and famine. Historically, severe famine periods have been associated with a sequence of two or more years in which the short rains failed and the subsequent main-season growing periods were so short that crop failure was inevitable. 1/ Again, one of the recommendations of the GOE/WB mission investigating the effects of the 1972-74 drought remains valid today:

> "Although such disasters cannot be prevented, it should be possible to obtain better early warning of their probability in future by, for instance, the satellite stations observing the world's climate from the stratosphere. Ethiopia should, accordingly, subscribe to, and vigorously take part in, any worldwide network of climatic observations that may be necessary. She already has facilities for data exchange along these lines, but these could be stepped up with advantage. Her own network of meteorological stations and records could also be greatly improved, though this depends also on improved communications." (GOE/WB 1974.)

Monitoring and evaluation will inevitably require a baseline from which subsequent positive and negative effects can be evaluated. However, care must be taken in designing the required baseline survey to ensure that it is not so general that the indicators therein could be affected by many other external factors. This calls for precise indicators to be identified after the components of the strategy have been agreed to, and a short specific rapid rural appraisal type of survey supplemented by aerial photography and satellite imagery to provide the baseline values for these indicators. Some suggestions for a participatory approach to establishing a baseline and subsequent monitoring have been made earlier in this chapter and are elaborated on in EHRS WP 4. Another possible component of the proposed monitoring system could be the establishment of a formal mechanism for receiving complaints and suggestions about Conservation-based Development activities; a kind of "ombudsman" function. This should also be considered during or after evaluation of this strategy by the Government.

In designing an M&E system for the implementation of the strategy and its components, particular attention should be paid to considerations of cost-effectiveness and flexibility. Flexibility is required in order to allow the system to evolve with the needs and capacity of implementation - e.g., those of the management of component projects. Cost-effectiveness considerations have often been under-emphasized in the design of M&E systems, and much can be learned from experiences with M&E systems in other countries. A review by FAO draws attention to lessons from Nigeria and Malawi:

1/ Henrickson, B. and Durkon, J. (1985 in prepn.): Moisture availability, cropping period and the prospects for early warning of famine in Ethiopia. ILCA, Addis Ababa.

Nigeria

"The system has generated a large amount of data, the processing and analysis of which has been subject to long delays because of computing and staffing difficulties. The processed data that have been transmitted to project management have, however, been unrequired, commonly disbelieved and invariably unused. On-going evaluation by project management seems, therefore, to be undertaken with little regard to the information provided by the large monitoring system. It is suggested that this unfortunate consequence is probably the outcome of the independent status of the monitoring system and the non-participation of project management in the design and operation of that system."

Malawi

"Only parts of this complex, comprehensive monitoring system have, therefore, proved of value to project staff. However, over a long period of operation, few changes have been made to the design and operation of the monitoring system in order to increase its cost-effectiveness. Nor have attempts to explain to project staff how to make better use of the monitoring system, been successful. The result has been the generation, at some cost, of much unutilised data." (FAO 1981d.)

It is suggested that the M&E system, along with regular progress reports, should feed into an annual report on Conservation-based Development in Ethiopia, analogous to the World Bank's Annual Development Report. The report should summarize the progress of activities and make recommendations for the future. To give the strategy for Conservation-based Development the attention it needs, consideration should be given to preparing such a report for the Head of State to present annually to the WPE Congress or similar forum.

Reference has already been made to the need for a specialist consultant to make more specific proposals for the design of an environmental monitoring system. Such a consultancy might be integrated into a broader consultancy to design a flexible, cost-effective, and popular-participatory M&E system for the whole strategy, after the major components and phasing of the strategy have been agreed on. Such a consultancy (probably consisting of at least two specialists) should provide satisfactory answers to the following questions:

"(i) What are the purposes of the monitoring and evaluation activity?

(ii) What types of information should be collected?

(iii) How will the information be collected?

"(iv) What methods of analysis will be used?

(v) To whom will the monitoring/evaluation findings be presented?

(vi) How will they be used?

(vii) How will the monitoring/evaluation system be organized?

(viii) Which agency, institute or organizational unit will be responsible?

(ix) How many and what type of staff will be involved?

(x) What is the cost of monitoring and evaluation, and how much of the total project costs should be allocated to the M&E systems?

(xi) How should monitoring and evaluation activities be financed?

(xii) What are the problems and lessons likely to be learned from implementation of the monitoring and evaluation system?"

(FAO 1981d.)

Finally, for evaluation in particular, it is considered that ample provision should be made for periodic involvement of external as well as national consultants, to bring new ideas and contribute to the continuous evolution of the strategy. The preparation of the Strategy, as presented in this report, has gained much from the short visits of a wide range of experienced specialists, Ethiopians and others.

Annex 1

PROFESSIONAL PERSONNEL CONTRIBUTING TO THE EHRS

Post	Incumbent	Dates	Total man-months up to 30-6-85
A. CORE TEAM			
FAO staff			
Team Leader/Agricultural Planner	M. Constable	May '83 to June '85	25
Agronomist	P.E. Cloutier	Oct. '83 to Dec. '84	14
Rangelands and Agro-forestry Specialist	A.C. Archer	Sept. '83 to Aug. '84	12
Soil & Water Conservation Eng.	R.B. Ibarra	July '83 to June '84	12
Agricultural Economist	W. Aggrey-Mensah	Sept.'83 to June '85	21
Associate Expert	P. de Keizer	Mar. '84 to June '85	15
Associate Expert	G. Possio	June '84 to June '85	12
		Total FAO	111
GOE staff			
Settlement Officer	Yibrah Hagos	Aug. '83 to June '85	22
Agronomist	Dejene Alemayehu	Aug. '83 to June '85	22
Livestock Specialist	Solomon Kebede	Aug. '83 to June '85	22
Agricultural Economist	Kassa Lakew	Oct. '83 to June '85	20
Sociologist	Simon Adebo	Aug. '83 to June '85	22
Conservation Engineer	Yeshinegus Adadseged	Nov. '83 to Feb. '85	14
		Total GOE	122
		Total all team	233

Post	Incumbent	Dates	Total man-months up to 30-6-85
B. SHORT-TERM PROFESSIONAL INPUTS AND CONSULTANTS			
Agriculture	C. Tagoe	July to Oct. '83	2.5
Soil Formation	H. Hurni	Sept. to Nov. '83	2
Sociological Survey	Institute of Dev't Research, University (3 professionals)	Aug. to Dec. '83	12
Sociology	Prof. J. Gay	Nov. to Dec. '83	1.5
Resettlement	Joint ECA/FAO Div. (4 professionals)	Oct. to Dec. '83	4
	R. Bishop	June 1984	1
	J. Colaris	Jan. to April '85	3
Transport	Bahre Gessesse	Nov. '83 to Dec. '84	1.5
Livestock	Prof. H. Jahnke	Oct. '83 to Dec. '83	3
Population	Dept. of Economics, University (2 professionals)	Oct. '83 to Feb. '84	3
Irrigation	P. Goorian	Dec. '83 to Feb. '84	1
	R. Hewett and J. Semple	Sept. '83 to Nov. '84	4
Macro-economy	Joint ECA/FAO Div. (3 professionals)	Jan. '84 to Apr. '84	5
Degradation assessment	R. Barber	Jan. '84 to May '84	2
	C. Wright	June '84 to July '84	2
Conservation	D. Thomas	June '84 to Sept. '84	2.5
Forestry	G. Booth	Feb. '85 to Mar. '85	1.5
Advisors	Prof. Belshaw and T. Jackson	Nov. '84 to Dec. '84	1.5
Editor	J. Dalton (part-time)	Jan. '85 to May '85	3
Evaluation Mission		Aug. '85	3
	Total short-term professional inputs		59
	TOTAL		292

Annex 2

EHRS REPORTS

Reports prepared by the FAO/GOE team preparing the Ethiopian Highlands Reclamation Study under project UTF/ETH/037/ETH may be grouped as follows:

(a) Project Inception Report, Progress Reports and Terminal Report - (all in blue covers)

- Inception Report (providing details of the agreed project objectives, work plan, inputs, outputs and operations)	December 1983
- First Progress Report - covering the period June to December 1983	January 1984
- Second Progress Report - covering the period January to June 1984	August 1984
- Third Progress Report - covering the period July to December 1984	
- Project Terminal Report	

(b) The EHRS Strategy Report - first draft (in yellow covers)

- Part I:	Resources for rural development	May 1984
- Part II:	The degradation of resources and an evaluation of actions to combat it	December 1984
- Part III:	Development Strategy	May 1985
- Annexes		May 1985
- Executive Summary		October 1985

(c) EHRS Working Papers (in green covers).
These, together with many other reports, analyses and data, provide the basis for the EHRS Strategy Report. The following table lists EHRS working papers.

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List of Project Working Papers Completed

	Subject	Author (primary)	Completion dates
1.	A tentative review of agriculture in the Highlands	C. Tagoe	Nov. 1983
2.	Soil formation rates in Ethiopia	H. Hurni	Nov. 1983
3.	Assessment of the causes, severity, extent and probable consequences of degradation	C. Wright	July 1984
4.	Report on the Sociological Survey and Sociological Considerations in preparing a development strategy	Institute of Dev't. Research and J. Gay	Jan. 1984
5.	An Evaluation of the Ethiopian Resettlement Programme	R. Bishop	July 1984
6.	A strategy for developing transportation in the Highlands of Ethiopia	Bahre Gessesse	Mar. 1984
7.	An assessment of the recent past and present livestock situation in the framework of the Ethiopian Highlands Reclamation Study	H. Jahnke	Dec. 1983
8.	Present population of the Ethiopian Highlands and population up to 2000	Getachew Yoseph	Mar. 1984
9.	A macro-economic survey of the Ethiopian Highlands	P. Packard Estifanos, P. Oben	Apr. 1984
10.	An assessment of the current situation in the rangelands and forestlands of the Ethiopian Highlands	A.C. Archer	Feb. 1984
11.	Agricultural assessment of the present situation in the Highlands of Ethiopia	P. Cloutier	Feb. 1984
12.	Degradation of the Ethiopian Highlands and actions to combat it: Economic implications, costs and benefits	W. Aggrey-Mensah	Nov. 1984

	Subject	Author (primary)	Completion date
13.	Soil and water conservation of the Ethiopian Highlands: assessment of requirements and evaluation of activities	D. Thomas	July 1984
14.	Agriculture - Strategies for reclamation and development	P. Cloutier	Dec. 1984
15.	Strategy proposals for the development of rangelands and forestry in the Highlands of Ethiopia	A.C. Archer	Sept. 1984
16.	Livestock development within an overall development and reclamation strategy for the Highlands of Ethiopia	H. Jahnke	Apr. 1984
17.	Resources for rural development situation (Strategy Report - draft Part I)	M. Constable	May 1984
18.	Cost-benefit analyses of proposed strategies for developing and reclaiming the Highlands	W. Aggrey-Mensah	Mar. 1985
19.	Resource degradation and evaluation of actions to combat it (Strategy Report - draft Part II)	M. Constable	Dec. 1984
20.	The development of irrigation in the Highlands of Ethiopia	P. Goorian	Feb. 1984
21.	A review of the Sirinka catchment rehabilitation pilot project	W. Aggrey-Mensah	Apr. 1984
22.	Soil conservation in Arjo	R. Ibarra	Apr. 1984
23.	An assessment of the dominant soil degradation processes	R. Barber	May 1984
24.	Highlands development strategy (Strategy Report - draft Part III)	M. Constable	May 1985
25.	Conservation Strategy	D. Thomas	Sept. 1984
26.	Irrigation Development	R. Hewett/J. Semple	Nov. 1984
27.	Forestry Strategies	G. Booth	Mar. 1985
28.	Resettlement Strategy Proposals	J. Colaris	Apr. 1985

Annex 3

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Annex 4

MAJOR PHYSICAL, SOCIAL AND ECONOMIC CHARACTERISTICS BY ZONE; LAND USE, CROPPING PATTERNS AND CALENDARS; AND FARM MODELS BY SUB-ZONE

1. INTRODUCTION

The Ethiopian Highlands study area has been divided into three zones and further subdivided into sub-zones according to three altitude belts in each zone (section 2.1). These belts follow traditional Ethiopian categories. The resulting nine sub-zones are fairly homogeneous for growing conditions, especially for length of growing period. The diagrams and tables presented in this Annex represent the most comprehensive attempt at a quantitative description of the Ethiopian Highlands farming patterns. Data generated by the EHRS has complemented data from several other sources, especially the FAO/GOE "Assistance to Land Use Planning" project (ETH/82/010), and the Central Statistics Office (CSO) annual sample surveys.

From the land use information and cropping patterns of the sub-zones, farm "models" have been derived which may be considered as indicative of the farming patterns in the areas. It must be stressed, however, that the patterns are the result of "distributing" estimates made for Regions or Awrajas to the sub-zones of EHRS. The models, profiles, therefore are arithmetic mean patterns, not observed farming systems. Indeed, there is no information on the standard deviations, skewness, or modal patterns associated with these arithmetic means.

There are also serious gaps and defects in some of the basic estimates which have been distributed. For instance, it has not been possible to get coherent information on the extent of fallow land, on the length of fallow periods, or even an operational definition of "fallow" as it may be found in Ethiopia. The field study of fallow in Ethiopia is a long overdue investigation which should start with the first preparation work for the follow-up projects.

Further, the CSO estimates of cropped area are probably significantly low, implying slightly smaller farm sizes (in hectares cropped) than seem plausible. On the other hand, the average crop yield estimates of the CSO series since 1979 certainly seem much too high. Consistently, for all the cereals and pulses, over the years and the Regions, CSO survey estimates of peasant yields seem to be 20 to 30 percent higher than yields found on control plots for trials, than yields used as baselines in project preparations, than the yields of the 1974/75-1978/79 surveys, or than those used as typical by the Institute of Agricultural Research in its Handbook. In the follow-up projects, these major uncertainties should be remedied by field studies of systems.

The farm models should therefore be seen as a first step toward the quantitative description of farming systems, which can and should be improved as more information is found. Despite the inadequacies, it is considered that the models are useful as broad indications of the different types of farming. In addition to the uses made of the models in the EHRS, 1/ such models, especially when confirmed or corrected by field surveys, can be useful for other policy analysis and planning for the agricultural sector.

2. LAND USE

The area and proportion of each major land use indicated in the tables and diagrams has been derived from the Land Use and Land Cover Map of Ethiopia, prepared by Odenyo (1983) on the basis of satellite imagery. This has been verified/modified by using aerial photographs. Fallow, failed and unreported crops have been grouped together with open grasslands because the imagery and photographs do not yet permit determining whether a particular parcel of land, often under grass, was cropped or fallow in the previous crop season or whether it was part of open grassland, and, if planted, whether any crop was actually harvested or failed. CSO figures provide estimates of the harvested area at the end of the main cropping season, when their annual crop survey is conducted. These do not take into account crop failures or previous cropping (if any) in the early season (belg) rains.

3. CROPPING PATTERNS AND CALENDARS

The cropping calendar diagramatically indicates period of planting and harvesting, while the cropping pattern depicts the relative importance of each crop in the farming model, i.e. in the sub-zone. The estimates of cropped areas, livestock numbers and production were derived from arithmetic means calculated from CSO data as described below. The tables of average farm inputs and outputs comprise the farm models. The cropping calendars, patterns and farm models, though based on imperfect data and necessarily crude methods, are considered generally illustrative of the farming systems in each altitudinal belt of the three major zones.

Determination of Crop Production

Using CSO data, the production of the various crops shown in the model was derived as follows:

1. Allocation of harvested area by crop to agro-ecological zones

   CSO provides Regional data on cropped (i.e. harvested) area by crop. These were allocated to the various agro-ecological zones, according to the area of each Region in each agro-ecological zone. For example, as 67% of Gonder region is in the LPCZ and 33% is in

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1/ See for example EHRS Working Papers 12 and 18.

the HPCZ, 67% of the harvested area of the particular crop in Gondar was allocated to the LPCZ, and 33% to the HPCZ. (The hypothesis is debatable but has had to be adopted given the inadequacy of the information.)

2. Allocation of harvested area of crop by altitudinal belts

The harvested area of each crop was allocated to the various altitudinal belts (which, together with the agro-ecological zones, determine the nine different farming patterns) on the basis of the altitudinal suitability of each crop, of the relative size of the area within the altitudinal belts in each agro-ecological zone, and of the field experience and judgement of project staff.

3. Determination of harvested area per farm

The total harvested area for each crop, as estimated in step 2 above, was divided by the number of farms in each sub-zone to determine the average area of that particular crop in the average farm. The number of farms in each sub-zone was derived on the assumption of an average family size of 4.5 persons (Source: CSO 1983) and from CSO population distribution patterns, pre-Census. CSO yield figures are considered to be surely on the high side. On the other hand, CSO harvested areas are also considered by many to be seriously under-estimated. However, CSO total national production figures are considered to be consistent with consumption estimates of the Ethiopian Nutritional Institute. The income estimates shown in the farm models might therefore be considered plausible, since downward adjustments in yields might be offset by upward revisions in area harvested and thus not significantly alter the level of average farm production on which the income estimates are based.

Post-harvest losses

A 10 percent post-harvest loss was assumed for all crops except the perennials. For grain-production totals, the cereal-equivalent of enset is put at 35 percent.

Crop prices

For cereal crops and pulses, Agricultural Marketing Corporation (AMC) prices paid to Service Cooperatives (SC's) for the year 1983/84 have been used as financial prices, which are taken to represent farm gate prices. 1/ The following are the estimated farm gate prices used:

1/ Official AMC prices are generally about 20-30% below free market prices. They could, therefore, be taken to approximate farm gate prices, which should be lower than the prevailing open market prices (WP12).

	AMC prices EB/quintal			Free market prices EB/quintal		Coffee Marketing Corporation prices EB/quintal	
Wheat	35	Millet	21	Enset	12	Coffee	250
Maize	24	Oats	30	Chat	140		
Sorghum	27	Oilseeds	48				
Teff	45	Pulses	31				
Barley	50						

Source: AMC and Coffee Marketing Corporation

Input costs

Seed costs have been calculated according to MOA's Agricultural Development Department (ADD) recommended seeding rates and to product prices shown in the table above. It has been assumed that the majority of farmers plant only local varieties. Animal costs have been calculated according to animal work requirements per ha. for each crop as estimated, in EHRS WP 11, Table A.3.2, and based on an estimated cost per animal-day of 1.5 EB. The latter estimation is based on the ox rental price, i.e., 3 EB/day for the work of a pair of oxen (ILCA, Bulletin No. 18, April 1984). No labour cost was inputed, since the farm model is intended to provide a measure of farm income, which is mostly a reward for family labour. (Some small part, of course, of farm income is a return to land and even capital.) Since 'hired' labour is prohibited by Proclamation, all labour is assumed to be provided by the farm family, or exchanged between farms at no cost. The number of man-days spent on cultivation and other farming activities has been based on the labour requirements estimated in EHRS WP 11, Table A.3.3. Hence the net crop return per man-day has been computed dividing net income from crops by total mandays used in crop farming operations. Farm income is net of variable costs for annual crops, but costs of perennial crops, and of livestock operations have had to be ignored because information is lacking.

Livestock feed balance

The livestock feed balance compares the livestock carrying capacity to the actual stocking in each farming pattern. The total carrying capacity in each farming sub-zone is calculated as follows:

a) The area of those land uses which are sources of feed is multiplied by an estimate of the corresponding feed yield (EHRS WP 14) to obtain the total production, expressed in tons of dry matter (DM). (This estimate admittedly is affected by the difficulty in distinguishing between 'fallow' and other grazed areas/open grasslands.)

b) The total available feed thus derived is then divided by the animal feed requirements per TLU (2.28 tons DM/TLU/year, i.e.

6.25 kgs/TLU/day), to obtain the carrying capacity (cc) for the farming system, i.e., the number of TLU's that can be sustained in that area, at normal productivity.

By comparing the actual stocking to the total carrying capacity for the farming system, the sub-zone can be described as either over-stocked or under-stocked.

Determination of Livestock Production

Livestock data are less comprehensive than crop data, and there is not the same critical limitation imposed by altitude on livestock. However, altitudinal variations can be identified. For example, it is know that sheep are relatively more important at higher altitudes and goats more important at lower elevations. Data used for developing the livestock models were derived from various sources. The major source is CPSC data on regional distribution of livestock in Ethiopia (1982).

A second source of data was the estimates of cattle, sheep and goats in each administrative Awraja of Ethiopia prepared by AFDA. The other source of information was estimates on the proportion of national livestock in the Ethiopian Highlands made by PADEP officers. All these data/estimates were interrelated, updated, and elaborated as required by the EHRS team.

Livestock number per farm

The livestock numbers for each farming system thus determined are divided by the number of farm families in the zone to obtain the livestock numbers of each family, which are shown in the farm models. For the cattle herd composition, the proportion of oxen ranges from 25 to 30 percent, depending on draught requirements (e.g., lower requirements in the zone where hoe cultivation is widespread). The proportion of cows in the total herd various inversely to that of oxen, that is, ranging from 25% to 35%.

Livestock productivities

Cattle productivity in terms of beef is based on an average offtake rate of 6%, which, assuming an average liveweight per head of 175 kgs (1 head = 0.7 TLU), gives a beef production per head of 10.5 kgs/year. Meat producitivy from sheep and goats is based on an average offtake of 33 percent which, assuming an average liveweight per head of 25 kgs (1 head = 0.1 TLU) gives a meat production per head of 8.25 kgs/year. Milk productivity from cows assumes a total yield per lactation of 200 kgs net of requirement for suckling calves, and a calving rate of 45%. Hence the average yield per cow is 90 kgs per year.

The above productivities were estimated in EHRS WP 7 as representative of the Highlands. Although actual survey data are lacking, it is likely that differences in productivities exist among agro-ecological zones and altitudinal belts, due to factors such as climate, health, genetics and nutrition. The calculated feed balances provide some information on the average nutritional status of livestock in each farming system (i.e. whether livestock on the average are eating less or more than they require for average production). The major limitation of feed balances is that they compare annual requirements to annual production, while the strong seasonal pattern of feed availability involves periods of nutritional stress and periods of excess of feed. Notwithstanding such limitations, animal productivities were differentiated to allow for differences in feed availability in the various farming zones, according to the following assumptions:

a) if the balance shows a deficit of X% of feed requirements, the consequent decrease in productivities will be:

   40% of X% if X ` 15

   60% of X% if X ¨ 15

   In other words, the percentage decrease in productivity is always lower than the percentage feed deficit, due to the fact that the livestock are able to adjust to nutritional stresses and to take advantage of periods of good feed availability;

b) If the feed balance shows a surplus of Y% of feed requriements, the consequent increase in productivities will be:

   30% of Y% if Y ` 30

   20% of Y% if Y ¨ 30

   If Y exceeds 50, then it will be considered to be equal to 50 (i.e. in the calculations the feed surplus is in any case considered not to exceed 50%). In other words, the percentage increase in productivity is always lower than the percentage feed surplus, due to the fact that local zebu breeds are genetically unable to substantially increase production if better fed. Where the feed surplus exceeds 50% it is assumed that animals are not able to obtain any additional gain above those obtained at the 50% feed surplus level. In such cases, part of the feed resources would remain unexploited.

Potential dung availability is assumed to be 1 000 kgs/TLU/year (EHRS WP 7). Only cattle dung is assumed to be collected, and in different proportions in each agro-ecological zone depending on fuelwood supply (i.e. 30%, 50% and 80% is assumed to be collected in the HPPZ, HPCZ and LPCZ respectively). Since a cattle head represents 0.7 of a TLU, the annual protential yield per cattle head is 700 kgs.

Animal Product Prices

The following prices have been assumed for animal products (EHRS WP 7):

Product	Price (EB/kg)
Beef, sheep and goat meat	1.00
Milk	0.45
Dung	0.02

MAJOR PHYSICAL AND SOCIO-ECONOMIC CHARACTERISTICS OF THE HIGHLANDS: 1985

Zone	Regions Covered	Major Soils	'000 km2	Slope %	'000 km2	Length of growing period days	'000 km2	Natural Vegetation	Land Use 1/	'000 km2	Other distinguishing characteristics	Total population 2/ million	Rural population density 3/ per km2	Net grain productn. per cap. 4/ km2	Farm Income per cap. 5/ EB
	Sidamo, G.Gofa	Nitosol	56	0-8	15	< 90	-	Forest: Juniperus; broadleaf;	Cropland	19	Perennial crops				
	SW Shewa, Welega,	Acrisol	46	8-16	31	90-150	2	woodland, shrub-	Grasslands	77	(coffee, encet,				
HPP	except NE,	Vertisol	11	16-30	39	150-180	3	woodland, with	Wood	19	(chat) & tubers,				
	Illubabor, Kefa	Others	31	> 30	59	180-240	27	bamboo & wild	Forest	12	handhoe tillage;				
				Total	144	> 240	112	coffee	Waste	17	warmer, humid				
										144	climate	10.9	82	193	113
	S Gondar, Gojam,	Vertisol	32	0-8	44	< 90	-	Broadleaf Forest	Cropland	21	Cereals; Livestock;				
	N & Cent. Shewa,	Luvisol	23	8-16	22	90-150	-	depleted, esp. of	Grasslands	85	ox tillage; intermediate climate				
HPC	Arsi except Rift,	Nitosol	20	16-30	28	150-180	7	Arundinaria,	Wood/shrub	9					
	Harrar & E Welo	Others	58	> 30	39	180-240	69	Podocarpus &	Forest	2					
	highlands, NW Bale,			Total	133	> 240	57	Juniperus;	Waste	15					
	NE Wellega							grassland		133		10.3	66	326	122
	Eritrea, Trigray,	Cambisol	44	0-8	38	< 90	11	Savannah grassland and wood	Cropland	21	Cereals; livestock				
	Gondar except S,	Lithosol	22	8-16	25	90-150	50	lands (depleted)	Grasslands	101	ox tillage; colder				
LPC	W & C Welo,	Luvisol	21	16-30	42	150-180	34		Wood/shrub	9	& dryer climate;				
	N. Shewa & Arsi	Others	63	> 30	45	180-240	41		Forest	1	strong winds;				
	Rift & S Bale			Total	150	> 240	14		Waste	18	drought risks	11.3	73	236	66
	highland									150					
Below 1500 masl	Throughout highlands							Savannah grass; acacia woodland, dense low broadleaf, woodland		89		0.6	8		
Above 3000 masl	Throughout highlands							Sub-Afro Alpine heath, mixed broadleaf, Juniper & coniferous forest		20		1.5	62		
1500-	Highlands	Nitrosol	76	0-8	97	< 90	11		Cropland	61					
3000		Acrisol	46	8-16	78	90-150	52		Grasslands	263					
masl		Vertisol	43	18-30	109	150-180	44		Wood/shrub	37					
		Other	262	> 30	143	180-240	137		Forest	15					
				Total	427	> 240	183		Waste	50					
								Sub-total, 1500 to 3000 metres		427		32.5	74	245	99
								Grand total		536		34.6			

1/ Cropland is based on CSO "harvested". This is almost certainly substantially underestimated. "Grasslands" here includes "fallow" and failed crops, as well as grasslands proper.

2/ EHRS estimate 1985, total for highlands

3/ Per km2 of useful land, excluding "waste".

4/ Includes cereal-equivalent of pulses, and of enset and other starchy crops, at 35%. These foods are important only in the HPP zone.

5/ Net of fixed costs, and of variable costs for annual crops, and excluding cost of labour.

Source: Compiled by EHRS team.

MAJOR PHYSICAL AND SOCIO-ECONOMIC CHARACTERISTICS OF THE HPP ZONE
BY ALTITUDINAL BELT 1985

Altitude m.a.s.l.	Slope	'000 km^2	Major soil types	'000 km^2	Length of growing period days	'000 km^2	Land use 1/	'000 km^2	Total population 2/ '000	Rural pop. density km2 3/	Net grain prod. 4/ per cap. kg.	Net farm income 5/ per cap. EB
1500-2000	0-8	9	Nitosol	23	< 90	-	Cropland	10				
	8-16	4	Acrisol	17	90-150	1	Grasslands	39				
	26-30	19	Cambisol	10	150-180	2	Wood/shrub	6	6062	100	162	130
	> 30	34	Vertisol	10	180-240	16	Forest	3				
			Others	6	> 240	47	Waste	8				
Sub-total		66		66		66		66				
2000-2500	0-8	4	Nitosol	26	<90	-	Cropland	6				
	8-16	23	Acrisol	20	90-150	1	Grasslands	29	3431	61	227	94
	16-30	17	Luvisol	4	150-180	1	Wood/shrub	10				
	> 30	16	Lithosol	3	180-240	9	Forest	8				
			Others	7	> 240	49	Waste	7				
Sub-total		60		60		60		60				
2500-3000	0-8	2	Acrisol	9	<90	-	Cropland	3				
	8-16	4	Nitosol	7	90-150	-	Grasslands	9				
	16-30	3	Vertisol	1	150-180	2	Wood/shrub	3	1432	90	246	89
	> 30	9	Luvisol	1	180-240	16	Forest	1				
			Others	-			Waste	2				
Sub-total		18		18		18		18				
Zonal Total	0-8	15	Nitosol	56	< 90	-	Cropland	19	10925	82	193	113
	8-16	31	Acrisol	46	90-150	2	Grasslands	77				
	16-30	39	Cambisol	10	150-180	3	Wood/shrub	19				
	> 30	59	Vertisol	11	180-240	27	Forest	12				
			Others	21	> 240	112	Waste	17				
Grand Total		144		144		144		144				

1/ Cropland includes perennials, plus CSO "harvested" only.

Note: For other footnotes, see the corresponding footnotes on page 278.

MAJOR PHYSICAL AND SOCIO-ECONOMIC CHARACTERISTICS OF THE HPC ZONE
BY ALTITUDINAL BELT: 1985

Altitude m.a.s.l.	Slope	'000 km²	Major soil types	'000 km²	Length of growing period days	'000 km²	Land use 1/	'000 km²	Total population 2/ '000	Rural popula-density km2 3/	Net grain production per cap. 4/ kg.	Farm income 5/ per cap. EB
1500-2000	0-8	7	Vertisol	8	<90	-	Cropland	5				
	8-16	9	Nitosol	6	90-150	-	Grasslands	23				
	26-30	5	Cambisol	5	150-180	2	Wood/shrub	3				
	>30	15	Luvisol	5	180-240	22	Forest	1				
			Others	12	>240	12	Waste	4				
Sub-total		36		36		36		36	2473	72	298	120
2000-2500	0-8	25	Vertisol	14	<90	-	Cropland	11				
	8-16	9	Luvisol	13	90-150	-	Grasslands	42				
	16-30	15	Nitosol	10	150-180	5	Wood/shrub	4				
	>30	15	Phaesom	8	180-240	35	Forest	0				
			Others	19	>240	24	Waste	7				
Sub-total	35	64		64		64		64	5554	62	363	135
2500-3000	0-8	12	Vertisol	10	<90	-	Cropland	5				
	8-16	4	Luvisol	5	90-150	-	Grasslands	21				
	16-30	8	Nitosol	4	150-180	-	Wood/shrub	2				
	>30	9	Cambisol	3	180-240	12	Forest	1				
			Others	11	>240	21	Waste	4				
Sub-total	35	33		33	35	33		33	2272	69	293	101
Zonal Total	0-8	44	Vertisol	32	<90	-	Cropland	21	10299	66	326	122
	8-16	22	Nitosol	20	90-150	-	Grasslands	85				
	16-30	28	Cambisol	8	150-180	7	Wood/shrub	9				
	>30	39	Luvisol	23	180-240	69	Forest	2				
		---	Others	50	>240	57	Waste	15				
Grand Total		133		133		133		133				

1/ For all footnotes, see corresponding numbered footnotes on page 278.

MAJOR PHYSICAL AND SOCIO-ECONOMIC CHARACTERISTICS OF THE LPC ZONE
BY ALTITUDINAL BELT

Altitude m.a.s.l.	Slope %	'000 km^2	Major soil types	'000 km^2	Length of growing period days	'000 km^2	Land use 1/	'000 km^2	Total population 2/ '000	Rural pop. 3/ density km2	Net grain prod. 4/ per cap. kg.	Farm income 5/ per cap. EB
1500-2000	0-8	28	Cambisol	19	<90	9	Cropland	11				
	8-16	10	Luvisol	12	90-150	23	Grasslands	49				
	26-30	18	Lithosol	11	150-180	18	Woodedland	5				
	> 30	18	Vertisol	7	180-240	18	Forest	0				
			Others	25	> 240	6	Waste	9				
Sub-total	Total	74		74		74		74	6096	78	237	66
2000-2500	0-8	5	Cambisol	2	<90	2	Cropland	8				
	8-16	12	Luvisol	9	90-150	23	Grasslands	41				
	16-30	21	Lithosol	8	150-180	10	Woodedland	3				
	> 30	21	Vertisol	5	180-240	17	Forest	0	4067	68	237	68
			Others	14	> 240	7	Waste	7				
Sub-total	Total	59		59		59						
2500-3000	0-8	5	Cambisol	23	< 90	-	Cropland	2				
	8-16	3	Phaezem	5	90-150	4	Grasslands	11				
	16-30	3	Lithosol	3	150-180	6	Woodedland	1				
	> 30	6	Vertisol	2	180-240	6	Forest	1	1146	71	232	59
			Others	5	> 240	1	Waste	2				
Sub-total	Total	17		17		17		17				
Zonal Total	0-8	38	Cambisol	44	< 90	11	Cropland	21				
	8-16	25	Luvisol	21	90-150	50	Grasslands	101				
	16-30	42	Lithosol	22	150-180	34	Wood/shrub	9	11308	73	236	66
	> 30	45	Vertisol	14	180-240	41	Forest	1				
		---	Others	49	> 240	14	Waste	18				
Grand Total		150		150		150		150				

1/ For all footnotes, see corresponding numbered footnotes on page 278.

HPP ZONE 1500 - 2000 m.a.s.l.
MAJOR PHYSICAL, SOCIAL AND ECONOMIC CHARACTERISTICS

PHYSICAL '000 km^2

Land use		Major soils	
Harvested Crops	10	Nitosol	23
Fallow, failed & open grassland	14	Cambisol	10
		Acrisol	17
Wooded grassland	25	Vertisol	10
Shrub land	4	Luvisol	1
Wooded land	2	Lithosol	1
Forest	3	Phaeosem	-
Waste	8	Others	4

Total Land Area 66

Land slopes %		Length of growing period	
0-8	9	<90	-
8-16	4	90-150	1
16-30	19	150-180	2
> 30	34	180-240	16
		> 240	47

LIVESTOCK FEED BALANCE

Source of feed	Area '000 ha	Yield MT/ha	Carrying capacity '000 TLU
Crop residue and stubble	580	2.25	572
Fallow, failed & open grassland	1350	2.1	1218
Wooded grassland	2463	2.0	2161
Alpine grass land			
Wood/shrub-lands	556	1.5	366

	TLU's
Total carrying capacity	4317
Actual stock	1775
Difference: surplus	2542
deficit	-
As a percentage of the stocking	+143%

SOCIAL

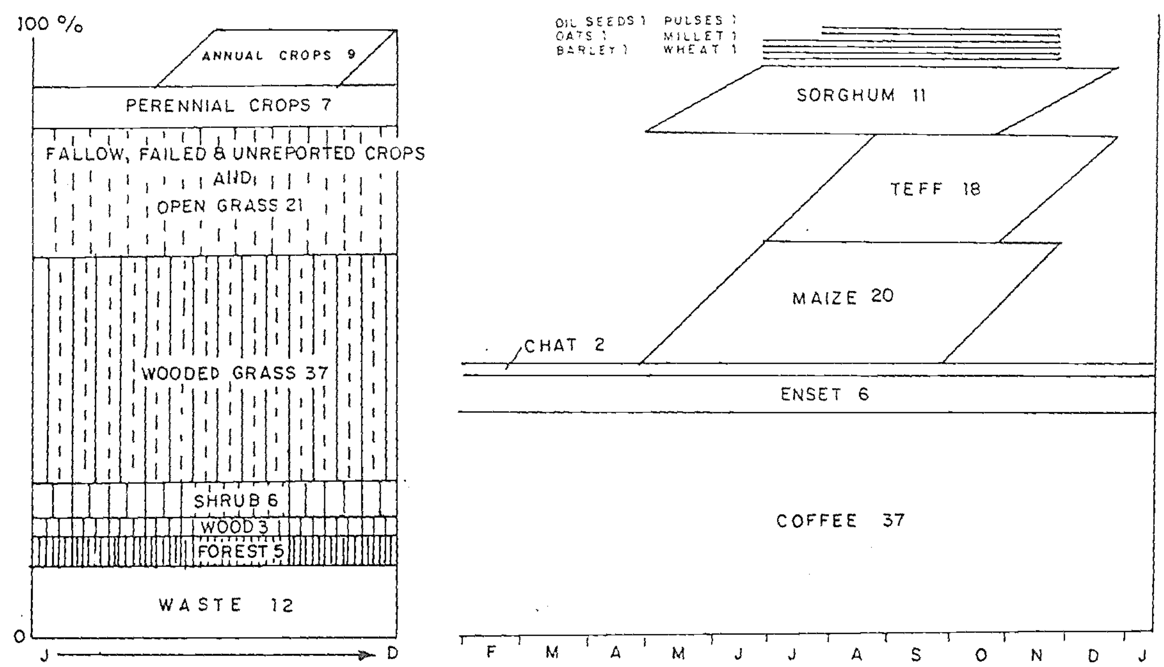
Population '000	Total	6062
	rural	5704
	urban	358
No.of rural families '000		1268
Rural population density on usable land	pers/km^2	100
Net grain production per capita/yr.kg		162

ECONOMIC

Annual income/farm EB	Livestock	68
	crop	515
	farm	583
Farm income per capita/yr		EB 130

LAND USE AND FARMING PATTERN BETWEEN 1500-2000 m.a.s.l. IN HPP ZONE IN 1985

LAND USE | CROPPING PATTERN AND CALENDAR



FARM MODEL

	Unit	Cattle	Sheep	Goats	Equines					
LIVESTOCK	no.	1.7	0.6	1.0	0.1	Draught ox no.		0.4	Total (TLU's)	1.4
Meat &	kg	19.7	5.5	9.1	-					
hide	EB	19.7	5.5	9.1	-	Dung	kg	357		
Milk	kg	59	-	-	-		EB	7		
	EB	26.5	-	-	-				Livestock income EB	68

CROPS		Teff	Bar-ley	Whe-at	Mai-ze	Sor-ghum	Mil-let	Oats	Pul-ses	Oil-seed	Cof-fee	Chat	En-set	
Outputs														
Area	ha	0.15	0.01	0.01	0.16	0.09	0.01	0.02	0.01	0.01	0.31	0.02	0.05	0.85
Yield	kg/ha	1070	935	1275	2115	1660	1110	1100	1320	1115	450	1000	4300	
Gross outp.	kg	161	9.4	12.8	338	149	11.1	22.0	13.2	11.2	140	20	240	
Net of losses	kg	144	8.4	11.5	305	134	10.0	19.8	11.9	10.0	140	20	240	
Value	EB	62.1	2.5	4.0	73.1	36.3	2.1	5.9	3.7	4.8	350	28.0	28.8	601
Inputs														
Var.cost 1/														
Seed	kg	4.5	1.0	1.0	4.0	1.8	0.2	2.0	1.0	0.2	-	-	-	
Seed cost	EB	1.9	0.3	0.35	1.0	0.5	0.04	0.6	0.3	0.1	-	-	-	5
Animal 2/	days	6.0	0.4	3.6	2.6	2.5	0.3	0.6	0.2	0.2	-	-	-	16
Animal cost	EB	18.0	1.2	10.8	7.8	7.5	0.9	1.8	0.6	0.6	-	-	-	49
Labour	m/days	16.0	0.8	8.2	16.5	8.8	1.0	1.6	0.6	0.5	51.5	0.8	4.4	111

Fixed cost

Depreciation of implements EB 6.5
Land tax EB 20.0
P.A. fees EB 5.0

Crop costs:	variable 1/	EB	54
	fixed	EB	32
	Total	EB	86
Net crop income		EB	515
Net crop return per man-day		EB	4.6
Farm income net of crop costs		EB	583

1/ Neglecting costs of livestock, perennials, (no estimate) and of labour.
2/ Draught, 2 oxen.

HPP ZONE 2000 - 2500 m.a.s.l.
MAJOR PHYSICAL, SOCIAL AND ECONOMIC CHARACTERISTICS

PHYSICAL '000 km^2

Land use		Major soils	
Harvested Crops	6	Nitosol	26
Fallow, failed & open grassland	18	Cambisol	2
Wooded grassland	11	Acrisol	20
Shrub land	8	Vertisol	2
Wooded land	2	Luvisol	4
Forest	8	Lithosol	3
Waste	7	Phaeosem	-
		Others	3

Total Land Area 60

Land slopes %		Length of growing period	
0-8	4	<90	-
8-16	23	90-150	1
16-30	17	150-180	1
>30	16	180-240	9
		>240	49

LIVESTOCK FEED BALANCE

Source of feed	Area '000 ha	Yield MT/ha	Carrying capacity '000 TLU
Crop residue and stubble	511	2.25	504
Fallow, failed & open grassland	1787	2.2	1762
Wooded grassland	1115	2.0	978
Alpine grass land			
Wood/shrub-lands	1027	1.0	450

	TLU's
Total carrying capacity	3694
Actual stock	2373
Difference: surplus	1321
deficit	
As a percentage of the stocking	+56%

SOCIAL

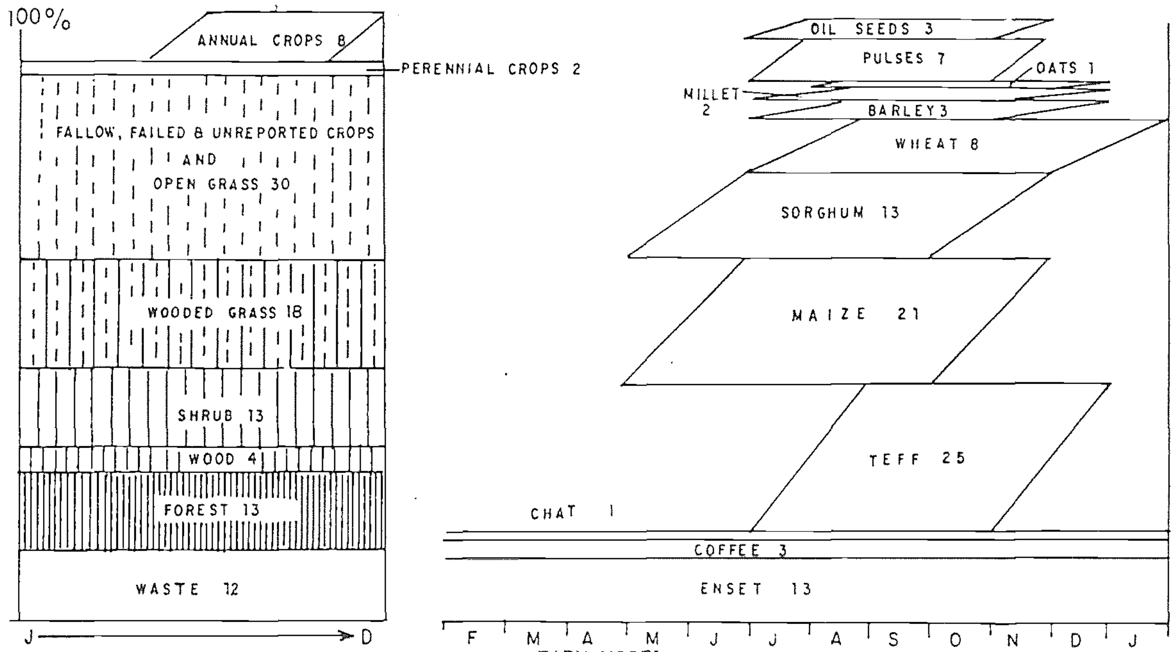
Population '000	Total	3431
	rural	3237
	urban	194
No. of rural families '000		719
Rural population density on usable land	pers/km^2	61
Net grain production per capita/yr. kg		227

ECONOMIC

Annual income/farm EB	Livestock	156
	crop	269
	farm	425
Farm income per capita/yr	EB	94

LAND USE AND FARMING PATTERN BETWEEN 2000-2500 m.a.s.l. IN HPP ZONE IN 1985

LAND USE — CROPPING PATTERN AND CALENDAR



FARM MODEL

	Unit	Cattle	Sheep	Goats	Equines				Total
LIVESTOCK	no.	4.2	1.5	1.0	0.2	Draught ox	no.	1.1	(TLU's) 3.4
Meat &	kg	48.8	13.9	8.9	-				
hide	EB	48.8	13.9	8.9	-	Dung	kg	882	
Milk	kg	146.6	-	-	-		EB	18	
	EB	66							Livestock income EB 156

CROPS		Teff	Barley	Wheat	Maize	Sorghum	Millet	Oats	Pulses	Oilseed	Coffee	Chat	Enset	
Outputs														
Area	ha	0.22	0.03	0.07	0.18	0.11	0.02	0.01	0.06	0.03	0.03	0.01	0.11	0.88
Yield	kg/ha	910	1140	1505	1800	1415	945	1250	1300	515	450	1000	4800	
Gross outp.	kg	200	34.2	105	324	156	18.9	12.5	78.0	15.3	13.5	10.0	528	
Net of losses	kg	180	30.8	94.8	292	140	17.0	11.3	70.2	13.9	13.5	10.0	528	
Value	EB	77.5	9.2	33.2	70.0	37.8	3.6	3.4	21.8	6.7	33.8	14	63.4	374
Inputs														
Var.cost 1/														
Seed	kg	6.6	3.0	7.0	4.5	2.2	0.4	1.0	5.7	0.6	-	-	-	
Seed cost	EB	2.8	0.9	2.5	1.1	0.6	0.1	0.6	0.1	0.3	-	-	-	10
Animal 2/	days	8.8	1.1	2.5	1.1	0.6	0.1	0.6	0.1	0.3	-	-	-	21
Animal cost	EB	26.4	3.3	7.5	8.7	9.3	2.1	0.9	3.6	2.1	-	-	-	63
Labour	m/days	24.4	2.5	5.7	18.5	10.8	1.9	0.8	3.6	1.4	5.0	0.4	9.6	85

Fixed cost

Depreciation of implements	EB	6.50	Crop costs:	variable 1/	EB 73
Land tax	EB	20.0		fixed	EB 32
P.A. fees	EB	5.0		Total	EB 105
			Net crop income		EB 269
			Net crop return per man-day		EB 3.2
			Farm income net of crop costs		EB 425

1/, 2/ (See corresponding numbers, page 283)

HPP ZONE - 2500 - 3000 m.a.s.l.
MAJOR PHYSICAL, SOCIAL AND ECONOMIC CHARACTERISTICS

PHYSICAL '000 km^2

Land use		Major soils	
Harvested Crops	3	Nitosol	7
Fallow, failed & open grassland	7	Cambisol	-
		Acrisol	9
Wooded grassland	2	Vertisol	1
Shrub land	3	Luvisol	1
Wooded land	-	Lithosol	-
Forest	1	Phaeosem	-
Waste	2	Others	-

Total Land Area 18

Land slopes %		Length of growing period	
0-8	2	<90	-
8-16	4	90-150	-
16-30	3	150-180	-
>30	9	180-240	2
		>240	16

LIVESTOCK FEED BALANCE

Source of feed	Area '000 ha	Yield MT/ha p.a.	Carrying capacity '000 TLU
Crop residue and stubble	185	2.25	185
Fallow, failed & open grassland	688	2.2	671
Wooded grassland	166	2.0	146
Alpine grass land	13	2.0	11
Wood/shrub lands	265	1.0	116

	TLU's
Total carrying capacity	1127
Actual stock	1000
Difference: surplus	127
deficit	
As a percentage of the stocking	+13%

SOCIAL

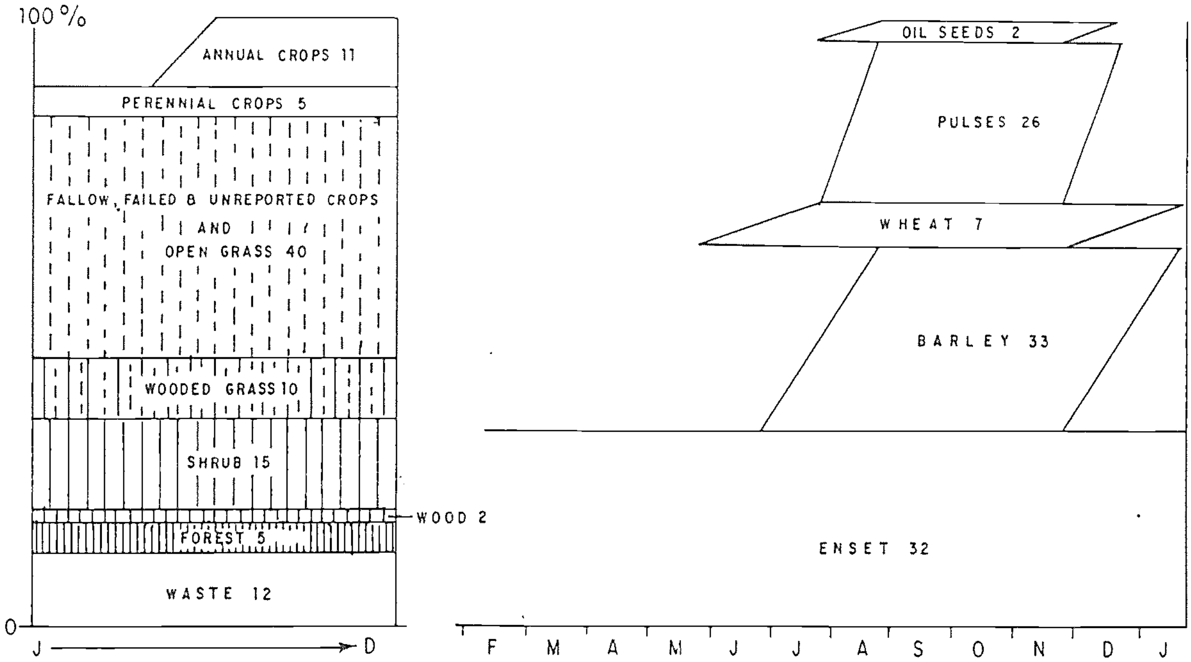
Population '000	Total	1432
	rural	1364
	urban	68
No. of rural families '000		303
Rural population density on usable land	pers/km^2	90
Net grain production per capita/yr.kg		246

ECONOMIC

Annual income/farm EB	Livestock	152
	crop	250
	farm	402
Farm income per capita/yr		EB 89

LAND USE AND FARMING PATTERN BETWEEN 2500-3000 m.a.s.l. IN HPP ZONE IN 1985

LAND USE — CROPPING PATTERN AND CALENDAR



FARM MODEL

	Unit	Cattle	Sheep	Goats	Equines					Total
LIVESTOCK	no.	3.0	6.0	1.2	0.7	Draught ox no.		0.8	(TLU's)	3.3
Meat &	kg	32.7	51.5	10.3	-					
hide	EB	32.7	51.4	10.3	-	Dung	kg	630		
Milk	kg	98.1	-	-	-		EB	13		
	EB	44.1	-	-	-					
									Livestock income EB	152

CROPS		Barley	Wheat	Pulses	Oilseeds	Enset	Total
Outputs							
Area	ha	0.31	0.06	0.24	0.02	0.30	0.93
Yield	kg/ha	1335	1275	1115	440	4000	
Gross outp.	kg	414	76.5	268	8.8	1200	
Net of losses	kg	372	68.8	241	7.9	1200	
Value	EB	112	24.1	74.7	3.8	144	358
Inputs							
Var.cost 1/							
Seed	kg	31	6.0	22.8	0.4	-	
Seed cost	EB	9.3	2.1	7.1	0.2	-	19
Animal 2/	days	11.2	2.2	4.8	0.5		18
Animal cost	EB	33.6	6.6	14.4	1.5		57
Labour	m/days	25.4	4.9	14.4	0.9	26.1	72

Fixed cost

Depreciation of implements	EB	6.5
Land tax	EB	20.0
P.A. fees	EB	6.0

Crop costs: variable 1/	EB	76
fixed	EB	32
Total	EB	108
Net crop income	EB	250
Net crop return per man/day	EB	3.5
Farm income net of crop costs	EB	402

1/, 2/ (See corresponding numbers, page 283)

HPC ZONE 1500 - 2000 m.a.s.l.
MAJOR PHYSICAL, SOCIAL AND ECONOMIC CHARACTERISTICS

PHYSICAL '000 km^2

Land use		Major soils	
Harvested Crops	5	Nitosol	6
Fallow, failed & open grassland	12	Cambisol	5
		Acrisol	-
Wooded grassland	11	Vertisol	8
Shrub land	2	Luvisol	5
Wooded land	1	Lithosol	1
Forest	1	Phaeosem	3
Waste	4	Others	8

Total Land Area 36

Land slopes %		Length of growing period	
0-8	7	<90	-
8-16	9	90-150	-
16-30	5	150-180	2
> 30	15	180-240	22
		> 240	12

LIVESTOCK FEED BALANCE

Source of feed	Area '000 ha	Yield MT/ha p.a.	Carrying capacity '000 TLU
Crop residue and stubble	512	2.25	514
Fallow, failed & open grassland	1204	2.0	1046
Wooded grassland	1081	2.5	1185
Alpine grass land			
Wood/shrublands	243	1.5	160

	TLU's
Total carrying capacity	2905
Actual stock	2888
Difference: surplus	17
deficit	
As a percentage of the stocking	+1%

SOCIAL

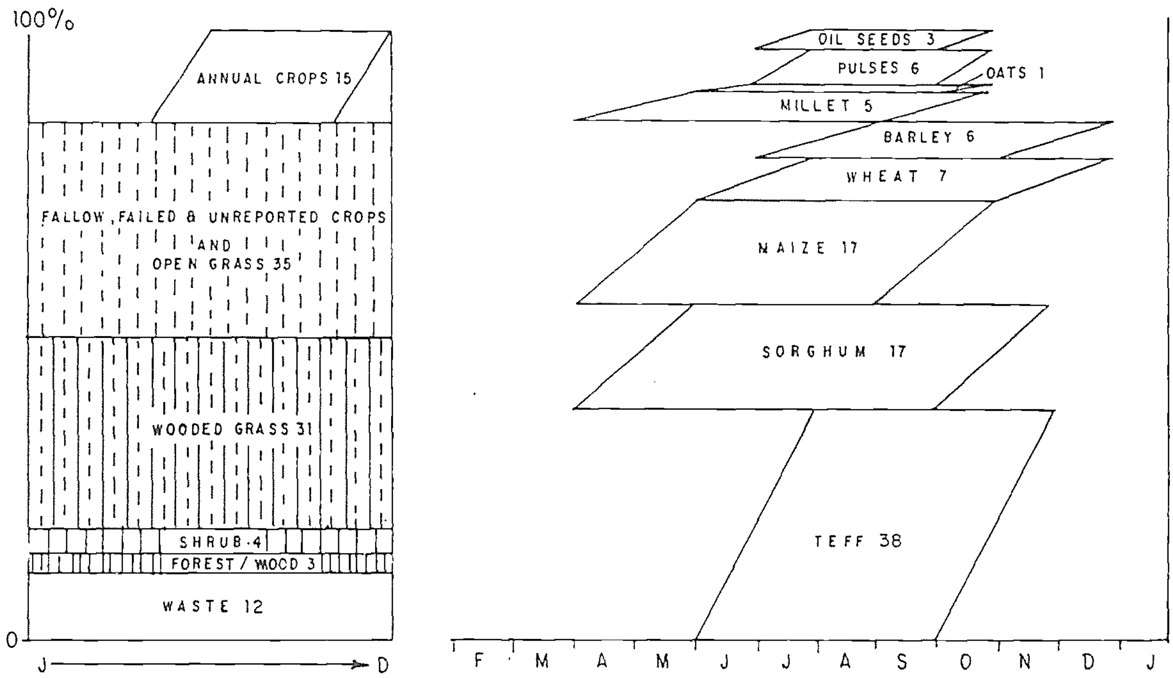
Population '000	Total	2473
	rural	2239
	urban	234
No. of rural families '000		498
Rural population density on usable land	pers/km^2	72
Net grain production per capita/yr.kg		298

ECONOMIC

Annual income/farm EB	Livestock	253
	crop	286
	farm	539
Farm income per capita/yr		EB 120

LAND USE AND FARMING PATTERN BETWEEN 1500-2000 m.a.s.l. IN HPC ZONE IN 1985

LAND USE | CROPPING PATTERN AND CALENDAR



FARM MODEL

	Unit	Cattle	Sheep	Goats	Equines				Total	
LIVESTOCK	no.	6.1	3.3	5.5	1.1	Draught ox no.		1.5	(TLU's)	5.8
Meat &	kg	63.5	27.1	45.4	-					
hide	EB	63.5	27.1	45.4	-	Dung	kg	2135		
Milk	kg	163	-	-	-		EB	43		
	EB	73.5	-	-	-			Livestock income	EB	253

CROPS		Teff	Barley	Wheat	Maize	Sorghum	Millet	Oats	Pulses	Oilseeds	
Outputs											
Area	ha	0.38	0.06	0.07	0.17	0.17	0.05	0.01	0.06	0.03	1.0
Yield	kg/ha	1190	1035	1270	2296	1955	1580	1250	1235	515	
Gross outp.	kg	452	62.1	88.9	390	332	79	12.5	74.1	15.5	
Net of losses	kg	407	55.9	80.0	351	299	71.1	11.3	66.7	13.9	
Value	EB	175	16.8	28.0	84.3	80.8	14.9	3.4	20.7	6.7	430
Inputs											
Var.cost 1/											
Seed	kg	11.4	6.0	7.0	4.3	3.4	1.0	1.0	5.7	0.6	14
Seed cost	EB	4.9	1.8	2.5	1.0	0.9	0.2	0.3	1.8	0.3	32
Animal	days	15.2	2.2	2.5	3.1	5.1	1.8	0.3	1.3	0.7	32
" cost 2/	EB	45.6	6.6	7.5	9.3	15.3	5.4	0.9	3.9	2.1	98
Labour	m/days	42.2	4.9	5.7	15.6	14.3	4.1	0.8	3.3	1.3	92

Fixed cost						
Depreciation of implements	EB	8.6	Crop costs:	variable 1/	EB	110
Land tax	EB	20.0		fixed	EB	34
P.A. fees	EB	5.0		Total	EB	144
			Net crop income		EB	286
			Net crop return per man-day		EB	3.1
			Farm income net of crop costs		EB	539

1/ Neglecting costs of livestock, and of labour

2/ Draught, 2 oxen

HPC ZONE 2000 - 2500 m.a.s.l.
MAJOR PHYSICAL, SOCIAL AND ECONOMIC CHARACTERISTICS

PHYSICAL '000 km^2

Land use		Major soils	
Harvested Crops	11	Nitosol	10
Fallow, failed & open grassland	30	Cambisol	
		Acrisol	2
Wooded grassland	12	Vertisol	14
Shrub land	.2	Luvisol	13
Wooded land	2	Lithosol	2
Forest	-	Phaeosem	8
Waste	7	Others	11

Total Land Area 64

Land slopes %		Length of growing period	
0-8	25	<90	-
8-16	9	90-150	-
16-30	15	150-180	6
>30	15	180-240	35
		>240	24

LIVESTOCK FEED BALANCE

Source of feed	Area '000 ha	Yield MT/ha p.a.	Carrying capacity '000 TLU
Crop residue and stubble	1075	2.25	1061
Fallow, failed & open grassland	3003	1.8	2367
Wooded grassland	1197	2.5	1313
Alpine grass land			
Wood/shrub-lands	397	2.0	348

	TLU's
Total carrying capacity	5039
Actual stock	4910
Difference: surplus	179
deficit	
As a percentage of the stocking	+4%

SOCIAL

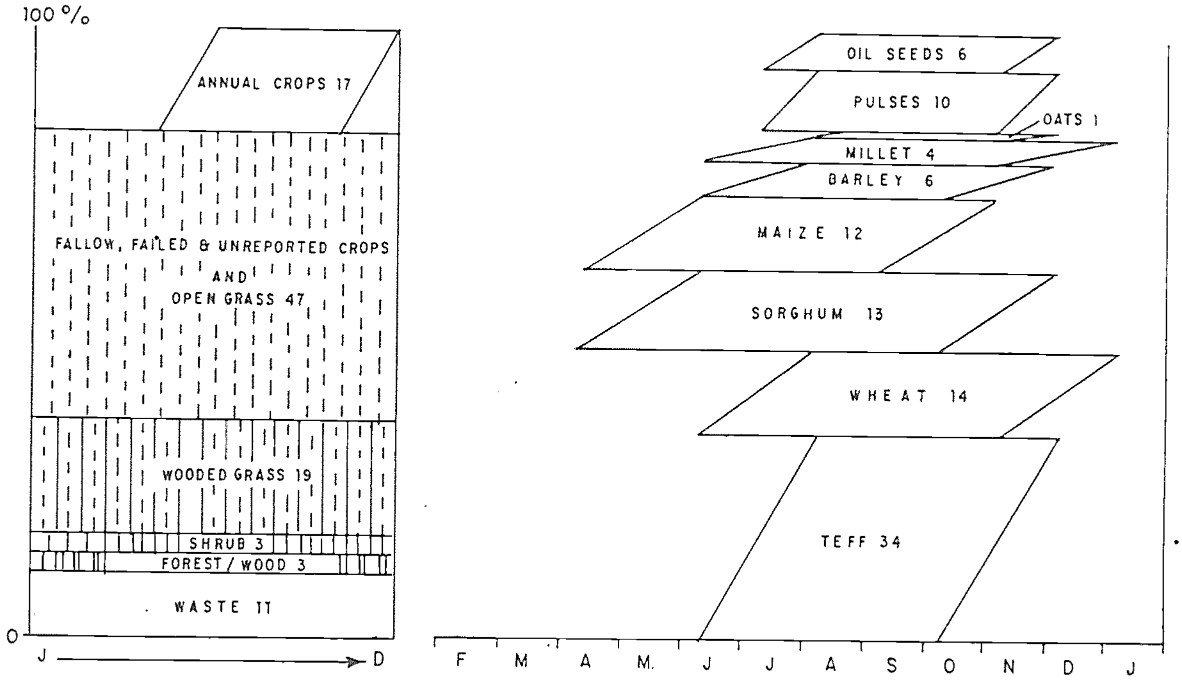
Population '000	Total	5554
	rural	3563
	urban	1991
No. of rural families '000		792
Rural population density on usable land	pers/km^2	62
Net grain production per capita/yr. kg		363

ECONOMIC

Annual income/farm EB	Livestock	249
	crop	359
	farm	608
Farm income per capita/yr		EB 135

LAND USE AND FARMING PATTERN BETWEEN 2000-2500 m.a.s.l. IN HPC ZONE IN 1985

LAND USE — CROPPING PATTERN AND CALENDAR



FARM MODEL

LIVESTOCK	Unit	Cattle	Sheep	Goats	Equines			
	no.	6.2	5.7	2.0	1.7	Draught ox no.	1.6	Total (TLU's) 6.2
Meat &	kg	65.5	47.4	16.9	-			
hide	EB	65.5	47.4	16.9	-	Dung kg	2170	
Milk	kg	168.3	-	-	-	EB	43	
	EB	75.7	-	-	-			
							Livestock income EB	249

CROPS		Teff	Barley	Wheat	Maize	Sorghum	Millet	Oats	Pulses	Oilseeds	
Outputs											
Area	ha	0.48	0.08	0.20	0.17	0.18	0.06	0.01	0.14	0.08	1.4
Yield	kg/ha	1010	1275	1495	1950	1665	1345	1470	1455	603	
Gross outp.	kg	485	102	299	332	300	80.7	14.7	204	48.4	
Net of losses	kg	436	91.8	269	298	269	72.6	13.2	183	43.6	
Value	EB	188	27.5	94.2	71.6	72.8	15.3	4.0	56.8	20.9	551
Inputs											
Var.cost 1/											
Seed	kg	14.4	8.0	20.0	4.3	3.6	1.2	1.0	13.3	1.6	
Seed cost	EB	6.2	2.4	7.0	1.0	1.0	0.3	0.3	4.1	0.8	23
Animal	days	19.2	2.9	7.2	3.1	5.4	2.2	0.3	2.9	1.9	45
" cost 2/	EB	57.6	8.6	21.6	9.3	16.2	6.6	0.9	8.7	5.7	135
Labour	m/days	53.3	6.6	16.4	15.6	15.1	4.9	0.8	7.7	3.4	124

Fixed cost					
Depreciation of implements	EB	8.6	Crop costs: variable 1/	EB	158
Land tax	EB	20.0	fixed	EB	34
P.A. fees	EB	5.0	Total	EB	192
			Net crop income	EB	359
			Net crop return per man-day	EB	2.9
			Farm income net of crop costs	EB	608

1/, 2/ (See corresponding numbers, page 289)

HPC ZONE 2500 - 3000 m.a.s.l.
MAJOR PHYSICAL, SOCIAL AND ECONOMIC CHARACTERISTICS

PHYSICAL '000 km^2

Land use		Major soils	
Harvested Crops	5	Nitosol	4
Fallow, failed & open grassland	19	Cambisol	3
		Acrisol	1
Wooded grassland	2	Vertisol	10
Shrub land	-	Luvisol	5
Wooded land	2	Lithosol	3
Forest	1	Phaeosem	2
Waste	4	Others	5

Total Land Area 33

Land slopes %		Length of growing period	
0-8	12	<90	-
8-16	4	90-150	-
16-30	8	150-180	-
>30	9	180-240	12
		>240	21

LIVESTOCK FEED BALANCE

Source of feed	Area '000 ha	Yield MT/ha p.a.	Carrying capacity '000 TLU
Crop residue and stubble	485	2.25	479
Fallow, failed & open grassland	1914	2.3	1664
Wooded grassland	151	2.0	132
Alpine grass land	15	2.0	13
Wood/shrub-lands	199	2.0	173

	TLU's
Total carrying capacity	2463
Actual stock	2740
Difference: surplus	-
deficit	277
As a percentage of the stocking	-10%

SOCIAL

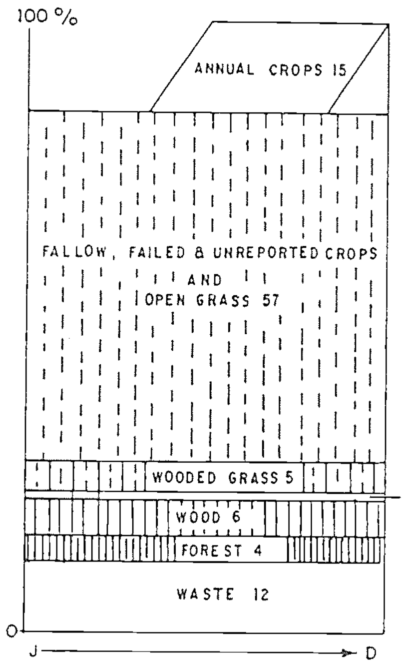
Population '000	Total	2272
	rural	1990
	urban	282
No.of rural families '000		442
Rural population density on usable land	pers/km^2	69
Net grain production per capita/yr.kg		293

ECONOMIC

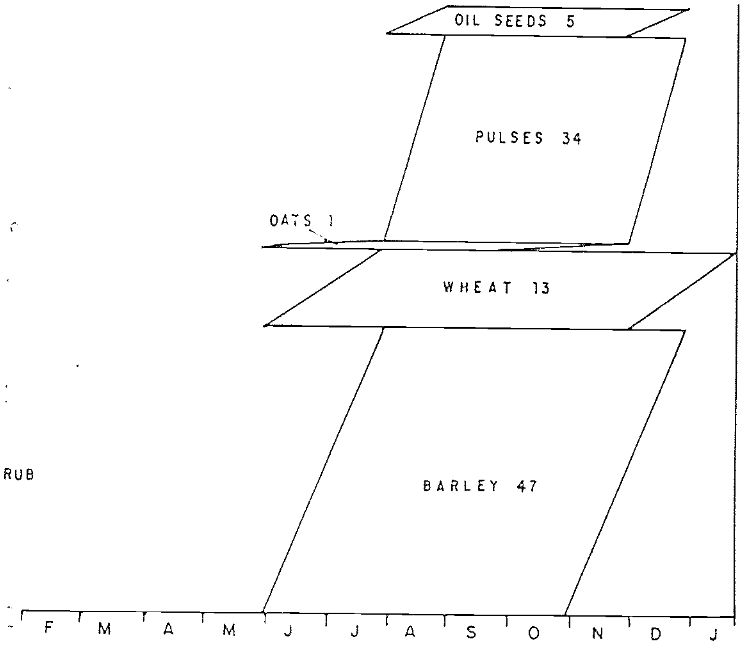
Annual income/farm EB	livestock	201
	crop	253
	farm	454
Farm income per capita/yr	EB	101

LAND USE AND FARMING PATTERN BETWEEN 2500-3000 m.a.s.l. IN HPC ZONE IN 1985

LAND USE



CROPPING PATTERN AND CALENDAR



FARM MODEL

	Unit	Cattle	Sheep	Goats	Equines					Total
LIVESTOCK	no.	4.9	6.2	1.5	3.1	Draught ox no.		1.2	(TLU's)	6.2
Meat &	kg	49	49.2	12.0	-					
hide	EB	49	49.2	12.0	-	Dung	kg	1715		
Milk	kg	126	-	-	-		EB	34		
	EB	56.7						Livestock income	EB	201

CROPS		Barley	Wheat	Oats	Pulses	Oilseeds	
Outputs							
Area	ha	0.53	0.15	0.01	0.38	0.06	1.13
Yield	kg/ha	1495	1270	1250	1235	515	
Gross outp.	kg	792	191	12.5	469	30.9	
Net of losses	kg	713	171	11.3	422	27.8	
Value	EB	214	60.0	3.4	131	13.4	422
Inputs							
Var.cost 1/							
Seed	kg	53	15	1.0	36	1.2	
Seed cost	EB	15.9	5.3	0.3	11.2	0.6	33
Animal days2/		19.1	5.4	0.3	8.0	1.4	34
Animal cost	EB	57.3	16.2	0.9	24.0	4.2	102
Labour	m/days	43.5	12.3	0.8	20.9	2.5	80

Fixed cost						
Depreciation of implements	EB	8.6	Crop costs:	variable 1/	EB	135
Land tax	EB	20.0		fixed	EB	34
P.A. fees	EB	5.0		Total	EB	169
			Net crop income		EB	253
			Net crop return per man-day		EB	3.2
			Farm income net of crop costs		EB	454

1/, 2/ (See corresponding numbers, page 289)

LPC ZONE 1500 - 2000 m.a.s.l.
MAJOR PHYSICAL, SOCIAL AND ECONOMIC CHARACTERISTICS

PHYSICAL '000 km^2

Land use		Major soils	
Harvested Crops	11	Nitosol	4
Fallow, failed & open grassland	29	Cambisol	19
		Acrisol	1
Wooded grassland	20	Vertisol	7
Shrub land	4	Luvisol	12
Wooded land	1	Lithosol	11
Forest	-	Phaeosem	5
Waste	9	Others	15

Total Land Area 74

Land slopes %		Length of growing period	
0-8	28	<90	9
8-16	10	90-150	23
16-30	18	150-180	18
<30	18	180-240	18
		<240	6

LIVESTOCK FEED BALANCE

Source of feed	Area '000 ha	Yield MT/ha p.a.	Carrying capacity '000 TLU
Crop residue and stubble	1119	1.5	736
Fallow, failed & open grassland	2907	0.7	921
Wooded grassland	2041	0.7	627
Alpine grass land			
Wood/shrub-lands	491	0.5	108

	TLU's
Total carrying capacity	2392
Actual stock	2652
Difference: surplus	-
deficit	260
As a percentage of the stocking	-10%

SOCIAL

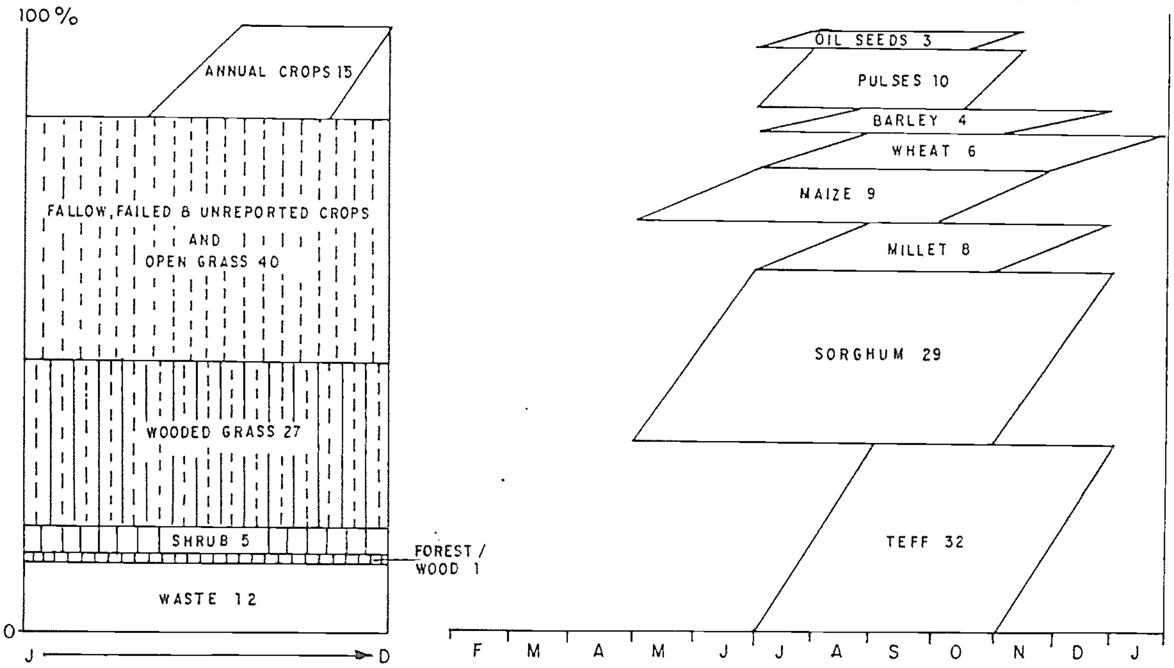
Population '000	Total	6096
	rural	5190
	urban	906
No. of rural families '000		1153
Rural population density on usable land	pers/km^2	78
Net grain production per capita/yr. kg		237

ECONOMIC

Annual income/farm EB	livestock	95
	crop	203
	farm	298
Farm income per capita/yr	EB	66

LAND USE AND FARMING PATTERN BETWEEN 1500-2000 m.a.s.l. IN LPC ZONE IN 1985

LAND USE / CROPPING PATTERN AND CALENDAR



FARM MODEL

LIVESTOCK	Unit	Cattle	Sheep	Goats	Equines				Total
	no.	1.7	2.7	2.6	0.9	Draught ox no.		0.5	(TLU's) 2.3
Meat &	kg	17.2	21.4	20.6	-				
hide	EB	17.2	21.4	20.6	-	Dung	kg	952	
Milk	kg	36.8	-	-	-		EB	19	
	EB							Livestock income EB	95

CROPS		Teff	Barley	Wheat	Maize	Sorghum	Millet	Pulses	Oilseeds	
Outputs										
Area	ha	0.32	0.04	0.06	0.09	0.28	0.08	0.10	0.03	1.00
Yield	kg/ha	920	990	975	2025	1495	1045	1060	350	
Gross outp.	kg	294	39.6	58.5	182	419	83.6	106	10.5	
Net of losses	kg	265	35.6	52.7	164	377	75.2	95.4	9.5	
Value	EB	114	10.7	18.4	39.4	102	15.8	29.6	4.5	334
Inputs										
Var.cost 1/										
Seed	kg	9.6	4.0	6.0	2.3	5.6	1.6	9.5	0.6	
Seed cost	EB	4.1	1.2	2.1	0.5	1.5	0.3	3.0	0.3	13
Animal days 2/		10.0	1.3	1.9	1.3	7.3	2.6	1.8	0.6	28
Animal cost	EB	32.7	3.9	5.7	3.9	21.9	7.8	5.4	1.8	84
Labour	m/days	46.4	4.2	6.3	10.4	30.0	8.4	6.5	1.6	114

Fixed cost

Depreciation of implements	EB	8.6	Crop costs:	variable 1/	EB	97
Land tax	EB	20.0		fixed	EB	34
P.A. fees	EB	5.0		Total	EB	131
			Net crop income		EB	203
			Net crop return per man-day		EB	1.8
			Farm income net of crop costs		EB	298

1/, 2/ (See corresponding numbers, page 289)

LPC ZONE 2000 - 2500 m.a.s.l.
MAJOR PHYSICAL, SOCIAL AND ECONOMIC CHARACTERISTICS

PHYSICAL '000 km^2

Land use		Major soils	
Harvested Crops	8	Nitosol	4
Fallow, failed & open grassland	25	Cambisol	23
		Acrisol	2
Wooded grassland	16	Vertisol	5
Shrub land	3	Luvisol	9
Wooded land	-	Lithosol	8
Forest	-	Phaeosem	4
Waste	7	Others	4

Total Land Area 59

Land slopes %		Length of growing period	
0-8	5	<90	2
8-16	12	90-150	23
16-30	21	150-180	10
>30	21	180-240	17
		>240	7

LIVESTOCK FEED BALANCE

Source of feed	Area '000 ha	Yield MT/ha p.a.	Carrying capacity '000 TLU
Crop residue and stubble	814	1.5	536
Fallow, failed & open grassland	2512	0.9	958
Wooded grassland	1635	0.7	502
Alpine grass land			
Wood/shrub-lands	300	0.5	66

	TLU's
Total carrying capacity	2062
Actual stock	2688
Difference: surplus	
deficit	627
As a percentage of the stocking	-23%

SOCIAL

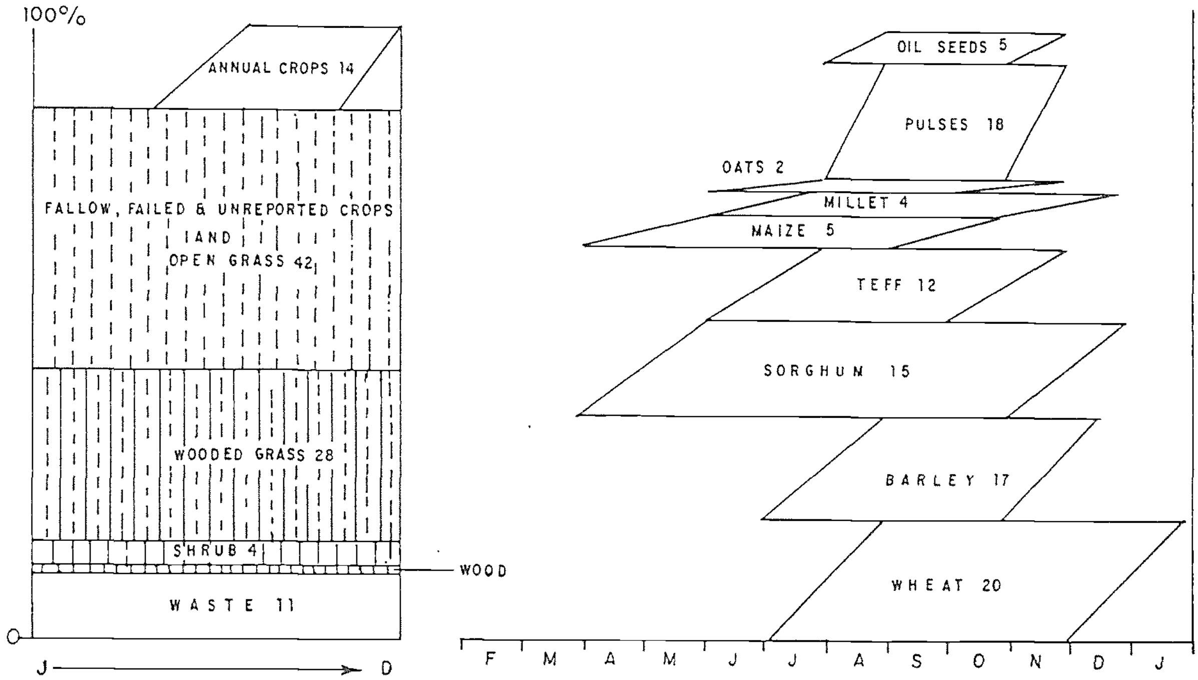
Population '000	Total	4067
	rural	3561
	urban	506
No.of rural families '000		791
Rural population density on usable land	pers/km^2	68
Net grain production per capita/yr.kg		237

ECONOMIC

Annual income/farm EB	livestock	108
	crop	197
	farm	305
Farm income per capita/yr		EB 68

LAND USE AND FARMING PATTERN BETWEEN 2000-2500 m.a.s.l. IN LPC ZONE IN 1985

LAND USE — CROPPING PATTERN AND CALENDAR



FARM MODEL

	Unit	Cattle	Sheep	Goats	Equines				Total
LIVESTOCK	no.	2.0	4.0	3.0	2.0	Draught ox no.		0.6	(TLU's) 3.4
Meat &	kg	18.1	28.5	21.4	-				
hide	EB	18.1	28.5	21.4	-	Dung	kg	1120	
Milk	kg	38.8	-	-	-		EB	22	
	EB								
								Livestock income EB	108

CROPS		Teff	Barley	Wheat	Maize	Sorghum	Millet	Oats	Pulses	Oilseeds	
Outputs											
Area	ha	0.13	0.18	0.21	0.06	0.17	0.04	0.02	0.20	0.05	1.06
Yield	kg/ha	785	1200	1150	1720	1270	885	1280	1245	410	
Gross outp.	kg	102	216	242	103	216	35.4	25.6	249	20.5	
Net of losses	kg	91.9	194	217	92.9	194	31.9	23.0	224	18.5	
Value	EB	39.5	58.3	76.1	22.3	52.3	6.7	6.9	69.5	8.9	341
Inputs											
Var.cost 1/											
Seed	kg	3.9	18.0	21.0	1.5	3.4	0.8	2.0	19.0	1.0	
Seed cost	EB	1.7	5.4	7.4	0.4	0.9	0.2	0.6	5.9	0.5	23
Animal days 2/		4.4	5.8	6.7	0.8	4.4	1.3	0.6	3.6	1.1	29
Animal cost	EB	13.2	17.4	20.1	2.4	13.2	3.9	1.8	10.8	3.3	86
Labour	m/days	18.9	18.9	23.1	6.9	18.2	4.2	1.7	13.0	2.7	110

Fixed cost						
Depreciation of implements	EB	8.6	Crop costs:	variable 1/	EB	110
Land tax	EB	20.0		fixed	EB	34
P.A. fees	EB	5.0		Total	EB	144
			Net crop income		EB	197
			Net crop return per man-day		EB	1.8
			Farm income net of crop costs		EB	305

1/, 2/ (See corresponding numbers, page 289)

LPC ZONE 2500 - 3000 m.a.s.l.
MAJOR PHYSICAL, SOCIAL AND ECONOMIC CHARACTERISTICS

PHYSICAL '000 km^2

Land use		Major soils	
Harvested Crops	2	Nitosol	-
Fallow, failed & open grassland	10	Cambisol	2
		Acrisol	1
Wooded grassland	1	Vertisol	2
Shrub land	1	Luvisol	1
Wooded land	-	Lithosol	3
Forest	1	Phaeosem	5
Waste	2	Others	3

Total Land Area 17

Land slopes %		Length of growing period	
0-8	5	< 90	-
8-16	3	90-150	4
16-30	3	150-180	6
> 30	6	180-240	6
		>240	1

LIVESTOCK FEED BALANCE

Source of feed	Area '000 ha	Yield MT/ha p.a.	Carrying capacity '000 TLU
Crop residue and stubble	225	1.5	148
Fallow, failed & open grassland	933	1.1	438
Wooded grassland	117	0.7	33
Alpine grass land	78	0.75	26
Wood/shrub-lands	98	0.5	21

	TLU's
Total carrying capacity	660
Actual stock	884
Difference: surplus	-
deficit	215
As a percentage of the stocking	-24%

SOCIAL

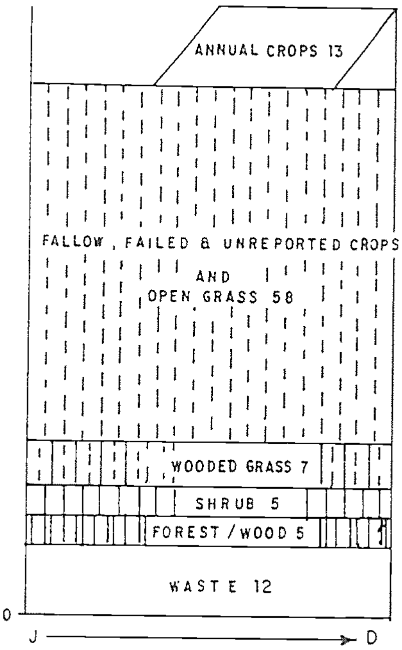
Population '000	Total	1146
	rural	1076
	urban	70
No.of rural families '000		239
Rural population density on usable land	pers/km^2	71
Net grain production per capita/yr.kg		232

ECONOMIC

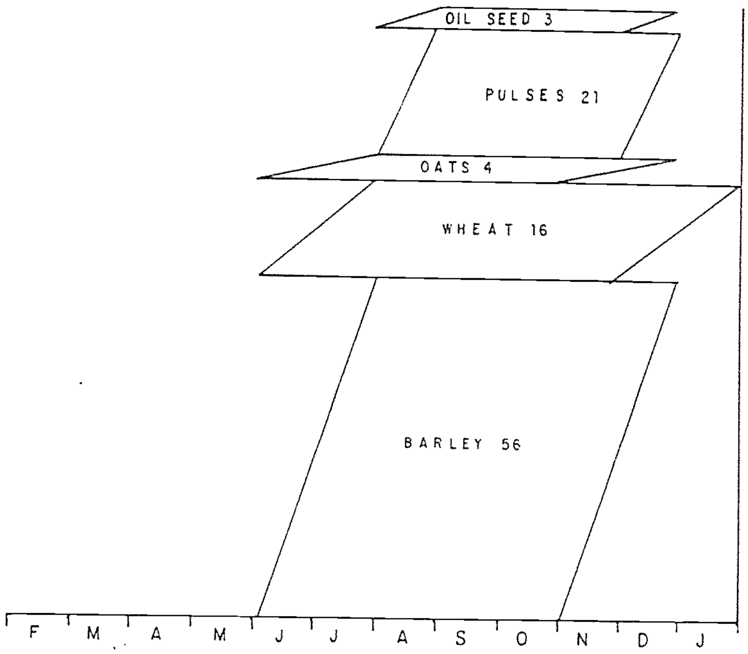
Annual income/farm EB	livestock	86
	crop	180
	farm	266
Farm income per capita/yr		EB 59

LAND USE AND FARMING PATTERN BETWEEN 2500-3000 m.a.s.l. IN LPC ZONE IN 1985

LAND USE



CROPPING PATTERN AND CALENDAR



FARM MODEL

LIVESTOCK	Unit	Cattle	Sheep	Goats	Equines
	no.	1.7	4.8	0.5	3.0
Meat & hide	kg	14.8	33.9	3.5	-
	EB	14.8	33.9	3.5	-
Milk	kg				
	EB				

Draught ox no.		0.5	Total (TLU's) 3.7
Dung	kg	952	
	EB	19	
Livestock income EB			86

CROPS	Unit	Barley	Wheat	Oats	Pulses	Oilseeds	Total
Outputs							
Area	ha	0.54	0.16	0.04	0.20	0.03	0.97
Yield	kg/ha	1415	975	685	1060	350	
Gross outp.	kg	764	156	27.4	212	10.5	
Net of losses	kg	688	140	24.7	191	9.5	
Value	EB	206	49.1	7.4	59.2	4.5	327
Inputs							
Var.cost 1/							
Seed	kg	54	16	4.0	19.0	0.6	
Seed cost	EB	16.2	5.6	1.2	5.0	0.3	29
Animal days 2/		17.3	5.2	1.1	3.6	0.6	28
Animal cost	EB	51.9	15.6	3.3	10.8	1.8	84
Labour	m/days	56.7	16.8	3.4	13	1.6	91

Fixed cost		
Depreciation of implements	EB	8.6
Land tax	EB	20.0
P.A. fees	EB	5

Crop costs: variable 1/	EB	113
fixed	EB	34
Total	EB	147
Net crop income	EB	180
Net crop return per man-day	EB	2.0
Farm income net of crop costs	EB	266

1/, 2/ (See corresponding numbers, page 289)

ANNEX 5

SUPPORTING TABLES

Table A2.1

LAND AREA IN EACH AWRAJA 1/ DISTRIBUTED ACCORDING TO SUB-ZONE

(percentage of land area in each Awraja)

	HPPZ				HPCZ				LPCZ			
	(000 metres above sea level)											
	Below 1.5	1.5- 2.0	2.0- 2.5	Above 2.5	Below 1.5	1.5- 2.0	2.0- 2.5	Above 2.5	Below 1.5	1.5- 2.0	2.0- 2.5	Above 2.5
Arsi												
Arbagugu	-	-	3	-	12	24	11	-	4	21	14	11
Chilalo	-	-	-	-	-	-	12	33	-	7	14	25
Ticho	-	-	-	-	17	21	38	6	12	6	-	-
Bale												
Dolo	-	-	-	-	8	6	11	9	43	13	8	2
El Kere	-	-	-	-	-	-	-	-	-	100	-	-
Genale	-	-	-	-	-	-	7	86	2	3	2	-
Mendayo	-	-	-	-	3	12	19	54	2	8	2	-
Wabe	-	-	-	-	-	8	14	1	4	64	9	-
Eritrea												
Akale Guzay	-	-	-	-	-	-	-	-	16	55	29	-
Akordat	-	-	-	-	-	-	-	-	100	-	-	-
Gash & Setit	-	-	-	-	-	-	-	-	100	-	-	-
Hamasien	-	-	-	-	-	-	-	-	7	62	31	-
Keren	-	-	-	-	-	-	-	-	-	73	27	-
Massawa	-	-	-	-	-	-	-	-	100	-	-	-
Sahil	-	-	-	-	-	-	-	-	-	100	-	-
Seraya	-	-	-	-	-	-	-	-	57	43	-	-
Gamo-Gofa												
Gamo	26	23	20	31	-	-	-	-	-	-	-	-
Gardula	37	31	31	2	-	-	-	-	-	-	-	-
Geleb & Hamerbako	33	56	11	-	-	-	-	-	-	-	-	-
Gofa	50	2	30	18	-	-	-	-	-	-	-	-
Gojam												
Agew Midr	-	-	-	-	-	17	51	32	-	-	-	-
Bahir Dar	-	-	-	-	-	57	19	24	-	-	-	-
Bichena	-	-	-	-	37	16	32	15	-	-	-	-
Debre Markos	-	-	-	-	26	22	36	16	-	-	-	-
Koladega Damot	-	-	-	-	20	29	25	26	-	-	-	-
Metekel	-	(some)	-	-	37	36	26	1	-	-	-	-
Mota	-	-	-	-	7	17	16	60	-	-	-	-
Gondar												
Chilga	-	-	-	-	-	-	38	-	9	42	11	-
Debre Tabor	-	-	-	-	1	30	25	3	2	5	11	23
Gayint	-	-	-	-	-	-	-	-	8	31	44	17
Gondar	-	-	-	-	-	37	-	-	5	34	4	20
Libo	-	-	-	-	-	20	37	34	-	5	4	-
Semien	-	-	-	-	-	-	-	-	21	31	26	22
Wegera	-	-	-	-	-	-	-	-	36	20	36	8

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1/ Only those Awrajas lying within the study area.

Table A2.1 (cont'd)

	HPPZ				HPCZ				LPCZ			
	(000 metres above sea level)											
	Below 1.5	1.5-2.0	2.0-2.5	Above 2.5	Below 1.5	1.5-2.0	2.0-2.5	Above 2.5	Below 1.5	1.5-2.0	2.0-2.5	Above 2.5
Hararghe												
Chercher	-	(some)		-	2	16	5	-	5	40	30	2
Deder & Webera	-	(some)		-	-	41	18	5	21	9	1	5
Dire Dawa, Isa & Gurgura	-	-	-	-	-	-	-	-	13	34	53	-
Gara Muleta	-	-	-	-	-	47	37	-	-	16	-	-
Gursum	-	-	-	-	-	100	-	-	-	-	-	-
Habro	-	-	-	-	21	12	-	-	46	18	3	-
Hara Zuria	-	-	-	-	-	56	9	-	-	14	19	2
Jijiga	-	-	-	-	1	23	3	-	-	70	3	-
Illubabor												
Buno Bedele	-	45	45	10	-	-	-	-	-	-	-	-
Gambela	-	64	36	-	-	-	-	-	-	-	-	-
Gore	18	19	50	13	-	-	-	-	-	-	-	-
Mocha	8	30	62	-	-	-	-	-	-	-	-	-
Sor & Geba	15	22	58	5	-	-	-	-	-	-	-	-
Kefa												
Gimira	-	49	35	16	-	-	-	-	-	-	-	-
Jimma	25	38	29	8	-	-	-	-	-	-	-	-
Kefa	32	25	19	24	-	-	-	-	-	-	-	-
Kulu Konta	71	19	5	5	-	-	-	-	-	-	-	-
Limu	7	59	22	12	-	-	-	-	-	-	-	-
Maji & Goldiya	29	46	24	1	-	-	-	-	-	-	-	-
Shewa												
Chebo & Gurage	3	19	28	29	-	2	14	5	-	-	-	-
Haikotch & Butajira	-	7	3	-	-	-	-	-	-	60	22	8
Jibat & Mecha	-	-	-	-	-	78	14	8	-	(some)	-	-
Kembata & Hadiya	6	2	24	20	-	-	-	-	14	34	-	-
Menagesha	-	1	2	1	-	8	43	45	-	-	-	-
Menz & Gishie	-	-	-	-	-	-	-	-	-	11	17	72
Merhabete	-	-	-	-	9	19	10	-	24	22	8	8
Selale	-	-	-	-	-	25	46	29	-	(some)	-	-
Tegulet & Bulga	-	-	-	-	-	13	23	29	-	8	12	15
Yerer & Kereya	-	12	-	-	-	16	6	-	-	66	-	-
Yifat & Timuga	-	-	-	-	-	-	-	-	-	87	10	3
Sidamo												
Arero	15	53	22	10	-	-	-	-	-	-	-	-
Borena	23	42	35	-	-	-	-	-	-	-	-	-
Gedeo	17	38	25	20	-	-	-	-	-	-	-	-
Jemjem	31	38	17	4	-	-	-	-	1	1	8	-
Sidama	15	26	17	27	-	-	3	6	-	-	3	3
Welayta	65	18	13	4	-	-	-	-	-	-	-	-
Tigray												
Adwa	-	-	-	-	-	-	-	-	12	36	52	-
Agame	-	-	-	-	-	-	-	-	9	21	64	6
Aksum	-	-	-	-	-	-	-	-	34	42	24	-
Hulet Awlailo	-	-	-	-	-	-	-	-	-	38	62	-
Inderta	-	-	-	-	-	-	-	-	46	44	10	-
Rayo & Azebo	-	-	-	-	-	-	-	-	12	68	20	-
Shire	-	-	-	-	-	-	-	-	46	44	10	-
Tembien	-	-	-	-	-	-	-	-	12	69	20	-

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Table A2.1 (cont'd)

	HPPZ				HPCZ				LPCZ			
	(000 metres above sea level)											
	Below 1.5	1.5-2.0	2.0-2.5	Above 2.5	Below 1.5	1.5-2.0	2.0-2.5	Above 2.5	Below 1.5	1.5-2.0	2.0-2.5	Above 2.5
Welega												
Arjo	8	52	40	-	-	-	-	-	-	-	-	-
Asosa	36	57	7	-	-	-	-	-	-	-	-	-
Gimbi	35	23	34	8	-	-	-	-	-	-	-	-
Horo/Gudru	24	5	3	-	15	2	46	5	-	-	-	-
Kelem	46	31	20	3	-	-	-	-	-	-	-	-
Nekemte	14	32	29	-	2	15	7	1	-	-	-	-
Welo												
Ambasel	-	-	-	-	-	-	41	15	11	11	14	8
Borena	-	-	-	-	3	8	1	-	7	21	27	33
Dessie Zuria	-	-	-	-	-	-	10	65	-	16	6	3
Kalu	-	-	-	-	-	63	12	25	-	-	-	-
Lasta	-	-	-	-	-	-	-	-	-	10	51	39
Raya & Kobo	-	-	-	-	9	45	5	-	10	14	17	-
Wadla Delanta	-	-	-	-	-	-	-	-	-	30	63	7
Wag	-	-	-	-	-	-	-	-	6	46	20	28
Were Ilu	-	-	-	-	-	-	-	-	-	-	25	75
Were Himenu	-	-	-	-	-	-	-	-	-	-	11	89
Yeju	-	-	-	-	-	21	23	-	9	18	16	13

Table A3.1

ESTIMATED POPULATION DENSITY AND LAND AREA PER FAMILY BY SUB-ZONE IN 1983 AND 2010

(persons/km^2)

Sub-Zone altitude (masl)	Total density 1983	Population density		Land area per family (ha)	
		Rural 1983	Rural 2010	1983	2010
HPP zone					
1500-2000	91.2	85.8	176.2	5.8	2.8
2000-2500	55.1	52.0	107.0	9.6	4.7
2500-3000	77.6	73.9	151.7	6.7	3.3
Average	74.3	70.0	143.7	7.1	3.5
HPC zone					
1500-2000	69.4	62.8	128.9	8.0	3.9
2000-2500	81.0	51.8	106.3	9.7	4.7
2500-3000	61.5	54.0	110.9	9.3	4.5
Average	72.9	55.1	113.1	9.0	4.4
LPC zone					
1500-2000	77.3	65.8	135.1	7.6	3.7
2000-2500	66.5	58.2	109.5	8.6	4.2
2500-3000	63.6	59.6	122.4	8.4	4.0
Average	71.5	62.2	127.7	8.0	3.9
Below 1500	6.5	6.5	13.3	76.9	37.5
Above 3000	65.7	52.2	107.2	9.6	4.7
	-	-	-	-	-
Overall Mean	61.3	52.6	108.0	9.5	4.6

Source: EHRS adjusted population estimate, pre-Census release.

Table A4.1

GROSS DOMESTIC PRODUCT BY MAJOR CATEGORY OF EXPENDITURE: 1974/75 to 1983/84
(Current market prices, Millions of Birr)

Item	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84 1/
Gross Domestic Expenditure	5 688	6 062	7 042	7 670	8 410	8 979	9 450	9 917	10 864	11 182
Consumption	5 109	5 484	6 436	7 124	7 711	8 125	8 528	8 836	9 745	9 898
Private	4 378	4 618	5 468	5 885	6 544	6 832	7 129	7 349	8 013	8 030
Public	730	866	967	1 239	1 167	1 293	1 340	1 487	1 733	1 868
Fixed Investment	579	578	605	545	698	854	897	1 082	1 119	1 284
Public Investment	199	294	350	321	466	627	674	764	785	n.a.
Private Investment	380	284	255	224	232	226	223	237	244	n.a.
Resource Trade Balance	-164	-58	-216	-405	-425	-445	-544	-750	-846	-1 127
Exports	683	760	839	865	942	1 209	1 148	1 076	1 142	1 267
Imports	847	818	1 056	1 270	1 367	1 654	1 692	1 824	1 991	2 394
GDP at Market Prices	5 524	6 004	6 826	7 265	7 985	8 534	8 910	9 169	10 016	10 055
National Savings	411	561	420	170	316	409	378	334	271	157

Source: Office of National Committee for Central Planning (ONCCP)

1/ Provisional

Table A4.2

GROSS DOMESTIC PRODUCT BY ORIGIN 1974/75-1983/84
(at Current Factor Cost, Millions of Birr)

Item	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Agriculture Sector	2 423	2 739	3 192	3 467	3 656	3 871	4 072	4 062	4 389	4 121
Agriculture	2 301	2 615	3 068	3 330	3 514	3 723	3 879	3 858	4 167	3 891
Forestry, Fishing and Hunting	122	123	123	136	141	148	193	204	222	230
Other Commondity Sectors	854	853	889	894	1 046	1 189	1 258	1 297	1 402	1 473
Mining and quarrying	12	11	11	7	7	8	8	10	10	13
Manufacturing	308	313	326	360	471	533	564	584	656	670
Handicraft + Small-scale Industry	260	268	274	275	286	296	307	318	328	339
Building and Construction	232	221	238	211	229	295	321	326	346	386
Electricity and Water	40	38	39	39	50	55	58	59	62	65
Distribution Services	795	854	878	890	1 075	1 167	1 222	1 339	1 504	1 540
Wholesale and Retail Trade	522	551	579	592	742	812	853	893	980	998
Transport and Communication	272	302	299	298	332	355	369	446	524	542
Other Services	1 029	1 083	1 186	1 263	1 332	1 425	1 549	1 601	1 773	1 864
Banking, Insur., and Real Estate	116	142	146	162	202	244	292	278	327	295
Public Administration/Defence	348	365	431	510	510	535	585	617	694	751
Ownership of Dwelling	190	188	193	193	196	200	206	212	217	224
Educational Services	135	136	158	143	157	168	178	196	224	270
Medical and Health Services	36	39	45	40	44	48	52	55	59	62
Domestic Services	64	64	65	65	66	67	68	69	70	72
Other Services	138	146	146	146	154	161	167	174	182	190
GDP at Factor Cost	5 103	5 530	6 146	6 516	7 110	7 653	8 100	8 299	9 068	8 997
Indirect Taxes Less Subs.	421	474	680	749	874	845	806	870	950	1 058
GDP at Market Prices	5 524	6 004	6 826	7 265	7 985	8 534	8 910	9 169	10 016	10 055

Source: Office of National Committee for Central Planning (ONCCP)

Table A4.3

SUMMARY OF CENTRAL GOVERNMENT FINANCE, 1974/75 - 1983/84
(Millions of Birr)

Item	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
1. Current Revenues (from table A4.4)	752	821	1 053	1 234	1 421	1 649	1 847	1 942	2 100	2 317
2. Current Expenditures (from table A4.6)	731	856	980	1 346	1 281	1 679	1 777	1 816	2 156	2 111
3. Current Surplus/Deficit (Line 1 - line 2)	21	-35	73	-112	140	-30	70	126	-56	206
4. Capital Expenditures 1/ (from table A4.5)	205	247	295	332	366	443	505	682	836	762
5. Overall Deficit and Financing (Line 3 - line 4)	-184	-282	-222	-444	-226	-473	-435	-556	-892	-556
6. Foreign Borrowing (Line 7 + line 8)	91	111	99	71	164	142	128	478	451	265
7. Loans and Credits	107	129	117	87	179	158	142	(496)2/	(472)2/	n.a.
8. Repayments	-16	-17	-17	-15	-15	-16	-14	-18	-21	n.a.
9. Domestic Borrowing (Net: Line 5 + line 6)	93	171	123	373	62	331	307	(78)3/	(441)3/	291
As % of GDP (at current mkt. prices)										
10. Domestic Rev. (Line 1)	14	14	15	17	18	19	21	21	21	23
11. Current Expend. (Line 2)	13	14	14	19	16	20	20	20	22	21
12. Capital Expend. (Line 4)	4	4	4	5	5	5	6	7	8	8
13. Total Expend. (Lines 2 + 4)	17	18	19	24	21	25	26	27	30	29
14. Overall Deficit (Line 5)	-3	-5	-3	-6	-3	-6	-5	-6	-9	-6

Source: Ministry of Finance

1/ Net of imputed value of external grants in kind.

2/ Unofficial: adjusted calculation by EHRS.

3/ Unofficial: calculated by EHRS, given the data for Foreign borrowing and Repayments. The figures for Domestic Borrowing are therefore derived residuals.

Table A4.4

CENTRAL GOVERNMENT REVENUE, 1974/75 - 1983/84
(Millions of Birr)

Item	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Taxes on net income and profits	168	160	191	206	272	332	439	507	505	590
of which: Personal income	70	69	74	84	103	119	128	133	138	143
Business profits	74	76	98	104	120	162	211	324	314	390
Others 1/	24	15	19	18	49	51	100	51	52	57
Taxes on domestic sales	200	183	188	193	283	386	399	396	439	486
of which: Petroleum products	55	24	24	25	30	33	34	34	35	41
Alcohol	34	41	45	47	68	123	123	136	154	171
Sugar	17	16	15	16	33	33	31	21	27	n.a.
Turnover and transaction taxes	52	56	62	68	95	130	141	143	154	166
Taxes on imports	172	171	243	238	323	239	285	275	301	308
Taxes on exports	42	86	218	281	229	297	188	185	198	256
of which: Coffee	24	68	199	262	215	265	155	160	173	226
(Sub-total: Tax Revenue)	(634)	(656)	(902)	(986)	(1 202)	(1 384)	(1 452)	(1 506)	(1 597)	(1 806)
Non-tax revenue	118	165	151	248	219	265	395	436	503	511
of which: Profit, interest, rent	61	97	76	84	79	125	278	333	396	401
Total revenue	752	821	1 053 2/	1 234 2/	1 421 2/	1 649	1 847 2/	1 942	2 100	2 317 2/

Source: Ministry of Finance, from Annual Budgetary Revenue and Expenditure.

1/ Includes Agricultural Income Tax.

2/ Unofficial; adjusted by EHRS to conform to addition of the columns. Discrepancies, which could not be reconciled, from the "original" figures for these years are as follows: 1976/77, 62m; 1977/78, 68m; 1978/79, 95m; 1980/81, 141m; 1983/84, 166m.

Table A4.5

CENTRAL GOVERNMENT CAPITAL EXPENDITURES 1974/75 - 1983/84
(Millions of Birr)

Item	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Economic Development	173	206	253	294	314	382	432	592	706	632
of which:										
Road Construction	54	99	90	49	84	144	137	148	106	109
Other Transport and Communications	10	8	27	39	17	13	25	28	13	11
Industry, Comm., Mining, Tourism	17	5	7	8	14	25	111	196	272	224
Agriculture and Land Settlement	65	75	103	162	164	168	132	164	197	187
Water Resources	4	15	16	23	20	20	23	57	42	33
Social Development	31	41	42	37	51	61	73	90	130	130
of which:										
Education; Universities	15	13	19	11	28	21	23	42	33	32
Health	12	8	15	18	17	9	20	24	18	19
Comm. Dev. and Social Welfare	3	18	7	7	6	31	30	24	79	79
Total Capital Expenditure	205	247	295	332	366	443	505	682	836	762

Source: Ministry of Finance.

Table A4.6

CENTRAL GOVERNMENT CURRENT EXPENDITURES, 1974/75 - 1983/84
(Millions of Birr)

Item	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
General Services	358	496	588	916	808	917	952	1 085	1 327	1 264
of which:										
General Government 1/	330	465	550	877	762	868	898	1 029	1 263	1 198
of which:										
Finance and Planning	20	21	25	27	34	36	39	40	47	47
Economic Services	67	80	82	90	83	100	99	129	143	129
of which:										
Agriculture and Land Settlement	18	24	25	29	29	36	37	43	44	46
Mining, Indus., Comm., Tourism	8	11	10	11	20	22	26	33	37	28
Transport and Communications	40	45	45	49	33	43	36	52	62	55
Social Services	203	198	212	227	257	286	338	352	405	439
of which:										
General Education and Culture	121	123	120	120	136	150	173	185	226	246
University Education	17	12	18	22	25	37	40	42	44	45
Health	33	43	49	51	59	65	77	80	80	83
Drought Relief	21	6	5	9	8	9	9	15	12	24
Pension Payments	44	48	52	57	65	68	90	87	91	99
Interest & Charges on Public Debt	20	32	42	48	65	64	78	83	84	132
Unallocated Expenditures 2/	37	1	0	7	2	224	220	80	106	48
Total Current Expenditures	731	856	980	1 346	1 281	1 679	1 777	1 816	2 156	2 111

Source: Ministry of Finance.

1/ Mainly National Defence, Public Order, and Security; also includes Organs of State, Ministries of Justice, Information, etc.

2/ Includes Fuel and Grain Subsidies as well as Regional Budget Support.

Table A4.7

VALUE OF EXPORTS BY MAJOR COMMODITY, 1974/75 - 1983/84
(Millions of Birr)

Item	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Coffee	117	297	408	512	541	631	524	477	498	590
Pulses	73	52	48	30	17	25	24	31	28	20
Oilseeds	89	35	26	11	9	13	28	20	16	28
Sugar 1/	6	9	13		0	16	10	7	10	10
Hides and Skins	37	42	52	58	107	138	93	98	77	93
Live Animals	16	31	3	1	1	8	10	8	16	14
Meat, Canned and Frozen	9	6	4	1	2	5	6	5	10	6
Fruit and Vegetables	9	7	9	4	2	7	5	7	5	6
Oilseed Cake	7	7	12	14	8	5	9	5	7	17
Raw Cotton	8	1	6	2		5	28	18	18	12
Petroleum Products 2/	7	12	26	25	28	58	76	71	69	74
Other Exports	62	20	27	17	24	37	39	48	56	59
Re-exports	30	13	5	1	0	0	1	0	0	1
Total Exports	476	539	646	670	744 3/	955	853	795	811	930

Source: Customs Office.

1/ Mainly molasses.

2/ Petroleum products data from Customs have replaced data from the Assab Oil Refinery.

3/ Excludes Br. 26.7 million of non-monetary sold in 1979/80.

Table A4.8

VOLUME OF EXPORTS BY MAJOR COMMODITY, 1974/75 - 1983/84
(000 metric tons)

Item	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Coffee	49	77	42	57	86	80	88	80	88	97
Pulses	112	86	75	46	26	33	25	35	36	28
Oilseeds	78	42	30	14	5	9	9	12	12	34
Sugar 1/	5	12	18	-	4	43	29	25	55	39
Hides and Skins	8	7	8	11	11	10	9	10	8	10
Live Animals	10	21	2	0	0	3	4	3	5	5
Meat, Canned and Frozen	5	2	3	0	0	2	2	1	3	3
Fruit and Vegetables	30	19	21	5	3	11	7	10	9	9
Oilseed Cake	33	34	46	15	36	19	21	18	27	52
Raw Cotton	4	2	2	0		2	8	6	8	3
Petroleum Products 2/	51	83	94	29		178	204	210	213	209

Source: Customs Office.

1/ Mainly molasses.

2/ Petroleum products data from Customs have been replaced by data from the Assab Oil Refinery.

Table A4.9

VALUE OF IMPORTS BY MAJOR COMMODITY GROUPS, 1974/75 - 1983/84
(Millions of Birr)

Item	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Food and live animals	18	24	33	45	60	62	84	136	174	169
Beverages and Tobacco	7	10	8	17	14	11	16	23	19	25
Raw Cotton	0	1								
Petroleum	99	110	118	124	141	244	287	329	360	326
Petroleum Products	13	19	45	34	86	76	56	29	39	53
Chemicals	93	79	65	63	151	198	40	55	99	99
Medical & Pharmaceutical Prod.	18	21	23	50	50	68	41	48	39	52
Soap, Polish, Preparations	5	11	10	12	9	14	10	27	24	16
Rubber Products	17	11	15	11	17	26	31	55	30	39
Paper & Paper Manufactures	15	11	11	9	19	21	33	19	17	26
Textiles	37	43	70	81	105	94	26	49	38	55
Clothing	11	13	21	63	27	11	6	-	14	6
Metal & Metal Manufactures	52	37	42	48	93	54	86	148	142	163
Machinery including Aircraft	90	114	90	102	140	238	218	282	279	424
Electrical Materials	31	36	38	55	82	45	29	26	118	110
Road Motor Vehicles	68	80	110	127	184	132	155	232	196	212
Other Imports	63	51	99	128	143	168	266	185	160	193
Unrecorded Imports	43	33	204	120	72	65	29	25	25	25
Adjustment 1/		-23		30	-182	-68	68	-45	-	-
Total Imports CIF	688	689	910	1 125	1 219	1 468	1 481	1 622	1 773	1 984
of which: Freight & Ins.	117	113	148	151	194	290	263	227	268	300

Source: Customs Office.

1/ Details have not been adjusted for lags and leads in customs data.

Table A4.10

ESTIMATED PRODUCTION AND CONSUMPTION OF MAJOR FOODS 1979/80 TO 1983/84

	Unit	1979/80	1980/81	1981/82	1982/83	1983/84
Production: Major cereals	Th. MT	6 397	5 612	5 394	6 718	5 903
Major pulses	"	700	848	820	965	752
(Cereals & pulses) 2/	"	(7 097)	(6 460)	(6 214)	(7 683)	6 655
Consumable production 3/	"	5 678	5 168	4 971	6 146	5 324
Plus root crops etc. mostly enset 4/	"	422	434	446	451	472
Total, main carbohydrate sources	"	6 100	5 602	5 417	6 597	5 796
Less exports, pulses	"	33	24	34	19	26
Net available from production	"	6 057	5 578	5 383	6 578	5 770
Plus: Commercial Imports	"	201	195	39	37	26
Food Aid Imports	"	147	203	182	237	253
(Total, above Imports)	"	348	398	221	274	279
Total net available for consumption	"	6 415	5 976	5 604	6 872	6 049
Above Imports as % of consumption	%	5.4%	6.4%	3.9%	4.0%	4.6%
Estimated total population 5/	Million	34.47	35.43	36.41	37.43	38.48
Implied est. consumption/cap 6/	Kgs/yr	186	169	154	183	157
Implied est. consumption/cap	Gr/day	510	460	420	500	430
Implied calories from these staples/cap	Cal/day	1 860	1 690	1 540	1 830	1 570
Plus *pro forma* allowance Calories from other food (350/cap) 7/	Cal/day	2 210	2 040	1 890	2 180	1 920
Adjusted for assumed 10% waste 8/	Cal/day	1 990	1 840	1 700	1 960	1 730
% of ENI standard of 2 330 Cal/cap/day 8/	%	85%	79%	73%	84%	74%
Implied associated consumption/adult male 9/	Cal/day	2 485	2 300	2 125	2 450	2 160

1/ Adjusted downward by 30% from 1 010 on judgement related to change in methods of estimation.
2/ From CSO "Time Series", including *pro forma* assumptions on Eritrea and Tigre, and on proportion of *belg* crop to main crop. (See notes to Annex Table A.5)
3/ Net of seeds, post-harvest losses and of calorific differences (cereal-equivalent).
4/ Cereal-equivalent, based on ENI nutrition survey 1980, implying 35 kg/cap/yr. (1 kg cereal = .35 enset, assumed)
5/ EHRS adjustment of CSO assumptions, pre-census. EHRS adjustment was 11% upward for total population, for mid-1983. (See Part I, chap. 3.4.) Census figure for mid-1984 now implies that total population is another 9.6% higher than EHRS figure.
6/ The crude arithmetic mean here cannot be very representative, given the variations.
7/ ENI 1980 nutrition survey (oil, animal products, fruits and vegetables, etc.).
8/ ENI; FAO Nutrition Division.
9/ WHO/FAO calorie requirements and age/sex structure of Ethiopia (factor of 1.15).

Sources: CSO Time Series; World Food Programme; ENI nutrition survey 1980; trade figures.

Table A4.11

ESTIMATED EQUINE POPULATION BY ALTITUDINAL BELT AND ZONE - 1983

Zone	Altitudinal belt (masl)	Equine population	Persons per equine
HPP	1 500 - 2 000	129 600	44
	2 000 - 2 500	147 200	22
	2 500 - 3 000	217 000	6
	Sub-total:	493 800	Average: 21
HPC	1 500 - 2 000	559 900	4
	2 000 - 2 500	1 377 000	3
	2 500 - 3 000	1 401 200	1
	Sub-total:	3 338 100	Average: 2
LPC	1 500 - 2 000	1 062 000	5
	2 000 - 2 500	1 618 000	2
	2 500 - 3 000	735 000	1
	Sub-total:	3 415 000	Average: 3
	Grand Total:	7 246 900	Average: 4

Table A5.1

OFFICIAL ESTIMATES OF PEASANT SECTOR PRODUCTION, AREAS, YIELDS

Major Crops 1979/80 - 1983/84 1/

		1979/80	1980/81	1981/82	1982/83	1983/84
All Cereals	Th.MT	6 235	5 366	5 114	6 467	5 702
	Th.ha	4 937	4 572	4 457	4 870	5 019
	Q/ha	12.6	11.7	11.5	13.3	11.4
of which:						
Teff	Th.MT	1 424	1 311	1 082	1 371	1 159
	Th.ha	1 510	1 360	1 330	1 398	1 409
	Q/ha	9.4	9.6	8.1	9.8	8.2
Barley	Th.MT	1 041	1 071	931	1 164	807
	Th.ha	903	829	808	906	845
	Q/ha	11.5	12.9	11.5	12.8	9.6
Wheat	Th.MT	514	500	582	781	630
	Th.ha	468	457	590	628	618
	Q/ha	11.0	10.9	9.9	12.4	10.2
Maize	Th.MT	1 413	847	1 074	1 505	1 460
	Th.ha	831	701	609	771	798
	Q/ha	17.0	12.1	17.6	19.5	18.3
Sorghum	Th.MT	1 626	1 385	1 184	1 184	1 313
	Th.ha	1 010	958	816	816	1 032
	Q/ha	16.1	14.5	14.5	14.5	12.7
Millet	Th.MT	214	205	197	197	267
	Th.ha	215	233	227	227	291
	Q/ha	9.9	8.8	8.7	8.7	9.2
All Oilseeds	Th.MT	85	94	79	121	103
	Th.ha	168	185	217	253	268
	Q/ha	5.0	5.1	3.6	4.8	3.8
of which:						
Noug	Th.MT	49	64	50	79	60
	Th.ha	111	122	151	173	159
	Q/ha	4.4	5.2	3.3	4.6	3.8
Linseed	Th.MT	21	27	26	36	40
	Th.ha	43	57	60	75	103
	Q/ha	4.9	4.8	4.3	4.8	3.8
All Pulses	Th.MT	1 009	846	818	963	752
	Th.ha	844	735	786	794	818
	Q/ha	11.9	11.5	10.4	12.1	9.2
of which:						
Horsebeans	Th.MT	488	469	470	601	402
	Th.ha	327	307	349	381	363
	Q/ha	15.0	15.3	13.4	15.8	11.1
Field peas	Th.MT	238	148	163	133	124
	Th.ha	211	169	174	151	130
	Q/ha	11.3	8.7	9.4	8.8	9.6

Table A5.1 (cont'd)

		1979/80	1980/81	1981/82	1982/83	1983/84
Chick peas	Th.MT	151	118	101	117	122
	Th.ha	171	149	138	135	195
	Q/ha	8.8	7.9	7.3	8.8	6.2
Haricots	Th.MT	26	19	11	35	46
	Th.ha	19	20	22	40	46
	Q/ha	13.8	9.6	4.8	8.9	9.8
Lentils	Th.MT	30	60	52	42	29
	Th.ha	42	53	70	55	45
	Q/ha	7.7	11.2	7.3	7.6	6.5
Vetch	Th.MT	76	31	21	34	30
	Th.ha	75	37	32	32	39
	Q/ha	10.1	8.4	6.6	10.4	7.7
Total major field crops	Th.MT	7 329	6 306	6 021	7 551	6 557
	Th.ha	5 950	5 492	5 460	5 916	6 105
Coffee	Th.MT	1 980	2 020	2 020	2 200	n.a.

1/ The estimates for 1980/81 - 1983/84 are for the period of UNDP/FAO assistance to CSO, ETH/79/013. The estimates for 1979/80 were produced by Ministry of Agriculture in a major ad hoc survey campaign. Previous field surveys of the Ministry of Agriculture, 1974/75 - 1977/78 were substantially different in design, methods and size and are strictly non-comparable. The above figures appear to have systematically underestimated harvested area and overestimated yields; the probable error on production is toward underestimation. The 1980/81-1983/84 estimates are claimed to be independent of the size of rural population, which the Census of 1984 puts at 26 per cent higher than previous CSO estimation.

Source: Compiled from tables of Time Series Data on Area, Production, and Yield of Principal Crops by Regions 1979/80 - 1983/84 (1972-1976 E.C.) Central Statistics Office, Addis Ababa, Dec. 1984. Coffee production from Ministry of Coffee and Tea Development.

Notes: Includes peasant private holdings (about 97% of area) and Producers Cooperative farms; also includes notional estimates of belg crop (small rains about 4.5% of area) based on the field survey of the belg, 1980, and the proportion the belg bore to the main season crop of 1978. The belg crop of 1984 is assumed to be a total failure. The belg crop of, say, 1983 is included in the crop year 1982/83. The above figures include pro forma estimates for Eritrea and Tigray, the averages of the estimates for these Regions of 1974/78. These estimates are carried unchanging for the years since. They are as follows: -

	Average 1974-78	Eritrea	Tigray
Cereals	Th.MT	175	200
	Th.ha	209	225
	Q/ha	8.4	8.9
Pulses	Th.MT	12	28
	Th.ha	21	37
	Q/ha	5.8	7.5
Oilseeds	Th.MT	3	3
	Th.ha	8	8
	Q/ha	3.7	3.6

Table A6.1

ESTIMATED SOIL DEPTH BY ZONE AND ALTITUDINAL BELT IN 1985

(km^2)

Depth (cm)		'000 masl				Total
	1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0	
LPC >150	3240	6160	6500	790	320	17010
100-150	3460	3460	7540	4400	280	19140
50-100	7980	15660	21420	3180	1540	49780
25-50	5100	15180	10120	2680	2020	35100
10-25	3780	12800	13670	4590	2360	37200
0-10	2780	13240	1120	840	520	18500
Rock	-	3240	500	-	-	3740
Total	26340	69740	60870	16480	7040	180470
HPC >150	1760	12690	27800	3360	1140	46750
100-150	1880	3180	10140	4800	870	20870
50-100	360	4700	11660	13260	2400	32380
25-50	3800	5900	8820	6480	6780	31780
10-25	8760	5660	7200	6520	2080	30220
0-10	-	1880	-	-	-	1880
Rock	-	-	-	-	-	-
Total	16560	34010	65620	34420	13270	163880
HPP >150	20220	35380	33060	7000	-	95660
100-150	5620	9080	8200	1420	280	24600
50-100	9700	13580	12580	7680	780	44320
25-50	8620	2500	4400	3020	520	19060
10-25	5780	560	660	1340	680	9020
0-10	-	-	-	-	-	-
Rock	-	-	-	-	-	-
Total	49940	61100	58900	20460	2260	192660
Highlands						
>150	25220	54230	67360	11150	1460	159420
100-150	10960	15720	25880	10620	1430	64610
50-100	18040	33940	45660	24120	4720	126480
25-50	17520	23580	23340	12180	9320	85940
10-25	18320	19020	21530	12450	5120	76440
0-10	2780	15120	1120	840	520	20380
Rock	-	3240	500	-	-	3740
Total	92840	164850	185390	71360	22570	537010

Source: EHRS estimates based on LUPRD data.

Table A8.1

GOVERNMENT LIST OF PRIORITY REGIONS AND CATCHMENTS FOR CONSERVATION

Region		Catchment	Total area (ha)	Implementing agency	Work started
Eritrea	1.	Asmara - Ginda	23 437	Joint	1982
	2.	Ansba (Maibella)	163 750	Joint	1982
	3.	Adikey-Zala-abesa	23 125	SWCD	1982
	4.	Feredait	28 750	FaWCDA	1980
Tigray	5.	Adigrat (Suluh)	36 160	Joint	1980
	6.	Wukro (Genfel)	28 032	Joint	1980
	7.	Agula	29 760	Joint	1980
	8.	Quiha (Mesanu)	15 104	Joint	1980
	9.	Debre (Meskella)	27 200	Joint	1980
	10.	Maichew (Main-tshet)	9 670	Joint	1980
	11.	Assem (Adwa)	50 000	FaWCDA	1982
Welo	12.	Borkena	157 960	Joint	1980
	13.	Northern Mille	45 610	Joint	1980
	14.	Upper Mille	77 350	Joint	1980
	15.	Upper Beshilo	262 810	FaWCDA	1980
	16.	Alawuha (Awira)	29 680	Joint	1980
	17.	Tirare	82 500	FaWCDA	1980
	18.	Upper Takeze	62 810	FaWCDA	1980
Hararghe	19.	Mulu-Aseba (Doba)	29 100	Joint	1980
	20.	Galleti	75 625	Joint	1980
	21.	Butiju	10 625	Joint	1980
	22.	Erer-Jarso	26 250	FaWCDA	1982
	23.	Hurso-Oda	16 100	SWCD	1980
	24.	Erer-Gota	63 800	SWCD	1982
	25.	Alemaya	18 500	SWCD	1982
Shewa	26.	Meki	283 750	SWCD	1980
	27.	Billate (Belate)	132 500	SWCD	1980
	28.	Ejere-koka	66 250	SWCD	1982
	29.	D. Berhan-D. Sina	60 812	SWCD	1982
	30.	Robi	29 200	FaWCDA	1980
Gondar	31.	Beshilo	59 375	Joint	1980
	32.	Gumera	140 000	SWCD	1982
	33.	Megecha	10 244	SWCD	1982
Gojam	34.	Kechem	16 094	SWCD	1982
Gamu Gofa	35.	Basso	24 687	SWCD	1982

Source: SWCD.

Table A8.2

WORK NORMS FOR CONSERVATION WORK USED IN FFW

Activity	Original work norm	Standard food for work payment	Work norm implied by standard payment	Work norm implied by actual payment
(1)	(2)	(3)	(4)	(5)
Soil bund	70 WD/km	200 kg/km	66.7 WD/km	61 WD/km
Stone bund	150 WD/km	300 kg/km	100 WD/km	100 WD/km
Hillside terracing	150 WD/km	450 kg/km	150 WD/km	145 WD/km
Check dams	350 WD/km	1000 kg/km	333.3 WD/km	313 WD/km
Pitting	24 P/WD	9.5 P/WD	28.5 P/kg	28.8 P/WD
Seedlings raised	62.5 S/WD	3 kg/WD	n.a.	63 S/WD
Seedlings planted	60 S/WD	20 S/kg	60 S/WD	63 S/WD
Road construction	3500 WD/km	1500 kg/km	500 WD/km	506 WD/km
Road maintenance	500 WD/km	1500 kg/km	500 WD/km	496 WD/km
Pond digging	6700 WD/p	3 kg/WD	n.a.	900 WD/p
Diversion canal	n.a.	3 kg/WD	n.a.	1633 WD/km

Note: WD refers to work day.

Source: SWCD.

Table A8.3

STAFF AND TRANSPORT OF SWCD AND FAWCDA IN 1984

Region	SWCD								FAWCDA							
	Staff					Transport			Staff 2/				Transport			
	Graduates	Agricul-tural Diplomates	Technical Diplomates	Other Staff	Total	Trucks 1/	Pickups	Saloon car	Regional team leader 3/	Regional Experts 4/	Techni-cians 5/	Assistant Techni-cians 6/	Trucks 1/	Pickups	Saloon car	Motorcycle
Eritrea	2	17	1		20	1	3	-	1	1	8	12	2	8	3	-
Tigray	2	24	1		27	1	4	-	1	4	6	12	10	12	2	1
Gondar	2	20	-		22	1	1	-	1	1	2	8	2	6	2	-
Welo	3	25	2		30	2	5	1	1	1	8	21	6	9	5	3
Shewa	2	30	2		34	2	4	-	1	1	2	8	4	14	15	1
Hararghe	2	22	2		26	2	4	1	1	1	8	30	4	9	4	2
Gamu Gofa	2	14	-		16		1						1	5	2	4
Gojam	4	17	2		23								-	5	2	4
Sidamo	1	11			12								3	1	12	3
Welega	1	14			15	transport supplied by regional MOA office and/or HQ			17	45	112	333	2	9	3	2
Illubabor	1	7			8								1	14	4	-
Kefa	1	8			9								1	4	11	-
Bale	1	5			6									5	3	2
Arsi													3	3	6	1
Headquarters	10	4	12	14	40	6	-	4					26	108	63	9
Total	34	218	22	14	288	15	22	6	23	54	146	424	65	212	138	32

1/ Includes tractors and trailers.
2/ FaWCDA had 6247 staff in mid-1984: 62 graduates, 445 diplomates, 1003 certificat holders, 4737 others.
3/ Not necessarily all graduates, but all with long service.
4/ Includes some graduates.
5/ All diplomates.
6/ Agricultural certificate holders.

Source: SWCD and FAWCDA.

Table A8.4

ANNUAL BUDGETS OF SWCD AND FAWCDA - 1978/79 to 1982/83
(By source of funds)
(EB 000)

AGENCY	1978/79		1979/80		1980/81		1981/82		1982/83	
	SWCD	FAWCDA	SWCD	FAWCDA	SWCD	FAWCDA	SWCD	FAWCDA	SWCD	FAWCDA
GOE	342	n.a.	325	n.a.	874	n.a.	1 549	18 900	n.a.	22 000
WFP	10 508	n.a.	18 197	n.a.	23 525	n.a.	27 691	2 700	n.a.	3 000
Others	2 734 1/	n.a.	6 021 1/	n.a.	5 565 1/	n.a.	6 421 2/	4 600 3/	n.a.	2 200 3/
Total	13 584	n.a.	24 543	n.a.	29 964	n.a.	35 611	26 200	n.a.	27 200

1/ Includes SIDA and FAO funds.

2/ Includes SIDA, FAO and UNCDF funds.

3/ Includes funds from SIDA and West Germany

Source: FAWCDA and SWCD.

Table A8.5

KOBO-ALAMATA AND GOLINA-HORMAT PROJECTS

Kobo-Alamata	Golina-Hormat
Objectives To provide relief measures to the famine-stricken people and undertake studies and surveys to prepare long-term plans for self-help development.	Objectives To recliam seriously eroded lands, simultaneously establishing sound land use.
Location Graben Valley below northeast escarpment (LPC zone)	Location
Duration Started in 1975 and still on-going.	Duration Designed in 1978 for 3 years, but had to be prematurely terminated because of security problems.
Budget (EB million) 1st Development plan 19.0 2nd Development plan 2.6 3rd Development plan 2.9 Total 24.5	Budget EB 18.7 million. (Various sources of funding, including Dutch.)
Achievements Feeder roads constructed 61 km Irrigation development 697 ha Const. of settlers houses 136 Sanitary wells 32 Agricultural Research Demonstration and Home-economic centers 27 The project has tested a range of improved crop varieties suitable for the area and established seed production facilities. Soil and water conservation activities: Bunding 2 755 km Terracing 696 km Hillside closure 171 ha Seedlings planted 919 000	Achievements and problems No records are available on the achievements or problems of this project.
Problems Periodic drought has killed many of the trees planted.	
Current status On-going.	Current status Closed.

Sources:
1. Golina-Hormat Catchment Rehabilitation Project Proposal, 1979.
2. Kobo-Alamata Development Project, Evaluation Survey, MOA (in Amharic), 1982.
3. Getachew Diriba (May 1984): Profile of Kobo-Alamata Agricultural Development Project, Addis Ababa.
4. Kobo-Alamata Agricultural Development Project: Department of Agricultural Extension, Progress Report, No. 7/1982.

Table A8.6

FOOD-FOR-WORK AND FOOD AID: 1975/76 - 1983/84
(000 metric tons)

Agencies	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
WFP/FFW	10	1	16	36	36	80	55	130	130
WFP/other	17	10	0	35	15	0	27	110	123
WFP/total	27	11	16	71	51	80	82	240	253
Other food aid	53	54	97	54	96	120	100	n.a.	n.a.
Total food aid	80	65	113	125	147	202	182	240 1/	253 1/
FFW as % of Total food aid	34	17	14	57	35	39	45	54	51

Source: WFP.

1/ Excluding food aid from sources other than WFP.

Table A8.7

SWCD TRAINING ACHIEVEMENTS: 1979 - 1984

ASSISTANCE TO SOIL AND WATER CONSERVATION PROGRAMME (ETH/81/003)

Type of Training	Course (weeks)	Number trained 1979	1980	1981	1982	1983	1984	Total
In-country Training								
In-service Training Course for Supervisors and Technicians	6	63	60	48	65	60	30	326
In-service Training Course for Rural Development Agents	1	118	200	218	27	300	300	1 163
In-service Training for Rural Development Agents	1				200			200
In-service Training for Graduates	3		50					50
Training for Peasant Association Leaders	.		600	200	200	200	300	1 500
Seminar on Soil Conservation for Supervisors	1.5				28	30	30	88
Seminar on Soil Conservation for Technicians	1				51	52	50	153
In-service crash training course in Revegetation Techniques for Supervisors and Technicians	1					149	150	299
In-service Training Course in Watershed Management Planning for Supervisors and Technicians	2					25	25	50
In-service Training for Technicians in Labour Base Rural Road Construction	3					25		25
In-service Training in Irrigation Practices	1.5					1	2	3
Refresher Training for Supervisors and Technicians	1.5					30	60	90
Crash Courses in:								
- Construction of Small Earth Dams	1.5					30	30	60
- Minor Irrigation	1.5					30	2	60
- Construction and Maintenance of Earth Bunds	1.5						30	30
TOTAL		181	910	466	571	902	1037	4 067

Source: SWCD

Table A9.1

COSTS OF FARM STRUCTURES (1984/85)

(RRC Settlement Model)

Type		No.		Cost (EB)
1. FARM BUILDINGS				
1.1	Settlement coordination office (1/5)*	1		4 103
1.2	Settlement office	1		6 734
1.3	Machinery shed	1		25 407
1.4	Generator shed	1		4 599
1.5	Workshop shed	1		28 872
1.6	Mill house	1		9 198
1.7	Grain store	1		44 895
1.8	Garage coordination office (1/5)*	1		5 030
1.9	Cooperative store	1		6 734
	Sub-total			135 572
2. FACILITIES				
2.1	Manager's house (RRC staff live on per diem			-
2.2	Staff quarters and accommodate themselves)			-
2.3	Clinic	1		6 734
2.4	Schools (Responsibility of Ministry of Education)			-
2.5	Community hall	1		44 895
2.6	Cooperative shop	1		3 975
2.7	Kitchen	2		12 702
2.8	Toilet	2		15 776
	Sub-total			84 082
3. SETTLER HOUSES		No.	Unit cost (EB)	Cost (EB)
3.1	House (type A)	250	2 700	675 000
3.2	House (type B)	250	2 600	650 000
3.3	Toilet	500	60	30 000
	Sub-total			1 355 000

* One such building is shared by 5 units.

Note: RRC provides materials not available locally; settlers provide locally available materials and labour.

Table A9.2

ESTIMATED COSTS OF FARM MACHINERY AND EQUIPMENT

(RRC Settlement model)

Type	No.	Estimated unit cost (EB)	Estimated total cost (EB)
A. SPECIAL SCHEMES			
1. Machinery			
1.1 Tractors	6	25 000	150 000
1.2 Trailor	1	6 000	6 000
1.3 Disc plough	5	4 000	20 000
1.4 Disc harrow	3	6 000	18 000
Sub-total			194 000
2. Equipment			
2.1 Flour mill	1	21 000	21 000
2.2 Maize sheller	1	5 590	5 590
2.3 Water tank	1	7 000	7 000
2.4 Knapsack sprayer	12	140	1 680
Sub-total			35 270
3. Hand tools required for one settlement unit of 500 settlers (One unit is provided with 100 sets) 1/			
3.1 Axe	100		
3.2 Shovel	100		
3.3 Pick axe	100		
3.4 Digging stick	100		
3.5 Hammer	100		
3.6 Sickle	100		
3.7 Hoe	100		10 000
Total, Special Schemes			239 270
B. LOW-COST SETTLEMENTS (250 families according to RRC model) Settlers joining a low-cost settlement are given the following assistance:			
1. Oxen	250	300	75 000
2. Ploughs 2/	250	12	3 000
3. Hand tools	250	20	5 000
Total, Low-Cost Settlements			83 000

1/ The value of hand tools distributed is estimated at EB 20 per settler (1984 prices); i.e. EB 10 000 for 500 settlers.

2/ Settlers are provided material for manufacturing traditional ploughs.

Table A9.3

FOOD SUPPORT FOR ONE FAMILY OF FIVE PERSONS

Type of food	Ration: Daily	Ration: Monthly	Ration: Yearly	EB/unit	Value (EB)
Grain	2 500 gr	75 kg	9 qt	44 qt	396
Oil	75 gr	2.3 l	27.6 l	3 l	83
Pulses	407 gr	12 kg	1.44 qt	150 qt	216
Pepper	67 gr	2 kg	.24 qt	300 qt	72
Salt	67 gr	2 kg	.24 qt	29 qt	7
Per family					774
Adjusted to 4.1 persons/family 1/					635
Other item					
Soap	-	2 cakes	24 cakes		18
Per family/year					653
Per person/year					159

SPECIAL SCHEME

Support cost for 487 families:	first year	318 000
Support cost for 487 families:	second year	159 000
Total support cost		477 000

LOW-COST UNIT

Support cost for 245 families:	first year	160 000
Support cost for 245 families:	second year	80 000
Total support cost		240 000

1/ Apparent average size of family in the settlements before the emergency programme, November 1984. However, in the first phase of this emergency programme (to July 1985) the average settler family apparently has been 3.05. (See resettlement cost Tables 9.5C,D,E in text.)

Table A9.4

SELECTED SETTLEMENT UNITS

Twenty settlement units were selected for the study, and for each of them data were collected by means of questionnaires.

SPECIAL SCHEMES

		Region
1.	Asosa unit 2	Welega
2.	Asosa unit 3	Welega
3.	Asosa unit 4	Welega
4.	Asosa unit 12	Welega
5.	Asosa unit 13	Welega
6.	Angar Gutin unit 2	Welega
7.	Angar Gutin unit 5	Welega
8.	Didessa Dimtu unit 2	Welega
9.	Didessa Dimtu unit 1	Welega
10.	Didessa Kone	Welega
11.	Didessa Kersa	Welega
12.	Harawa unit 2	Bale
13.	Harawa unit 3	Bale
14.	Haralle unit 1	Shewa
15.	Tadelle unit 6	Shewa

LOW-COST SCHEMES

1.	Negesso unit 1	Shewa
2.	Negesso unit 2	Shewa
3.	Jeweha	Shewa
4.	Yayaotana (Haralle)	Shewa
5.	Jeju (Tadelle)	Shewa

Table A9.5

CROP PRODUCTION COSTS - SPECIAL SCHEMES

(RRC model - 500 households)
(Before emergency schemes from November 1984)

Type	Cost per unit (EB)
Seeds	2 530
Fertilizers	22 125
Pesticides	1 000
Packing materials	11 150
Gas/oil	11 260
Oil	3 475
Grease	560
Other tractor costs	5 890
Total	57 430

Table A9.6

PERSONNEL COSTS - SPECIAL SCHEMES

Variations in the number of staff posted in the field have been observed among settlement sites during field visits. The following represent average costs of personnel for one settlement unit (pre-emergency of November 1984).

Type	No.	Annual Cost (EB) (Salary)
1. COORDINATING OFFICE 1/		
1.1 Coordinating manager	1	8 520
1.2 Technical staff (different scales)	2	14 520
1.3 Administrative officer	1	2 160
Total cost for 5 units		25 200
Total cost for 1 unit		5 040
2. SETTLEMENT UNIT		
2.1 Unit manager	1	5 040
2.2 Technical staff (different scales)	3	10 920
2.3 Junior mechanic	1	2 300
2.4 Tractor operator	5	8 250
Total cost per unit		26 510
Total cost of salaries (1+2)		31 550
Cost of per diem (20% of salary)		6 310
Total personnel cost		37 860

1/ Shared between 5 units.

Remark: Teachers and Clinic dressers are not included.

Table A9.7

RRC BASIC REQUIREMENTS FOR SETTLEMENT SELF-RELIANCE

A settlement is considered self-reliant if it fulfills the following requirements:

1. If a settler-family's annual production meets the following levels:

(a)	Crop	-	9.2 qt	or	EB 193.00
(b)	Pulses	-	1.5 qt	or	57.99
(c)	Pepper	-	24.5 kg	or	36.75
(d)	Salt	-	24.5 kg	or	9.80
(e)	Oil	-	27.4 l	or	95.90
	Total				392.45

2. Clothing — EB 150/family

3. Measurement of the settlers' cooperative organization.

4. Measurement of the settlers' production of tools and materials.

5. Accessibility to extension services and settlers' preparedness for self-management and training.

6. Consolidation of basic infrastructures and social services.

Source: RRC

Table A11.1

SUMMARY OF THE CHARACTERISTICS OF MULTI-PURPOSE PLANT SPECIES

Plant Species	Suitable Soils	Altitude (masl)	Rainfall (mm)	Seed-rate (kg/ha)	Seed Treatment	Tolerance to Drought	Tolerance to Water-Logging
(A) GRASSES							
1. Cenchrus ciliaris (Buffel)	Light-textured well drained soils	<1 800	350-1000	3-5	6-months rest period after harvest	Very good	Poor
2. Chloris gayana (Rhodes)	Light-textured loam soils	<2 000	600-1000	4-6	No dormancy but seeds improve in storage	Good	Fair
3. Panicum maximum (Guinea)	Well drained medium textured fertile soils	<1 900	650-1500	4-10	6-months rest period after harvest	Good	Poor
4. Phalaris aquatica (Phalaris)	Heavy fertile soils	>2 000	430-650	6-10	-	Very good	Good
5. Pennisetum clandestinum (Kikuyu)	Heavy fertile soils	>1 800	1000-1600	3-6	-	Fair	Fair
6. Pennisetum purpureum (Napier)	Well drained heavy fertile soils	<2 000	800-1000	Cuttings	-	Fair	Poor
7. Setaria anceps (Setaria)	Well drained fertile soils	<2 000	500-700	5-10	-	Fair	Good
8. Sorghum almum (Columbus)	Black alluvial soils	<1 800	400-900	5-7	-	Good	Fair
(B) LEGUMES							
9. Desmodium uncinatum (Silverleaf desmodium)	Well drained sandy loam soils	<2 000	900-1000	2-4	Seed inoculation	Fair	Fair
10. Lablab purpureus (Lablab)	Deep sandy to clay loam soils	<2 000	700-2000	5-7	-	Good	Fair
11. Macroptilium atropurpureum (Siratro)	Light-textured low fertility soils	<1 700	700-800	2-4	Seed scarification	Good	Fair

Table A11.1 (cont'd)

Plant Species	Suitable Soils	Altitude (masl)	Rainfall (mm)	Seed-rate (kg/ha)	Seed Treatment	Tolerance to	
						Drought	Water Logging
12. Stylosanthes guianensis (Stylo)	Coarse-textured well drained soils	<2 000	500-4000	1-3	Seed scarification	Good	Fair
13. Stylosanthes hamata (Varano stylo)	Poor scrub soils	<1 800	300-1250	3-6	Seed scarification	Very good	Poor
(C) TREE FODDER							
14. Acacia albida (Albida)	Deep sandy loam soils	<2 000	450-800	Seedlings	Seed scarification	Good	Poor
15. Acacia saligna (Saligna)	Poor rocky soils	<2 000	450-800	Seedlings	Seed scarification	Good	Poor
16. Albizia lebbeck (Albizia)	Well drained medium soils	<1 800	600-2000	Seedlings	-	Good	Poor
17. Atriplex nummularia (Atriplex)	Poor sandy soils	<1 800	150-200	Seedlings or cuttings	-	Very good	Fair
18. Cajanus cajan (Pigeon peas)	Variety of soils	<1 800	600-1000	2-6	-	Good	Fair
19. Leucaena leucocephala (Leucaena)	Well drained heavy fertile soils	<1 800	500-2000	5-10 or seedlings	Seed scarification and inoculation	Good	Poor
20. Prosopis juliflora (Prosopis)	Sandy or rocky desert soils	<1 600	150-600	Seedlings	Seed scarification	Very good	Poor
21. Sesbania grandiflora (Sesbania)	Heavy well drained soils	<1 800	1000-1500	Seedlings	-	Fair	Fair

Source: Chadhokar 1984a.

Table All.2

SUGGESTED OR INDICATED SPECIES FOR GRASSLAND IMPROVEMENT

Grass	Legume
High Altitude	
Lolium perenne (introduced) for grazing on red and black clay soil. Dactylis glomerata (introduced) for grazing, hay and silage on red clay soil. Phalaris tuberosa (introduced) for grazing, hay and silage on red and black clay soils. Phalaris aurundinacea (indigenous) for hay and silage on heavily waterlogged soils.	No cultivated legumes have yet been found but wild legumes such as Trifolium ruepellianum, Trifolium lanceolatum and Trifolium burchellianum establish readily.
Medium Altitude	
Chloris gayana (introduced and indigenous varieties) for grazing, hay and silage on red clay and sandy soils. Panicum coloratum (introduced and indigenous varieties) for grazing, hay and silage on black clay soils. Setaria sphacelata (indigenous) for grazing, hay and silage on heavily waterlogged soils. Sorghum almum (introduced) for hay or silage on well drained soils. Pennisetum purpureum (introduced and indigenous) for grazing and silage on all soil types.	Medicago sativa (introduced) has proved the best legume for growing in pure stands or mixed with Chloris gayana. Desmodium uncinatum (introduced) has proved useful for mixing with Pennisetum purpureum and is also used for improving natural pastures. Glycin wightii (indigenous) has proved useful for mixing with Pennisetum purpureum. Lablab niger (introduced and indigenous varieties) seems promising for mixing with Sorghum almum or grown in pure stands.
Low Altitude	
Chloris gayana (introduced and indigenous varieties) for grazing, hay and silage on well drained soils. Panicum coloratum (introduced and indigenous varieties) for grazing, hay or silage on waterlogged black clay or swampy soils. Panicum maximum (indigenous and introduced varieties) for grazing, hay and silage on well drained soils in good rainfall areas. Brachiaria ruziziensis (introduced) for grazing under dry conditions. Pennisetum purpureum (introduced and indigenous varieties) for grazing and silage on all kinds of soils in good rainfall areas.	Medicago sativa (introduced) is the most promising legume for growing in pure stands or mixed with Chloris gayana. Desmodium uncinatum (introduced) seems useful for mixing with Pennisetum purpureum and Chloris gayana. Glycine wightii (indigenous) is probably useful for mixing with Pennisetum purpureum and Chloris gayana. Lablab niger (introduced and indigenous varieties) is probably useful for growing in pure stands or mixed with Sorghum almum.

Source: Mengistu (1981) and EHRS working papers.

Table A12.1

SOME SUGGESTED FORAGE CROPS FOR THE HIGHLANDS

Grasses:	Oats (*Avena sativa*), an annual crop well suited for medium high altitudes. If planted in July, it will be ready for harvest in early October.
	Sudan grass (*Sorghum sudanese*) drought-resistant annual crop well suited for low-medium altitudes. If planted in June it will be ready for harvest in October.
Legumes:	Local peas have proved useful in mixtures with fodder oats at high to medium altitudes.
	Vetch (*Vicia dasycarpa*) is a promising legume for medium-high altitude grown in pure stand or in mixture with oats and sudan grass.
	Sweet clover especially the indigenous *Melilotus altissimus* can be grown in pure stand or in mixture with sudan grass at medium altitudes.
	Lupines are also useful for silage or green feeding in the beginning of the dry season in October.
	Narrow-stemmed kale is another promising annual crop for silage, at medium altitudes. It is also drought-resistant and can be used for green feeding in October to November.
	Local rape is a high yielding silage crop for medium-high altitude.
Root crops	can be stored in the field during the dry season and harvested when they are needed for feeding.
	Fodder beet (*Beta vulgaris*) is a good forage crop for medium-high altitudes.
	Turnip and swede are useful at higher altitudes and sweet potato at low altitudes.

Source: Alemayehu (1981)

Table A12.2

LEGUMES INDICATED FOR UNDERSOWING WITH MAJOR CEREAL CROPS, BY ZONE AND ALTITUDINAL BELT

Zone	Elevation (masl)	Cereal crop	Indicated undersowing date	Possible legumes
HPP	2 500-3 000	barley	early August	*Trifolium rueppellianum* *T. steudneri* *Vicia dasycarpa*
	2 000-2 500	wheat, barley	mid-August	*Vicia vicosa*
	1 500-2 000	maize	July	*Stylosanthes* spp.
		sorghum	August	*Desmodium dichotomum* *Vicia* spp. *Medicago* spp.
HPC	2 500-3 000	barley	early September	as above
	2 000-2 500	wheat, barley	early September	
	1 500-2 000	maize	early July	
		sorghum	July	
LPC	2 500-3 000	barley	end July	as above
	2 000-2 500	wheat, barley	end July	*Medicago* spp. *Stylosanthes* spp.
	1 500-2 000	sorghum	early June	*Stylosanthes humilis*
		maize	early June	*Medicago* spp.
		millet	July	*Centrosema* spp. *Siratro*

Source: EHRS WP 15.

Table A12.3

THE RECOMMENDED TECHNICAL PACKAGE FOR MAIZE

(i) Variety. For the immediate future for most peasants this will be the best available composite. Hybrid 625 should immediately be included in on-farm tests and demonstrations to show farmers the benefit of hybrid seed and emphasize the need to purchase fresh hybrid seed each year. Ethiopia has had problems with hybrid seed in the past but there is no reason why these problems cannot be overcome as in Kenya, Tanzania, Zambia and Zimbabwe, where hybrids are more widely grown by peasant farmers. The best available composites average a 40 percent yield increase over local maize and hybrid 625 will give another 40 percent increase.

(ii) Row planting. Row planting is essential to get a full and even stand and a reasonably accurate plant population. Much maize is still broadcast which makes weeding difficult and fertilizer placement almost impossible. The row planting is recommended by hand or by hand-jab planters. Recommended spacing: 75 cms x 75 cms, planting 5 seeds per hole and thinning to 3 plants per hole. This gives a population of about 53 000 plants/ha.

(iii) Fertilizer. A planting application is recommended of a mixture of 150 kg/ha triple superphosphate and 50 kg/ha of ASN (ammonia sulphate nitrogen) or sulphate of ammonia. This should be followed when the maize is knee-high, by 200 kg/ha of ASN or sulphate of ammonia. Use of ASN or sulphate of ammonia would involve making specific import arrangements because urea is the only form of nitrogenous fertilizer currently available in quantity in Ethiopia. Urea is far less efficient on maize than ASN or sulphate of ammonia. ASN is preferred because (a) it has both ammonia and nitrate forms of nitrogen and is therefore longer acting; (b) it has only half the acidifying effect of sulphate of ammonia; and (c) the import cost is usually about the same as sulphate of ammonia but the nitrogen content is 26 percent, as opposed to 21 percent, so that the cost per unit of nitrogen is about 25 percent cheaper.

(iv) Early planting. Early planting increases yield more than any other production factor. Planting should be at the start of the rains or as soon after as possible. The ear of maize is well covered by the sheath or husk so, unlike most other crops, there is little or no damage from rain if maize matures before the end of the rains.

(v) Weeding. Three hand weedings are needed. Timing is important and especially the first weeding should be done as soon as possible - that is, as soon as the maize plants can be seen.

(vi) Pest and disease control. Carbaryl applied by hand in the funnel of one leaf of the maize plant as soon as stalk borer damage is observed; 5 kg/ha is recommended (a number of other insecticides are equally effective if carbaryl is not available). Sometimes a higher than usual incidence of other pests justifies use of insecticide but stalk borer is the only pest requiring regular control. Recommended varieties have been bred for resistance to most diseases which require no other control measures.

Source: PADEP Report by A. Harrison: "Current Crop Technology".

Table A12.4

ZERO-TILLAGE EFFECTS ON CROP YIELDS IN AFRICA

Crop	Zero-tillage yield as % of ploughed	Year	Country
Maize	233	1961	Ghana
Maize	77	1967-68	Tanzania
Maize	98	1975	Nigeria
Cowpea	117	1974	Nigeria
Maize	105	1975	Nigeria
Cowpea	131	1974	Nigeria
Maize	72	1974	Liberia
Maize	215	1973	Liberia
Rice	152	1973	Liberia
Maize	78	1974	Nigeria
Maize	129	1975	Nigeria
Sorghum	99.5	1974	Botswana
Maize	97	1973	Uganda

Source: FAO Soils Bulletin, 1980.

Table A12.5

HYDROLOGICAL CHARACTERISTICS OF SELECTED GAUGED CATCHMENTS IN THE HIGHLANDS

Major Catchment	River	Station	Zone	Catchment Area Km^2	Total Mean Km^2	Annual Runoff		Spec.Disch. Feb-Mar		Length of Record
						Mean spec. $1/sec/km^2$	80% Ex* $1/sec/km^2$	Mean $1/sec/km^2$	80% Ex* $1/sec/km^2$	
Abay (Blue Nile)	Andassar	Bahir Dar	HPC	573	258	14.3	11.5	7.10	5.70	1960-1983
	Beresse	D.Berhan	HPC	211	103.6	15.6	11.1	0.85	0.32	1961-1982
	Beno	Guder	HPC	290	172	18.7	16.9	0.97	-	
	Fatto	Guder	HPC	96	81	26.6	22.5	0.99	-	
	Indis	Guder	HPC	111	77	21.9	19.4	2.48	-	
	Muger	Chancho	HPC	489	223	14.4	9.9	0.67	0.03	1965-1982 1/
	Tencha	Denbecha	HPC	406	689	53.9	30.4	1.12	-	
	Fettam	Tilile	HPC	280	287	32.7	27.8	1.68	-	
	Neshi	Shambo	HPC	322	168	16.5	14.6	1.04	-	
Awash	Berga	Addis Alem	HPC	248	151	19.3	15.9	0.62	0.39	1975-1982 2/
	Holetta	Holetta	HPC	119	81	21.5	17.9	2.00	1.21	1975-1982
	Mojo	Mojo Bridge	LPC	1 205	194	5.1	2.7	2.06	-	
	Teji	Asgari	HPC	717	211	9.3	7.9	0.50	0.36	1978-1982
Ghibe Omo	Gogeb	Indibir	HPP	109	-	-	-	1.96	-	
	Gotam	Indibir	HPP	65	-	-	-	3.51	-	
	Megecha	Gubre	HPP	288	-	-	-	2.88	-	
	Rebu	Wolkite	HPP	480	243	16.1	10.2	0.79	0.47	1972-1980 3/
Wabe Shebelle	Wabe Shebelle	Drddla	HPC	1 035	152	4.7	3.4	1.44	-	
	Maribo	At W.S.	HPC	1 039	270	8.2	6.0	1.05	-	
	Maribo	At Bridge	HPC	200	129	20.5	17.9	8.29	1.19	1967-1979 4/
	Ukuma	At Bridge	HPC	137	71	16.5	12.1	3.04	0.76	1976-1980

1/ 1980 data incomplete.
2/ 1979 data incomplete.
3/ 1976 data incomplete.
4/ 1972 data incomplete.

Table A12.6

TRACTOR PLOUGHING VS. OXEN

I. TRACTOR PLOUGHING COST

Assumptions:

Ownership cost

Estimated ownership period		5 years
Usage (hours/yr)		1 200
Ownership usage (total hours)		6 000
1) Delivery price of a tractor		38 000 1/
2) Depreciation cost per hour (38 000 ÷ 6 000)	Birr	6.30
3) Interest cost (9% of 1/2 initial value p.a./1 200)		1.43
A) Total hourly ownership cost (2 + 3)		7.73
Operating Costs (per hour) 2/		
Fuel (81. per day)	Birr	6.32
Oil and lubricants		1.58
Repair and maintenance		3.20
Operator's wage (EB 8/day)		1.00
B) Sub-total		12.10
C) Total owning & operating costs (A+B) per hour	Birr	19.83
D) Additional charges for equipment (attachments)		
Hourly charges per ha for ploughing		2.37
for discing		4.74

As it takes an average of 3-1/2 hours to plough and 3 hours to disc., 6-1/2 hours in all, for the two operations in land preparation, the average cost/ha is:

Cost item	Hourly cost (EB)	No. of hours	Cost/ha (EB)
Ownership	7.73	6.5	50.3
Operating	12.10	6.5	78.7
Ploughing	2.37	3.5	8.3
Discing	4.74	3	14.2
			151.5

II. OXEN PLOUGHING COST 3/

1) Average oxen-days for ploughing one hectare in the nine farming systems		30.3
2) Cost of hiring a pair of oxen per day	Birr	3.0
Therefore: cost per ha. for oxen ploughing is	Birr	91.0

1/ The cost could be as much as EB 53 000, depending on the type of tractor.
2/ State Farm experience.
3/ Based on EHRS farm models.

Table A12.7

SUGGESTED SPECIES FOR EXPANDING
SIMPLE AGRO-FORESTRY IN THE HIGHLANDS

Zone/ masl	Species	Nitrogen Fixing	Fuel	Poles	Fodder	Soil Erosion	Live Fence
HPP							
Below 1 500	Terminalia brownei		x	x			
	Ginchira arborea		x	x			
	Tamarindus indica	x	x	x	x		
1 500-2 000	Moringa oleifera				x		
	Terminalia brownei		x	x			
	Erythrina burana	x	x	x	x		x
2 000-2 500	Albizia schimperiana	x	x	x	x		
	Milletia feruginea	x	x	x		x	
	Erythrina burana	x	x	x	x		x
2 500-3 000	Milletia ferruginea	x	x	x		x	
	Acacia abyssinica	x	x	x	x		
	Hagenia abyssinica		x	x			
Above 3 000	Acacia abyssinica	x	x	x	x		
	Hagenia abyssinica		x	x			
	Croton macrostachys		x	x	x		
HPC							
Below 1 500	Acacia nilotica	x	x	x	x		x
	Croton macrostachys		x	x	x		
	Leucaena leucocephala	x	x	x	x	x	x
1 500-2 000	Acacia albida	x	x		x	x	
	Erythrina brucei	x	x		x	x	
	Sesbania grandiflora	x	x	x	x	x	
2 000-2 500	Acacia albida	x	x		x	x	
	Croton macrostachys		x	x	x		
	Cordia africana		x	x	x		
2 500-3 000	Acacia abyssinica	x	x	x	x		
	Hagenia abyssinica		x	x			
	Juniperus procera		x	x			
Above 3 000	Acacia abyssinica	x	x	x	x		
	Hagenia abyssinica		x	x			
	Croton macrostachys		x	x	x		
LPC							
Below 1 500	Acacia saligna	x	x	x	x	x	
	Acacia nilotica	x	x	x	x		x
	Leucaena leucocephala	x	x	x	x	x	x
1 500-2 000	Acacia albida	x	x		x	x	
	Acacia saligna	x	x	x	x	x	x
	Sesbania grandiflora	x	x	x	x	x	
2 000-2 500	Acacia albida		x		x		
	Acacia saligna	x	x	x	x	x	x
	Sesbania grandiflora	x	x	x	x	x	
2 500-3 000	Schinus molle		x			x	x
	Olea africana		x	x	x		
	Juniperus procera		x	x			
Above 3 000	Acacia abyssinica	x	x	x	x		
	Hagenia abyssinica		x	x			
	Croton macrostachys		x	x	x		

Source: Booth (personal communication).

Table A12.8

THE CURRICULUM BY SUBJECT
AT FARMER TRAINING CENTRES

Subject	Total hours
Reading and writing	294
Culture and politics	100
Sport and military training	212
Health and family planning	738
Agriculture	660
Cooperatives	660
Others	582
Total	3 246

Source: Agarfa FTC

Table A13.1

ESTIMATED WOOD DEFICITS BY ZONE

Zone	Total Population 1985 (mill.)	Demand for wood (mill. m^3)	Estimated Production (mill. m^3)	Estimated Demand Satisfaction (%)	Additional wood supply needed (mill. m^3)
LPC	12.1	13.2	1.6	11	12.8
HPC	10.7	12.7	4.7	37	8.0
HPP	11.9	15.3	11.0	78	3.1
TOTAL	34.6	41.2	17.3	42	23.9

Table A13.2

SUBJECT CONTENT OF SECONDARY EDUCATION UP TO GRADE 10 1/

Subject	All Schools 7	All Schools 8	Vocational Stream 9	Vocational Stream 10	Academic Stream 9	Academic Stream 10
Amharic	4	4	4	4	4	4
English	6	6	5	5	6	6
Mathematics	5	5	5	5	6	6
Biology	-	-	2	2	2	2
History	2	2	-	-	2	2
Geography	3	3	-	-	2	2
Natural Science	4	4	-	-	-	-
Agriculture	2	2	3	3	2	2
Production Technology	3	3	4	4	2	2
Home Economics	1	1	2	2	1	1
Business Education	1	1	2	2	1	1
Political Education	1	1	3	3	2	2
Physical Education	1	1	1	1	1	1
Art	1	1	-	-	-	-
Music	1	1	-	-	-	-
Chemistry	-	-	2	2	2	2
Physics	-	-	2	2	2	2
Total	35	35	35	35	35	35

1/ The subject content varies slightly for 2-shift systems in which the teaching hours per week are reduced to 30 (mainly by reduction in Amharic, English, Mathematics, Agriculture and Physical Education. There is further streaming for grades 11 and 12, concentrating on academic subjects, Agriculture, Production Technology, Business Education and Home Economics.

Table A13.3

ROAD DENSITY BY ZONE

Zone	All-weather road		Density of road		Total Dry-weather road (km)	Density of road per 1 000 km^2 (km)	Density of road per 1 000 people (km)
	Asphalt (km)	Gravel (km)	per 1 000 km^2 (km)	per 1 000 people (km)			
LPC	872	3 325	18	0.28	2 821	16	0.24
HPC	1 058	4 561	28	0.41	2 116	13	0.19
HPP	845	4 383	23	0.38	2 405	12	0.21
Total	2 775	12 269	23	0.35	7 342	14	0.21

EHRS estimates from Ethiopia road map issued by ETCA and printed by Ethiopian Mapping Agency (1984).

Table A14.1

PRICE INDICES OF AGRICULTURAL COMMODITIES
AND MANUFACTURED GOODS

(1963 = 100)

Year	Agriculture 1/	Manufactured commodities 2/	Term of Trade A ÷ M
1967	133	121	110
1968	132	120	110
1969	135	124	109
1970	156	130	120
1971	155	133	117
1972	137	137	100
1973	154	146	106
1974	168	155	108
1975	175	171	102
1976	248	185	134
1977	290	210	138
1978	340	238	143
1979	401	264	152
1980	422	278	152
1981	441	290	152
1982	468	287	163
1983	471	282	167
1984	523	283	185

1/ CSO retail prices of food are taken as a proxy estimate for agricultural commodity prices.

2/ Published CSO retail prices for manufactured goods are adjusted for their weights based on CSO Report on Rural Household Expenditure Survey 1968.

Source: CSO.

Annex 6

INVENTORY OF DEVELOPMENT ASSISTANCE PROJECTS IN THE HIGHLANDS

This annex presents an inventory of on-going and proposed development assistance projects in the Ethiopian Highlands, based on information obtained from major bilateral and multilateral agencies and NGO's. Considerable effort has been made to obtain information from all agencies concerned. Letters were sent to some 36 agencies and follow-up telephone calls made. Fifteen of the 36 agencies contacted replied, and this annex is based on their replies and any other available information. It is believed that the inventory covers the agencies providing most development assistance in the Highlands. Table A summarizes the on-going development allocations (averaged per annum) by sector and funding implementing external agency. For each sector the total annual allocation from external services has been calculated. Given the incompleteness of the information received, such figures will inevitably under-estimate the actual external contributions, and extreme caution is needed in interpreting the table. Table B presents the detailed inventory. Projects have been grouped according to two criteria:

(a) sector of activity; and

(b) status of project (i.e., whether on-going or proposed)

As many projects follow an Integrated Rural Development approach, they are multi-sectoral in character. In such case the projects have been assigned to a certain group according to their major component. The projects in each group have been listed according to the magnitude of the average annual allocation from external sources.

Table A

SUMMARY OF ON-GOING DEVELOPMENT ASSISTANCE:
ANNUAL ALLOCATIONS BY SECTOR AND FUNDING IMPLEMENTING AGENCY

Sector	Annual Allocation in million US$ (by funding implementing agency)						Other	Total
	1	2	3	4	5	6		
Rainfed Agriculture	24.9 (IDA)	18.6 (EEC)	15.0 (UNDP/FAO/WFP)	11.9 (IFAD)	11.1 (SIDA)	9.8 (Switzerland)	12.6	103.9
Irrigated Agriculture	8.3 (Italy/UNDP)	5.0 (IFAD) 2.8 (ADB)	1.3 (UNDP/FAO)	0.2 (Switzerland)	-	-	-	17.6
Livestock	1.6 (UNDP/FAO/WFP)	0.4 (France)	0.2 (Switzerland)	-	-	-	-	2.2
Forestry	1.4 (UNDP/UNSO)	1.0 (SIDA)	0.7 (FRG)	-	-	-	-	3.1
Settlement	9.5 (WFP)	0.3 (Australia)	-	-	-	-	-	9.8
Health, Education Water supply	3.8 (EEC)	1.5 (Canada)	1.0 (SIDA)	0.7 (RE D BARNA)	0.6 (FRG)	0.5 (UNCDF/UNDO)	-	8.1
Transport and Communications	9.9 (EEC)	0.4 (UNCDF)	-	-	-	-	-	10.3
Energy	22.5 (EEC)	-	-	-	-	-	-	22.5
Processing, storage and Marketing of Agricultural products	1.3 (FRB/BTZ)	1.1 (UNCDR/UNCDF/WFP)	1.0 (The Netherlands)	-	-	-	-	3.4
Other	10.0 (IDA)	0.7 (EEC)	-	-	-	-	-	10.7
TOTAL Development 1/ Assistance	55.5 (EEC)	39.1 (UN)	34.9 (IDA)	16.9 (IFAD)	13.1 (SIDA)	10.2 (Switzerland)	21.9	191.6

1/ The figures in this row are not the summation of each column value, but summation of each agency's annual allocations.

Table B

1985 INVENTORY OF ON-GOING AND PROPOSED DEVELOPMENT ASSISTANCE PROJECTS IN THE HIGHLANDS, BY SECTOR OF ACTIVITY

Project title/ objectives	Location	Major components	Budget US$m		Years	Agencies		Status/ Comments
			Ext.	GOE		Funding	Imple-menting	
RAINFED AGRICULTURE, ON-GOING								
Rehabilitation of forest, grazing and agricultural lands WFP 2488	Eritrea, Tigray Gondar, Welo, Shewa, Hararghe, Sidamo, Gamo-Gofa	Reafforestation; structural conservation measures; hillside closure; water development; FFW	108.2	76	82/85	WFP Australia EEC SIDA FRG	SWCD FaWCDA	Implementation Follow-up of other WFP/FFW projects since 1975. Extension beyond 1985 very likely.
MPP II	Nationwide	Strengthening of MOA and its field extension (staff training, vehicles, buildings and equipment); provision of credit for fertilizers, improved seeds, pesticides and tools; strengthening of Ethiopian Seed Corporation; low-cost rural roads; strengthening of IAR and expansion of soil and water conservation effort.	58.9	18.3	80/85	IDA IFAD SIDA		Implementation
Second Coffee Processing and Marketing Project	Kefa, Sidamo	Processing and marketing of coffee; strengthening of institutions serving washed coffee sub-sector; construction of new washing stations and related facilities; research trials and studies related to washed coffee production.	35	19.4	84/87	IDA	PIU and CMC of MCTD/ AIDB/IAR	Implementation

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple-menting	Status/ Comments
Food-for-Work Project	Northern Shewa	Food grain supply for 160 000 people for approx. six months, supply of hand tools for soil conservation work, surface pond excavation and micro-dam construction.	9.4		'85	See comments	SCRP Awraja committee for Drought Relief Operations, Debre Berhan	Appraisal with possible implementation starting April 1985. Funding through Swiss Government and other donor countries for grain supplies (possibly Canada and Australia).
Rehabilitation programme for Drought-affected areas	Sidamo, Shewa, Hararghe, Welo, Gamo-Gofa	1-Provisions of inputs and implements/institutional support. 2-Soil and water conservation/ Small-scale irrigation. 3-Rural Health and Drinking water. 4-Pilot Cooperative Credit Fund. 5-Programme Management and Technical Assistance	17.5	1.9	two	IFAD/. Belgian Survival Fund	MOA MOH	Approved and ready for implementation. Belgian Survival Fund's contribution amounts to approximately US$5m to finance components 3 and 4.
Agricultural Research Project	Nationwide	Research on field crops, coffe, farming systems, irrigation/salinity/animal husbandry/pasture/fodder, improvement of adaptive research, rehabilitation of research stations, improvement HQ support services, technical assistance training	22	10	83/86	IDA	IAR	Implementation
Arsi Rural Development Unit (ARDU)	Arsi	Research on field crops and animal husbandry; seed production; agricultural extension, coop. development; soil and water conservation; rural infrastructure.	4		84/85	SIDA	SIDA/MOA	Implementation

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Implementing	Status/ Comments
Coffee Improvement Project (Phase II) No. 5100.031.20 007	Welega, Illubabor, Kefa, Sidamo, Hararghe	Personnel HQ. and field; vehicles and running costs; tools, fertilizers, fungicides, offices and stores n 15 Wereda; rural roads (230 km); TA.	20	5.6	five	EEC	CIP of MCTD	Implementation
Agricultural Credit Project	440 Weredas	Provision credit line for oxen loans, stores, flour mills, oil mills, dairy and miscellaneous investments.	10.5	-	84/88	IFAD	MOA/ AIDB	Implementation
Agricultural Research Stations	Adet (Tigray) Bale, Arsi	Construction of research stations; equipment and supplies.	2.5	-	85/86	EEC	IAR	Implementation
National Fertilizer and inputs Development Centre GCP/ETH/039/ITA			2.2	-	85/87	Italy	FAO/MOA	Implementation
Kobo-Alamata Agricultural Development Projects	Kobo and Alamata Awrajas (Welo)	Rural Development through -Drinking water supply -Road construction -Small-scale irrigation -Soil and water conservation -Afforestation -Agricultural Research and Development	12	-	74/86	GTZ	GTZ/RRC	Implementation. Extension beyond 1986 very likely.
Assistance to Soil and Water Conservation Programme Phase II ETH/81/003	Shewa, Welo, Hararghe, Gamo-Gofa, Eritrea, Tigray, Gondar	Strengthening of capacity of Community Forestry and Soil Conservation Dev. Dept. (ex SWCD) through: in-service and overseas training; improvement of watershed dev. planning, by identifying cost effective tech. involving physical & vegetative measures.	2.8	0.8	four	UNDP/UNSO	FAO/MOA	Implementation.

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple- menting	Status/ Comments
Assistance to Land Use Plan- ning, Phase II ETH/82/010/A/ 01/02	Throughout the country, Borkena and Bichena Catchments	Direct support to GOE for preparation of: a Master Land Use Plan, land use plans for watershed development, A methodology for detailed land use plans. Institution building.	2	3	83/86	UNDP	FAO/ LUPRD of MOA	Implementation
Crop Protection ETH/82/015		Strengthening extension services and related support infrastructure for crop protection	2.0	2.9	83/87	UNDP	MOA/FAO	Implementation
National Soil Service Project ETH/82/011	Nationwide	Inventory of country's soil resources and build- ing of National Soil Service capable of providing infor- mation on soil properties, through: establishment of soil laboratory; development of methodology; training of national personnel; interpre- tation of soil data; storage and retrieval of soil; plant and water analysis data.	1.2	7.9	84/87	UNDP	FAO/MOA	Implementation
Soil Conserva- tion Research Project (SCRP) Phase II	Shewa, Welo, Eritrea, Gojam, Haraghe and Sidamo	Research on soil erosion, formation and degradation; Designing, applying and testing adapted soil con- servation measures; Evaluation training.	0.7	-	84/86	Swiss Govt. through Univ. of Berne	SCRP/MOA	Implementation
Institute of Agric. Research, Phase V, ETH/82/014		-Dryland farming -Horticultural crops -Irrigation and drainage	1.4	0.4	83/87	UNDP	IAR/FAO	Implementation

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	GOE	Years	Agencies Funding	Imple-menting	Status/ Comments
Agricultural Implements Res. and Improvement Centre, ETH/82/004	Nazareth (Shewa)	Research and development (up to production drawing stage) of improved agricultural implements	1.6	0.8	83/88	UNDP	IAR/FAO	Implementation
General Agriculture/Animal Husbandry Direct Assistance and Research	Gorro (Bale) Hamer (Gamo Gofa)	Seeds and fertilizer dist; tractor plowing of virgin land; res. on field crops; dist. of veg. and fruit seeds; promotion of small-scale irrigation; agricultural extension and education. Tree nursery establishment; provision of plowing oxen and heifers on credit system; farm tools & cattle vaccination; introduction of modern bee keeping; Aerial and ground survey for animal husbandry and griculural development in Hamar Wereda.	0.3	-	83/86	REDD BARNA	REDD BARNA	Implementation
Soil and Water Conservation	Borkena (Welo)	Farmland terracing; hillside closure; afforestation; training of MOA staff and farmers.	0.2	-	84/86	SIDA	SIDA MOA	Implementation (in cooperation with WFP)
Desert Locust Control in Eastern Africa	Addis Ababa (Shewa) Dire Dawa (Hararghe)	Construction of insecticide stores	0.2	-	83/85	ENC	Desert Locust Control Org.	Implementation
Evaluation and Training in improved Soil & Water Conserv. Tech. TCP/ETH/4403	-	-	0.1	1.5		FAO	FAO/AAU	Implementation

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	GOE	Years	Agencies Funding	Imple-menting	Status/ Comments
Training of agronomy engineers	Alemaya College (Hararghe)	Field research and training about farming systems	0.1	-	82/88	French Tech.Coop. (FTC)	FTC	Implementation
Soil Conserva-tion Evaluation	Hararghe	Training of farmers; erosion plots layout; dev. of evaluation methodologies	n.a.	n.a.	two	FAO	AAU	Implementation
Army Worm Infestation	-	Provision of: -3 000 sprayers -2 000 knapsack sprayers -72 000 dry cell batteries	n.a.	-		UK	n.a.	Equipment arrived, not yet delivered.
Rural Tech-nology Centre	SODDO (Wolayta)	Research and dev. of adapted technologies for peasants	0.1	1	1976 on-going	FTC CCFD Maison S Familiales rurales	FTC CCFD	Implementation
RAINFED AGRICULTURE - PROPOSED								
Assistance to Agricultural Planning		Strengthening of the Planning and Programming Service (PPS) of the MOA	5.4	0.8	four		PPS	Proposal (FAO, 1985)
Continuation and Follow-up to Sirinka Pilot Catchment Reha-bilitation Proj.	Sirinka (Welo)	Improved cropping systems; new cultural techniques; improved crop varieties; new crop species; fertili-zers; pest control; fuel lots; grazing improvement and control; conservation measures.	0.9	n.a.	one		RRC	Proposal (FAO, 1985)
Strengthening of national capabi-lity in soil survey	Nationwide	Strengthening LUPRD, to pro-vide soil surveys, land evaluation and soil management data	2.2	3			LUPRD	Proposal (FAO, 1985)

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	GOE	Years	Agencies Funding	Imple-menting	Status/ Comments
Strengthening the Training service of the Ministry of Agriculture		Strengthening of Training Service and MOA in managing the various training programmes for: -Ministry staff -Peasant farmers -Development Agents (DAs)	0.7	0.3	one		MOA Training Service	Proposal (FAO, 1985)
Soil Investigation and Soil Conservation on State Farms	Nationwide	Conservation of Soil, Water, Forests and other environmental resources; Optimization of agricultural production	1.7	0.2	2.5		Min. of S.F.D. ARAD	Proposal (FAO, 1985)
Regional Soil Conservation Project for Africa (Phase I) GCP/RAF/181/NOR	Nationwide		0.3		one	Norway	FAO/MOA	In pipeline
Strengthening Fruit Crops Introduction, Propagation and Development	Nationwide	Estab. of foundation blocks from which disease-free propagating material of different temperate, sub-tropical and tropical fruit crop varieties will be introduced to farmers; on-the-job and overseas formal training.	0.5	n.a.	two		FAO/ADD of MOA	Proposal (FAO, 1985)
Strengthening the Technical capability of the Agricultural Research and Advisory Dept. of the Ministry of State Farms Development		-Training of selected RAD Staff Members in dry land agronomy. -Development of a Five-Year applied or adaptive research programme. -Dev. of a long-term programme up-grading RAD's tech. personnel, and physical and manpower capabilities.	0.2		one		MSFD/RAD	Proposal (FAO, 1985)

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple- menting	Status/ Comments
Strengthening the IAR-ADD Adaptive Research Programme		Strengthening the IAR-ADD Joint research programme in a few selected areas through: -Identification of Agro-Ecological zones and new sites for adaptive research -Training -Programme Development -Acquisition of Equipment/ supplies	0.2		0.5		MOA/IAR	Proposal (FAO, 1985)
Support for Adaptive Research Centres in drought-affected areas	Tigray, Welo, Sidamo, Hararghe, Gojam, Shewa	Upgrading of Mekele (Tigray) and establishment of new stations in drought-prone areas for: -strengthening of agronomic research and extension programmes in crop management techniques for dry land farming; -initiation of research programme on drought resistant field food and horticultural crops; -training.	0.8		four		IAR	Proposal (FAO, 1985)
Crop Diversification through expansion of root crops, legumes and mixed cropping	Gondar, Welo, North Shewa, Gojam	Multiplication of planting material of sweet potato and root crops; improvement of agronomic practices for root crops, pulses; pomotion of mixed cropping; technical assistance; in-service and overseas training; equipment supply.	0.4	0.4	two		FAO/ADD of MOA	Proposal (FAO, 1985)

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple-menting	Status/ Comments
Strengthening of Agarfa Farmers Multi-purpose Training Centre	Agarfa (Bale)	-Improvement of methods of teaching farmers; -Provision of training materials and implements; -Establishment of a training materials production unit.	0.1		0.25		MOA	Proposal (FAO, 1985)
Assistance to Yekatit 25 Cooperatives Institute	ARDAITA (Arsi)	Strengthening of Yekatit 25 Cooperative Institute's library and dairy uni.	0.1		0.75		MOA	Proposal (FAO, 1985)
Assistance to upgrade the Alemaya College of Agriculture University		Expatriate consulting assistance in: -Education planning -Curriculum development -Laboratory equipment and supplies.	0.1		0.25		Univ. of Addis Ababa	Proposal (FAO, 1985)
Peasant Agriculture Development Programme (PADEP	Gondar, Gojam, Welega, Illubabor, Kefa, Arsi, Bale, Hararghe, Shewa	Improved tech. packages, farming systems research, extension, animal resources dev., planning, monitoring and evaluation, training, infrastructure, inputs supply, support central services (AISCO, ESC, MOA)	n.a.		n.a.	IDA SIDA IFAD	MOA	Appraisal
Assistance for seed supplies			16.7	n.a.	n.a.	FAO	FAO	In pipeline
Assistance to fertilizer imports			9	n.a.	n.a.	FAO	FAO	In pipeline

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	GOE	Years	Agencies Funding	Imple-menting	Status/ Comments
Soil Degradation Studies	Hararghe	Soil differences mapping; crop residue removal; macro and micronutrient status	n.a.	n.a.	five	SAREC	AAU	Proposal
Provision of equipment for land preparation			6.1				FAO	In pipeline
Support for farm machinery services in drought-affected areas			6.3	n.a.	n.a.	n.a.	FAO/n.a.	In pipeline
Support for importation and local manufacture of hand tools and implements			3	n.a.	n.a.	n.a.	FAO/n.a.	In pipeline
Assistance for oxen supplies			6.9	n.a.	n.a.	n.a.	FAO/n.a.	In pipeline
IRRIGATED AGRICULTURE - ON-GOING								
Programme of irrigated agriculture	Kobo (Welo) Jijiga (Hararghe)	-Small & medium-scale irrigation; -Storage construction; -Feeder roads const.; -Credit; -Water supply; -Health (water borne diseases); -Inputs distrib.	25		85/88	Italy	MOA/ NWRC/ UNDP	Under process of finalization and approval Arising from drought
Small-scale irrigation project	Bale, Shewa Sidamo	-Small scale irrigation schemes; -Extension; -Input supply; -Farm implement dev.; -Credit; -Institutional support to Irrigation Dev. Dept., PAs, SCs, other MOA Dept's. -Monitoring and Evaluation.	15	n.a.	85/88	IFAD	IDD AISCO AID BANK MOA	Identification/ preparation

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	GOE	Years	Agencies Funding	Imple-menting	Status/ Comments
Small-scale Irrigation Project	7 Central Highlands Regions	Small-scale irrigation development based on run-of-river diversion and storage; soil and water conservation; const. of access roads; provision of inputs; demonstrations and training of farmers; mediu-term credit for farm equipment and small stores; technical assistance and training.	14.2		five	ADB	MOA	Implementation
Development of Irrigated Agriculture (Phase II)	Hararghe, Sidamo, Bale, Welega, Gojam	-Water Resources assessment -Reconnaissance, pre-feasibility and feasibility studies for large-scale irrigation development -Strengthening (investigation, design) of small-scale irrigation capability -Technical assis./training	2.6	2.3	84/87	UNDP	FAO/WRDA	Implementation
Small-scale I Irrigation Schemes ETH/84/010	Gamo Gofa, Arsi, Gojam, Shewa	Implementation of 13 small-scale irrigation schemes	2.1	3.8	85/90	UNCDF UNDP	UNDP/OPE MOA	Approved; equipment under procurement
Stone Masonry Dam and related Irrigation Scheme	Adfeyu (Eritrea)	Construction of stone masonry dam and irrigation of 12 hectares or more, food-for-work.	0.1		'85	Helvetas (Switzerland)	MOA	Implementation
Irrigation Scheme	Lake(Welo) Maybar	Purchase and installation of a diesel pump, constr. of a small irrigation scheme	0.1		'85	Helvetas (Switzerland)	MOA	Implementation

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	GOE	Years	Agencies Funding	Imple- menting	Status/ Comments
IRRIGATED AGRICULTURE PROPOSED								
Medium-scale irrigation schemes			7.9				FAO	In pipeline
Small-scale irrigation schemes			1.9				FAO	In pipeline
Small and medium-scale irrigation schemes	Welo North Shewa		3				FAO	In pipeline
Low lift pump irrigation			2.2				FAO	In pipeline
LIVESTOCK - ON GOING								
Dairy Development WFP 2500	Shola/Addis Ababa (Shewa Asmara (Eritrea)	-Dairy Development through provision of DSM, BO, DWM -Training, extension, A.I., milk collection, processing, distribution -Milk distribution to vulnerable groups.	6.4	15.5	82/87	WFP	DDE FINNIDA	Implementation
Fodder development for small-scale farming	Ethiopian Highlands	Soil/plant nutrition and forage agronomy research in ILCA's Highland Programme.	0.6		82/85	Swiss Govt.	ILCA	Implementation
Training in Rinderpest diagnosis and vaccine production and control TCP/RAF/4408(T)			0.2		84/85	FAO/	FAO/ OAU/IBAR	Implementation

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	GOE	Years	Agencies Funding	Imple-menting	Status/ Comments
Sheep Improvement ETH/84/004	Amed Guya, Debre Berhan	Improved sheep breeding and husbandry	0.3	0.3	85/87	UNDP	MOA	Implementation
Research and implementation of solutions to cattle food deficiencies	Debre Zeit Awash	Realisation of a workshop producing salt lick blocks, applying the field research of biologists team.	0.4			F.T.C. IEMVT	IEMVT	Workshop should begin soon its production.
LIVESTOCK - PROPOSED								
Technical Assistance for feed resource assessment	High Potential Cereal/Livestock Zone	Establishment of a feed analysis laboratory; inventory of feed resources in High Potential Cereal/ Livestock (HPCL) zone; advise on diets for animals; training of local staff.	1.0	0.2	three	F	FAO	Proposal (FAO, 1985)
Assistance to Development of Sheep Stud Farm at Debre Berhan/Amado Guya	Debre Berhan/ Amado Guya (Shewa)	Establishment of a stud sheep station and of an elite sheep flock of the Menz breed; establishment of an on-station recording system, of a feasible management system, of an effective selection programme, dissemination of improved stock.	0.7	0.3	four		FAO ARDD of MOA	Proposal (FAO, 1985)
Assistance for feed supplies			3.8				FAO	In pipeline
Livestock Marketing Project	Nationwide	Livestock procurement, slaughter and processing; meat mrktg; export; hide skin and leather development	n.a.	n.a.	n.a.	Undetermined	MOA	Under discussion World Bank/GOE

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple-menting	Status/ Comments
Emergency animal disease control in drought areas			0.8				FAO	In pipeline
Assistance for Tsetse and Try-panosomiasis control and eradication			2.4	n.a.	n.a.	n.a.	FAO/n.a.	In pipeline
Feeds and Forage	Nationwide	Forage development in live-stock exclusion areas, in soil cons. structures; prod. of forage seeds; forage extension activities; tech. assist., training; research aimed at introduc-tion of legumes, at improving productivity of permanent pasture and use of fallow land for forage production.	n.a.	n.a.	n.a.	Undeter-mined	MOA	Proposal
National Animal Health Project	Nationwide	Establishment of Central Investigation Laboratory; disease surveillance; pro-vision of additional bldgs., equip. and tech. assist.; strengthening of tsetse and trypanosomiasis invest. centre; assist. to training institution (Veterinary Faculty of U.A.A., Bahr-Dar Zonal Investigation Laboratory, Veterinary Services Headquarters); Animal Disease Control.	n.a.	n.a.	n.a.	Undeter-mined	MOA A.A. Univ.	Under discussion between MOA and World Bank

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Implementing	Status/ Comments
FORESTRY - ON-GOING								
Establishment of Fuelwood Plantations for the Towns of Debre Berhan and Nazareth UNSO/DES/ETH/82/001	Debre Berhan/ Nazareth areas (Shewa)	-7 600 ha Fuelwood plantation to meet needs of Nazareth; -1st phase of fuelwood plantation to meet needs of Debre Berhan (1 100 ha)	5.9	1.0	83/84	UNSO	MOA UNDP/OPE	Implementation
National Forestry Programme		Forestry school; community forestry; state forestry; wood utilization and research institute; technical assistance to MOA HQ (Natural Resrouces)	4		84/86	SIDA	SIDA/MOA	Implementation
Ethio-German Reforestation Project GTZ PN 74,2022,7	Eritrea, Tigray, Welo, Shewa, Hararghe, Gondar, Welega, Bale	Reforestation in 19 catchments as well as RRC settlements	2.0	n.a.	85/88	BMZ of FRD	GTZ/ MOA/	Implementation. The project is the follow-up of projects started in '74.
National Institutional Support and Fuelwood Plantation Establishment UNSO/ETH/83/X01	Dessie area	1st phase of fuelwood plantation to meet needs of Dessie (200 ha) Tech./ Adm. support to Fuelwood plantation planning and management unit within MOA	0.5	0.3	84/86	UNSO	MOA UNDP/OPE	Implementation
Dessie Fuelwood Project Phase II	Dessie (Welo)	Establishment of 7 300 ha of fuelwood plantation	4.7	0.3	87/90	UNSO	UNSO/MOA	Proposal (Project formulation mission scheduled Oct/Nov 1985)
Debre Berhan Fuelwood Project Phase II	Debre Berhan (Shewa)	Establishment of 2 100 ha fuelwood plantation	2.0	0.4	86/88	UNSO	UNSO/MOA	Proposal (Project formulation mission schedule June 1985)

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple-menting	Status/ Comments
Forestry for Community Deve-lopment and Environmental Rehabilitation	Gojam and other regions	Preparation of management plans for 43 000 ha of natural forest and 10 000 ha of bamboo; extension through PAs and PCs to expand their woodlots by about 10 000 ha; identifica-tion of suitable areas for wind breaks, roadside and riverbank plantations; fodder trees; extension of agro-forestry; establishment of 10 nurseries; training of local leaders.	2.3	n.a.	five		FAO/MOA	Proposal (FAO, 1985)
Forestry	9 Awrajas and 3 cities	Farm Forestry and fuelwood plantations establishment, management, research and training	n.a.	n.a.	n.a.	IDA/SIDA	NRCDMD of MOA	Appraisal
SETTLEMENT - ON-GOING								
Resettlement Scheme WFP 2522	Assosa, Anger-Gutin (Welega) Gambela (Illubabor)	-Resettlement 65 800 families -Food for work (FFW)	37.8	94.1	83/87	WFP	RRC	Implementation in '85, but de-earmarked for following years
Const. of Grain stores and food grain and seeds in Settlements Projects GCP/ETH/033/AUL	Major settlements		0.5		85/87	Australia	FAO/RRC	Implementation; some settlements are not in the Highlands

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple-menting	Status/ Comments
SETTLEMENT - PROPOSED								
Construction of storage facilities at settlement sites	All new settlements in Welega, Kefa, Illubabor	Provision of storage capacity at each of the new settlement sites, for a total of 600 stores of 250 tons capacity each.	1.9		two		FAO/RRC	Proposal (FAO, 1985)
Kishe Settlement ETH/85/001	Kishe (Jimma Awraja, Kaffa)	Support for new settlement (settlers coming from northern Welo).	1.5	1.8	85/87	UNDP	RRC UNDP/OPE	Under process of finalization and approval.
Provision of equipment for land clearance			3.6				FAO	In pipeline
HEALTH, EDUCATION, WATER SUPPLY								
Health	Mizan Teferi (Kefa) Addis Ababa (Shewa)	-Const. of 80-bed rural hospital at Mizan Teferi, supply of all equipment and furniture; -Const. of school for laboratory technicians at Addis Ababa.	7.5		83/85	EEC	MOA	In pipeline
Rural Water Supply Development Project in Southern Regions Phase I	Sidamo, Gamo Gofa	Development of drinking water supply through: -Equipment supply -Technical aid	10.8		78/85	Canada	AESL Int/EWWCA of NWRC	Operational
Rural Water Supply	Hararghe	Hand-dug wells; boreholes; training of engineers; institutional support to HQ.	2		84/86	SIDA	SIDA/NWRC	Implementation

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple- menting	Status/ Comments
Training in water works PR.N.76.2105. 5-09.300	Arbaminch	Training of water supply technicians in installation, operation, maintenance and repair of urban and rural water supply systems.	1.8	n.a.	three	BMZ of FRG	GTZ	Implementation at Provisional Training Centre until Sept.'85, when the water Technology Institute construction will be completed.
Health Promotion	Bale Gamo Gofa	Construction of health posts; standard clinics, includes furnishing, equipping and staffing. Health education, primary health, mother and child care and training of Community Health Agents and Traditional Birth Attendants. Preventive Medical treatment.	1.3		83/86	REDD BARNA	REDD BARNA/MOA	Implementation
Water supply for Central Region	Shoa, Arsi, Welega	Drinking water supply in rural areas	1.3	4.4	83/87	UNCDF	NWRC	Implementation
Water supply	Bale, Gamo Gofa	Construction of village water supply schemes.	0.3		85/86	REDD BARNA	REDD BARNA/EWWCA	Implementation
Environmental Health Control ETH/79/011		Preventive health and environmental control measures (water borne disease) related to irrigation.	0.4	0.2	80/86	UNDP	NWRC WHO	Implementation
Arba Minch Water Technology Institute ETH/83/035	Arba Minch	Preparation of plans and equipment specifications for laboratories.	0.1		83/85	UNDP	NWRC	Implementation

Table 8 (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple- menting	Status/ Comments
Education	Bale/Gamo Gofa	Construction and repair of schools; provision of school supplies to students	0.1		83/86	REDD BARNA	REDD BARNA	Implementation
HEALTH, EDUCATION, WATER SUPPLY - PROPOSED								
Rural Water Supply Development Project in Southern Regions Phase II	Sidamo, Gamo Gofa	Development of drinking water supply through: -Equipment supply -Technical Aid -Training in education on water use.	15		86/91	Canada	AESL Int/ EWWCA of NWRC	In pipeline
Rehabilitation of Water Works Structures in Central Region ETH/82/003	Central Regions	Drinking water supply in rural areas	2.1	0.8	84/85	UNCDF	UNDP/OPE NWRC	Approved; equipment under procurement
Support for rural Water supply Schemes			13.5				FAO	In pipeline
Establishment of engineering materials testing facilities for the Water Resource Development Auth.			0.9				FAO	In pipeline
Provision of tools and equip. for Central and Regional Workshops of Ethiopian Water Works Construction Authority			0.3				FAO	In pipeline

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple-menting	Status/ Comments
Support for rural water supply schemes	Welo		2.1				FAO	In pipeline
Water Exploration I	Welo	Provision of one Halco Drilling Rig	n.a.			UK	NWRC	Equipment ordered
Water Exploration II	Welo	Provision of one Hands England Drilling Rig	n.a.			UK	OXFAM	Equipment ordered
TRANSPORT AND COMMUNICATIONS - ON-GOING								
Ghimbi-Gambela Road	Welega Illubabor	Construction of 276 km of all-weather road.	19	3	82/85	EEC	ETCA	Implementation
Rural Roads ETH/78/CO2	Welo	Road construction	1.5	3.1	81/85	UNCDF	ETCA/UNDP/ OPE	Implementation
Ethio-Djibouti Railway		Supplies for rehabilitation of rolling stock and track	18		82/87	EEC	Ethio-Djibouti Railway	Implementation
TRANSPORT AND COMMUNICATIONS - PROPOSED								
Rural roads			2.5				FAO	In pipeline
ENERGY (OTHER THAN FUELWOOD) - ON-GOING								
Amarti Diversion	Amarti Valley-Fincha (Welega)	Const. of earth/rock dam with spillway across Amarti River; const. of diversion tunnel; raising by 2m ex	27		83/85	EEC	EELPA	Implementation

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple-menting	Status/ Comments
Dessie Region Power	Cotabie, Debre Behan, Rooi (Shewa) Combolcha, Dessie (Welo)	Const. of transmission lines and construction of farm sub-stations.	18		83/85	EEC	MM&E	Implementation
PROCESSING, STORAGE AND MARKETING OF AGRICULTURAL PRODUCTS - ON-GOING								
Ethiopia/FRG Horticultural Development Project	Addis Ababa's Merti Food Processing Plant	Technical Assistance in Food Processing	8		seven	GTZ	MSFD	Implementation
Food Security Reserve WFP 2586	Addis Ababa (Shewa) Nazareth	Provision and storage dry skim milk and butter oil	3.7	127	81/85	WFP Netherlands	RRC	Implementation
Technical Assist. for operation of the Ethiopia Food Security Reserve (FSAS) GCP/ETH/032/NET			1.0		84/86	Netherlands	FAO/RRC	Implementation
Seed Cleaning and Storage Sturctures ETH/77/C31	All regions	Construction of 50 seed cleaning centres and storage structures	2.6	0.4	79/85	UNCDF	MOA UNDP/OPE	Implementation
Strategic Seed Reserves	Kombolcha, Arba Minch, Harar; other sites not yet identified	Const. of stores and building up to 12 strategic seed reserves in drought-affected areas	2.0	n.a.	five	UNCDR/GTZ	ESC/PGRC/ GTZ	Starting implementation. More sites will be selected and a total external contribution of US$10m is planned.

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple-menting	Status/ Comments
PROCESSING, STORAGE AND MARKETING OF AGRICULTURAL PRODUCTS - PROPOSED								
Construction of Storage facilities for RRC	Kombolcha (Welo), Gondar, Nekempte (Welega), Asmara (Eritrea)	Const. of 80 000 tons of storage capacity, equally shared at farm locations.	5.8		one		FAO/RRC	Proposal (FAO, 1985)
Prevention of Food Losses and Construction of Warehouses in RRC			2.6		two	FAO	FAO/RRC	In pipeline
Reduction of Post-harvest losses and provision of on-farm storage	Nationwide	Technical assistance to promote known technology (rib driers and storage bins) and training for the reduction of post-harvest losses.	0.6	n.a.	two		FAO/MOA	Proposal (FAO, 1985)
Hides and Skins and Animal By-product Improvement		Provision of technical assist. and equipment for improvement of quality of hides and skins available for export and for domestic consumption; training in processing and marketing.	0.7	0.9	four		FAO/ARDD of MOA	Proposal (FAO, 1985)
Provision of Training facilities in the AMC			0.2		one	FAO	FAO/AMC	In pipeline
OTHER ON-GOING								
Drought Emergency Project	Nationwide	Provision of fertilizers, pesticides, trucks/spare parts; water supply development.	30	11.4	85/86	IDA	MOA/RRC/ Private Sector/ NWRC	Implementation

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	GOE	Years	Agencies Funding	Imple-menting	Status/ Comments
Fisheries Development Project	Addis Ababa (Shewa), Ziway (Shewa), Arba Minch (Gamo Gofa)	TA; cold storage and equipment; fishing gear and boxes; research	1.3	1.5	three	EEC	FRDD of MOA	Final stage of implementation. Probably extended for two more years.
Low-cost housing	9 provincial towns	Construction of 1 178 low-cost houses	1.1	0.5	80/85	EEC	MUDH	Implementation
Programme Base and Social Promotion	Bale, Gamo Gofa	Construction of programme base, building; carrying out social promotion programmes and community development education among rural people; financial and infrastructural inputs to strengthen service cooperatives.	0.1		83/86	REDD BARNA	REDD BARNA	Implementation
OTHER PROPOSED								
Pilot Plant for Agric. Implements ETH/83/026		Pilot plant for manufacture of improved agricultural implements	1.5	n.a.	85/88	UNDP	MOI/ UNIDO	In pipeline. Government contribution. Location to be determined.
Integrated Development of Lake Tana Fisheries	Laka Tana (Gojam)	Const. of fishing fleet; commercial production fishing operations; on-the-job training of boat builders, fishermen and Govt. fishery staff; credit; strengthening national capabilities in planning.	0.9	0.4	2.5		FAO/ FRDD of MOA	
Techn. Assist. for Logistics			1.7				FAO	In pipeline

1985 INVENTORY OF ON-GOING AND PROPOSED RURAL DEVELOPMENT ASSISTANCE IN ETHIOPIA

Project title/ Objectives	Location	Major components/objectives	Budget US$m Est.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple-menting	Status/ Comments
EMERGENCY-RIBS/REHABILIATATION								
Establishment of supplementary Food Project(s) using Dried Meat	2 sites in Welo; 1 site in Hararghe; 1 site in Eritrea.	-Provide drought-affected people , mostly nomads, with the oppotunity to sell their lean cattle that would anyhow die as a result of lack of forage and water. -Provide very poor drought-affected people, mostly women, with employment, by including them in activities of slaughtering, slicing, drying and packing process of project -Distribute the dried meat as a supplement to grain. -Main components are: Water supply and sanitation, horticulture, feedtools to enable beneficiaries to attain self-sufficiency.	$75 000 per site = $300 000		84/85	UNICEF (from donations received from various sources)	RRC + concerned local level government + mass organization representatives.	On-going
Local purchase of food commodities	5 sites in Shewa, Arsi and Gamu Gofa Regions	-Avoid displacement of population who go in search of food to survive; -Reduce delays in delivery of in-kind assistance; -Encourage, insofar as possible, community development. -Promote self-sufficiency by introducing integrated basic services components such as safe potable water; nutritional survey of children under 5; supplementary feeding programme; ./.	Approx. $100 000 per site = $500 000		84/85	UNICEF (from special contributions received from various sources	RRC + Local-level concerned, Government and mass Organization Representatives	On-going

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	GOE	Years	Agencies Funding	Imple- menting	Status/ Comments
		introduction of education and play facilities for children; sanitation and hygiene education and practice; appropriate technology interventions to conserve scarce wood for fuel and for construction of clinics, recreation centres, stores, etc.						
AGRICULTURE								
Food and Nutrition Surveillance Programme/ Early Warning System	Nationwide	The purpose of this project is to provide a continuous flow of information about food production, distribution and consumption for planners of emergency food relief and agriculture development: -To monitor the performance of crop and market dependent food supply systems by collecting monthly crop and market information from a number of areas and to indicate the areas expecting food shortage as surplus production ahead of time. -To strengthen and extend meeorological reporting with particular application to agricultural conditions. -To establish a system for monitoring the nutritional status of the community and family. -To strengthen RRC Early Warning Unit through workshops, training of existing staff, provision of equipment and transportation.	330.0		83/88	UNICEF	RRC	On-going

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m		Years	Agencies		Status/ Comments
			Ext.	GOE		Funding	Imple-menting	
SETTLEMENT								
Integrated Basic Services (IBS) in Selected Settlement Sites.	9 selected settlements (Eritrea, Hararghe, Gamu-Gofa, Tigray and Welo)	Provision of safe potable water;screening of nutritional status for children under 6; child feeding programme; introduction of new crops and legumes; upgrading day-care centres and residence of extension field staff; const. of pit latrines and education on its usage; and production of local weaning food.	1 195.8		83/88	UNICEF	RRC	On-going
Regional Integration of Basic Services	Bale/Kefa/ Illubabur/ Gojam	The programme aims at creating an integrated set of basic services that are geared to the genuine needs of communities and are low-cost, self-sustaining and easy to modify as the communities' needs and capabilities change. Objective to be attained by promoting and facilitating planning, programming, implementation and evaluation processes to: -start with communities in identifying their needs, problems and resources; -build on these resources and, where necessary, fill in and/or bridge gaps; -strengthen planning and management capability of participants, from the benefitting communities to the sub-regional, regional and national levels. The programme supports and motivates alternative, low-cost, community-based approaches. Activities such as afforestation, max. use of natural and available resources such as spring protection and dev., irrigation, water diversion, and prom. of indigenous and approp. technologies.	4.3		83/88	UNICEF	NCCP and Steering Committees at various levels	On-going

Table B (cont'd)

Project title/ objectives	Location	Major components	Budget US$m Ext.	Budget US$m GOE	Years	Agencies Funding	Agencies Imple-menting	Status/ Comments
OTHER								
Development and Expansion of Awraja and Local Weaning Food Production	Gojam Region (Yetnora Pilot Project) Aris and Hararghe Regions	The aim of this project is to develop nutritious and palatable weaning foods to be prepared at local and Awraja levels. -To encourage and demonstrate the production of low-cost nutritionally balance and acceptable foods processed from indigenous ingredients at 3 Awrajas with a population of about 300 000 each. -To promote/demonstrate the development and production of local level weaning food at 6 selected communities. -To improve the food habits, food contamination and dietary practices among families in the Awraja and local level project sites. -To promote the development and adoption of appropriate technology at the Awraja and local levels especially devices such as low-cost cooking stoves and food storage facilities.	327.1		83/88	UNICEF	ENI	On-going

Source: The external development agencies concerned.