AGOA:ETH/78/003
Consultant's Report 2

ASSISTANCE TO LAND USE PLANNING

E T H I O P I A

CURRENT LAND EVALUATION ACTIVITIES IN THE LAND USE PLANNING DEPARTMENT OF THE MINISTRY OF AGRICULTURE AND ON THE FUTURE ACTIVITIES AND STAFFING OF A NATIONAL LAND USE SERVICES INSTITUTION FOR ETHIOPIA

UNITED NATIONS DEVELOPMENT PROGRAMME

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS ADDIS ABABA
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Report prepared for
the Government of Ethiopia
by
the Food and Agriculture Organization of the United Nations
acting as executing agency for
the United Nations Development Programme

based on the work of

Professor Anthony Young
Consultant

UNITED NATIONS DEVELOPMENT PROGRAMME
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ADDIS ABABA, JULY 1980

This technical report is one of a series of reports prepared during the course of the UNDP/FAO project identified on the title page. The conclusions and recommendations given in the report are those considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained at subsequent stages of the project.

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FAO. Assistance to Land Use Planning Project, Ethiopia. Current Land Evaluation Activities in the Land Use Planning Department of the Ministry of Agriculture and on the Future Activities and Staffing of a National Land Use Services Institution for Ethiopia, based on the work of Anthony Young. Addis Ababa, July 1980. 64 Pages, 6 tables. AGOA:ETH/78/003. Consultant's Report 2.

ABSTRACT

This report takes as a basis the central recommendation of the preceding consultancy, that a land use services institution for Ethiopia should be created, to be responsible for all aspects of land use planning and to provide services in the field to other agencies. (Chapter 1).

The nature and activities of land use planning are reviewed, with special reference to the present circumstances and needs of Ethiopia. It is recommended that the land use services institution should have the capacity for surveys at all scales, from reconnaissance to detailed, and should undertake all three stages of the land use planning process, namely resource survey, land evaluation, and land development planning. (Chapter 2).

The draft master land use plan, in course of preparation by the FAO-assisted team, is reviewed, with special reference to the stage of land evaluation. Detailed suggestions are put forward for consideration with respect to the objectives of the evaluation, coordination of activities, the activities flow chart, land utilisation types, determination of the requirements of land use, economic evaluation, and possibilities of more detailed sample studies. Proposals are made for strengthening of inputs to the evaluation stage in any or all of the following fields: environmental impact, agroclimatology, coordination of activities and matching procedures, economics, and pasture resources and livestock production. Of these, it is recommended that priority should be given to a review of environmental impact. (Chapter 3).

The staffing needs of a land use services institution are reviewed, in relation to the activities to be carried out. Staffing should be based on the principle of mutli-disciplinary activity by teams of specialists. Two operational units are proposed: (i) a central land resources unit, to be responsible for surveys and planning guidance at national and regional levels, identifying and determing the location and boundaries of development projects, and supplying specialist services to the project planning units; (ii) a number of project planning units, to be responsible for the detailed planning and implementation of development projects. The central land resources unit and the project planning units would not be administratively separate, and would interchange staff as necessary.

Cont'd

The most numerous specialists within the proposed staffing would be soil surveyors. It is recommended, however, that the soil survey staff should remain an integral part of the institution, and that there should not be created an administratively separate soil survey.

The needs for professional staff are reviewed in detail, in terms of the specialist disciplines to be covered. Three groups of disciplines are proposed: environmental sciences, the technology of land use, and economics and sociology. A minimum professional staff of 43 is proposed. The staffing needs are summarised in Tabe 6 (p. 62).

If the land use services institution is to be created, with the range of activities and staffing proposed, a large and carefully-planned programme of training will be necessary. (Chapter 4).

ACKNOWLEDGEMENTS

I am pleased to acknowledge the willing and helpful co-operation of every member of the Land Use Planning Department and of other Government Institutions with whom I have talked. Time did not allow me to meet all those who could have contributed to the matters under review, and I offer apologies to those who were not consulted.

I owe a special debt of thanks to Ato Mekbib and Mr. Choi, for so smoothing my path administratively and logistically that I was able to concentrate exclusively on the job in hand; to Ato Berhanu and Ato Sultan, who by their knowledge of the Ethiopian environment and people enabled the field tour to be so instructive; to Dr. Ridgway, for acting as a personal liaison officer throughout my visit, and also for contributing Table 4 to this report; and to Wzr. Shewaye for so rapidly converting the text and tables into a report in the FAO Format.

TERMS OF REFERENCE

The Consultant will advise on the structure, organisation, staffing and work methodology of the Land Use Planning Department of the Ministry of Agriculture.

More specifically, he will:

- study the ongoing land appraisal work being carried out by the Department;
- Advise on the methodology for land evaluation and land use planning;
- make recommendations on future activities, the organisation of the work in the varioius disciplines involved and the final preparation of results;
- advise on the staffing, organisation and working means required to carry out this work in the most effective way;
- upon completion of his assignment, prepare a final report setting out his findings and recommendations.

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Chapter 1

INTRODUCTION

1.1 AMPLIFICATION OF TERMS OF REFERENCE

Contained within the terms of reference there are essentially two aspects:

(i) To review the ongoing FAO-assisted activities directed towards the production of a master land use plan, and make recommendations (first three clauses, following 'More specifically...').

(ii) To advise on the future staffing and work methodology of the Land Use Planning Department in relation to the kinds of activities, particularly in the fields of resource survey and land evaluation, which it will be required to carry out (opening sentence and penultimate clause).

These two aspects will form two of the main sections in this report. In order to be able to achieve the second, however, I have included also a brief review of land use planning activities in Ethiopia, in order to indicate the kinds of decisions which are likely to be taken and thus the kinds of information which will be needed as a basis for these decisions.

The activities of the Land Use Planning Department include a control and regulatory function, as derived from heading 8 of the gazetted responsibilities of the Minister of Agriculture ('... issue regulations and directives with regard to land tenure, etc.'). However, it is neither within my terms of reference nor technical capabilities to comment on this function, except insofar as land use planning, to be effective, requires that there shall be regulatory means of some kind to put the plans into operation. I shall assume throughout that this is the case.

1.2 RELATION TO PRECEDING CONSULTANCY

My work was immediately preceded by, and in part rests upon, "Consultant's report on an institutional framework for a national land use planning institution for Ethiopia', prepared in draft by Mr. R.I. Green, June 1980. In this he recommends that the various organisations and staff engaged in land use planning activities in the country should in large measure be centralized, through the creation of a land use services institution. This institution would provide a reservior of skills, and would be required to provide services in land use planning to other organisations requring them. In the final part of that report, it is recommended that the land use services institution should have the status of an authority.

There has not yet been time for this recommendation to be adequately considered by Government. It would, however, be inconvenient in my present report repeatedly to insert reservations to the effect "in the event of the establishment of such an institution...". I shall therefore write on the assumption that some kind of institution will in due course be created. Whether it has the status of an authority is immaterial for my purposes, and so in order to avoid such further assumption, I shall refer to the proposed body as the 'Land Use Services Institution.'

Chapter 2

LAND USE PLANNING IN ETHIOPIA

2.1 WHAT IS LAND USE PLANNING?

Land Use Planning is the formulation of policies and programmes for the use of land. Sometimes these will concern development of areas which previously were empty and under natural vegetation. More often, especially in a country such as Ethiopia, the policies and programmes will be concerned with areas in which several different uses for the same land are possible. These different uses may be said to 'compete'; land use planning makes decisions about which uses shall prevail on which kinds of land.

Such decisions need to be based on reliable information. This is of many kinds: physical, economic, social. If the information on which the plans are based is faulty or inadequate, the development which results from these plans will soon run into problems.

So land use planning in the broader sense of the term means much more than 'planning' in the narrow sense. It means also the collection of relevant information, and the evaluation of that information.

There are three stages to land use planning, sometimes referred to briefly as description, evaluation and development planning. More precisely, these stages are:

(i) Description - The survey of basic resources, both physical (natural resource surveys) and economic and social;

(ii) Evaluation - assessment of the various uses to which the resources could be put, and the consequences which would result from each alternative use.

(iii) Development Planning - making plans to put the chosen kinds of land use into operation.

These three stages of planning are followed, if the decision is made to go ahead, by implementation.

A land use services institution needs to cover all of these three stages. It needs to have the terms of reference, powers, staffing and equipment needed to survey resources, evaluate them, and translate the evaluation into actual plans.

2.2 ORGANISATION CONCERNED WITH LAND USE PLANNING IN ETHIOPIA

An account of the many different government agencies engaged in aspects of agricultural land use planning is given in the preceding consultant's report; a further account is contained in Annex 1 of the draft Lower Didessa proposal. I have drawn upon these and upon interviews to construct Table 1. In this table an attempt is made to distinguish the various kinds of activities related to land use planning, indicating which organisations have capabilities for each. The activities distinguished are as follows:

(i) High-level Decisions. This refers to the capacity for decisions about policies and programmes at a national level. These are necessary as the starting point or authority for more detailed activities. Clearly this capacity is confined to Ministry level.

(ii) Resource Survey and Land Evaluation. This is the capacity for scientific surveys, involving, for example air photograph interpretation or remote sensing, field survey of landforms, soils, vegetation, etc., agroclimacological analysis, together with land evaluation in both physical and economic terms. It requires a high degree of intellectual ability, based on training to at least the level of masters degree. It provides the scientific basis for development planning. Relatively few organisations in Ethiopia possess this capacity.

(iii) Land Development Planning and Implementation. This refers to the stage of putting plans to work: for example, laying out settlement schemes in the field, establishing irrigation schemes or forestry plantation, together with the subsequent operation of these projects. A rather large number of organisations in Ethiopia are more or less independently engaged in activities of this kind.

(iv) Non-agricultural Uses of Land. This column is included to indicate that rural land use extends beyond agriculture (within which I include livestock production). Five major non-agricultural uses of land are included: forestry, wildlife conservation, water resource conservation and utilisation, road construction and tourism. The first two fall administratively within the Ministry of Agriculture, the last three outside it. The same surveys that serve agricultural land use can benefit these other kinds of use.

(v) Research and Training. The capacity for fundamental and applied scientific research into agriculture, forestry, etc. is confined to a small number of institutions. Such research is an essential complement to resource survey, the latter providing the geographical base for extending the results of research.

The capacity for training in various aspects of land use planning is confined to the University of Addis Ababa, and at present much advanced training takes place abroad.

(vi) Services to Land Use Planning. These are organisations which, whilst not engaged in land use planning, provide essential services on which such planning depends: mapping, climatic records, and statistics.

A feature of Table 1 is the contrast between the large number of organisations engaged in land development planning and implementation compared with the much smaller number with the capacity for the resource survey, land evaluation and research on which such development planning should be based. This has implications for the future staffing and activities of the land use services institution, as discussed below.

Table 1

SOME ORGANISATIONS ENGAGED IN ACTIVITIES RELATED TO LAND USE PLANNING IN ETHIOPIA

Ministry Level	Department Level	Other Levels	Name	High level Planning Decisions	Resource Survey and Land Eval.	Land Develop. Planning and Implementation	Non-Agricultl Uses of Land	Research (R) Training (T)	Services to Land Use Planning	Notes
MOA			Ministry of Agriculture	X						
	LUPRD		Land Use Planning Department		X	X				
		SSurv.	Soil Survey Staff		X					
	ADD		Agricultural Development Department			X				Formery EPID Extension
		SWCS	Soil and Water Conservation Section			X				
	FWDD		Forestry and Wildlife Development Department			X	X			
		For	Forestry			X	X			
		WCon	Wildlife Conservation			X	X			
	ARDD		Animal Resources Development Department			X				
	LMB		Livestock and Meat Board		X	X				
MCTD			Ministry of Coffee and Tea Development	X		X				
MSFD			Ministry of State Farms Development	X		X				Research done by IAR
		ADCs	Agricultural Development Corporations			X				
RRC			Relief and Rehabilitation Commission	X						
	SD		Settlement Department			X				
MMEWR			Ministry of Mines, Energy and Water Resources	X						
	VADA		Valleys Agricultural Development Authority		X	X				Irrigation Schemes 1
	EWRA		Ethiopian Water Resources Authority			X	X			
	LWSA		Land and Water Studies Agency		X	X				Merged with VADA
STC			Science and Technology Commission							
	IAR		Institute of Agricultural Research					R		
CHE			Commission for Higher Education							
	UAA		University of Addis Ababa					R,T		
		IDR	Institute of Development Research					R		
		Geog.	Faculty of Geography					R,T		
		Geol.	Faculty of Geology					R,T		
		Agric.	Faculty of Agriculture					R,T		
			Tourism and Hotel Commission				X			
			Ministry of Transport and Communications	X			X			
	ERA		Ethiopian Roads Authority				X			
	CAA	Met	Meteorology Department (Civil Aviation Authority)						X	
			International Livestock Centre for Africa		X			R	X	
CPSC			Central Planning Supreme Council	X						
	PP		Physical Planning	X		X				
	EMA		Ethiopian Mapping Agency						X	
	CSO		Central Statistical Office						X	

2.3 EXAMPLES OF LAND USE PLANNING NEEDS IN ETHIOPIA

A few examples of the kinds of decisions needed for land use planning in Ethiopia may be given, in order to illustrate the range of functions which will need to be served by a land use planning institution.

In a very general sense, the same two kinds of planning decisions are needed as in any developing country. First, to determine the best location and boundaries of any kind of development project, and secondly, having determined that sitting, the established best layout of the differen kinds of land use within that area. Competition between alternative kinds of use is frequently present.

More specifically within the Ethiopian context, some examples of land use planning needs and conflicts are as follows:

- Selection of priority areas for rehabilitation and conservation; this applies both to eroded highland areas and to degraded semiarid lowland areas.
- Selection of suitable sites for state farms, for food-crops or other forms of production.
- Expansion of coffee production: selection of best areas, avoidance of land unsuited or only marginally suited to coffee competition for land with food-crop production.
- Identification and comparison of sites for irrigation schemes.
- National parks and wildlife reserves: sound allocation of land as between reserves and domestic livestock grazing areas, and provision for loss of grazing land in existing 'reserves'.
- Diversification of the cropping base, especially for export crops.
- Forestry: appropriate locations of productive industrial (sawnwood) forests, productive domestic (firewood) forests, and protective forests.
- Forestry versus grazing: correct allocation of sloping land as between forestry and dry-season grazing.

- Road layout: good alignment of service roads such as to minimize washouts and maintenance costs.
- Erosion control: (i) Correct land use selection; (ii) Suitable management practices; (iii) Design of physical conservation works. Numbers (i) to (iii) represent increasing levels of costs.
- Arable versus grazing: decisions as to the limits between these uses, first on sloping land (wet season grazing) and secondly on low-lying wet land (dry season grazing.

Three more general points may be added, which apply with particular force to Ethiopia.

The first is the present lack of scientific information about the resources of the country and their distribution. Unlike some other developing countries, there have been no systematic attempts in the past to assess and map the natural resources of the whole country; only a few limited areas, such as the Awash Valley, have been surveyed at even reconnaissance scale. Moreover, as it is a large and diverse country, the problems now being faced are considerable. A substantial, and carefully deployed, investment of both money and skills will be needed to rectify this situation.

Secondly, as is well known, the present upsurge of the land development planning has come at a time when the soil and vegetation resources of large areas are already subject to considerable population pressure. In some areas these resources are also substantially degraded; it should not be supposed, however, from the well-known existence of 'disaster' (recurrent famine) areas, that such degradation has occurred throughout the country. Forest resources are severely reduced over large areas, throughout the country. Forest resources are severely reduced over large areas, through the demand for firewood. Pasture resources are under heavy pressure through much of the semiarid zone. Soil erosion, however, whilst

severe in some areas, in others has not yet reached serious proportions. Thus although reclamation and improvement of degraded resources are certainly needed in some areas, and are currently the focus of much externally aided land planning, there are other areas in which there is still time to preserve at least the soil resources. This time may be short.

The third point concerns the livestock population of the country. Outsiders might initially suppose that livestock production was important in the semiarid lowlands, but that the highlands were largely concerned with rainfed arable cropping. In fact, as is well-known to Ethiopians and quickly apparent to the visitor, there is a very large population of cattle, sheep and goats in the highlands, together with donkeys and horses. All of these animals play a part in the rural economy, for food, ploughing, transport and cash needs. There are something of the order of 30 million cattle and a further 30 million other livestock units in the country.[1/] Unfortunately this high livestock density has also been responsible for no small part of the resource degradation. Future land use planning must take full account of the effects, and needs, of this large livestock population.

2.4 SCALES OF RESOURCE SURVEY AND LAND USE PLANNING

There are five ranges of scale at which resource surveys are carried out. Of these, one, the intensive scale (larger than 1:10 000) is mainly employed for urban and peri-urban surveys. This leaves the following four ranges of scale needed for rural land use planning:

(i) Rapid Reconnaissance

This was formerly called 'exploratory', but the advent of satellite imagery has rendered the term inapprorpriate. Mapping is at scales of 1:1 000 000 or 1:2 000 000.

1/ 1 livestock unit = 1 adult cattle, horse or camel, or 5 sheep or goats.

Remote sensing is from satellite imagery and not aerial photographs. Field survey is by road traverses or helicopter stops. The object is to obtain a very generalised but rapid overview of the resources of large areas, for generalised planning decisions on a national scale. This scale cannot, however, be used for project location, because of the very large areas covered by a single mapping unit, made necessary by the technical limitations of satellite imagery.

(ii) Reconnaissance

Mapping is typically in a scale of 1:250 000, sometimes 1:500 000. Remote sensing is from small-scale aerial photographs. Field survey is by planned sampling, based on the previously-established photointerpretation units. The object is the approximate location of arable farming projects, or sometimes the more specific location of extensive types of land use such as livestock ranching. This scale is inadequate for the precise location of arable farming projects, but serves to limit the areas which need to be covered by semidetailed survey.

(iii) Semidetailed

Mapping is typically on a scale of 1:50 000. Remote sensing may be from either small-scale or large-scale air photographs. Field survey is either by landform-based "free survey' or regularly-spaced traverses. The object is the precise location and boundaries of arable farming projects and other forms of land use of comparable intensity. Generalised road alignments may be obtained. This scale is inadequate for detailed farm and settlement planning, e.g. layout of conservation works, precise allocation of arable, grazing, forest, etc. land.

(iv) Detailed

The usual mapping scale is 1:20 000 or 1:25 000. Remote sensing is from air photographs at this or larger scales, and maps are sometimes plotted on a photomosaic base. In field survey, every land unit with different use capacities is visited. This is the necessary scale for land capability classification. The object is the detailed layout of farms and settlement schemes, including conservation works.

The need for these scales of operation may be illustrated by the draft Lower Didessa report. The rapid reconnaissance stage in this instance was accomplished by general knowledge of the area, and as a first approximation an area of 800 000 ha was identified as possibly containing areas suitable for settlement. This whole area was mapped at reconnaissance scale, on the basis of which a potential area of 130 000 ha was selected. This latter area was mapped at the semidetailed scale, from which the area required for settlement, 70 000 ha, was delineated. Finally the 70 000 ha was surveyed at the detailed scale for the purpose of demarcating land capability units, leading to land development planning.

Thus all four scales were required in this scheme, each being employed to reduce the area to be covered at the next leavel of detail, and thus keep the costs to a minimum. This pattern of surveys will be needed not only for future settlement schemes but for many kinds of land development.

2.5 SOME IMPLICATIONS FOR LAND USE PLANNING SERVICES IN ETHIOPIA

This brief and elementary review of the nature of land development planning, with particular reference to the needs of present-day Ethiopia, indicates certain principles which need to be taken into account in future activities. These are as follows:

(i) Land development planning must be based on the preceding stages of resource survey and land evaluation. To go directly to detailed planning without such a basis could lead to environmental degradation, waste or inefficient use of investment capital, human suffering, or all of these.

(ii) The country's land use services must have the capacity to operate at all of the major scales of survey, from reconnaissance through semidetailed surveys. (it is assumed that the rapid reconnaissance stage will be achieved by the current project). In view of the fact that so little is known at present, it would be a false economy to attempt to proceed directly from small-scale studies to detailed planning.

(iii) Land use planning in Ethiopia should not be conceived too much in terms of arable farming only. The needs of the large livestock population and the serious shortage of firewood and other timber need equally to be taken into account.

(iv) In the stage of land evaluation, it is desirable to proceed on a comparative basis; that is, to compare the consequences of one form of land use with those of others. Land evaluation sets out alternatives, the final decisions lie beyond the stage of evaluation. If evaluation does not present alternatives, there are no options open for planning. (This is Principle No. 6 of the Framework for land evaluation, but is repeated here to emphasise its importance in an Ethiopian context).

(v) In the light of the size of the country, its population, the present desire for rapid land development, and the sparse nature of scientific knowledge about the resources, the task ahead is a massive one.

Chapter 3

THE DRAFT MASTER LAND USE PLAN

3.1 NATURE AND AIMS OF THE PLAN

3.1.1 Aims of the Plan

The aims of the draft master land use plan are clearly stated in the Project Document. Taking the Immediate Objectives, and separating out those which refer specifically to the plan (as distinct from other aspects of developing national land use planning capacities covered by the Project as a whole) the relevant objectives are:

- 'In cooperation with the relevant specialised Government Agencies (to) prepare a master land use plan for the country, establish guidelines for the improved use of land resources and prepare land use plans as required'; (Immediate Objective 2)
- 'Establish a national inventory of land resources...'; (I.O.4)
- 'Recommend appropriate management systems and production structure for different types and levels of land use as required'; (I.O.5)

It is further relevant to draw attention to two of the Development objectives which have a clear bearing on the nature of the plan. These are to improve the conservation and rational use of land resources; and to aid in improved diversification of the economy through rational use of these resources.

3.1.2 Nature of the Plan

The scale of the plan is clearly and necessarily that of rapid reconnaissance. At no other scale would it be at all possible to achieve coverage of the entire country in the time span available.

Much of the basic mapping is at 1:1 000 000 scale. The development planning stage will probably be drafted on this scale, and later reduced to 1:2 000 000 scale for presentation.

The conduct of the resource survey stage at this scale has been rendered possible by the use of satellite imagery, and there are a number of precepts for rapid national coverage in this manner (e.g. studies by the FAO Remote Sensing Unit). Land development planning at a national scale is no new thing. However, to my knowledge there have been no previous attempts to conduct a land evaluation study at this very small scale. The methodology for land evaluation was conceived in terms of scales ranging from the detailed to the reconnaissance, and some adaptations and simplifications will almost certainly be necessary in order to apply it to the rapid reconnaissance scale. The scale of working raises particular difficulties for the economic aspects of land evaluation, as discussed further below.

The stages of land use planning to be covered are clearly all of the following three: description, evaluation and development planning. To an outside observer this is at first sight a starting discovery;for to achieve any one of those three stages for a country of this size in under four years would seem a task of magnitude enough. There is no doubt at all, however, both that the Project Document calls for the completion of all three stages, and that the needs of the country require this.

Allowing for a substantial overlap between stages, and that the first six months or so were required for establishing basic scientific and administrative capabiliites, this means that each of the three stages will have to be accomplished in something of the order of eighteen months.

During the stages conducted to the present, which largely concern resource survey and land evaluation (the forestry input is an exception) it has been possible for the FAO team and associated Ministry staff to work as a relatively independent unit, that is, whilst there has been considerable consultation with, and assistance from, other agencies within and outside the Ministry of Agriculture,

the nature of the results has been determined by internal consultation. Clearly, once the development planning stage is reached, there will need to be more interaction with Ministry officials and other government agencies, since national land use planning objectives and priorities can have considerable economic, social and political implications.

For the remainder of this Chapter, I shall be concerned primarily with the stage of land evaluation, together with resource survey as a necessary input. Development planning will only be further considered insofar as it bears upon the required outputs from land evaluation.

3.2 REVIEW OF PROGRESS TO DATE

3.2.1 Individual Inputs

This short review is based upon the Activities Flow Chart for the project, together with interviews with the members of staff involved.

Mr. Henricksen (Land Resources Expert), Ato Sultan and staff working with them have nearly completed a twice-over interpretation and mapping of the entire country, based on the 71 Landsat frames by which it is covered. Two maps have been prepared in draft at 1:1 000 000 scale. The map showing geomorphology is complete as to boundaries; the legend will be built up partly on the basis of fieldwork yet to come. The map showing present land use/land cover has been completed with a provisional legend; this legend will be substantially amplified and refined during subsequent fieldwork. In addition, a map of slope angle, based on the contoured topographic maps at 1:250 000, will shortly be completed.

The major contrasts both in landforms and land cover appear to show up well on the imagery. The limited stereoscopic facility available along the margins of the images has been of use. The major landform units of the country are readily distinguished, together with a substantial number of boundaries delineating

mapping units down to dimensions of about 10 km across (1 cm at 1:1 000 000 scale). There is a difficulty in places in distinguishing natural tree or shrub vegetation from crops, both giving a red signature on the false colour composites; comparison between images at different seasons, coupled with field studies, will resolve this problem.

Dr. Odenyo (Agroecology Expert) has the tasks of characterising the main agroecological zones of the country, based on the collection and analysis of climate data, and secondly on the relation of these data to ecological and agricultural information. Basic to this task is the assembling of available climatic records, and assessment of their reliability. This has not been easy in a country the size of Ethiopia, and is still continuing. Personal visits to some climatic stations have been made and will continue to be necessary. Until such data are assembled, the identification and mapping of climatic zones cannot proceed. With respect to vegetation and agriculture, there has only been time up to the present for collection of a limited amount of data on the production and regional distribution of principal crops. The difficult task of determining crop requirements has not been commenced.

The sheer difficulty of getting hold of climatic data, coupled with the short period of some records, has been the main problem to date. Given the small scale of mapping, it is likely that this problem will be satisfactorily overcome. Once mapping is attempted, a technical problem is likely to be that climatic boundaries in Ethiopia will be of some complexity, owing to the strong influence of relief; there will not be the smooth boundaries and broad zones typical of, say, West or Central Africa. This technical problem can be met by simplifying the initially mapped boundaries into such major zones as appear in the country.

I strongly support the use of the methodology established in the FAO World Agroecological Zones project and the succeeding Land Carrying Capacity Project; this methodology includes considerable work on matching climatic conditions to crop requirements, which will be of much assistance in the later stages of the Ethiopian study.

Ato Berhanu (Soil Surveyor, LUPRD) has the gargantuan task of providing the soils component of the basic resource survey. As the other staff assigned to him are presently untrained in soil survey, this has been, and will continue to be for the duration of the project, a single-banded task. Given its magnitude, the project document has conceived it in terms of an upgrading of the synthesis provided by the FAO/UNESCO Soil Map of the World.

The surveyor's considerable previous experience of the soils of the country is a great asset to the project. The main problem need hardly be repeated: that soil maps at any scale exist for only small areas of the country. A review of these maps, as a pointed report, has been completed. It is already clear that for large areas of the country, the mapping units shown on the Soil Map of the World are unrealistic.

A soils laboratory has been established in support of this part of the work. I did not have time to visit this, but am informed that the working conditions provided by the building in which it is at present housed are highly unsatisfactory. So far as I am aware, there has been no recent check on the reliability and replicability of the analytical results produced by this laboratory. It is standard practice for soils laboratories to conduct such a check. In order to give confidence to the field soil survey that the related analytical services can be fully depended upon, some means of carrying out an independent check should be found.

Soil mapping at the small scale of the plan must, however, be largely dependent on fieldwork. This will require road traverses during the dry seasons of 1980-81 and 1981-82, and to fit in with the needs of the plan, much must be accomplished in the former. It is up to the surveyor to decide whether to map largely in terms of the FAO legend, as has been done, for example, in Kenya. Were it myself, I should not do it in this way. I believe that soil mapping should commence with identification of the natural soil types present in the field, with their modal properties and ranges. Allocation to a classification system comes afterwards. The soil types identified on a survey of this scale would be considerably broader than soil series.

The reconnaissance survey of Malawi conducted some years ago, or the system established in Malaysia, provide possible models, although it is recognised that they are both much smaller countries. Once local soil types have been defined, and given local names, these in due course can provide the basis for agricultural research, planning and extension. The FAO and other international classification systems are for 'translation' between local soil types and international scientific and agronomic research.

Mr. Kir (Forest Resources Expert) has at the time of writing just completed his studies and prepared his draft final report. An inventory of the existing remaining forest areas has been conducted. Demand projections for firewood and sawn timber have been made, the former taking account of the need to replace the use of cow dung as fuel with use of wood. By relating demands to rates of tree growth, requirements for additional timber plantations have been calculated.

The forestry input to the project has been directed towards the land planning stage in the forestry sector, and not explicitly towards land evaluation. However, of the two main inputs needed from forestry towards land evaluation, the formulation of land utilisation types and the land use requirements of these, the former has in fact been achieved and the latter partially so. Three classes of forestry have been distinguished for planning purposes, which in terms of land evaluation represent the land utilisation types:

(i) Protective Forestry, on steep slopes, which need not necessarily be planted, but in some areas need only be protected from cattle.

(ii) Subsistence Forestry, to supply firewood, building poles and other domestic timber needs; such areas are established within Peasant Association areas and make substantial, although by no means exclusive, use of Eucalyptus species.

(iii) Industrial Forestry, mainly to supply sawnwood; this is at present dependent on the remaining high forest areas in the south-west and south (coniferous, mainly Podocarpus gracilior and Juniperus procera, and mixed hardwood forests), but will require additional plantations of fast-growing softwoods, e.g. Pinus Patula, Cupressus lustanica. In the context of land evaluation, it should particularly be noted that industrial forestry will necessarily compete for land with agricultural uses, and decisions at government level will be needed.

The climatic and other requirements of individual tree species (in evaluation terminology, the 'requirements of the land use') have not been covered by this study. Information is available, however, from at least two sources. First, generalised requirements with respect to altitude zones have been compiled by the Forestry Department (Dr. Rock)[1/]. Secondly, the FAO-assisted Project, Assistance to Forestry Research, has established tree species trials in four of five rainfall zones of the country (350-700 mm, 700-1050 mm, 1050-1400 mm, and over 1400 mm with all-year rain)[2/]. Data from these should be sufficient to supply the needs of the evaluation.

Dr. Nair (Agricultural Economist) is concerned with economic aspects of the evaluation stage, together with related demographic data, institutional and social aspects. Data on crop areas, yields and production have been assembled both on a national basis and for the 14 administrative regions. These data will be used to obtain representative crop yields, taken as being at the low-input level, first by regions and subsequently related to agroecological zones. Costs of production for crop enterprises will subsequently be obtained by regions or other units. At higher technology levels, a limited amount of data are obtainable from Institute of Agricultural Research stations. By taking the proportions of crops in different areas, a first approximation to farming systems can be synthesized.

1/ E.g. Appendix 5, 'Appropriate tree species...' to Sirinka Catchment Reclamation Pilot Subproject, Report by Noel Cossins, May 1980.

2/ Assistance to Forestry Research. Phase I. Ethiopia. Project findings and recommendations. FO:DP/ETH/74/006, published 1979. Phase II of this Project commenced in 1979.

At least three main problems were reported. First, cattle play a substantial part in Ethiopian farming systems, and there is no staff member of the project with expert knowledge of, or responsibility for, this aspect. Secondly, the scale at which the study is being carried out presents considerable problems for economic analysis; the basic data for such analysis normally comes from farm system studies, but the gap in size and degree of generalisation between these and the scale of the plan is vast. The third problem is that economic land suitability evaluation is dependent upon preceding evaluation in quantitative physical terms, and it will still be some time before this stage is reached through other inputs to the project. Each of these problems is discussed further below.

Dr. Ridgway (Land Administration and Documentation Expert) has to date been concerned with the land evaluation study only indirectly, through the establishment of a data centre. This centre, or library, has been established, and a loans system is already in operation. It is stocked with material of two kinds; basic reference works on natural resources and agriculture, and reports and other scientific studies of Ethiopia. A keyword indexing system is in course of preparation. The usefulness of this centre to the LUPD was clearly demonstrated to the present consultant in that when I learnt of some, often quite obscure, publication on Ethiopia, it could nearly always be produced rapidly.

Having accomplished this initial stage, Dr. Ridgway is currently employed partly on work below his capacity. The day-to-day running of the centre, particularly the loans system, should be immediately transferred to local staff. Ongoing acquisition of material, together with establishment and subsequent supervision of the indexing system, will continue to require professional attention, but not on a full-time basis.

Dr. Ridgway's other area of responsibility, that of land tenure and administration, falls outside the scope of this report.

Mr. Choi (Land Use Planning and Training Expert) is largely concerned with aspects of the project only indirectly related to that covered by the present report. To date he has been active principally in training activities, in soil conservation and detailed land use planning. Subsequently, he will be in a position to provide an input to the plan with respect to soil degradation and soil conservation, a required step (environmental impact assessment) in land suitability evaluation.

3.2.2 Comparison of Inputs

The basic factors of the physical environment, on which information is required for land use planning, are geology, geomorphology, hydrology, soils, vegetation, fauna and disease. To these may be added information on present land use. Most of these factors have been or can be covered by the present study, although there are some gaps.

For geology, the existing published geological map of Ethiopia is adequate for the needs of the survey; in addition, the project is maintaining excellent liaison with the Faculty of Geology of the University of Addis Ababa and links with the Geological Survey. Geomorphology is fully covered by the remote sensing study and associated fieldwork. Similarly, data on climate is being collected. There is no hydrologist on the project, but information on hydrology is available from the Water Resources Authority and the Valleys Agricultural Development Authority[1/]. Soils are covered, albeit with inadequate manpower, by the project. Vegetation has been covered only in respect of forestry; there is no capacity on the project to study natural vegetation, as a means of refining the agroecological zones, nor to survey pasture resources and their problems. An experienced ecologist, Dr. Hywood, works in the International Livestock Centre for Africa, and has done some agroecological mapping at 1:250 000 scale. Fauna are relevant first with respect to wildlife reserves and secondly with respect

1/ For potential irrigation areas, it will be possible to make considerable use of the report, VADA. Guide to the development of the river valleys of Ethiopia. Halcrow-ULG Ltd, 1979. 6/ETH/01/1. Technical Reports 1 and 2.

to insect transmitters of disease. Major problems of disease include tsetse infestation and the need to guard against schistosomiasis in irrigation schemes. Neither of these last two factors are professionally covered by the project staff. Land use is covered by the remote sensing studies, in conjunction with Ethiopian government statistics. There appears to be some possibility of overlap between the studies on crops being commenced by Dr. Odenyo and Dr. Nair, and liaison should be maintained.

A comment may be added on the nature of climatic zones, agroecological zones, and their relations with geomorphological units. Any mapping units constructed wholly on the basis of climatic data (including growing periods, as calculated from rainfall and potential evapotranspiration data) are to my way of looking at it climatic zones. To use the term 'agroecological zones' at this stage is jargon. They become agroecological zones only after they have been matched with crop suitabilities, a later stage in the procedures. Thus an agroecological zone is an area with given climatic characteristics (temperature, rainfall, growing period, presence/absence of frost hazard, etc.) and which has been assessed as suitable for a given range of crops.

It appears that the surveys currently in progress will produce two basic resource maps; climatic zones and geomorphological units. The latter will have more detailed boundaries than the former. Members of the team raised the question of how these two kinds of boundaries should be combined. It is difficult to offer an opinion until one sees the finished maps. Tentatively, one possibility seems to be that the climatic zones could be lettered, A, B, C,..., the geomorphic units numbered, 1, 2, 3, ..., and combined mapping units characterised by such combinations as C3, C22, D22. This suggestions should not be taken as a recommendation.

3.2.3 Field Studies

The importance of field studies primarily during the coming 1980-81 dry season, cannot be too strongly emphasised. It is a widely-established principle that remote sensing is only of value when combined with field observations ('ground truth' in the jargon phrase).

Indeed, if one had to choose between a remote sensing study without fieldwork and a fieldwork study without the use of imagery, the latter is the more useful. Fortunately such a choice need not be made; remote sensing is infinitely better at providing boundaries of mapping units, whilst fieldwork is similarly much superior in finding out what conditions are really like within those units.

In order to accomplish the necessary field programme, the team must be provided with good facilities of finance, transport, and field accommodation, and perhaps even more important, a great effort should be made to smooth administrative obstacles out of their way. Apart from areas to which access is impossible for reasons of national security, the team should be in a position to plan and execute several extensive field tours throughout the country. I suggest it would be beneficial if to some extent this field programme were to be undertaken as a team, i.e. individual experts travelling to the same areas at the same time. The brief field tour undertaken by the present consultant was illustrative of how much can be gained from field study conducted on a multi-disciplinary basis.

3.3 SOME COMMENTS ON THE LAND EVALUATION ACTIVITIES

3.3.1 Objectives of the Land Evaluation

The three stages leading to the master land use plan namely, description, evaluation and development planning, are conceived in the Project Document as a single operation. Hence this Document does not refer specifically to an interim output from land evaluation. On the Activities Flow Chart, however, it is clear that such an interim output is envisaged, as represented by the two items:

- 'Compilation of 1:2 000 000 scale land suitability map of the country with relevant explanatory reports.'
- 'Qualitative and possibly quantitative characterization of the suitability of the main agroecological zones for present and potential land uses.'

The extracts from the Project Document are also relevant. First, the reference (p.3) to a 'national policy of priorities'; secondly, the statement (p.4) that the master land use plan 'will serve as the basis for formulating agricultural development policies...'

The three words (here underlined for emphasis) 'uses, priorities, basis', clearly indicate that the stage of land evaluation should present alternative uses for each area, together with the consequences, favourable and unfavourable, of each. This is in agreement with normal practice in land evaluation. Final decisions on development planning depend partly on land suitability, but partly on policy considerations which lie outside the evaluation procedures. Such decisions are made easier by not pre-empting them at the evaluation stage.

Thus the major objectives of the land utilisation stage are:

(i) To identify and describe a series of land utilisation types, or different kinds of land use, which are relevant for consideration in Ethiopia (see further Section 3.3.3 below).

(ii) To assess the suitabilities of mapped land areas of the country for each of a number of different uses.

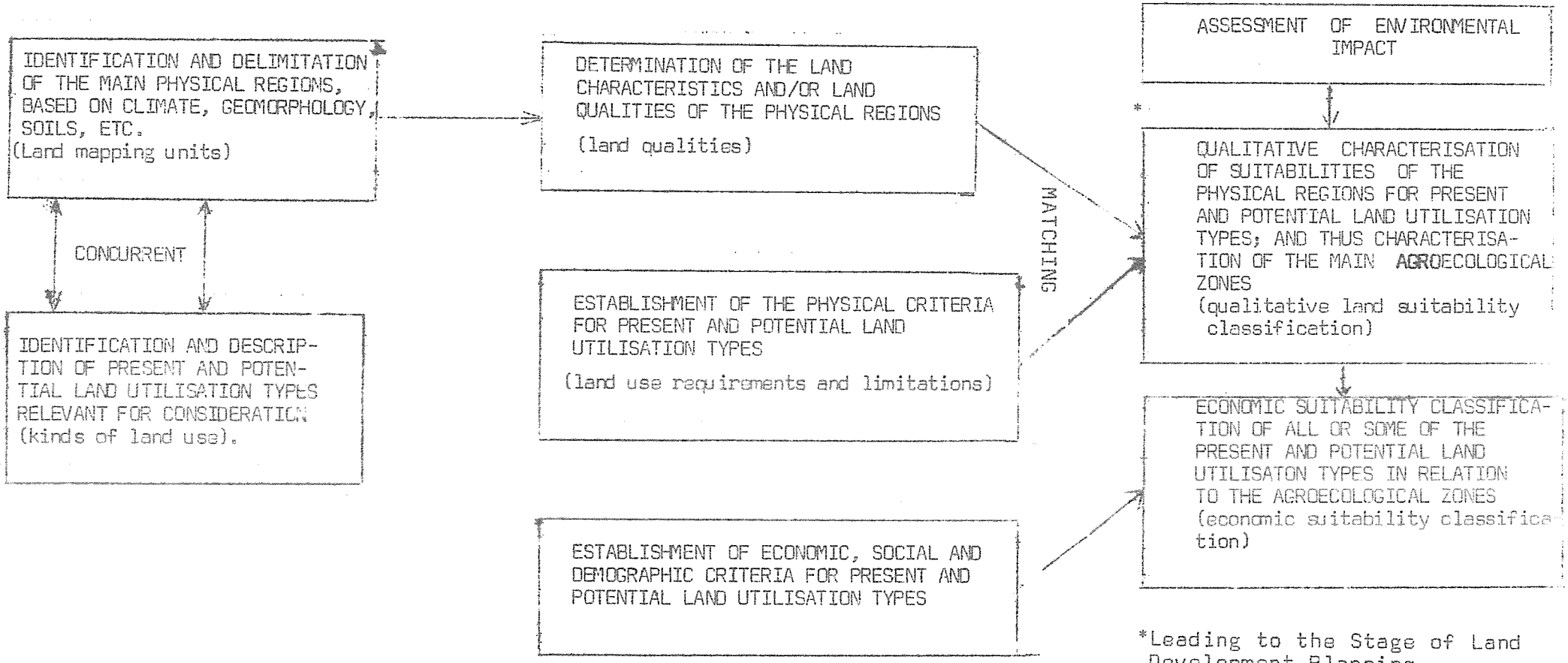
There will of course be cases in which only one use is shown to be suitable, but this does not detract from the principle involved.

Two cartographic devices for showing such suitabilities are a tabular legend (Framework p.44) and a series of individual suitability maps (Framework p. 24). The tabular legend is better for the basic representation, but individual maps showing suitabilities for each use, on a smaller scale, are a very effective presentation device.

3.3.2 Co-ordination of Land Evaluation Activities

At the time of this review, it appears that adequate provision has not been made for co-ordination of the various contributory activities into an integrated land suitability evaluation output. With certain exceptions, noted below, the various types of data needed

TABLE 2 SUGGESTED REVISION OF PART OF THE LAND EVALUATION STAGE OF THE PROJECT ACTIVITIES FLOW CHART
Terms given in brackets refer to the corresponding activities on p.28 of the Framework.



*Leading to the Stage of Land Development Planning

TABLE 3 - SOME EXAMPLES OF PRESENT AND POTENTIAL LAND UTILISATION TYPES IN ETHIOPIA
Potential types, i.e. at present nonexistent or rate, are marked*

Major Kind of Land Use	Land Utilisation Types
Rainfed Agriculture Annual Crops	- Individual crops (teff, maize, wheat, potatoes, cotton, etc.)-considered within the context of (a)-(c) below.
	- Crop combinations (e.g. commercial production of tobacco with subsistence maize and pulses); considered within the contexts of (a)-(c) below.
	- Mixed farming: arable-livestock systems
	- (a) Unimproved traditional farming, low inputs.
	- (b) Improved farming by Peasant Associations, intermediate inputs, animal-drawn implements.
	- (c) State Farms, high inputs, partly mechanised.
Rainfed Agriculture: Perennial Crops	- Individual crops (coffee, tea, sisal, etc.); considered within the contexts of (b) and (c)* above.
	* Commercial horticulture, for urban markets and/or export.
Irrigated Agriculture	- Individual crops (cotton, sugar cane, citrus, rice, etc.); considered within the context of State Farms or other large-scale management units.
	- Potential sites for irrigated agriculture in general, as large-scale management units.
	* Irrigation in the context of Peasant Associations, based on small earth dams.
Livestock Production	- Nomadic pastoralism.
	- Commercial ranching for meat production, on large-scale units, state-operated or supervised.

	-	Meat production as a component of mixed farming; considered within (b) or (c) above.
	*	Dairying; considered within (b) (c) above.
Forestry: Natural Forests	*	Industrial forestry, based on controlled utilisation of natural forests, with regeneration; as state-operated Forest Reserves.
Forestry: Plantations	*	Industrial forestry, based on soft-wood plantations, state-operated in conjunction with Peasant Associations.
	-	Subsistence forestry, for fire-wood and domestic timber, based on plantations (Eucalyptus, etc.) operated by Peasant Associations with advice from Forestry Department.
Tourism/Wildlife Conservation	-	National Parks for Tourism, re-creation and wildlife conservation.
Rehabilitation and Conservation	-	Protective forestry, for rehabilitation of eroded areas and conservation of areas with severe erosion hazard.
	-	Water catchments; areas of particular importance as water sources.
Roads	-	Suitability of land for road construction.

TABLE 4 EXAMPLE OF THE DESCRIPTION OF A LAND UTILISATION TYPE: LARGE-SCALE IRRIGATED SUGAR CANE FARMING

Major Kind of Land Use: Irrigated Agriculture: Field Perennial Crops.

Summary

Irrigated cropping of sugar cane by state-operated commercial farms of greater than 500 ha; high capital intensity, medium labour intensity, fuel-driven machinery supplemented by manual labour; an advanced technology farming system with a high level of inputs.

Setting

This land utilisation type is appropriate for alluvial floors of the Awash and other larger rivers at 400-1200 m altitude. These areas have a semiarid to savanna climate (Köppen BShw to Aw) with mean annual rainfall from 300 to 650mm. The land is naturally thorn scrub, used for nomadic grazing. Under irrigation, sugar cane can be grown on a wide range of soil types, each requiring special management practices. The best soils (S1, Highly suitable) have a moderately heavy texture, are more than one meter deep, well drained, have a total available water capacity over 15% and a pH of 6.0-7.0.

Initiation of this kind of development requires high initial investment, and the subsequent level of returns must be sufficient to pay off the amortization costs. Skilled engineering studies and design are essential, coupled with careful land selection.

Description

Crops Grown. Sugar cane (Saccharum officinarum) grown entirely under irrigation.

Market Orientation. 100% commercial production.

Capital Intensity. High capital intensity. Capital investment on farms exceeds Birr 1000 (US$ 500) per ha. Recurrent costs exceed Birr 200 (US$ 100) per ha.

Labour Intensity. Medium labour intensity, 0.25-2.5 man-months per ha per year. Whilst some operations are mechanized, labour-intensive methods are used for planting of sets and cane cutting.

Technical Knowledge. Famrs are operated by managers and professional staff with degree or diploma-level agricultural education. Technical and supervisory staff are required,plus moderately large numbers of both semi-skilled and unskilled labour.

Power. Fuel-driven machinery, supplemented by manual labour.

Mechanization and Implements. Operations carried out by machinery include land preparation, ridging, ferilizer and insecticide applications and removal of the harvested crop from fields. Manual operations include planting out stem cuttings (setts), weeding with hand hoes and cane cutting with machetes.

Size and Configuration of Management Units. Large farms in excess of 500 ha, laid out in regularly-shaped blocks, bounded by sloping not suitable (N2) land.

Land Tenure. State farms, owned and operated as government enterprises.

Infrastructural Requirements. Ready access to processing factory, preferably on farm site. Supply of improved varieties of plant material, access specialist services including agronomy, soil science, entomology. Good road transport essential.

Cropping Practices. Farming system based on medium-term field perennial crop, with life of 3-8 years depending

on land suitability. Cultivation factor (number of years land is under crop as percentage of total crop-rest cycle) and cropping index (number of crops harvested as a percentage of total cycle) both exceed 70%. No crop rotation. Period from planting to first harvest 15-18 months. Harvests from ratoon crops continue for up to 3-8 years. Frequency of harvesting and number of ratoons which can be harvested before replanting becomes necessary are both higher on highly suitable (S1) soils than on moderately suitable (S2) soils.

Material Inputs. High level of inputs. Modern methods with advanced technology and large capital resources. Fertilizers applied near to levels of maximum economic return. A carefully-controlled irrigation system. Soil conservation measures are not required on the level land.

Crop varieties: improved high-yielding varieties as selected for low-medium altitudes in Ethiopia, e.g. xxx, xxx.

Fertilizers: Sugar cane has a high requirement for N and K but relatively low P; approximate applications (kg/ha of elements) 100-200 N, 20-90 P, 125-160 K, for a 100 t/ha yield. Levels of N increased with ratoon crops to encourage vegetative growth. Heavy soils can be improved by mill waste organic matter.

Crop protection: in soils with pH greater than 8.5 protect against ratoon stunting disease. Possible nematode problem on sandy soils.

Cultural Practices. Land preparation: ploughing and ridging; row spacing 1.1-1.4 m, number of setts 21 000-35 000/ha. Setts planted in furrows and ridged up after 3 months; an alternative method of planting on ridges is under trials.

Fertilizer applications: apply total P and K in furrows at planting, N within 3 months of planting.

Water applications: by furrow and siphon. During vegetative growth apply approximately 1500 m^3/ha at 21-day intervals on soils with high available water capacity, increasing up to 8-day intervals on sandy soils. During establishment, frequent light irrigations; during stem elongation, increase depth; during ripening increase intervals between applications until these are stopped to bring crop to maturity.

Harvesting: burn crop before harvesting to facilitate cutting and remove leaves from processing. Cut by hand. Transport stem rapidly to processing factory to minimize loss in sucrose content.

Salinization hazard: it is important to ensure adequate drainage and include a leaching requirement in water application, particularly in more arid climates or where incipient salt accumulation is detected.

Yields and Production. Under good management, yield of first crop 100-175 t/ha cane with 10-16% recoverable sucrose. Yields decline with successive ratoon crops. Allowing for yield decline and soil rest and replanting period, production will average at least 50 000 t cane per year from a 500 ha farm.

Economic Information

Fixed Costs:)
Variable Costs:) (information not available)
Gross Margin:)
Net Farm Income:)
Income Levels: not applicable.

3.3.4 Requirements of Present and Potential Kinds of Land Use

As in most land evaluations, the most difficult activity will be to determine the requirements and limitations of the various land utilization types under consideration. It might be approached by the following steps:

(i) Consider individual crops, in isolation from their manner of production. Requirements and limitations will be confined to those related to the ecology of each crop, together with some (but not all) aspects of the technology of its production. Selected fodder crops should be included.

(ii) On the basis of (i), crop combinations can be constructed, e.g. tobacco-groundnut-sorghum farming, coffee-maize-ensat farming.

(iii) Consider next the land utilization types belonging to rainfed arable farming, taken in all their aspects. This will require additional of the requirements and limitations related to the technical methods of farming, e.g. conditions for mechanization. For example, soil nutrient requirements may differ as between low, intermediate and high-input farming, inherent soil fertility being of greater significance to low-input systems. As another example, drought hazard is more significant to low-input smallholder agriculture than to large-scale management units with capital reserves.

(iv) The land utilisation types belonging to major kinds of land use other than rainfed agriculture will for the most part need to be considered as a whole. It has been noted that the land utilisation types for forestry have already been defined. Individual crop suitabilities can, however, also be considered for irrigated agriculture. It will be apparent that requirements for irrigated production, of say, cotton, will differ substantially in some respects from requirements for rainfed production.

(v) I suggest that the factor of location, in relation to sources of inputs and to markets, should be treated separately and subsequently superimposed on the suitabilities determined from other criteria. For example, land might initially be assessed as highly suitable for, say, rainfed cotton production despite the fact that it is remote and without road access. This allows for planning consideration of priorities for road construction. Both actual and potential accessibility might be considered (see Guidelines on land evaluation for rainfed agriculture, Chapter 5, land quality 26). The Framework device of conditional suitability (pp. 20-21) might appropriately be employed; in the example cited, the area is currently not suitable for cotton production owning to location, but is conditionally highly suitable, conditional upon construction of a road.

For some land utilisation types, I would draw attention to the Framework device of 'Not Relevant'. Where it is clearly out of the question for some land utilisation type to be applied to a particular area, there is no need to assess the suitability of the area; the map carries the symbol 'N.R.'. For example, there is no need to assess suitability as National Parks for parts of the country that are already densely settled.

The Project will have to decide on whether to make use of land characteristics, land qualities, or a combination of the two in defining requirements, and thus assessing suitabilities. The Framework recommends the employment of land qualities where possible. The Guidelines on land evaluation for rainfed agriculture contains a lengthy discussion of this question (Chapter 4); this also recommends employment of land qualities where possible, but recognises that there will be circumstances when the use of land characteristics will be needed.

The above recommendations were conceived in the context of evaluation on scales ranging from reconnaissance (1:250 000) to

detailed.

In the light of the very small scale of the present project, I think it likely that use will have to be made of land characteristics in at least some cases. Land qualities are ultimately more precise and more applicable to a given land utilisation type in all the circumstances in which it may be found, but land characteristics are simpler to use. The small scale and the necessary generalised nature of the information being collected make it appropriate to use land characteristics in some cases. Examples might be mean annual temperatur (preferable to altitude), and slope angle (generalised, as derived from the 1:250 000 maps). The use of land characteristics does not reduce the validty of the suitability assessment, given that values are determined with respect to the Ethiopian context.

More specifically, it appears that the following would be appropriate as means of expressing requirements and limitations:

- Climate. Make use of the methodology of the FAO Agro-ecological Zones Project, including both major climates and growing periods. The major climates defined on the project, however, are very generalised, and will need subdivision for Ethiopia on the basis of temperature. Much data on crop suitabilities are available from the Agroecological Zones Project, although it should be critically reviewed in the context of Ethiopian condition.

- Geomorphology. The slope angle maps already oonstructed are an excellent basis, assessed in relation to conservation and other requirements (e.g. mechanisation).

- Soils. Given the very generalised nature of the information that will be available it may be found appropriate to assess suitabilities in terms of soil types as a whole, rather than individual properties of soils. For example, suitability for

maize cultivation would be assessed for chromic luvisols, considered as a soil type, rather than separately for soil depth, pH, nutrient content, etc. There exists an FAO paper (Sys and Arens)[1/] giving crop suitabilities in relation to FAO soil types.

3.3.5 Economic Evaluation

The economic input to the project as a whole is directed in part at the stage of land development planning. The data required for this are very considerable indeed in amount, and economic activities are by no means exclusively directed towards land evaluation.

Further problems in applying economics to the land evaluation are the large area of the country, the very small scale of treatment, and the paucity of data on costs of production. I understand that such data are available (with some reservations) for regions, but not at the level of awraja or woreda. There will thus be difficulties in relating this macro-aggregate data to the agroecological zones, since the latter are far from being coincident with administrative regions.

These difficulties have been recognised, in that the activities flow chart refers to 'Qualitative and possibly quantitative (economic) characterisation of the suitabilities...'

The strengthening of this input is discussed further in Section 3.4.6 below. Otherwise, I have no clear suggestions to make as to how these formidable problems could be solved, other than by a large increase in staffing in the economic sector. It is clear that the economic evaluation must be achieved by the two-stage approach,

1/ Sys, C. and Riquier 1979. Ratings of FAO/UNESCO soil units for specific crop production. Report of the Second FAO/UNFPA Expert Consultation on Land Resources for Populations of the Future. FAO, Rome, 1980: 55-95.

i.e. economic analysis succeeding suitability assessment in physical terms, since the close integration required by the parallel approach is out of the question at this scale of working. (Framework, p. 6). The aims of the Project, and the needs of the country, call for an economic evaluation, and I believe that despite the considerable difficulties, such an attempt should be made. It will necessarily be in very generalised terms.

Given that coverage of macro-economic, micro-economic, demographic, social and institutional aspects of land use planning must necessarily be very generalised during the present phase of the Project, the Project results should include a clear statement that more detailed coverage of these aspects is essential before successful land use planning can proceed.

3.3.6 Possibilities of Sample Studies at More Detailed Scales

Two members of the team have put to me the possibility of including in the activities, some that are carried out at more detailed scales than that of the main mapping exercise, for representative sample areas. These suggestions are:

(i) That following the completion of the basic geomorphic map at 1:1 000 000, some representative areas should be mapped at 1:250 000 or possibly also more detailed scales, using enlarged satellite images, air photographs or both.

(ii) That, at least for the economic input, it is preferable to concentrate efforts on selected watersheds within representative agroecological zones. This would lead towards the Immediate Objective No. 3 to 'develop appropriate methodology for land use studies and land use planning at regional, sub-regional and village levels, for use by ... Institutions concerned with land use planning.'

The overall tenor of the Project Document appears to be clear: that a leading, possibly the primary, aim should be the production of a plan at the national level. By implication, this calls for coverage of all areas of the country to at least some degree. If this interpretation is correct, and if this remains the wish of the Ministry, then more detailed sample studies should only be conducted if this can be done without sacrificing overall coverage. If, on the other hand, it is held that Immediate Objective 3 has priority over Nos. 2 and 4 (prepare a master land use plan, and establish an inventory of land resources, respectively), then the posiion is different.

With respect to suggestion (i), by good fortune the photo-interpretation officers have the assistance of an active and trained supporting staff, their skill in part built up by training during the project (Immediate Objective 6). Moreover they are already receiving requests from other agencies for more detailed interpretations. A further advantage in proceeding in this way is that the results will serve to demonstrate the highly generalised nature of the basic map, and the need for it to be followed by studies at more detailed scales. Given that fieldwork directed towards the amplification of the legend to the basic map should retain priority, these seems much to be gained from including such supplementary studies in photointerpretation as part of the Project.1/

With respect to suggestion (ii), I do not feel able to proffer an opinion either way. I therefore merely draw attention to the existence of this suggestion, and the cogent arguments that can be advanced both for and against its adoption, and leave the matter for further discussion.

1/ The phytoecological maps at 1:250 000 drawn up by Dr. M.Haywood, of the International Livestock Centre for Africa, may also be cited by the Project as examples of the added detail obtainable by air photograph interpretation.

3.4 STRENGTHENING OF INPUTS TO THE LAND EVALUATION

3.4.1 Introduction

This section contains suggestions for areas in which the inputs to the land evaluation activities might be strengthened by additional staffing. I understand that possibilities include consultants, UN Volunteers and associate experts. For brevity I shall refer throughout to all of these as 'consultants.'

3.4.2 Co-ordination of Evaluation Activities

This aspect has already been discussed (Section 3.3.2). Of the several possible means of achieving additional co-ordination noted there, one would be the employment of a consultant. The terms of reference for such a land Evaluation Expert might appropriately be to assist with matching procedures in the qualitative evaluation.

3.4.3 Environment Impact

Development Objecrive No. 1 refer to the 'conservation of vegetation, soil, and water resources to ensure a permanent productive agriculture and... a sustained provision of forest products', whilst the Special Considerations state that 'The Project is oriented towards the preservation and improvement of environmental conditions.' This emphasis was by no means inspired by 'environmentalism' in the more affluent Western sense of the term, but arose from the already severe degree of resource degradation in some parts of the country. As is well known, this degradation has led to recurrent famine in some areas, with expenditure of large amounts of money in relief and rehabilitation measures.

It is thus surely an oversight that the listed Outputs in the Project Document do not include specific reference to resource degradation, conservation and environmental impact. There is also no member of the present team with specific responsibility for this aspect, nor is it included in the Activities Flow Chart.

I therefore strongly recommend:

(i) That the outputs of the Project should be amended to include 'A first approximation to mapping the degree of actual (past and present) soil erosion in the country; a map showing the kinds and relative severity of potential erosion and other degradation hazards; and guidelines on the measures of conservation necessary for different kinds of land use in different areas.'

(ii) That 'Assessment of environmental impact' should be added to the activities flow chart (See Table 2).

(iii) That there should be a consultancy on environmental impact. The consultant should have a background primarily related to soil erosion, but should have sufficient breadth of mind to take into consideration other types of resources degradation and environmental impact.

The methodology developed for the FAO World Soil Degradation Assessment would appear highly appropriate for the requirements of the present Project. Being developed specifically for rapid assessment of degradation hazard over large areas, it would require relatively little adaptation. I recommend its use for mapping hazard. It should be noted, however, that what is stated in the methodology as 'actual degradation' does not refer to the present state of degradation. In Ethiopia, this present state should be mapped. The FAO Remote Sensing Unit has substantial experience of the use of Landsat Imagery for small-scale mapping of soil degradation.

3.4.4 Pasture Resources and Livestock Production

There is no expert on pasture resources/livestock production on the present project team. Livestock production is an important element of Ethiopian agriculture, not only on the semi-arid lowlands which make up nearly half the country, but also as a component of existing farming systems on the uplands. A lot of the degradation of both soils and vegetation has been caused directly or indirectly by the activities of cattle and other livestock. The evaluation should include assessment of suitabilities for selected fodder crops.

Despite excellent liaison with the relevant government departments, a further input to the project will be necessary if information on livestock is to be adequately assembled and evaluated. There seems a clear case here for a consultancy, of substantial duration. Insofar as a choice is necessary, the consultant should be oriented towards pasture resources rather than towards the animal production aspect. He/she should preferably have experience of the assessment of vegetation and soil degradation caused by livestock.

3.4.5 Agroclimatology

The terms of reference of the Agroecology Expert are very wide. It is also possible that they were drafted without knowledge of the difficulties that would be encountered in initially collecting climatic data.

The processing of the climate data, coupled with assessment of crop suitabilities in terms of climatic requirements, is a substantial and specialized task, and moreover one of great importance to the Project. For whereas in studies at large scales, climate is relative uniform and suitabilities are determined by landforms and soils, in small-scale studies, climatic variations have an equal or greater importance.

I therefore recommend the services of a consultant in agroclimatology. The ground for his/her work would have been prepared by the present Agroecology Expert, through collection and ordering of the climatic data. The consultant would assist in processing these data, and determining crop suitabilities in climatic terms. This would enable to Agroecology Expert to direct attention further towards suitabilities in relation to soils and other factors.

An alternative would be to employ a consultant agronomist (rainfed crops), leaving the agroclimatology to the agroecologist, but this seems a less satisfactory deployment of skills.

3.4.6 Economics

Although I am not an economist by training, it seems to an observer that the range of data called for as the economic input to the Project, which must cover both land evaluation and the needs of development planning, is excessive in relation to the present staffing. I note in particular that the information called for is not confined to economics in the narrow sense of the term, but covers also demographic, social and institutional aspects.

There seems a need for at least some strengthening of this input by additional staffing, consultant or otherwise. One possible course would be to engage an agricultural production economist, to initiate and supervise farm system studies, leaving the present Agricultural Economist to concentrate more on macro-economic, social and institutional aspects. Supporting staff of technical level (or recent graduates in agriculture) would be essential.

3.4.7 Summary Strengthening of Inputs

The following suggestions for strengthening of staffing, through consultancies or other means, are therefore put forward for further consideration. I place environmental impact first as I consider it to be a clear priority. The remaining suggestions I do not wish to place in any relative position, and to avoid any such appearance they are listed in alphabetical order.

- Environmental Impact. To review and assist in the mapping of actual soil erosion, the hazard of soil erosion under different land utilisation types, and other forms of environmental degradation. (Priority).

- Agroclimatology. To assist in processing of agroclimatological data, and in the determination of crop suitabilities in terms of climate.

- Economics. Some form of strengthening of inputs in this broad area; details of the field to be covered I leave open to discussion.

- Land Evaluation. To assist in the co-ordination of the land evaluation activities of the Project, with particular reference to matching procedures.

- Pasture Resources and Livestock Production. To assist in the review and mapping of resources of natural pasture, in the description of land utilisation types based on livestock production, and to provide guidelines on the actual and potential effects of livestock on vegetation and soil degradation.

Chapter 4

THE STAFFING OF A LAND USE SERVICES INSTITUTION

4.1 INTRODUCTION AND ASSUMPTIONS

4.1.1 Introduction

The staffing of a land use services institutions is dependent on the activities to be carried out. In turn, the need for staffing has implications for training, as discussed in the last section of this Chapter. Thus whilst the focus of this Chapter is the number and types of qualified staff needed, the basic for deriving such estimates is the nature and extent of work to be carried out.

The needs must be assessed against a background of the special circumstance of Ethiopia. It is a very large country; it has, by comparison with other African countries, an exceptionally high pressure of population upon resources; there has up to the present been relatively little modern development of its land resources; and the government wishes to embark upon rapid development of these resources over the next ten years. Taken together, these circumstances will make considerable calls upon land use planning services.

This raises the question of how ambitious a scale to employ to conceiving the institution. It would be very easy, by taking the size of the country and the expected rate of development, to make calculations leading to a profesional staff numbering well over 100. For several reasons I have not proceeded in this way: such a recommendation would be unlikely to receive acceptance, such an institution would be of disproportionate size in relation to other government services, and it would be impossible to meet the training needs.

I have instead attempted to put forward a minimum necessary staffing, just sufficient to provide the services required. I would

not disagree with arguments that might be put forward that the staffing as a whole, or some components, should be substantially larger. To use the analogy of the market place, I have not named a price three times too high in the knowledge it will be knocked down by bargaining; mine is the minimum selling price.

4.1.2 Assumptions

The discussion is based on the following assumptions:

(i) There will be one land use services institution, serving the needs of the various other governmental and quasi-governmental agencies concerned with land use planning. (See recommendation of the preceding consultancy).

(ii) The institution will need to have the capacity to carry out all three stages of land use planning resource survey, land evaluation, and development planning; and to operate at the reconnaissance, semi-detailed and detailed scales. (See Chapter 2 above).

(iii) In addition to arable land use, the institution will be concerned with the planning of livestock production and forestry. I have assumed that it will not, however, be involved in the development of water resources (but will, of course, give attention to aspects such as catchment protection and flood control in drawing up land use plans). The question of irrigated agriculture is discussed in Section 4.2.3.

(iv) As stated in the Introduction, I have omitted consideration of all staffing needs related to land administration and regulation.

Further to assumption (ii), a question arises as to the relative size of the economic and social component of the institution. I have assumed that the institution will have the internal capacity to carry out economic and social analysis on a feasibility basis; but that at the point of detailed project implementation, support in the economic

field will be provided by the implementing agencies. Were it to be required that the complete economic analysis is to be carried out within-house, the whole balance of the land use services institution would need to be changed.

4.1.3 Multidisciplinary Activities

The staffing outline below is based on the concept of specialists in individual disciplines working together as a team. This appears appropriate to Ethiopian conditions, in which for the initial years of the institution, a high proportion of the staff will be relatively recently trained. In developed countries there are institutions of long standing, for example consultant firms, in which the more senior staff have built up the ability to carry out a range of activities, extending beyond the specialism in which they were originally trained; this allows a certain flexibility to project staffing.

The same situation can ultimately be reached in Ethiopia, but it will take time. There will, of course, be overlaps in knowledge, e.g. all soil surveyors need a knowledge of geomorphology and agronomy. Such overlaps aid in teamwork. In the following Section, team activity is taken for granted, and the proposals are framed in terms of the specialist disciplines needed in such teams.

4.2 A C T I V I T I E S

4.2.1 Operational Units

As a starting point, two operational units, of a different nature are proposed:

(i) A Central Land Resources Unit. This will be responsible for surveys at reconnaissance and semidetailed scales, for providing ongoing planning guidance at national and regional levels, for identifying the location and boundaries of development projects, and for supplying specialist services to the Project planning units. It will contain the scientific and technical nucleus of the institution.

(ii) Project Planning Units. These will be responsible for the detailed planning and implementation of individual development projects. They will identify and map different kinds of land use at the detailed scale (typically 1:20 000), and set out such areas on the ground. (This is the kind of activity referred to in Sections 2.3.1 and 2.3.3 of the preceding consultancy).

The central land resources unit will be active in a number of different surveys at any one time, but will operate as a single team, internally transferring staff to the next project as soon as their contribution to an existing one is completed.

The project planning units will consist of a number of teams operating concurrently, each attached to a specific project. As a working basis I have assumed five teams.

There is no necessity for the project planning units to be physically or administratively separated from the central land resources unit. Their headquarters should be in the same building and there could be some interchange of staff. The individual project planning units will, however, operate in the field of their projects for substantial periods, ranging from perhaps 3 months to 3 years. In course of time, it could be that certain teams would become located in regional offices; for example, a team experienced in planning for coffee production could be permanently based within the producing area.

4.2.2 Soil Survey

In most land use planning exercises, soil surveyors are the most numerous of the specialists involved. This arises both from the fundamental importance of soil survey and also its time-consuming nature. Moreover, many countries possess a national soil survey, separate from other land use institutions.

This raises the question of whether the soil survey should be distinguished as a separate sub-unit of the institution. I see no necessity for such a course, and at least one disadvantage. If isolated as 'the soil survey', such bodies tend to become engaged in survey, that is, soil mapping, for its own sake, and to become divorced from the needs of land development which soil survey is intended to serve. The existence of a survey conducting routine mapping for resource inventory purposes, without any specific purposes in mind, is a luxury that Ethiopia cannot afford.

As an instance of the kind of unitary institution here envisaged for Ethiopia, one may cite the Land Resources Development Centre of the UK Ministry of Overseas Development. There, almost half the total staff are nominally soil surveyors (although both geomorphology and photo-interpretation are included under this name), but there has been no call for a distinct soil survey unit.1/

This view is not the conventional one. Most countries have a national soil survey. I nevertheless hold to the view that in Ethiopia, the soil survey should be an integral part of the land use services institution.

The estimate of the number of soil survey staff given in the later discussion is conceived in terms of the overall balance of land use services institution. It may be helpful for further consideration of this aspect to calculate the number on a different basis, that of estimated needs for soil survey coverage in relation to average rates of progress.

The current FAO-assisted Project will cover the whole country at rapid reconnaissance scale. It will be assumed that over the next 10 years, planning needs will call for coverage of 50 percent of the country at reconnaissance scale (1:250 000) and 20 percent at semidetailed scale (1:50 000). These are for surveys directed towards planning at the regional level, and for project identification

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1/ The position in the US is reversed; what is nominally the 'Soil Conservation Service' in fact encompasses survey of other environmental factors, and could be regarded as the country's land use services institution.

and location. As a conceptual estimate one might reasonably suggest 5 percent of the country to be covered at detailed scale (1:20 000); however, the report of the preceding consultancy contains an attempt to build up such detailed mapping needs on the basis of Ministry and other authority estimates, and arrives at a figure of 3 percent.

In accordance with the principle here of giving minimum requirements, the latter value will be adoped.

Rates of soil survey vary widely with the nature of the terrain, purposes of the survey, and other factors. There are, however, average values which have been derived from retrospective studies of actual surveys. These have been combined with the areas to be covered in Table 5, to give a calculation of the man-years of soil survey required, and thus the manpower if spread over 10 years.

TABLE 5

ESTIMATE OF SOIL SURVEY REQUIREMENTS IN ETHIOPIA 1980-1990

Scale of Survey	Percent of Country %	Area to be Covered km^2	Average Rate of Progress km^2/Man-Year	Survey Requirement Man-Years
1:1 000 000	100	1 200 000	Completed by Current Project	
1: 250 000	50	600 000	3,650	164
1: 50 000	20	240 000	330	727
1: 20 000	3	36 000	100	360

Total Man-years 1,251

Over 10 years, requires average soil survey staffing of 125

It will be noted that the soil survey staffing needs as calculated in this manner exceed by a large margin the staffing projections given in Table 6 below (p.62). The latter indicates 10 professional and 10 technical soil surveyors plus 7 professional and 10 technical land use planners (the latter may be included in the soil survey requirements' at the detailed scale). This total of 37, even if technical staff are included, compare with 'requirements' of 125, the requirements being based on extremely modest assumptions on percentage of the country to be covered at different scales.

This calculation serves to emphasise the great magnitude of the land use planning tasks which face the country. For soil survey, rates of progress are well established whereas for other kinds of resources studies there are no such guidelines; but it is certain that for these other kinds of survey also, any calculation based on areas to be covered compared with rates of progress would similarly show staffing needs far in excess of those in Table 6.

4.2.3 Surveys for Irrigation Projects

Irrigation projects are a special case of land development. Because of the large amount of money to be invested,it is essential that both the engineering and the soils and agronomy aspects shall be executed to the highest professional standards. In the immediate future, it is likely that the engineering consultancy for larger irrigation projects in Ethiopia will continue to be carried out by consultant firms. Such firms frequently employ an agricultural consultant firm as associates, for the soil survey, land selection and agricultural planning. They may continue to wish to do so, in order to retain overall responsibility for the irrigation project design.

It nevertheless seems desirable that the land use services institution should establish some capacity and experience in land use planning for irrigation. An irrigation agronomist has therefore been included, and at least one of the soil surveyors might specialise in this aspect. In the early years these services might be directed

at smaller irrigation projects, until such time as experience, and confidence in the abilities, has been built up. There is also need to provide for possible development of small-scale irrigation based on earth dams, for which the Water Resources Authority has plans.

4.2.4 Services from Other Agencies

It can readily be assumed that the land use services insititutior will cooperate with other specialists in the Ministry of Agriculture as regards services in agriculture, livestock production and forestry. As noted under the assumptions above, I have assumed that the planning of domestic and livestock water supplies would be provided by the Water Resources Authority. Geological information will be made available by the Geological survey.

With regard to photogrammetry and map production, two extremes would be possible. On the one hand, the land use services institution could be wholly selfsufficient in this respect. On the other, it could contract out all such work to the Ethiopian Mapping Agency. It is relevant to note the statement in the preceding consultancy (Section 2.2.7) that the Agency 'attempts as far as possible to meet the requi ements of user agencies for specialised mapping at a variety of scales.' But it should also be noted that the Agency has a responsibility (presumably primary) to proceed with basic topographic coverage of the country at 1:50 000 scale.

I suggest an intermediate position. Requirements for printed maps and other products requiring a high standard of cartographic draughtmanship, precise photogrammetry, or both, would continue to be met by the Mapping Agency. The land use services institution would have the capacity to produce maps for use as working documents on development projects, and to produce accurate and clear drafts of material taken from air photograph interpretation.

Thus limited capacities for photogrammetry and cartography will be needed within the institution, but without the need to duplicate the more advanced and expensive plotting equipment.

4.3 S T A F F I N G

4.3.1 The Central Land Resources Unit

Three groups of disciplines are required:

- Environmental Sciences. The staff needed to conduct surveys of the natural environment, to evaluate such surveys in physical terms, and to prepare basic resource and evaluation maps and reports.

- The Technology of Land Use. Specialists in agronomy forestry, etc., who will on the one hand assist in the evaluation of basic resources in terms of their uses, and on the other, act as a link with associate specialists in implementing agencies.

- Economics and Sociology. The staff needed to translate physical evaluations into economic terms, to assess the social and economic implications of developments, and to act as a link with economic specialists in implementing agencies.

In addition, not falling into any of these groups, are the staff needed to operate the data centre, direction and administration.

(i) Environmental Sciences

Air Photograph Interpretation/Remote Sensing. This is basic to resource surveys at all scales and for almost all purposes. It is the starting point on which field surveys are superimposed. Many other specialists in the institution will possess some measure of skill in photo-interpretation. As specialists, a minimum of 2 professional staff, supported by 2 or more technical staff, are proposed.

Photogrammetry and Cartography. For reasons outlined in Section 4.2.4 above, one professional photogrammetrist is proposed. There should be at least 4 cartographic staff of technical level, serving the map production needs of the whole institution.

Geomorphology. Landforms are fundamental to the distribution of soil, vegetation and water resources, as well as being important in their own right for conservation. In many survey institutions the geomorphological input is provided by soil-surveyors. However, in accordance with the principle of a team of specialists, one professional officer whose primary training and responsibility lies in this field is proposed.

Soil Survey. This will be the largest specialist group in the institution. The needs of Ethiopia for soil survey are so large that it is hard to arrive at a realistic number. In terms of the overall balance of the institution, a minimum of 5 professional soil surveyors within the central land resources unit, supported by 5 technical staff is proposed. An alternative method of estimating this number is given in the discussion of soil survey under project units below.

Soil Conservation/Environmental Impact Assessment. Any soil surveyor in Ethiopia would be incomptent were he not to possess some knowledge of soil conservation, but, it would in addition be highly desirable to have at least one professional officer with primary training and responsibilities specifically in this field. This specialist would also provide advice on environmental policy and legislation at a national level.

Soil Chemistry. Requirements in this discipline refer to the operation of the soils laboratory. The present 13 technical staff would appear more than adequate, but the professional staff should be increased to two.

Agroclimatology. There has been a tendency in the past to regard soil survey as the sole basis of crop production. It is now being increasingly recognised that climatology is equally fundamental, particularly through the water balance training in this specialism is hard to acquire, and partly for this reason only one specialist is proposed in the first instance.

Ecology. There is a view that an ecologist can give as good or better guidance to land development as a soil surveyor. Whilst not subscribing to this, the ecological viewpoint can provide an insight into aspects of land potential, and will be of specific value where pasture resources are concerned. One professional officer is proposed.

Land Evaluation. Having previously been carried out by soi. surveyors, land evaluation has emerged as a specialism in its own right. Land suitability evaluation is now a complex operation, requiring skilled and specialized training. It also serves to link the three groups of disciplines. Two professional staff are proposed, with one technical assistant.

Land Utilisation. The mapping of land use, and the definition of farming and other land use systems is complementary to the mapping of physical resources. This specialist would also assist land evaluation through definition of land utilisation types. One geographer specialising in this aspect is proposed.

(ii) The Technology of Land Use

Agronomy: Rainfed Crops. Rainfed agriculture is likely to be the most widespread form of land development. At least two professional staff are proposed. One should be a general crop agronomist. The other could usefully have special knowledge of soil-water-crop relations (and could thus alternatively be considered as a soil physicist).

Agronomy: Irrigated Crops. For reasons discussed in Section 4.2.3, one irrigation agronomist is proposed for the institution staff. This would need to be increased if and when the institution was called upon to execute larger amounts of irrigated land use planning.

Pasture Resource Management. As discussed in relation to the current FAO-assisted project, livestock production is important as a component of upland arable farming systems as well as in the semi-arid lowlands. One expert in pasture resource production and utilisation is proposed, who would work in liaison with the ecologist.

Forestry. Most land use plans in Ethiopia will include a forestry component. Correct forestry development is very far from being a matter of planting eucalyptus in hillsides, and requires skilled professional attention. One officer is proposed, who would work in liaison with the Forestry Department.

Land Use Planning. The need for land use planners in the narrow sense of the term, that is for detailed project layout and implementation, arises primarily in the project units. There will in addition need to be coordination of these activities, development and modification of techniques, and policy decisions, so two officers in this field are proposed for the central unit.

Technical Supporting Staff. Seven technical supporting staff are allocated to this group of disciplines, without spefic assignment to individual disciplines.

(iii) Economics and Sociology

Agricultural Economics. This is the principal component in the third group of disciplines. At least 4 professional staff are proposed. There would be some subdivision of specialisms, e.g. farm systems expert, which is left open for further discussion.

Demography. Relationships between population and land resources, and thus pressure upon land, are so important in Ethiopia that one specilist demographer is called for. He/she would work in conjunction with the land use specialist.

Sociology. One officer is proposed, with duties relating to social and institutional aspects of land development. Assistance in gaining the full cooperation of local people would be no small contribution to the overall prospect of success of projects.

Technical Supporting Staff. Six technical supporting staff, for data collection, etc., are allocated to this group of discipline, without specific assignment to individual disciplines.

(iv) Data Centre

One professional and two technical staff are proposed for the supervision and running of the centre.

(v) Direction and Administration

Director and Deputy Director. From a scientific point of view, there seems no immediate need for an internal structure of responsibilities within the institution, beyond the direct responsibility of all staff to the Director. There will, of course, be members of each of the larger specialisms who will be more experienced and they can be allocated internal coordinating responsibilities. NOTE: I have not attempted to investigate the administrative structure of comparable organisations in the Ethiopian government, and hence the above remarks are in no way authoritative.

Administrative and Technical Support. Administrative, accounting and secretarial staff, drivers and vehicle mechanics, etc.

4.3.2 Project Units

Planning

A discussion of the staffing of units for land use planning and implementation at the detailed scale is given in the report of the preceding consultancy, which is accepted here. Accordingly, to each of an assumed 5 concurrent teams, one soil surveyor and one land use planning specialist[1/] is allocated, the former each with one technical assistant, the latter with two. These numbers would of course be increased if there was a demand for a larger number of project units.

Combining these staff with the central unit, the total number of professional soil survey staff becomes 10 (See also discussion in Section 4.2.2 above) and the number of land use planning specialists becomes seven.

Other specialist skills required by project units are assumed to be seconded from the central unit or provided by implementing agencies.

1/ This specialism is also sometimes referred to as a soil conservation officer (a misleading term, since the skills required extend far beyond conservation) or a land husbandry officer. The term land use planning specialist correctly implies the wide range of skills and duties required.

4.3.3 Summary of Staffing Needs

Table 6 gives a summary of staffing proposals for a land use services institution. Attention may be drawn to the balance between the three main groups of disciplines. The largest group, and the basis of the institution, are environmental scientist, those whose skills derive from knowledge of the natural environment and its use by man. The other two groups, on the technology of land use and on economics and sociology, are each smaller but are an essential complement to the basic resource scientists, the one to aid in translating resource potential into practical methods of land use, the other to integrate economic and related analysis with planning in physical terms.

This table refers primarily to the professional staff. I do not have experience of the level of technical support staff customary in Ethiopia, and it may be that the estimates of these staff given in the table are too small.

TABLE 6

SUMMARY OF PROPOSED STAFFING FOR
A
LAND USE SERVICES INSTITUTION

Scientific Discipline	Central Land Resources Unit Professional	Central Land Resources Unit Technical	Project Planning Units Prof.	Project Planning Units Tech.	TOTAL Prof.	TOTAL Tech.
(i) Environmental Sciences						
Remote Sensing	2	2+			2	2+
Photogrammetry & Cartography	1	4+			1	4+
Geomorphology	1				1	
Soil Survey	5	5	5	5	10	10
Soil Conservation[1/]	1				1	1
Soil Chemistry (Laboratory)	2	6-13			2	6-13
Agro-Climatology	1				1	
Ecology	1				1	
Land Evaluation	2	1			2	1
Land Utilization	1				1	
	17	18+	5	5	22	23+
(ii) Technology of Land Use						
Agronomy: Rainfed crops	2				2	
Agronomy: irrigated crops	1				1	
Pasture resource management	1	7			1	7
Forestry	1				1	
Land Use Planning[1/]	2		5	10	7	10
	7	7	5	10	12	17
(iii) Economics and Sociology						
Agricultural Economics	4				4	
Demography	1	6			1	6
Sociology	1				1	
	6	6			6	6
(iv) Data Centre	1	1			1	1
(v) Director, Deputy Director	2				2	
TOTAL, SCIENTIFIC STAFF	33	32+	10	15	43	47

ADD: Administrative and Technical Support Staff

1/ ~~See footnote to p.62.~~ Thus existing soil and water conservation staff in Ethiopia, to the extent that they are in fact concerned with overall land use planning, may be related to the 17 staff listed under Land Use Planning, and not only to the Soil Conservation Specialist included in the Central Land Resources Unit.

4.4 SOME IMPLICATIONS FOR TRAINING

Although my terms of reference make no specific mention of training they call for advice on staffing, and in the present situation of Ethiopia the staffing of a scientific institution requires training. These are brief comments only, and not intended as a review of training needs.

Means of providing staff to a land use services instituion other than by training include:

- Incorporation of the present staff of the Land Use Planning Department. This will include those with skills acquired as a result of the training component of the present FAO-assisted project.

- Transfer of land use planning staff from other government agencies engaged in such activities (as recommended by the preceding consultancy).

- Secondment of expatriates, possibly as a Phase 2 of the current project. A small number of experts of this type are recommended, to be decreased progressively as training programmes for national staff are completed. There should be an overlap of at least six months to such transfers of responsibility.

Over and above these sources, the adequate staffing of the land use services instituion will call for a training programme.

Methods of training include:

- Overseas postgraduate degrees (Masters or Diploma for the most part, but a few to Ph.D level). Minimum of one year, frequently two or more.

- Development of an appropriate range of post-graduate training in the University of Addis Ababa (one might hazard the idea of postgraduate School/Faculty of Environmental Sciences or Earth Sciences, or for that matter of Land Use Planning which,

could in part draw upon skills from the Faculties of Geography, Geology, Agriculture, Biology and Economics). Clearly this is a long-term solution.

- Overseas short training courses.

- Inservice training.

As my one comment on training methods, I would emphasise the importance of basing the land use services institution on a highly-skilled professional nucleus. This is essential for efficient direction, coordination and functioning of the required activities. It is, for example, not sufficient to go on applying existing methods of survey, evaluation and planning. Such methods are constantly evolving, and will require continuing adaptation to the needs of Ethiopia. Only professional staff with substantial exposure to the nature of scientific research are able to carry out such adaptation. Training to posgraduate level takes time, but for the nucleus of the institution it is better to hurry slowly.

If the proposal to create a land use services institution is accepted, and if the minimum numbers and range of skills for staffing proposed here are to be appropriate, then further consideration must be given to the large and carefully planned training programme, extending over a number of years, that will be necessary.