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TECHNICAL REPORT

Farming Systems of the Syrian Arab Republic

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Table of contents

List of Tables

List of Figures

Abbreviations and Glossary

ACB	Agricultural Cooperative Bank
Al Badia	The Syrian Steppe, broadly defined as "stabilization zone 5" after excluding irrigated land
Strategic crops	Wheat, barley, lentil, chickpea, cotton, sugar beet and tobacco are considered strategic crops. Of these, cotton, sugar beet and tobacco have the strictest follow-up on compliance with the agricultural plan
Dunum	Measurement unit for agricultural land in Syria; 1 du = 0.1 hectare
GEFV	General Establishment for Fruits and Vegetables
GECS	General Establishment for Cold Storage (formerly GEFV)
GEOT	General Establishment of Tobacco
GoS	Government of Syria
MAAR	Ministry of Agriculture and Agrarian Reform
Mantika	Second administrative level, equivalent to districts in most countries
Maslaha	Agricultural administration immediately above the extension unit level
Muhafazat	First administrative level, equivalent to governorates in most countries
Muhtar	Village elder or village representative
SP	Syrian Pound; exchange rates (April 2004): 51 SP= 1 USD; 60 SP=1 Euro
SZ	Stabilization zones = term used for five agro-climatic zones of Syria (see text box)

Executive Summary

The development and analysis of Farming Systems is an instrument adopted in support of agricultural policy analysis at the National Agricultural Policy Centre. The specific contribution of the national farming systems study to the tasks undertaken by the NAPC lies in providing a framework of analysis considering the geographical differentiation as well as the socio-economic stratification of the agricultural sector of Syria.

The farming systems study considers the potential impacts of changes in agricultural policy (e.g. prices, institutional support) at the household as well as aggregate level. Within the framework of the study, staff of the Centre implemented the concept in selected systems. Given that this is the first national farming systems study in Syria, a remarkable degree of differentiation was achieved, as presented in the individual farming systems reports.

The specific objective of the study is to define relatively homogenous areas of agricultural production, based on appropriate agro-ecologic and socio-economic characteristics. These zones of major farming systems cannot be based on statistics following upper level administrative boundaries. Each farming system is characteristized by its natural conditions, market integration and historic influences leading to differentiation and specialization of production within it. In order to allow the presentation of each farming system in the national context, available secondary information had to be adjusted to derive the number of producers and the systems' share of major crops and to indicate the degree of specialization between the systems. Within each farming system, typical households represent the socio-economic variation, which exists naturally in any rural society. These household types are developed in light of typical resource endowment, their mix of livelihood assets and changes in the last decade. The share of each household type in the farming system in combination with their production orientation allows analysing their ability to adjust to, opportunities deriving from, and vulnerabilities to changing production conditions.

The methodology of the study comprises several analytical steps. In a first step, the team defined the major farming systems, which reflect geographic zones, marked by different agro-climatic, agro-ecologic and market conditions as well as production traditions based on socio-demographic characteristics and supporting public investments. Secondary literature was used to develop a preliminary structure and criteria for differentiation, which was subsequently refined in collaboration with experts of the different regions.

This resulted in the distinction of six major farming systems. Within the analysis of the structure of these systems, field-level information resulted in sub-divisions of the broad farming systems. A number of typical villages, representing the variation of the defined farming systems, was selected and the NAPC team spent on average three days in each one of the selected villages. The purpose of the village visits was to develop and adjust household typologies and to obtain information on major changes in the agricultural sector of the particular village.

The fieldwork included the household selection for individual farmer interviews as well as group discussions focussing on the compilation of information for each of the three household types, which represent socio-economic groups and their corresponding livelihood systems. Available statistics provided descriptions on the importance of each system in the national context in terms of contribution to the production of key commodities as well as the determination of socio-economic characteristics of each system in terms of average holding sizes and cropping patterns.

Policy change and technological innovations will affect each household type differently, depending on the relative importance of the different income sources and livelihood strategies of the household. The characterization of each farming system in the national context allows

reviewing the possible aggregated effect of policy change as well as the dependence of a farming system on major crops, which could be subject to policy adjustments.

For each household type, past developments in terms of resource endowment and composition of income sources shape the capacity to adjust to future challenges. Understanding the geographical expression of these patterns permits to address aggregate as well as social aspects for each household type, based on the presented framework for analysing the agricultural sector.

A description of the six farming systems with reference to their internal differentiation in subsystem and the characterization of prevailing household typology is presented in the individual reports, while this summary places emphasis on the comparative review of the six main farming systems and the policy lessons of the study.

Basic Characteristics Of The Major Farming Systems

The Coastal Intensive Irrigated Farming System (Fs 1) covers 141000 ha along the Mediterranean coast, which is marked by very favourable agro-ecologic conditions and an old cultivation tradition. Despite the small size of the system (1%[1] of Syria), it contributes a very high share of its specialized products, especially citrus and greenhouse crops. Small average holdings (1.3 ha cultivated land) reflect the high population density and result in a disproportional share of holders (6%) compared to its geographical size. The specialisation in crops under free market arrangements (greenhouses, citrus, field vegetables) are specific characteristics, as are the extremely good infrastructure for input supply and market access and the high importance of off-farm employment across the farm size classes. These off-farm opportunities are found in the public sector located in the two Muhafazat centres (Lattakia and Tartous), the important service sector of Lattakia as a national summer resort, as well as in the agricultural processing industries.

Climatic risks are relatively lower than in most other systems (but existent for citrus through frost and pests and for greenhouse in storms and pests). The major risk is however, the price risk associated with intensive cultivation of perishable crops, such as vegetables. Small households are at risk because of a lack of savings to compensate crop or price failures. Some reduction of these risks is achieved through the cultivation of different citrus species and varieties.

Poverty levels, in comparison with many other systems of Syria, are low because farm income risk is partly offset by high levels of off-farm employment in the public sector. Decreasing farm sizes, however, put pressure on the system, exacerbated by the increasing expansion of areas under construction. The low average farm size is a risky factor for future incomes of the household, especially in the case that public sector and other off-farm employment opportunities fail to keep up with the population increase. In the former agrarian reform areas, land tenure will inevitably become an issue over the next decade. The absence of commercial credit limits the possibilities for the poorest in the system to invest flexibly in new opportunities.

Environmental risks, caused by the high use of fertilizer and other chemicals in the system, require further study and attention. Potential threats from chemicals exist for farmers that are directly exposed without adequate training and equipment as well as for the public due to limited controls of residuals in the produce and to possible damage to groundwater caused by chemical infiltration into the aquifers. Within the greenhouse system, nitrate leaching is of particular concern.

Overall, the farming systems have shown great adaptability to market opportunities and farmers are prepared to capture new production and market opportunities, taking advantage of the very

[1] For ease of reading, all percentages in the executive summary are rounded to full percentages. Detailed figures are contained in the main part of the report and the individual farming systems reports.

favourable environmental conditions. The introduction of new species and varieties to satisfy more differentiated demand could reduce price risks. The public sector could contribute significantly through the creation of an enabling trade environment, but also by strengthening quality control, including of produce relevant for the export market. Adequate attention to land tenure issues and credit development can prepare the system for a positive performance over the next decade.

The Hilly and Mountainous Farming Systems (FS 2) cover the Syrian western mountains from Lattakia and Rural Damascus to the northern hills in Idleb and Aleppo governorates. They account for 6% of the area of Syria, 15% of its population and 28% of its holders. High annual rainfall with relatively little variability, sloping terrain, a high share of perennials and forests characterize the system. Basic farming systems characteristics are the smallholder structure based on tree crops, with a high reliance on off-farm income and little livestock presence. The latter is partly explicable by the lack of grazing areas.

The high population density leads to holding sizes of 2 hectares, which is the lowest average after the coastal system. Combined with high population growth, this results in increased fragmentation of agricultural land. The agricultural income of the producers depends mainly on Olive, Apple Cherries and Tobacco. The specialisation of the farming system in these crops leads to high shares of national production stemming from this system (61% of olives, 57% of cherries, 37% of rainfed and 52% of irrigated apple and 85% of tobacco). Within FS 2, the differences in production orientation related to the agro-ecologic conditions led to a sub-division of the broad farming system into two units.

Limiting production factors are the small holding sizes on slopes with narrow areas on shallow agricultural soil and the reliance on rainfall for the dominant perennials (mostly olive and apple trees). Tobacco is the only crop with strictly controlled agricultural plans and is mostly concentrated in niches under the influence of the processing factory. Capital access constrains the investment, especially for the poor, whereby credit is particularly important to reclaim uncultivable land. Poor and medium private farmers often lack sufficient collaterals from small holdings; second, they possess incomplete documentation of ownership (unregistered and agrarian reform land).

The farming system is self-sufficient in labour and exports surplus labour to neighbouring systems, especially skilled agricultural labour for orchard operations. International labour migration is likewise important (Lebanon and Gulf States).

Major recent changes in the farming system include a strong decrease in livestock numbers, while cherry and apple areas were reduced to expand olive cultivation. The role of non-agricultural employment increased and women have a larger share of formal employment due to better education and social change.

Agricultural policy affects the farming system directly or indirectly: All policies that affect the areas under cotton in neighbouring systems impact the off-farm income possibilities within the system by decreasing the work for the migrating labour groups, particularly contracted for harvesting cotton. Similar effects occur with developments in the coastal FS 1, where market trends and technical progress (drip irrigation) are more important than policy decisions. Non-agricultural work hence gains importance, which can be supported by public investment in rural education in order to allow surplus labour to seek employment outside the system. Policies affecting the procedures and efficiency of land administration, such as transparent procedures for the sale of agrarian reform land and registering land rented from the state under private ownership could contribute to reduce the negative effect of land scarcity by easing investment.

In the past, rapid expansion of olive areas was an obvious policy objective. The strong response to these policies in FS3 could negatively affect olive farmers within this farming system,

especially if this policy should result in price declines. These would particularly hurt poor and medium farmers. Negative effects could be prevented, if the expanding production is met with increased and competitive processing capacities and the access to niche markets for low-input high-quality olive products from this system. The success to find export markets for the increasing production will depend on the success to build on earlier progress in improving the quality of olive oil, including the storage, processing and quality control functions of the state.

Suitable agricultural diversification could spread labour peaks and generate additional income while minimizing the risk associated with the high dependency on olive production. Considering the agro-ecologic conditions and the small prevailing farm sizes in the system, most field crops are unsuitable.

In the Mountainous and Hilly Farming Systems, agricultural remains vital to the livelihood of many families, despite the importance of non-agricultural income. Increasing off-farm income and acquiring non-agricultural employment are the key strategies for the future, especially for poor and medium households. Preferred strategies of better-off farmers are agricultural diversification and intensification, complemented by non-agricultural work. The poorest farmers tend to increase their options through education and envisage exit from agriculture. In addition, due to population growth, poor farmers need to increase the share of income from non-agricultural sources to prevent declining living standards with falling holding sizes.

The beauty of the landscape offers a potential for rural development policies, which aim at environmentally friendly and aesthetically attractive agriculture. This in turn would strengthen linkages in the rural economy by attracting tourism and could generate employment and income from accommodation, restoration and the marketing of locally processed products.

The Farming Systems of the Northern and North-eastern Plains (FS 3) are the largest ones in terms of area (4.7 Million hectares), covering one quarter of the national area, 31% of agricultural holders (293000) and half of the cultivated land (2.7 Million hectares). A high dependence on so-called strategic crops, relatively large holding sizes and low market access characterize these farming systems. Rainfall levels are in parts relatively good and are in other (large) parts improved with public investment or private wells.

This system includes land in stabilization zones one to three and the areas under publication irrigation schemes in stabilization zones four and five of Der Ezzor, Al-Hassakeh, Al-Rakka and Aleppo Muhafazats. Within this large FS 3, large public irrigation networks in the drier, southern parts have special characteristics in terms of average holding size, water availability, dominant crops and tenure regime. Therefore, the broad farming system is sub-divided in the main report considering the smaller, intensive irrigated and the larger, mixed farming system, where rainfed farming is complemented partly by private irrigation from wells or small rivers.

Crops considered strategic by the Government, especially wheat (49%), cotton (6%), barley (18%) and lentil (3%), dominate the cultivated land in the farming system. The expansion of olives is the result of recent Government projects in the western part of the system. Given the large size of the system, its' major and sometimes even crops with a minor share of cultivated land within the system contribute a huge share of their national cultivated area. The most noticeable among them are rainfed and irrigated wheat (75.8% and 74%, respectively), cotton (90.8%) and rainfed lentil (68%). A particularly good example for the effect of the size of the system is sugar-beet, of which one third of the national area falls into the system, even though it covers only 0.4% of the cultivated land in the system. Similarly, the 1% cultivated land under pistachio represent 49% of the national production area.

Livestock plays generally a secondary role for the agricultural holders in the system, and is particularly among holders of medium to large holdings more a specialised activity than integrated crop-livestock farming. Particularly in the southern parts of the system, smaller farmers had an interest in combining small ruminant holding in the vicinity of villages with

farming, but these were affected seriously in the recent drought years, where the sale or loss of animals was common. Migrating herds belonging to FS 6 account for the largest share of small ruminants in the farming system, even though their formal registration may partly fall into FS 3.

The vast size and low population density within the system give it an overall more rural structure than the other farming systems (with exception of FS 6), implying that public sector and other fixed employment are relatively less important. Educational levels are considered lower than at the national level (85% of the system population was estimated not to exceed basic education levels, with a disproportionate share of women among them).

The scale of the system zone in combination with the large average holding size attracts huge flows of seasonal casual labour from all across Syria, most dominantly from the neighbouring agro-pastoral system, but also from the mountainous and hilly (FS 2) as well as the central plains farming systems of FS 4 (Idleb, Homs and Hama areas). Casual and seasonal employment is of high importance for the poorer households.

Mechanisation, particularly outside the irrigation schemes plays an important part of system characteristics there, as wheat and particularly barley farming can be characterized as low-input systems, which coincides with the higher prevalence of absentee farmers and investors among those cultivating larger areas.

Direct policy intervention into the cropping pattern in the FS is mostly restricted to cotton cultivation, which plays the highest importance in the irrigated areas. In these areas, increasing the efficiency of the quality determination and delivery mechanisms combined with speedy processing of payments were concerns for farmers. As the drought affected the potential of farmers to repay earlier credit, strategies to allow (especially poor) farmers exit from their depth will be needed to increase their productivity and income potential.

Policy decisions over expansion of and efficiency measures in existing irrigation systems as well as water use rights affect the producers in large parts of the farming system. Past expansion has created expectations in the farming community that such investments will continue and that they will benefit from it. Deficiencies in water provision within existing schemes (most seriously in the Al Khabour basin) affect smallholders, sharecroppers and labourers alike, as a lost crop affects also those not owning land through reduced employment possibilities within the village.

The risk of increasing water shortages due to raising demand combined with restrictions to extraction from international waters due to international treaties limit the viability of future expansion, and water policies will have to continue focussing on improved water use efficiency. Policy instruments should encourage the development of drip irrigation equipment to overcome existing mechanical problems (related to the salinity of irrigation water). Complementarily, attention should be given to the suitability of water harvesting technologies for some crops, accompanied by applied research into their impact on farm economic performance. Complementary crop financing instruments need to be developed particularly for poorer farmers, where investments are profitable, but can only be captured after initial reductions in return to labour.

The Farming Systems of Al Ghab and the Central Plains (FS 4) cover an area of approximately 1.16 Million hectares (6.2% of national land) along the central section of the international road, which also connects Aleppo and Damascus. Due to its mostly long settlement tradition, historic cities or special development efforts, its infrastructure was regularly upgraded in recent decades, creating overall very good market access to large urban markets, combined with relatively good rainfall levels and water availability.

The combination of a relatively favourable temperate climate with the good market access has led over time to a varied cultivation pattern with a number of local niche systems. For that reason it can be argued that a calculated average across this FS is probably most artificial. The common feature is, however, a relatively modern farming community, which includes almost

162000 holders (17% of national figure) with a very diverse cropping pattern. Land use in the system is fairly intensive, frequently also including irrigation from wells and partly from public networks. Average holding sizes within the broad farming system is 4.8 hectares of cultivable and 4.5 hectares of cultivated land. Across the system, 63% of cultivated land is rainfed, 27% irrigated and 10% fallow. Of the cultivated land, 52% are under so-called strategic crops and 4.3% under industrial crops. Within the above general characteristics of the broad farming system, three geographical sub-units are defined which are differentiated by public sector involvement and irrigation prevalence with the associated farming systems differentiation.

The largest homogenous geographical area within this major farming system, Al-Ghab, was created by huge public investment to drain the swamps starting 45 years ago. It is for that reason treated as a separate unit in the agricultural statistics of MAAR as well as a separate FS in the individual report on FS 4. The *Agrarian Reform Law* distributed the reclaimed land and resulted in homogenous holding sizes and land tenure regimes. Homogeneous ecological conditions, intensive irrigation and cropping patterns based on the agricultural plan jointly with the dominance of Agrarian Reform Land are typical for the farming system. Intensive cultivation of wheat, cotton and sugar beet dominate in the 141000 hectares of the system, giving it an extremely high share of regulated crops. High population density (41300 registered holders) compared to other rural areas of Syria, results in an average holding size of 2.1 hectares per registered holder.

Al Ghab is the farming system with the highest share of cultivated land under irrigation (92%) and no fallow land. Despite the small size of the system, the specialization on industrial crops makes it relevant at the national level and almost one third of the sugar beet area of Syria is located there. The large cotton areas in other farming systems reduce the national importance of the cotton area in the system somewhat, but they contribute nonetheless 6% to national crop area (compared to 1.6% of cultivated land). The farming system further includes 17% of the national irrigated potato area and is a major contributor to the national market.

Several changes have occurred in the farming system during the last decade. The considerable decrease in the available water resulted in a decline of the cotton and sugar beet areas in favour of wheat. The expansion of irrigation in the southern part of the system (the result of drilling deep wells) has partly offset the change, as cotton expanded there at the expense of rainfed wheat. The intensive cultivation of cotton and sugar beet accompanied partly with unsuitable land management has caused soil deterioration especially in the north of Al-Ghab. This resulting yields decline reduced farm income.

The part not belonging to the Al Ghab farming system (1 Mio ha of total and 649000 ha of cultivated land) is under the influence of the good market access, the presence of two major cities and a differentiated production structure of commercially focussed farming and off-farm income possibilities. The average holding size for the 121000 holders is 5.4 ha of cultivated land. Differences in characteristics, trends and development options are discussed in the individual report separately for the Irrigated and the Rainfed Farming System of the Central Plains.

Several cross-cutting themes will influence the further development of the systems: Population growth will predictably increase pressure on land resources and reduce the average farm size, unless off-farm jobs opportunities absorb the excess labour outside of the agricultural sector. Constraints in the land market prevent adjustments in the holding structure. In Al-Ghab, the land tenure arrangements prohibit selling such land. Unflated land prices in the irrigated farming system render land purchases unfeasible for most holders. Some sub-division of land goes unreported in statistics, while the families effectively divided it. The *Agrarian Reform Law* makes such approaches a necessity, while in the other two farming systems it occurs due to slow administration of the cadastral system. The backlog of issuing updated land titles causes difficulties even on private land.

The pricing policies of regulated crops (wheat, cotton, barley and sugar beet) aim at stable, reasonable farm income, but are reduced by administrative procedures for the delivery of cotton and wheat to the Establishments. Especially in Al-Ghab, a significant part of poor farmers is unable to obtain credit even for regulated crops due to accumulated ACB debt. The alternative private credit at high interest rates effectively transfers part of the subsidies to the traders. In both central plains farming systems, small (poor) farmers devote a major share of their production to home consumption (especially wheat, vegetables, and dairy products), although surplus sales occur in good rainfall years.

Increased integration into international markets will probably lead to price reductions of strategic crops (wheat, cotton and sugar beet), with negative impact on profit margins of farmers. This applies to all farmers in Al-Ghab and mainly better-off farmers in the irrigated farming system, as poor and medium farmers there focus on fruit and vegetable production.

Poor and medium farmers in the entire farming system are likely to react with diversified production (e.g. dairy keeping, expanding peanuts or cabbage). However, these adjustments could be hampered if markets for such products are not developing, as indicated by the underdeveloped milk markets far from major urban centres. Cost reducing technologies would ease the liquidity constraint, particularly for poor households. The negative impact of policy change upon better-off farmers would be lower in both systems, due to their higher flexibility in adapting to new conditions, as they face little liquidity constraints.

In order to support incomes of poor farmers, Government policies should focus more on intensifying and increasing the value of products such as fruit and vegetables, for which Syria has a comparative advantage, and that are mainly produced by poor and medium farmers. Government policy towards better-off farmers should focus more on increasing their efficiency by encouraging them to be more capital intensive.

The land use intensity in both plains farming systems is relatively low. Therefore, the increase in the intensity could have a positive impact on farmers' incomes especially if crop-livestock integration is considered. The latter can be encouraged through the introduction of fodder crops, coupled with an enabling environment for improved local livestock markets. Both changes would improve soil management and soil fertility.

Public investment, (particularly irrigation canals), shaped the distribution of production systems. Among the most important barriers for further development of the farming system are low irrigation efficiency and limited credit access especially for poor farmers. Their removal would increase production intensity, conserve water and lead to productive employment for the increasing population.

The Farming Systems of the Southern Semi-arid Mountains and Plains (FS 5) cover an area of 1.1 Million hectares (6% of total), where approximately 115000 holders cultivate 434000 ha. The FS5 is characterized by high market integration, good market access to the main national market in Damascus and a long export tradition to neighbouring countries. Its agriculture is dominated by freely marketed crops under generally good rainfall conditions, which are in the west complemented by a large number of private wells. Crops considered strategic cover 45% of cultivated land. Tobacco is the only industrial crop (0.4% of cultivated land). The system contains one third of land under cereals (wheat and barley), 12% tree crops and 55% of other crops (most prominent are 13% of chickpea). The latter group (legumes, field vegetables etc) represents the highest share in any of the farming systems.

Average holding size is one third below the national average (3.8 ha compared to 5.8 ha). Agro-climatic and market factors have led to a variation within the farming system, which permits the differentiation of two farming systems, mainly distinguished by the nature of the terrain and differences in production orientation: The mountain FS and the FS system of the rainfed and irrigated plains, are presented in the individual report.

The mountain FS has benefited from considerable public investment in order to make the difficult, rocky terrain suitable for perennial cultivation (mainly apples, which gained increasing importance over the last decade). The remaining area allows only marginal cereal cultivation. The agricultural income is primarily defined by access to improved land and the success of managing cultivation as well as marketing of tree crops. The dependence on off-farm income and poverty are high in the marginal areas, from which emigration of the younger generation are most successful strategies, as non-agricultural income possibilities are limited. Risk reduction strategies for the owners of orchards depend on the possibilities to reduce the price fluctuations of apples, for which the access to storage facilities appear to be an increasing concern. Reclaiming additional land to improve cultivation conditions is a desire expressed by the population of marginal areas. However, such expansion of land reclamation into marginal areas should consider the production potential under the agro-climatic conditions of such areas as well as alternative social policies. Water conservation and the prevention of soil mining practices should receive additional attention.

The plains farming system is a highly dynamic and market integrated system, particularly along the international road with intensive field vegetable cultivation. The larger holdings are oriented towards wheat (and associated rotational crops) cultivation for their economies of scale and calculable return due to fixed prices. Investment and innovation is very dynamic and farmers frequently engage in share cropping arrangements to reduce supervision costs of field vegetable cultivation. The increase in wells was an important driving force to allow such a development, complemented by increased water use efficiency through drip irrigation, which is most advanced in this farming system. Considerable private investment as well as exit from agriculture indicates the dynamic of the system, which at the same time employs considerable migrant labour from other farming systems.

Particular development concerns are the high volume of water extraction from deep aquifers, which contributes to declining water tables despite expanding drip irrigation. Larger local involvement in water use management could increase the awareness and acceptance of water conservation measures. Legal and institutional constraints associated with attempts to reduce the average crop-water demand needs further study. Market-related problems due to saturation of the local market with the varieties of some vegetables add insecurity. Further differentiation of market demand in terms of new vegetable varieties and species could reduce the risks associated with excessive degrees of specialization in the system on a small number of vegetables. The main public input in this development should be to allow free information and input access to private farmers, while ensure public supervision of input and product quality.

The Pastoral and Agro-pastoral Farming Systems (FS 6) represent slightly over half (ca 10 Mio ha, i.e. 55%) of the Syrian area, making it the largest farming system in terms of size, but with only 1 Million inhabitants, who jointly raise the far majority of the 12 Million sheep. Of the broad farming systems, approximately 10% are considered cultivable and 9% cultivated land (929000 hectares, 30% of which was fallow in the high-rainfall year 2002).

The farming systems cover most of the Stabilization Zones 4 and 5, the former characterized by cereal cultivation under high risk of failure of the grain harvest. Given the high reliance on sheep (and occasionally camel) raising, the frequent absence of a grain yield is perceived as part of the natural cultivation conditions in the system. Pockets of irrigated farming from oasis and wells have a long tradition, often in small areas.

This entire zone is marked by considerable Government intervention in terms of settlement policy of its population, social organization (promotion of co-operative organization of Bedouins), provision of social services and subsidized feed and intervention in the grazing rights of the traditional social groups. Definition of the boundaries of legal cultivation of the fragile environment and the permit system for the establishment of wells are important policy decisions influencing the development of the systems.

Within the above area, the composition of livelihoods, development options and policy interventions suggest the definition of three farming systems, of which two are defined geographically, while the pockets of irrigated farming are disperse in nature. Small ruminant production (mostly sheep) is the dominant provider of agricultural income, which is in parts of the system complemented by barley cultivation (often providing an input as feed). The availability of the barley production options defines the agro-pastoral system described in the study, wile the issues concerning pastoral land use component are relevant across the FS6.

Pastoralism represents the traditional land use type in Al-Badia and a livelihood system adjusted to the fragile and highly variable environmental conditions. Tribes agreed migratory cycles and adjusted movements at the lower levels of social organization. The expanding and contracting encroaching of the Badia by cultivation damaged the natural habitat and lead to the ban of cultivation. Over the last decade, the Government established forage reserves, which indicated the technical feasibility of improving the range quality through regulated access. The decentralized management responsibility of the local communities has so far not been sustainable and been hampered with during drought years. Subsidized feed provided a buffer against feed shortages and reduced feeding costs in the winter. Co-operatives as a new form of social organization, including management of designated grazing areas, received so far only exceptionally exclusive use of co-operative land and unfortunately, their grazing boundaries were mostly abolished during the recent drought.

The structure of the system allows as internal development strategies to expand herd sizes to accumulate capital. Markets provide the possibility to those with information access and skills to react to it. Alternatively, employment as herdsmen or casual employment within or outside the farming system can be sought. The possibilities for income generation through milk processing are largely exploited and demand for these products might even decline.

Support programmes often focus on traditional weaving and Bedouin handicrafts, but marketing of these items is frequently a constraint and depends on tourism development. Additional income could stem from the involvement of Bedouins in the tourism sector, either through provision of accommodation, guided tours to natural scenery or wildlife sights. At present, initial developments are observable, but are confined to the vicinity of Palmyra and mostly organized by Hotels. Additional and largely unexplored potential exists near other historic sites.

The farming system with its' harsh ecologic environment resulted in livelihood strategies with high resilience to climatic stress. Policy change is one potential additional stress factor. Acceptance of policy signals as new frameworks, which should guide systems development, such as grazing management or water access regulations, occurs only over time. Too frequent and sporadic policy change leads to mistrust in the institutions identified with these measures. In case the confidence to institutions is lost, a second driving force derived from a harsh ecological system might otherwise be applied, which is the rapid exploitation of new opportunities without entering long-term commitments.

Such behaviour could become an asset: once, range management strategies have become engrained in the society, they become stress resilient - if sufficient flexibility for local range management decisions is permitted. The pastoral farming system can only then contribute to valorisation of the steppe areas, if its livelihood system can survive the stress from the natural and the institutional framework. Locally managed and socially acceptable range management strategies are a key to its success, such as are stable and predictable policies influencing the pastoral farming system. Range policies have not always provided incentives, which encouraged social groups (co-operatives or traditional forms of social organization) to reap the benefits from improved management of the range.

The marginal barley cultivation provides a second source of income in years of high rainfall, where rainfall is too low and unreliable for crop-based livelihood strategies and allows only close

barley-sheep integration. The frequent grazing of the crops instead of grain production is inherent to the system. Off-farm income and casual employment is an important livelihood strategy. The agro-pastoral farming system is relatively free of large-scale policy interventions (except on the establishment of wells) and operates under free marketing of its produce, with exception of establishing its legal boundaries to avoid destruction of the Badia ecosystem.

The socio-economic stratification is based on herd size and the capacity to cultivate barley under the high-risk agro-climatic conditions, as off-farm employment opportunities are limited to employment as herdsmen and occasional casual labour in the agriculture based FS. The drought years considerably reduced the investment potential of the population due to failed crops and emergency sales of sheep. Investors carry out part of the barley cultivation against share cropping arrangements tailored to cover the production risk, where the land owners provide no additional input except the land. In the western part of this system, the experience of the drought and the transfer of observations from the green belt project leads to the introduction of olive cultivation and poultry raising as alternative livelihood strategies for household able to afford the investment.

The *Pockets of Irrigated Farming* are based on licensed wells in oasis or near the Euphrates River. Cultivation restrictions for water conservation apply, but sheep are frequently an important component of these systems as well. To the extent possible, farmers cultivate regulated crops such as cotton and wheat with reportedly high yields. No clear boundaries for this system exist and depending on the implementation of legal restrictions on the type of cultivation, it partly contains elements of the irrigated farming systems of FS 3.

Policies affecting the pastoral and agro-pastoral farming systems relate to marketing, input pricing and resource management. Changes in the meat export policies in 2000 supported income generation from exploiting the preference for Awassi meat in Arab countries, which could be expanded if combined with feed policies encouraging increased returns per head of sheep and per grazing-day in the Badia. Investors from outside the farming system presently carry out most fattening. Supporting traditional breeders to fatten lambs would generate additional income while reducing pressure on the range. A stronger role of traditional social organization or of co-operatives (particularly where the tribal structure coincides with co-operative affiliation) could encourage sustainable management of emergency feed resources from improved rangelands. This would prevent particularly medium-size holders from loosing their herds (i.e. capital stock) in droughts. Developing such a role requires long-term commitment by the state to reduce the fear of managers that spontaneous external interference in stress situations might occur. Technical possibilities for increased the forage production in the traditional run-off areas in Al-Badia (*Faydat*) instead of the barley cultivation should be considered. Experiences for area-based insurances for breeders could be explored, but careful implementation in a socially adjusted manner would be indispensable. Policies allowing poor and medium holders to recover from their loss of capital should be pursued, including careful re-stocking and working capital provision for rainfed producers in the agro-pastoral system (to prevent the long-term resource use of these lands by external investors). The development of additional income sources besides sheep breeding will be indispensable to raise the living standards of a growing population, but increased resource use efficiency and income generation within the farming system could considerably reduce this pressure.

Comparative Review of Farming Systems

The farming systems of Syria show a remarkable degree of differentiation in terms of production orientation and socio-economic characteristics of the typical producers. The former influences the contribution of each farming system to the agricultural sub-sectors of Syria, sometimes differing vastly from the size of a farming system. The latter reflects the result of differentiation under natural and social conditions and effects of policy as well as institutional changes. This comparative review summarizes the agricultural differentiation and specialization, before

presenting the main conclusions relevant for policies to support the adjustment process of these farming systems.

The summary of the six major farming systems of Syria lays out their expected relative importance for the contribution of major food and industrial crops. Due to their size, the farming systems of the northern and north-eastern plains contribute more than half the production area of wheat, cotton and lentils and a high share of many other crops. The medium size crop-based broad farming systems (FS2 & FS4) are the main contributors to crop areas of their specialized crops, such as tobacco, olive and cherry in case of FS2 and almond, irrigated pistachio and almonds (FS4). A high degree of specialization gives even the small farming systems national importance at the national level for these crops. The coastal irrigated farming system (FS1) contributes above 95% of the national greenhouse and 75% of citrus production, while in the small Al-Ghab farming system (part of FS4, 0.8% of national area), one third of the national sugar beet is cultivated.

From a farming systems perspective, the relative resource endowment of its producers is likewise a main consideration, as it influences the production orientation and development potential, particular in the context of a growing population. Based on the late settlement and investment in land improvement, the northern plains farms are on average endowed with by far the largest farms (7.9 ha), which are even larger after exclusion of the smaller holdings of its irrigated part (with land attribution under agrarian reform regulations). At the other end of the spectrum is the densely populated coastal farming system (FS1), where average holding sizes of cultivated land are 1.3 ha. The high availability of off-farm income and non-agricultural employment in FS1 make other FS more critical from a poverty perspective. The Al-Ghab farming system (in FS4) provides little possibilities for non-agricultural employment and has average holdings of only 2.1 ha (based on statistics, but smaller in reality due to informal sub-divisions). Similar farm sizes prevail also in the hilly and mountainous farming system (FS2: 2.0 ha) in difficult terrain and under a high percentage of olives, cherries and other perennials, which provide productive employment potential. The pastoral and agro-pastoral farming systems are particularly vulnerable, as the main capital of the holders consists of livestock, which is easily lost in drought years or must be sold at depressed prices to purchase feed.

Most systems (except FS1) produce a high share of so-called strategic crops, many of which are subject to much less practical regulation than in the past. In terms of sensitivity to policy reform, most relevant is therefore the reliance on industrial crops. The national average of 4.5% of cultivated land is exceeded most in the Al-Ghab farming system (26%) and absent in the coastal and the farming systems of the southern mountains and plains (FS5).

The characterization of the farming systems in terms of all their individual crops is not very well suited to analyze the risk exposure, due to the large number of crops grown across the country. However, the **dependency on four major crop groups** serves as an entry point for discussion (cereals, industrial crops, tree crops and other crops).

At the level of major farming systems, it is noticeable that FS1 has the most extreme reliance on tree crops (80%), followed by FS2 (56%). The farming systems FS4 and FS5 (16% and 12%) represent approximately the national-average (13%) share of cultivated land under tree crops, while they are relatively unimportant at present in FS3. The long-term investment characteristic of tree crops from a farm management perspective considerably restricts the adjustment possibilities of farmers. Among the tree crops, olive represents a high share in FS2 and FS4, which are characterized by lower price fluctuations than the fruits and nuts dominating the other FS. Public sector promotion of olive cultivation in other FS may lead to long term price pressure. The citrus dominating the FS1 (especially the northern FS) permits some storage on the tree, while apple (FS5 and 2) compete for limited storage space as production increases.

Industrial crops (tobacco, sugar beet and cotton) provide price security, are therefore appreciated by farmers, but cultivation areas are most strictly controlled compared to all other

crops. The national average of 4.3% of industrial crops is influenced by the 6.5% of land under crops in the huge FS3, while it constitutes 4.3% of the cultivated land in FS4. However, due to the specialization within FS4, the Al Ghab FS is cultivated to almost 26% with industrial crops. These crops are relatively unimportant at the aggregate level in FS2 (2.9%), but are extremely important within pockets of tobacco cultivation near processing plants, while they are nearly absent in the other FS.

Cereals dominate the cropping pattern of the vast majority of the cultivation areas and constitute over half (53%) of cultivated land at the national level, with the highest share (70%) in FS3, followed by the FS4 (43%) and FS5 (33%). Cereals are particularly suitable for larger farms due to the achievable economies of scale, but traditional wheat farming (animal traction) still exists in the marginal cereal producing areas of FS5. The share of barley in the cereal crop increases parallel to increasing rainfall risk (in absence of irrigation) and a high share of barley is grazed as part of the livelihood strategy of sheep breeders. Price risk is not an issue for the cereal producers, while climate risk is a serious problem.

The last crop group comprises mostly crops under private marketing arrangements, including most importantly legumes (important in FS3 to FS5) and field vegetables (FS1 and FS 5). The former group is more characterized by climatic risks, while the second group is regulated when based on irrigation and subject to very high price risk, but offers high profit to growers who succeed to market at the correct moment (which depends on debt service requirements and household liquidity factors).

This presentation by crop groups allows the differentiation **vulnerability factors**, notably to price shocks (by relying highly on crops subject to price fluctuations), climatic risks (mostly drought vulnerability of the system) and policy change (notably by controlled areas and adjustments in the official prices). The comparative review indicates that FS3 has the highest exposure to policy change, due to its high reliance on wheat and cotton, the latter particularly of the poor farmers who frequently exceed the permitted share under the agricultural plan. Policy change at the broad farming system level is next important for FS4, while at a close look, the Al Ghab FS (within it) is overall strongest exposed to political prices and agricultural plan adjustments (25% of cultivated land under industrial crops). Policy sensitivity of the FS6 is of a very different nature, as the system is not affected by direct output price control. Policy decisions have affected mostly resource use decisions, frequently out of environmental concerns. The first intervention was the ban to cultivate floodplains in the Badia. The second intervention refers to restrictions on water use from wells for the irrigation of crops, for which exemptions are reportedly under consideration. The establishment of grazing reserves and the provision of subsidized feed are supporting the population living in a risk-prone environment. However, the fact that this support is controlled by institutions far from the traditional Bedouin organization the adds insecurity to a system where it requires certainty. Past policy decisions on grazing area access and the role of co-operatives have raised concerns about the stability of policy decisions. The Badia policies are theoretically neutral to scale, i.e. poor farmers get the same benefit per animal as large holders. Asymmetric information on markets and credit access make better-off members of the system less vulnerable and they adjust quicker to the risks of the system.

A high reliance on crops under free market arrangements, particularly if these are perishable and highly seasonal exposes farmers to great profit opportunities but also vulnerability to price shocks. FS 1 and mostly its southern, Greenhouse dominated part, are most sensitive to it. Loss of capital resulting from years with climatic incidents or unlucky sales management is the most important factor prevents the smallholders from cultivating in all seasons. Successful farmers there and in the southern plains farming system of FS 5 are on the contrary well prepared to make high profit, particularly where they combine good crop management knowledge with knowledge about the commercialization of their produce. The substantially improving supply with fruits and vegetables in the last decade provides testimony for this success.

Climatic risks increase generally from west to east, making FS1 and FS2 least exposed. FS6 is clearly the most risky one of all systems due to the direct dependence on the range. Within FS6 again, the non-migrating herd owners (coinciding with the poor ones) have least flexibility by migrating to other areas compared to owners of larger herds. In a drought situation, these farmers lose the highest share of their capital as they lack resources to purchase feed at increased prices and small herd sizes make migration uneconomic. Within FS3, the irrigated farming system (Euphrates Basin and tributaries) is less exposed to climatic risk than rainfed areas, as water deficiencies are prevented through irrigation. In practice, however, not all irrigation systems are resilient to fluctuating rainfall conditions and particularly in the Khabour basin, low rainfall years transmit their effect through the irrigation system through reduced water quantity and coverage of the schemes. Lack of irrigation water affects households differently depending on their position in the scheme and sharecroppers loose the possibilities to engage into cropping arrangements. Climatic and policy risks reinforce each other partly, when the agricultural plan announcement (irrigated or rainfed "plan" in an irrigation scheme) is announced belatedly due to uncertainty of planners themselves on their ability to provide water in the irrigation scheme. By nature, the vulnerability level of rainfed agriculture is highest, be it the rainfed barley cultivation of the agro-pastoral farming system (of FS6) or the mixed farming system (of FS3). Access to complementary water resources, such as wells, is correlated with the socio-economic classification and owners of deep wells are less likely to be hit hard. Poor households are often losing not only their own crops in a drought, but also their casual labour possibilities to harvest cotton or other crops.

This review of vulnerabilities focuses primarily on short-term effects. Perennial systems are subject to specific price risks in cases where long-term price declines occur when a steadily increasing supply is not met with increasing demand. Some citrus varieties appear to be in such a decline (due to the private expansion from late adopters of a successful strategy), as might occur with apple and olives in the future due to public promotion of orchard expansion. Ensuring markets for these crops is important to avoid the negative effects of asset fixity of farmers' investments, as declining margins would hurt poor producers most.

Apart from the natural conditions, several **cross-cutting themes** influence the present structure and development potential of the farming system.

The endowment with land as the principal agricultural resource was a long-standing public concern in Syria and social equity considerations led to the agrarian reform process of the 1960s. Nevertheless, the growing population and sub-division of land requires further attention to the role of land fragmentation when discussing the farming systems of Syria. Agrarian reform was achieved through the redistribution of large, private holdings as well as the distribution of public land, partly after considerable state investment in land reclamation. No systematic study on land tenure was part of the present study, but the legal restrictions of holders of such land arouse frequently. Comparing the share of agricultural land under restrictions from the agrarian reform law, it is apparent that the Al Ghab (FS4) and the irrigated farming system of the north-eastern plain (FS3) have the highest share of agrarian reform land.

The farming systems differ in the prevalence of absentee and part-time farming. The remoteness of holdings from urban centres leads many large farmers in the rainfed plains of FS3 to visit their farms mostly for the supervision of agricultural operations, which are highly mechanized for the dominant wheat. The phenomenon is at the same time associated with holdings, where owners engage in sharecropping arrangements to reduce supervision costs. This is most important in labour intensive field vegetable cultivation and on irrigated land. Sharecropping is therefore most important in the irrigated parts of FS3 and the plains of FS5, while it is less important in the plains farming systems of FS4. In several tree-based systems, smallholdings do not provide sufficient employment capacity for full-time presence on the farms, resulting in seasonal absence from farms in FS2 and the mountain FS5. The land relation policies, e.g. the law of agrarian relations, intends to protect share-croppers, but at the same time reduces the

interest of land owners to engage in new longer commitments which could affect their ownership rights.

Poor and landless individuals and families seek employment within their own farming systems and move to other farming systems known for their need for casual labour in specific seasons. A review of employment generation in the farming systems involves considering the potential for productive employment generation for family labour as well as the possibility of a system to absorb casual labour (often resource-poor or even landless households) on a seasonal basis. Apart from the self-employment on their managed land, casual agricultural income within the system is a standard feature and the extremely high importance of this income source across all systems has been pointed out.

Seasonal agricultural labour flows to the cultivation areas of the labour demanding cotton or sugar beet, but also to regions with field vegetable cultivation, among others. The most important receiving systems are FS3 (particularly the irrigated system), FS5 and FS1, while the areas of out-migration are the agro-pastoral farming system of FS6, FS4 (particularly Al-Ghab) as well as FS2. The poor households within a system mostly migrate for unskilled labour (particularly in harvesting), while better-paid skilled operations such as pruning of orchards attract to a higher degree also medium household types. Population growth and increasing labour availability within the systems (declining average holding sizes over time) leads to an increasing reliance on labour from within the systems, which appears to affect the employment possibilities for the poor from the agro-pastoral FS in FS3 (particularly the irrigated part). A similar trend exists for local casual employment in FS1. Poor households from within FS3 are preferred for cotton picking as they have more experience in the operation. The irrigated plains of FS5 continue to attract casuals for field vegetable cultivation, but also engage migrant labour to a considerable share through sharecropping arrangements. These labourers, for example originating from FS2 and FS4, complement these contracts with migration to non-agricultural work. With increasing labour supply and the use of internal labour within the system, the capacity to absorb surplus labour between the systems is likely to decrease. This will increase pressure on the labour market, as has already happened in the rainfed part of FS3, where labour flows within the system are now more important than in the past.

The **environmental concern** most commonly raised across all farming systems are those on the present and future water availability, possibly less marked in the FS1 & FS2. Policies restricting the drilling of new wells tapping into already overexploited aquifers are in place, but enforcement is partly an issue. More attention on the role of water use or service fees for demand management is required, in order to increase the crop-water use efficiency. Efforts for upgrading traditional to modern irrigations have been more successful in FS5 than in most other farming systems (particularly FS3), partly due to unresolved technical problems. The role of runoff management under rainfed conditions deserves more attention, including for forage production. The success of better soil fertility management especially under rainfed conditions is closely related to water management as well as credit facilities.

A particular environmental concern in vegetable cultivation, most markedly under greenhouse conditions, is the pesticide and insecticide use. Spraying intensity has not specifically been studied, but the public facilities presently appear underdeveloped to analyse for a significant sample the compliance with prescribed waiting periods after application and potential hazards to ground water resources. Pesticide application in cotton is at levels considerably below many other countries and offers the possibility to seek price premiums if used for marketing. The control function of the public sector in ensuring the quality of sold products in the interest of farmers and consumers should be strengthened. The requirements for obtaining training and licenses by agro-chemical traders should be assessed from this perspective, as should procedures to ensure the safe and efficient operation of spraying equipment.

One of the most important concerns for increasing the flexibility of farm management across Syria is the access to seasonal as well as longer-term credit. Particularly farming systems most

seriously affected by drought and asset loss, e.g. FS6 and part of FS3, require mechanisms to give these farmers new access to crop finance. Marginal producers will otherwise face serious difficulties to avoid expensive alternative credit sources. The governing procedures for guaranteeing credits within the co-operative system include an element of decentralized social control for debt repayment, but are not fully functional at present and must be improved.

Governing **policies on the registration of land** and the transfer of registered ownership of agrarian reform land require urgent attention. The transition from original reform beneficiaries to the next generation has started. It will rapidly broaden the scope of negative effects faced by holders without title deeds in the near future. Under the practical difficulties to obtain credit using such land as collateral, part of the farmers informally sought pragmatic solutions, which occasionally involve formally illegal land sales and distribution of land among several young families. This approach is inefficient and carries the risk that particularly smallholders negotiate from a weak position in these circumstances and are consequently forced to accept expensive credit arrangements. In some farming systems, holding sizes will become too small to be viable and the social implications if such resulting holdings cannot be sold should be considered.

The gradual move towards an indicative planning process has led to the decentralization and flexibilization of many production decisions. **The agricultural plan** for non-strategic crops serves mainly as approximate orientation for a desired situation, except for well-irrigated crops affected by water conservation policies. **Industrial crops** are under the strictest control of their cultivated areas, which is necessary to contain excessive budget effects and meet the requirements of processing facilities or to meet export objectives. The policies and procedures for influencing the cultivated areas, delivery time and product quality are at the same time expensive, complex and not always transparent in their application. Other critical areas are the procedures to obtain yield estimates, the assignment of delivery dates (sugar beet) and inefficient delivery mechanisms to factories causing long waiting periods and additional cost. Procedures for grading of industrial crops are a necessity to ensure the quality of supply. Area control may also be required as long as crops remain highly desirable for many farmers and production tends to exceed requirements of factories (which imply no statement about the economic efficiency of the commodity chain as such!). However, from a social point of view, inefficiencies of the procedures tend to favour large producers compared to smallholders, which is partly compensated at the local level in that smallholders are permitted to exceed licensed areas without sanctions. At the same time, the monetary importance of the administrative process of certifying product grades (as certificates of origin) becomes a part of a negotiation between employees and farmers. Part of the illegal practices are possible because of the serious cash and liquidity constraint faced by farmers with irregular cash flows and where delayed payments by public institutions are particularly hurting.

Given that the **extension unit** is the branch of the agricultural support system with the most regular and direct contact with the farming community, it is heavily involved in the collection of local information and the transmission of agricultural decisions from the higher administration. The activities required for the planning, data collection and supervision of the agricultural plan are among the most important and time-consuming extension unit tasks, particularly in farming systems with a high importance of industrial crops. Agricultural extension advice in the sense of providing information on modern farming practices and being an active partner of farmers in solving practical problems receives therefore less attention. Apart from the time aspect, the role as an institution responsible for implementation of the plan occasionally reduces the precision of information given by farmers. The research-extension linkage is presently relatively weak and the generation of technical solutions would benefit from better information access to international research results by researchers. The outreach capabilities in the extension systems should be strengthened.

Introduction

The agricultural sector continues to play a dominant role in the economy of the Syrian Arab Republic, both in terms of employment and gross domestic product, as it provides 25-30% on both accounts. The agricultural development strategy is facing several constraints such as the increasingly apparent shortage of water resources and depletion of other natural resources; lack of agricultural investments; competition of foreign products resulting from the subsidy policies applied by the main producing countries; and the difficulties of meeting the international quality standards.

As agriculture will have to provide an important share of income for large parts of the population, the efficiency of the use of natural capital and public resources is of increasing concern. In order to be able to successfully compete in international markets and to benefit from increasing market integration, considerable reforms of agricultural policies have been undertaken. Moreover, attention will be given to sustainable natural resource use through the modernization of irrigation systems and enhancing the productivity of agricultural labour.

The document presents the results of intensive fieldwork by six staff members of NAPC under guidance from an international consultant, whereby three steps were carried out. First, based on literature, statistics and in consultation with national experts the main farming systems of Syria were defined and approximate boundaries and typical field study sites identified. In a second step, several types of farm households were defined within each farming system, representing typical producer groups relevant to policy-making. The third step quantifies household characteristics, farm economic structure (livelihood patterns) and performance for each household type. This combination of methods allows the qualitative assessment of the potential impact of policy changes at the farm household level. Combined with information on the distribution of farm households between the farming systems zones, the study furthermore allows estimating the aggregate impact of policy changes within the society, particularly at regional level or for particular socio-economic groups.

Chapter 1 – Recent Developments in the Agricultural Sector and Agricultural Policies

The Syrian Arab Republic contains an important part of the modern agricultural societies. Over the millennia, the expression of agriculture in the region has seen numerous adaptations, but even at the beginning of the 21st century, the agricultural sector plays a dominant role for national income as well as for employment generation within the modernized society.

In order to ensure the positive contribution of agriculture to the national objectives, the rural areas and the agricultural sector have received considerable attention by policy makers in the last decades. Major policies were formulated to establish direct support through price mechanisms for strategic crops, infrastructure investment in rural areas (primarily roads and irrigation as well as land reclamation) as well as the laws of agrarian relations and agrarian reform as tools for obtaining a structure of production according to the policy preferences. At the same time, the agricultural sector and the farming community has faced a series of developments, which include, among others, increasing exposure to international markets.

Farmers operate at the same time in an environment prone to high rainfall variation and, with the exception of the coastal and northeast, with low average annual rainfall. Consequently, only one-third of the total 18.5 million hectares are considered arable land (including forest areas), with the remainder belonging mostly to the steppe areas (Al Badia). Based on the roughly equal distribution of the population between urban and rural areas, the average rural population density is approximately 1.15 rural inhabitants per hectare of agricultural land (Fiorillo and Vercueil 2003).

Over the last decades, the orientation on food self-sufficiency was remarkably successful and food production kept pace with the rapidly growing population, leading to a low dependency of imports for basic food items. Food production needs in combination with the state stimulated orientation of raw material production for the agro-industrial sector has shaped the production structure of the agricultural sector.

However, at a population growth rate of still 2.45% the population in Syria continues to increase at approximately 400000 per year and the slowly decreasing rate will continue to increase the pressure on agricultural resources. Until recently, the population was approximately equally distributed between urban and rural areas; it is estimated that close to half the population depends to an important degree on agriculture-based activities, while the public sector is increasingly unable to absorb the additional population. Hence, the private non-agricultural sector in combination with agriculture will carry the main responsibility for employment generation. However, the slow growth of the non-agricultural sector left agriculture as the second driving force of the national economy, last not least under the umbrella of domestic support, public investment and protection from international competition.

However, inherent trends to decreasing farm sizes and limits of natural resources (particularly water to expand irrigation) in the agricultural sector and the cost of support to agriculture led to

increasing difficulties to pursue earlier policies in the long term. Income generation through specialization and increasing reliance on external trade offered the possibilities to gain access to new agricultural markets and simultaneously allow stronger growth of the non-agricultural economy.

The Syrian economy operated over four decades under a system of centralized planning, which gradually shifted from formally issued five year plans towards indicative planning, starting from the sixth one (1986-90). Annual plans, taking the role of reference documents, were prepared through a more participatory and decentralized approach. In consequence, more and more space was given to private production and trade activities within the framework of the State co-ordination of resource allocation.

The agricultural policies in Syria simultaneously pursue several objectives. In the case of food crops, they include a focus on stimulating food production in support of increased national food self-sufficiency as one of the several ways to achieve food security. At the same time, it aims at supporting the farming community by offering floor prices and fixed prices. In the case of industrial crops (sugar-beet and cotton), there are also the objectives to ensure an adequate supply of the processing plants and to enhance the trade balance by increasing exports (cotton) and reducing imports (sugar-beet).

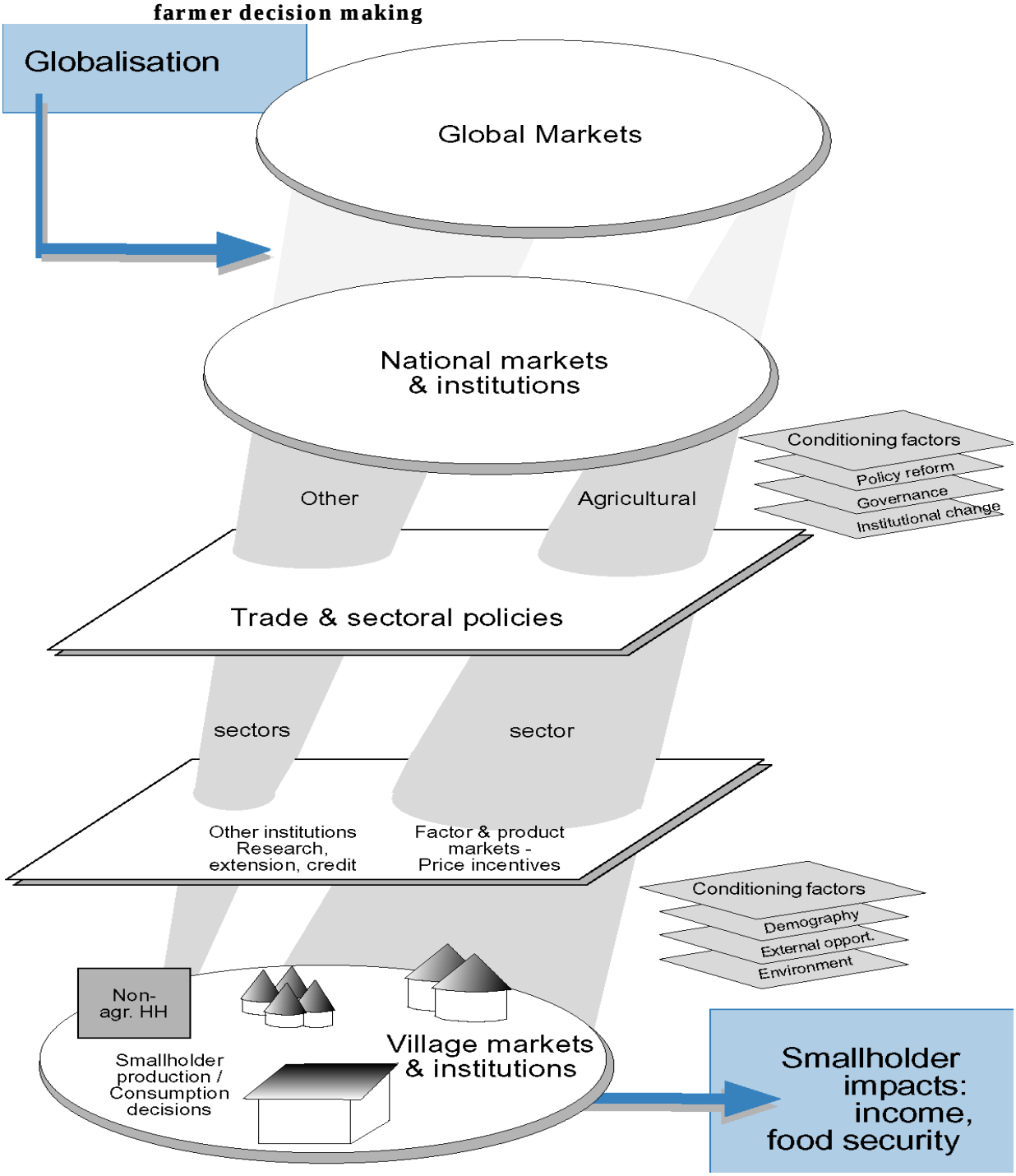
The traditional objectives of agricultural policies were directed at full utilisation of natural and human resources and securing adequate supplies for food security, processing industries and exports. They evolved over the last 15 years from strict self-sufficiency policy to broader self-reliance, based on the recognition of the critical role of competitiveness to marketing raw and processed output internationally. The declared policies reflect at the same time an increasing concern for environmental constraints of production, especially the necessity for efficient use of scarce natural resources including land and water (Fiorillo and Vercueil 2003).

A number of domestic factors will challenge the Syrian agricultural sector in the future, including larger urbanisation, population growth, as well as changing food habits (e.g. shifting the demand from animal to plant fats, increasing demand for processed food), and external factors such as a greater exposure to developments in the international economy. These will require that Syrian farmers to improve the quantity and quality of their produce, in compliance with international and regional food standards of potential trading partners. Doing so while coping with emerging shortage of water and declining quality of soils and grazing land will require additional efforts, for which the agricultural support system will have to provide guidance and support. Farmers' revenues are also at risk, due to the limited size of most farms and growing competition from import that will also challenge domestic agro-industry.

In order to support the informed policy decision-making at this crossroads of Syrian's agriculture history, NAPC has commissioned over the recent years a number of specific studies documenting policy change and sub-sectoral trends and responses to policy changes. These studies cover the analysis of risks, opportunities and policies in meeting these challenges while preserving the social achievements inherited from the past. Most of them have been summarized in an impressive volume (Fiorillo and Vercueil 2003). It covers for example the so-called strategic crops (Westlake 2003b), the olive sub-sector including olive oil developments (Malevolti 2003), citrus sub-sector which so strongly influences the economy in the coastal farming system (Westlake 2003a), the livestock sub-sector (Vercueil and Cummins 2003) and dairy as well as horticulture crops, including their marketing arrangements (Rama 2003). A different series of studies on policies, including taxation (Wehrheim 2003), policies affecting soil and grazing management (Edwards-Jones 2003), irrigation water use (Varela-Ortega and Sagardoy 2003), input as well as agricultural credit (Parthasarathy 2003b; Parthasarathy 2003a).

The increased opening of the agricultural sector to international markets leads to new opportunities for farmers in terms of income generation and for the agricultural sector to contribute to economic development (see Figure 1).

Figure 1: Transmission of national and international factors on the rural economy and farmer decision making



Source: adopted from Dixon, Tanyeri-Abur, Wattenbach and Ndisale 2004

This increasing exposure to international and global developments feeds through different channels to the farmers, who are the ultimate decision makers in terms of production reaction. National markets and institutions are in that model condition factors, which allow the

transmission of international signals to the local economy (for a detailed discussion of the transmission paths, see Dixon, Tanyeri-Abur et al. 2004).

The present report presents a complementary view to the above studies, by reviewing the perception and impact these policies had over time on the structure, dynamic and development options of rural society in Syria.

Chapter 2 – Background and Methodology to Farming Systems Studies for Improved Agricultural Policies

Characteristics of farming systems analysis

Farming system studies have a long tradition in agricultural research, but in the past have strongly focussed on practical applications to raise production and to bring the efforts of agronomic research institutions closer to the multi-criteria decision making processes of farmers. These studies frequently focus on the variation of farming conditions in small geographical areas or the influence of socio-economic characteristics of a small group of farmers on the adoption capabilities of research recommendations, among others (see text box below).

The present approach to a national farming systems study is based on a classification of homogeneous zones of farming systems, i.e. larger geographical areas that reflect natural and economic conditions determining the evolution of farm types. Some of the systems boundaries are often sharply demarcated (e.g. irrigated and coastal fish based farming systems) while others follow in reality a smooth transition path due to gradually changing agro-ecological conditions and economic factors such as market distances.

The description of each main farming system contains their production characteristics, including the ecological conditions, representation of the farming population, production orientation and its contribution to the production of strategic crops. In discussing, among others, the diversification and intensification potential with agricultural research management, the reader may review the potential development of the farming systems in a systematic way. Through a policy dialogue, the development options within the farming systems can be discussed in a structured way. The development potential for each system can be reviewed in light of the potential impact of agricultural or trade policy change, applied research for the zone, intensified extension and public investment under changing effective farm-gate price ratios.

Within each of the geographically identified farming system, a number of typical farm-households are defined. These household types reflect the range of articulations of agriculture (including where appropriate: livestock, fisheries and forest dwellers) within each zone. They are defined considering resources available for the household (e.g. land, labour, equipment, income and other social factors) and production orientation (the same farm size class might contain very different production orientation; e.g. intensive dairy production vs. horticultural crop producers).

Background to the farming systems method:

Farming systems approaches evolved in the background of agricultural research experiences with the lack of adoption of on-station research by farmers. Social scientists frequently found that a lack of understanding of farmers' priorities and decision making criteria were the reasons behind slow adoption of new technologies. Under the influence of evolving Rapid Rural Appraisal and later Participatory Rural Appraisal methods, the identification of research domains leading to recommendation domains for extension had a strong influence on the development of early farming systems research methods.

The "soft-science" notion in farming systems research was also driven by failures to apply traditional farm management methods to individual, complex, smallholder farms. These are mostly characterised by mixed cropping practices, small production units, as well as decision making under the influence of multiple constraints on resource availability (absolute as well as seasonal fluctuations) and social obligations. The early statements on the presumed irrational behaviour of smallholders have in the meantime given way to the acceptance that the discrepancy between predicted and observed smallholder behaviour lies in the above constraints and failure to reflect properly these decisions in analysing smallholder systems.

Farming system studies, for over one decade, were therefore mostly based on PRA methods alone, and in the context of problem censi identifying farmers' perspectives and constraints as well as for target group identification in project preparation and implementation.

Farm management methods have evolved and earlier work of presenting farming systems in a geographical context (Ruthenberg 1971) has been recently updated. The study "Farming systems and poverty" (Dixon, Gulliver et al. 2001) was prepared by FAO upon request from the World Bank as a background document to the development of its new Rural Development Strategy. The earlier study analysed farming systems from the perspective of their potential for intensification and generating productive employment capacities for an increasing population. The new study builds on new technologies to map systems boundaries more precisely, and discusses the development potential of each farming system in light of five possible strategies: diversification, intensification, expansion of farm sizes, increased off-farm income as well as exit from agriculture.

In principle and depending on the intended use of the information as well as the resources and secondary information available for a farming systems study, the definition of household types may be carried out at different degrees of differentiation. For instances, based on census data, it is possible to derive household typologies by using cluster analysis. In most cases, digital data are however not available and published information is not presented in a way suitable for defining household types. In these case, and applied in the Syria farming systems study, three household types are sufficient, representing:

- typical (medium) producers, contributing the bulk of production within a zone and representing the middle range of production resources available per household. They are mostly operating at an intermediate management level. The large dormant potential within this group to contribute to national production objectives makes knowledge of their constraints particularly important for rural growth.

- poor producers, characterised by low availability of production resources and frequently combined with poor management levels. In most instances, they are the food insecure households, but could comprise a range of specific reasons and chances to escape the insecurity conditions. This group is frequently a particular policy concern. Their management capabilities and constraints to making use of incentives require knowledge of their production constraints so that production incentives can be beneficial.

- better-off producers, characterised by above-average resource endowment and often operating at higher technology and management levels than the other two groups. Access to information, credit and markets are usually additional characteristics of farmers within this group.

In selected systems, particularly highly diversified ones such as in the Homs-Hama area, the definition of additional typical households or niche systems representing important farming systems might be desirable. Nevertheless, the number of presented household types should not exceed five. If the household types can be represented in a two- factor matrix (e.g. farm size and combination of production activities such as fruit tree and vegetable combinations), then a number of these combinations effectively represent the same system at a different scale (and income level). Presenting all of these combinations will result, however, in little additional information for a policy maker (unless considerable economies of scale occur).

Benefits of Farming Systems Approaches for Policy Support

Pursuing such a farming systems approach to the assessment of the status and potential development of the agricultural sector provides the following possibilities:

- Farm household models provide descriptions of typical farm households whose structure can be discussed easily at the Governorate and administrative level. These allow one to define easily understandable economic models, based on gross margin calculations combined with farm level economic models;
- The approach, even though initially undertaken at a degree of differentiation suitable for national level discussion, can be applied at different levels and easily be refined to further differentiate within agro-ecological zones or Governorates (subject to available information);
- Develop notional models of the functioning of typical farms for policy makers that allow them to assess the potential impact of policies from a farm perspective;
- Farm economic modelling can be based on modules, representing steps of analysis: a) the definition of farming systems zones, b) household models representing the zones, and c) activities (farm enterprises), which may be complemented by models of the non-farm economy at later stages. This way, farming systems analysis can be linked to a Farm Management Information System, which is an information system based on farm enterprise gross margins and household models usable for agricultural support systems managers (agricultural research, extension etc) but also for policy analysis;
- The presentation of farm models is transparent and can readily be communicated to staff with limited background in economics;
- Development options and support needs can be discussed with sub-national authorities by household type;
- The aggregation of household models into regional models based on the definition of farming systems allows linking the household level with economic policy. Modelling was beyond the scope of the present study.

Implementation of the Syria farming systems study

The present report is based on the joint work of a team of seven professionals of the National Agricultural Policy Centre, supported through the GCP Project by the author as international consultant over the period of nine months in study design, implementation, analysis and reporting. During part of this period, Dr Mahmoud Al Ashram supported the team as National Consultant. The entire study had a strong field component of 300 field days, which was funded by the Technical Cooperation Programme (TCP) facility of FAO. The fieldwork generated

primary information from individual farmers and through group discussions in each major farming systems and sub-zone. The implementation steps of the study were the following:

a) Decide on the number of broad farming systems (based on a combination of agro-ecological factors with socio-economic parameters). The areas under and population in main farming systems were allowed to vary when defining systems boundaries. The number of mapping units considered at the first level was set to a maximum of approximately 8 to 12, which could be further differentiated into geographical sub-units at a later stage. After review of the literature and discussion with national experts, the main farming systems were initially defined as six (boundaries see below), which allowed the assignation of responsibilities within the team. The systems zones were roughly characterized through the derivation of farming systems statistics as a derivation from the annual agricultural statistics. In order to do so, the areas under all main crops relevant to the farming systems were entered at the Mantika and stabilization zone level. A presentation even at the Nahia level would have been desirable, but as a preliminary secondary source of information and considering the time available, the Mantika level had to be considered sufficiently detailed. The resulting systems and sub-systems level characterization is presented in each of the systems sections;

b) These first-level units define main livelihood sources within each geographical zone, such as livestock (pastoral) systems, irrigated agriculture and rainfed systems (partly sub-divided into several sub-systems) and urban and peri-urban agriculture;

c) Within each mapping unit, several household profiles were developed, indicating the structure and key economic parameters for these farm households. At an initial stage, the definition of three to five household models representing socio-economic strata (average farm household, poor farm-household and better off farm household) was considered advantageous;

d) The survey instruments for the definition and specification of the household models contained a combination of existing reports and statistics, geo-referenced information on natural resources and rapid appraisal methods, key informant interviews and surveys (See Annex);

e) At the village level, the extension unit staff provided information on the agricultural production at the village level, assisted in establishing contact to the village authorities and helped in organizing the group discussions. Group discussions provided additional information on the changes in the agriculture in the village. For each household type, the relative importance of income sources, the approximate cropping pattern and changes were discussed. Lastly, the vision of the farmers on development under expected changes such as decreasing farm sizes was assessed;

f) Quantitative information for the gross margin database was collected through a combination of questionnaires at the household level, complemented by secondary sources. The number of crops and sample sizes were determined within the boundaries of the total number of field days available, the prevalence of major crops within each farming systems and the requirements to provide information for the Comparative Advantage Study executed simultaneously.

Table 1: Conversion of administrative units to six farming systems for field assessment

FS	Administrative Units	Comment
1	Within Lattakia and Tartous GVT up to 100 masl	
2	Within Idlib GVT: Mantikas Ifrin, Harem, Sh Shbouni, Ariha, Haffeh, Within Lattakia GVT: Krdaha, parts of Jableh, Within Tartous GVT: Banias Sh Badr, and Safita, Misif, Talkalkh, Within Damascus Rural GVT: Yabroud, Tal and Zabadani	The boundary between zone 1 and 2 on the coast is defined as the 100 meter altitude line, and the areas of each system are calculated accordingly
3	Areas of stabilization zones 1 to 3 as well as irrigated areas along the Furat and its affluent in Der Ezzor, Qamishle, Rakka, Aleppo,.	Approximate limits defined between the pastoral/agro-pastoral and northern irrigated plains according to irrigation boundaries
4	Within Idleb GVT: Idleb and Nouman Mantikas; Hama GVT: AlGhab, Maherda, Hama, part of Salamiya; Homs GVT: Rastan, Homs and Kusier Mantikas	Boundary to agropastoral zone defined at the line between stabilization zones 3 & 4
5	Quneitra and Deraa Governorates, Within Sweida GVT: Mantikas Sweida, part of Salkhad and Shaba, Damascus rural GVT: Qatana, rural Damascus and part of Douma	
6	Stabilization zones 4 and 5, with exception of irrigated areas in the northern and northeastern plains included in the system 3	

Within each of the main working zones, the literature review suggested to cover the variation in the system assessing several potential sub-units for later treatment in data analysis and reporting. The following table presents the Mantikas, which were selected to represent each system and potential sub-zones within them.

Table 2: Selected Mantikas for field study and coverage of farming systems and niches

FS	Selected Mantikas	In Governorate	Farming systems	Niches
1	M Lattakia M Tartous	Lattakia Tartous	Citrus dominated FS north, and greenhouse FS in the south	
2	M Harem M Haffeh M Dreiki or Sheik Badr	Idlib Lattakia Tartous	Hilly FS Mountainous FS	Tobacco and pomegranate based system
3	M Maiaden M Ras Ein M Al Hassakeh M Manbej M Iazaz	Deir EsZoor Hassakeh Hassakeh Aleppo Aleppo	Mixed FS in North: suppl irrig. wheat-cotton Irrigated FS South: large sc.irr. wheat-cotton West: diverse	Intensive maize and sugar beet in special project areas on Lake Assad
4	Al Ghab M Rastan M Idleb (M Numan)	Hama Homs Idleb	Int. irrigation AlGhab Rainfed FS Irrigated FS	Buffalo-milk niche
5	M Sweida M Dara'a	Sweida Dar'a	Mountain FS Plains FS (perennial & extensive cereal)	
6	M Tadmoor M Salamiya	Homs Hama	Bedouin FS Agro-pastoral FS	Oasis system

Farming systems and household types:

Each agricultural household manages a farming system (FS) as part of his or her livelihood strategy. From a close perspective and considering all livelihood assets (social, physical, financial, natural and managerial) rarely do two households operate the same system. Such degree of differentiation is, however, not suitable for policy support nor from a systems perspective. Instead of dealing with individual households, some grouping is necessarily required. In order to avoid confusion, some terminology is defined in this box.

a) Farming systems (FS) are geographical areas where a particular farming system is important (= represents a significant part of the agricultural activity, measured by land use, employment, or output, in this zone). These FS are closely related to natural resources adjusted for economic and technical factors with a geographical expression.

b) (Farm-) Household types (HT) are distinguished within each farming system, and capture the variability in resource endowment and technology that can be observed within the population of farms regrouped (notionally) under the FZ.

In order to avoid confusion between the geographically presented farming system zones and the household level variation within the zones, the term household type instead of farming system is used for the latter of the two.

However, several FS can be important in the same zone. This may be due to the gradual transition from one idealized zone from a map. In this case the map boundaries are not strict geographical ones. In other cases, there may be zones best characterised by the coexistence of several distinct FS. In some cases these FS may be presented at a more differentiated map geographically and hence be sub-systems of farming systems which can be presented in maps. In this study, two such level of farming systems were defined. Where the presence of these FS does not follow a geographical pattern, they represent mere HT in the above sense.

Existing farming systems zoning for Syria

The majority of farming systems studies in the Syrian Arab Republic reflect their application in the context of the research-extension interface, such as in the case of the ICARDA research outputs. The geographical focus envisaged for the present work is in the tradition of similar studies from Ruthenberg and Dixon et al (see text box). A recent joint FAO/World Bank study on global farming system distinguishes five major farming systems for Syria, based on secondary information, the intensive application of geographical information systems and expert judgement. Their brief description draws heavily on the study “Farming Systems and Poverty” (Dixon, Gulliver et al. 2001), and was refined in two steps (adjustment based on available information in the country and later the study results). The main relevant systems according to Dixon et al are:

- Irrigated Farming System
- Dryland mixed farming system
- Rainfed mixed farming system
- Pastoral farming system
- Sparse (arid) farming system

An additional relevant system defined in the above study is urban/peri-urban agriculture (urban farming system), which is not represented in the maps. These systems are nevertheless important in some countries in securing urban food supplies, especially with horticultural crops. In Syria, high intensity of farming occurs in the city perimeter and the rural Mantikas of Damascus as well as Aleppo.

The salient features of these five systems are the following:

Irrigation based farming systems are traditionally important where permanent water flows allowed the establishment of schemes at affordable costs. In order to comply with increasing demand by the raising population, the Government has considerably expanded irrigation areas over the last decades and increased the importance of the system in meeting food requirements. However, given the high investment requirements of these schemes, which is usually not reflected in the farm level production costs, construction and maintenance of the schemes is highly dependent on policy support. Water use efficiency and agricultural pricing policies are particular policy concerns relevant for studying this farming system. An important secondary concern related to irrigated farming systems is their employment capacity for unskilled labour. Frequently, initial land allocation in new schemes is rather egalitarian, but depending on the situation, resource availability per household tends to become more diverse.

Additionally, irrigation occurs outside mappable geographical zones based on wells and artesian springs within other farming systems zones. These small systems are not presentable as map units, but where farmers have developed irrigation possibilities (frequently with a long tradition) that contribute significantly to their livelihoods. Landlessness or families with small owned or managed land combined with high dependency on off-farm labour are important constituents in this system.

Rainfed mixed farming systems in the Middle East are generally marked by high population densities with a high importance on tree crops and vines, and include cattle. The expansion of drilled wells has led to increasing importance of supplementary irrigation for winter wheat and partly fully irrigated summer cash crops. Seasonal in-migration of sheep for stubble grazing is common to make use of the by-products from wheat, barley, chickpea and lentil cultivation as well as fodder crops. Small farm sizes and highly diversified system will require particular attention for refinement within this farming systems zone.

Dryland mixed farming systems cover the second largest part of Syria and are mostly defined within the 150 to 300 mm isohyets. The farming systems are based on cereal-fallow systems, with wheat and barley being the dominant crops depending on the location within the rainfall bound. Rainfall risk is high, and the production of forage in times of crop failure is an important secondary concern for farmers. Small pockets of high value crops could be explored, but farmers frequently face marketing constraints in doing so. Small farmers in that zone are under particular food security risk, as off farm employment opportunities are limited.

The pastoral farming system in Syria is mostly sheep and goat based, with camels and cattle playing a minor role. Traditionally, Awassi sheep dominate the mixed small ruminant flocks. Cereal farming plays a secondary role, and is devoted equally to forage production and to the grain crop, due to the high production risk. State encouragement to expanded cultivation has led in the past to larger cropped areas. However, care needs to be taken to reflect farm level responses to recent changes in policy support to crop expansion in the semi-arid zones. Seasonal migration from the pastoral areas into the mixed zones is a characteristic feature of the pastoral farming system, which therefore uses by-products mapped in the dryland and rainfed mixed system.

The sparse (Arid) farming system is of relatively little importance in Syria. In other countries of the Middle East and North Africa, this zone is marked by land use by pastoral population with a strong reliance on camel herding, complemented by sheep and goat herding and oasis based cultivation as complementary sources of income. The importance of this system in Syria is to be determined.

Definition of household types

At least three different household types were defined within each farming systems. The term "household type" is used in this report in order to avoid confusion with the farming systems defined for mapping purposes. Effectively, these household types could be similar farming systems in terms of production orientation (differentiated mostly by farm size) or could have very different production orientation (share of different crops, marked difference in the role of livestock or non-agricultural sources of income). In other words, each household type could represent a rather different farming system[2]. While the farming systems can be displayed with geographical boundaries, the household types occur within the same geographical area and cannot be presented in maps.

Technology levels and management levels:

Farm management is a complex managerial task, which is not performed with similar success by farmers, even if they possess similar resource endowments. Consequently, available inputs are used with a variable degree of success, resulting in a wide range of net margin within a matrix of farm management and input levels. Frequently, high input levels under bad management yield net benefit levels below those of low input levels under bad management. In other words, farmers can only fully benefit from higher input and technology levels, if their farm management capabilities are expanded simultaneously. For the purpose of our study, similar technology levels and management levels should be selected for the households represented as one household type. The differentiated analysis of the influence of management quality on economic performance of farms is more relevant for agricultural planning and extension than for policy analysis.

Even though it is acknowledged that, effectively, each household manages his or her own, unique farming system, such specificity is meaningless in support of policy making. Therefore, with the policy purpose of the study in mind, a number of typical households need to be defined which can indicate and support analysis of the capacity of farming systems to adjust to a policy of outwards opening and competitiveness. Some simplifications and abstractions are required in defining the household types within each of the farming systems.

The final criteria for classifying household types are specific to each system and go beyond farm size alone, even though size was a very useful starting point. The development of the classification system is based on discussions with the extension unit, village authorities and most importantly with farmers themselves. The set of livelihood sources and the farmers perception of their relative importance determined their set of criteria which is at the basis of the household models. The criteria used in each system are summarized in the chapter on each system and further detail is provided in the full systems reports.

Development of a farm management database

The research team collected during the field work a large number of gross margin calculations on the dominant crops and livestock enterprises. This information was collected in support of the Comparative Advantage Study undertaken by NAPC in collaboration with CIRAD, but also in support of the farming systems analysis itself. The total number of gross margins exceeded 400, even though the single visit approach does not allow to consider every one of them fully reliable

[2] The definition of a larger number of household types might be necessary in broad farming systems (defined in the first step) with large variation of specialised farms.

due to recall difficulties of the farmers. The results of this effort are documented separately in support of the development of a farm management database at NAPC. In the future, this collection could be converted into a formal database suitable for adjustment or simulation on the farm economic effect of (relative) price changes and the impact of technical innovations.

Furthermore, this database allows studying the relative profitability of the important crop and livestock enterprises under different management conditions and in the different farming systems zones. This relative profitability is affected by technical innovations, management capacities, and more importantly for the policy support mandate of NAPC, changing price ratios and institutional arrangements in agricultural production, marketing and support service provision.

Some analysis of the gross margin data is being presented in the individual farming systems reports, which are though not summarized in this full report as it goes beyond the scope of the document.

Limitations of farming systems studies

The results from the present study approach provide an important complementary perspective in understanding farm level reactions to policy change, as well as to its social effects under the agro-climatic reality of Syria. At the same time, this does imply that the approach renders complementary work or the updating of existing studies unnecessary.

Updated statistics can only be generated through formal and structured surveys. The present study used existing statistics to the extent possible to present the farming systems on the basis of official sources by defining the convergence of administrative boundaries. At the same time it has to be acknowledged that not in all cases are the statistics to be considered accurate in all respects. The collection of data for the annual agricultural statistics is an additional task entrusted to the extension units, which are faced with limited transport capacity and field survey experience. In the farming community, they are in some areas more known as control instruments for agricultural plans than as service providers, which limits the willingness of some farmers to share information, with the result that especially for the non-strategic crop, data related to the original agricultural plan are process into statistics which are not fully implemented at the farm level. Apart from data access problems, there are also difficulties in data classification, for example when reviewing the distribution of irrigated and rainfed crops in some of the systems. At the aggregate level, the compilation of the agricultural statistics is a good first indication to represent the farming systems zones, but a further definition and data compilation at the lower level such as Nahias would be desirable, especially if such information could be directly shared electronically between the authorities concerned.

The definition of the boundaries between the systems is obviously a preliminary and approximate one, as with the exception of public net irrigated areas in otherwise dry regions, climatic conditions are not very clearly demarcated. A further sub-division or the identification of local niches could help learning interesting lessons on the adjustment process of the farming community to market opportunities and institutional decisions.

The results from the analysis of typical households such as the ones defined in the study should not be taken as representing a statistically significant simple mathematical average of statistical information commonly generated in national agricultural censi or household surveys. They are abstractions or notional models describing typical farms within the farming systems they represent, with the intention to indicate the impact of policy decisions on one family with their income sources. The average household derived from census data would not allow such an understanding. Consequently, however, it cannot be expected that the direct extrapolation of typical household data to regional production data is possible.

The typical households developed in the study provide nevertheless a very useful basis for applying complementary analytical tools, such as the development of simple household models to study the impact of improved farm management and the application of new technologies or price changes.

Chapter 3 – Overview of Farming Systems

The variation in climate, altitude, rainfall as well as historic settlement pattern create at first sight the impression of a complex pattern which cannot easily be converted into a clear area-based system of agricultural zones. Despite the differences in variation when considering individual factors influencing agriculture, the combination of natural and human (including market) factors have led to a pattern, which allows the mapping of broad farming systems zones.

The present section briefly describes the broad farming systems and sub-systems and their contribution to the agricultural sector. Furthermore, the main household types resulting from the field work are presented. This short presentation is necessarily a simplification of the richness of results from the fieldwork. The detailed description of the systems as well as of the household level analysis is documented in the six background documents to this report.

The concept of Stabilization Zones (Agro-climatic Zones)

The stabilization zones are the Syrian approach to defining land use suitability classes, with implications for the legal position of crop farming, support services and delineation of intervention areas of Government supported projects. The definition of the five zones given below is adopted from MAAR annual statistics. The mapping of the stabilization zones and hence delineation of land in the different classes is subject to revisions by Government committees.

Syria is divided into five agro- climatic zones according to annual precipitation and rainfall probability:

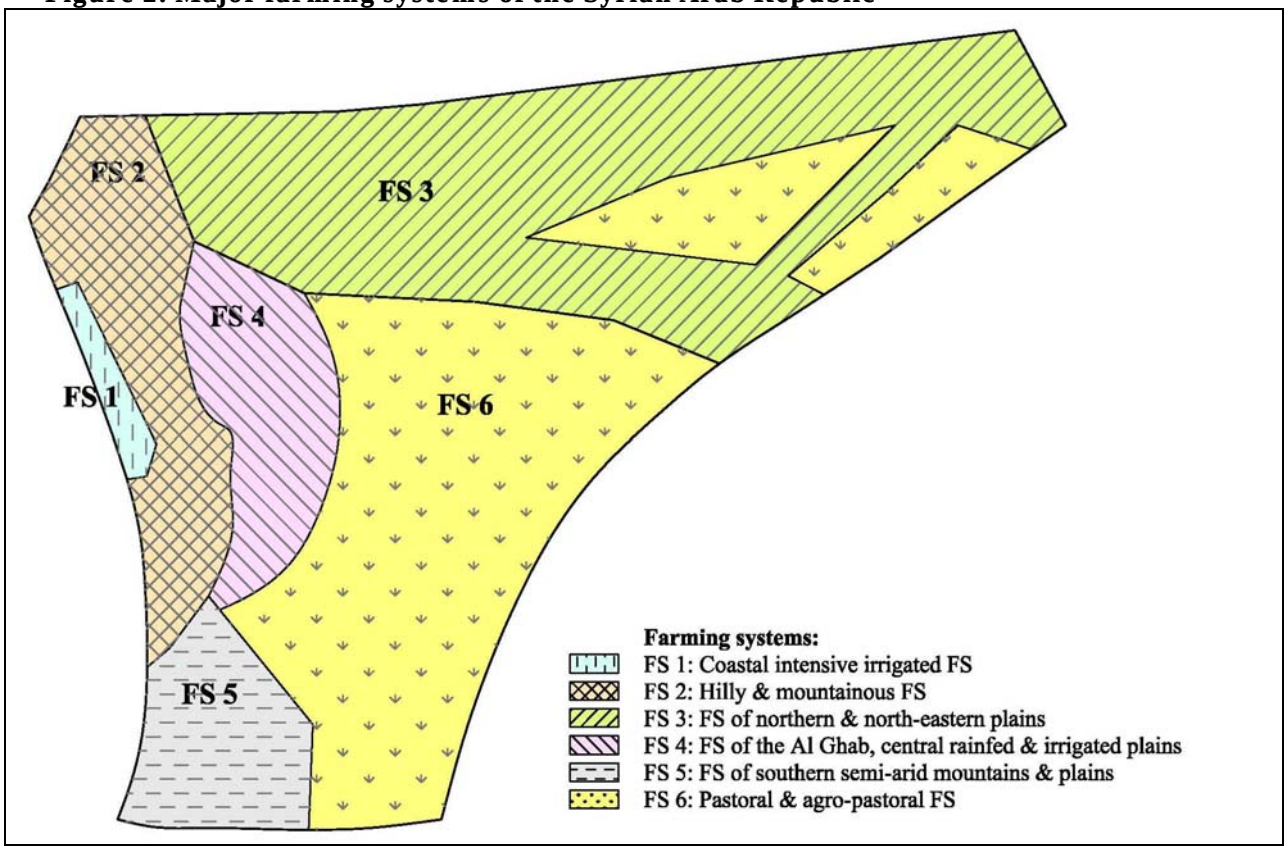
Zone 1: With annual rainfall over 350 mm the zone is divided into two areas:
a) Those with annual rainfall over 600 mm. where rainfed crops can be successfully planted.
b) Those with annual rainfall between 350- 600 mm and not less than 300 mm during two thirds of the relevant years i.e. it is possible to get two seasons every three years and the main crops are wheat, legumes and summer crops.
The area of this zone is 2,701,000 hectares and forms 14.6 percent of the country's area.
Zone 2: It has an annual rainfall between 250 - 350 mm and not less than 300 mm during two thirds of the relevant years i.e. it is possible to get two barley seasons every three years and in addition could be planted with wheat, pulses and summer crops. The common rotation in this zone is:
- On deep soil: wheat-pulses and forage legumes – a summer crop is planted if winter rain is sufficient, otherwise fallow will take the place of summer crop.
- On shallow soil: mainly barley, but part of the land is planted to cumin. Fallow is rare.
The area of this zone is 2,470,000 hectares and it forms 13.3 percent of the country's area.

Zone 3: It has an annual rainfall of 250 mm with not less than this amount during half of the relevant years i.e. it is possible to get one to two seasons every three years and the main crops is barley, although legumes could be planted. Fallow is practiced in case of capital shortage. The area of this zone is 1,306,000 hectares and it forms

7.1 percent of the country's area.
Zone 4: It has an annual rainfall of between 200- 250 mm with not less than 200 mm during half of the relevant years i.e. it is good just for barley, which in some years is grazed as the yield is too low to harvest. Fallow is practiced in case of capital shortage. The area of this zone is 1,833,000 hectares and forms 9.9 percent of the country's area.
Zone 5: (Desert and steppe) this area covers the rest of the country's land. It is not suitable for rainfed planting. The area of this zone is (10,208,000) hectares which forms 55.1 percent of the country area. It is natural grazing for sheep and camels. Source: adapted from MAAR annual statistics.

The following Figure 2 presents the six major farming systems of Syria as a result of the literature review, analysis of geographical distribution by administrative units, agroclimatic considerations and discussions with local experts. Some adjustments to the initial system boundaries were effected as a result of the field work.

Figure 2: Major farming systems of the Syrian Arab Republic



Farming system 1 corresponds to the coastal region of Syria, marked by high population density and commercial farming of few crops under private production and marketing regime, mostly citrus and greenhouse cultivation.

Farming system 2 is dominated by hills and mountains with relatively high rainfall levels. The sloping terrain and agro-climatic conditions created a smallholder dominated agriculture based on temperate and Mediterranean tree crops, the most important one being olives, but including apple, cherries and other trees and tobacco as the most important regulated crop.

Farming system 3 is marked by vast plains and is characterized by the largest average farm sizes in Syria. The system is dominated by crops, which are considered strategic by GoS, but particularly under rainfed conditions a number of spices and leguminous crops are important as well.

Farming system 4 reflects the central plains and undulating land of central Syria along the major international road and is composed of a diverse zone of highly market integrated agricultural communities. This is a highly differentiated farming system, due to the long exposure to market opportunities and favourable market access.

Farming system 5 corresponds to the southern mountains and plains, with a commercial agriculture based on traditional farmers but a strong influence of agricultural investors. Agro-ecological conditions have led to the development of several sub-units with field vegetable, cereal-chickpea and orchards as the lead crops. A marginal cereal zones is included on the rain-shadow of Sweida mountain.

Farming system 6 is dominated by pastoral landuse of marginal and arid lands, with a transition to the neighbouring agricultural system of agro-pastoral land use. A limited number of irrigated niches based on well irrigation exist within its perimeter.

The remainder of this chapter presents in some detail the main characteristics of each of these farming systems, including the sub-systems, which were defined and analysed in the course of this study. There reader particularly interested in one of these farming systems should obtain the specific report about this system for a more detailed treatment.

FS 1: Intensive Irrigated Coastal Farming System

Description of the system

High population densities and intensive land use on smallholdings with an extremely high dominance of fruit trees and greenhouse cultivation mark the coastal area of Syria[3]. The latter is encouraged by the favourable climatic conditions with mild winters, high humidity and average rainfall levels of 600 to 800 mm on almost flat land in combination with good infrastructure. This combination of factors creates a unique environment for intensive farming in Syria and requires its separate treatment as a broad farming systems zone, despites its small size of only 142000 hectares or 0.8% of Syria (estimated using the 100-meter altitude line as boundary).

There is some differentiation in cultivation along the coast from west to east, where environmental factors lead to a decrease of the dominant irrigated crop (greenhouses and citrus) towards the east and a subsequent substitution with olives. Areas above 100 meter above sea level are therefore considered under the mountain farming system, as it delineates the increasing prevalence of olive cultivation and sloping terrain.

Given the high water availability and absence of edaphic restrictions, the share of cultivated and land under crop[4] in the total land belonging to the Farming System is the highest of all major farming systems. More than 50% of the system area is considered cultivable, where the relatively low rate is explained by approximately one quarter of the area being classified as forest and the high share of land under infrastructure. Almost the entire cultivable land is presently under cultivation (i.e. 71000 out of 74000 hectares).

The rural population within the zone is estimated at approximately 366000 (CBS estimates, excluding Lattakia and Tartous city), equivalent to 3% of the rural population of Syria. the two Muhafazat of Tartous and Lattakia cover a portion of the local demand on agricultural production, particularly fruit and green house production. The high market integration and vicinity of cities has led to a high integration of the agricultural with the non-agricultural economy within the zone and a high share of farmers being engaged in off-farm employment. Off-farm income plays an important role for smaller farmers, and the share of farmers for which agriculture is only a secondary activity is high. Seasonal immigration of casual labour for the harvesting season is considerable, while some full-time agricultural employment exists on larger farms and partly in share cropping arrangements.

[3] This section has been prepared with reference to the individual farming system report prepared by Akram Shhaideh, which is available as a separate working document from NAPC.

[4] Cultivated land according to the latest definition of MAAR includes rainfed, irrigated as well as fallow land. Land under crops is the actually cultivated land during the year.

Table 3: The intensive irrigated coastal farming system (FS 1) and its sub-systems in the national context

	Syria	% of	FS 1	% of	SZ 11	% of	SZ 12	% of
	Area	National		national	South	national	North	national
Area (ha)	18517971	100%	141557	0.76%	57388	0.31%	84170	0.46%
Rural Population (No.)	8531000	100%	373422	4.38%	186365	2.18%	187057	2.19%
Holders (No.)	938748	100%	54618	5.82%	24785	2.64%	29833	3.18%
		Avg. Holding (ha)		Avg. Holding (ha)		Avg. Holding (ha)		Avg. Holding (ha)
cultivable l.(ha)	5911020	6.30	74517	1.36	38640	1.56	35877	1.20
cultivated l.(ha)	5420656	5.77	70909	1.30	38640	1.56	32269	1.08
	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land
land under crops (ha)	4590899	84.69%	70262	99%	38640	100%	31622	98%
a) of which rainfed (ha)	3258115	60.11%	42582	60%	22429	58%	20153	62%
of which irrigated (ha)	1332783	24.59%	27680	39%	16211	42%	11469	36%
b) fallow (ha)	829757	15.31%	647	0.9%	-	-	647	2%
Main crops								
Rf. Olives	460535	8.50%	31149	43.9%	18328	47.4%	12821	39.7%
Ir. Citrus	28095	0.52%	25375	35.8%	8623	11.2%	16752	51.9%
Ir. Cucumber	6485	0.12%	1969	2.8%	1734	4.5%	235	0.7%
Ir. Tomato	12337	0.23%	1420	2.0%	355	0.9%	1065	3.3%
Greenhouses	2398	0.04%	2356	3.3%	2012	5.2%	344	1.1%
Total	509850	9.4%	62269	88%	26771	69%	31227	97%

Source: constructed based on MAAR statistics for 2002.

The broad farming system is therefore characterized by intensive, commercial market integrated farming combined with importance of off-farm income. Off-farm income plays an important role for smaller farmers, and the share of farmers for which agriculture is only a secondary activity is important.

Land under crops at the level of the farming system, which is almost identical to the invested land due to the negligible size of fallow land, is used to 44% for rainfed olive, 36% for citrus and almost 5% jointly by field cucumber and field tomato cultivation[5]. Other vegetables of minor importance at the national level are produced to an even higher percentage within the farming system, such as squash and eggplant, among others.

[5] The statistics underlying these estimates are only available at the Mantika level. Due to these constraints in the differentiation of crop statistics, the figures are based on an approximate distribution of areas within a Mantika, where boundaries between sub-systems needed to be defined within a Mantika. The same applies in some cases for boundaries between farming systems. In this particular case, olives have been distributed between this and the neighbouring farming system proportional to their area within the administrative unit. Crops, which clearly belong into one system, are obviously attributed directly to the correct systems or sub-systems zone. These figures could therefore be made more precise once data would be generated for example at the Nahia level.

Several factors have led to a differentiation within the coastal system from north to south. The southern part of the system is marked by a higher prevalence of green houses, which decreases when moving towards the north and especially north of Banias. This greenhouse orientation in the south is explained by a higher average temperature. Historically, many farmers from the southern part gained experience in the greenhouse sector when employed in neighbouring Lebanon and upon return, these skills were put into practice on their own land holdings. Parallel to the decrease of greenhouses to the north, there is an increasing dominance of citrus cultivation in the northern part of the system. The narrow part of the coastline on the border between the Lattakia and Tartous Muhafazat is the northern border of the greenhouse prevalence, leading to the very convenient coincidence between administrative borders and farming system boundaries. The distinguishing features of the resulting two farming systems are presented in the following table.

Given the small farm sizes and therefore plots not being distributed over large areas (except maybe in the large holding group), relatively simple cropping patterns at the household level are to be expected on the western side of the coast, with dominance of citrus centred farms in the north and higher importance of green houses in the south. Mixed farms of the latter, each associated with olives become more prevalent towards the east.

The specialization within the FS 1 is reflected in the share of greenhouses and citrus of the total system being produced in the two farming systems (see Table 4), which are relatively similar in size of cultivated land (38640 ha in the southern farming system, compared to 32270 ha in the north[6]). The total systems area shows olive as the highest share of cultivated land[7]. The cropping pattern varies within the farming system according to its general characterization, i.e. along the north-south axis through the lead crop (citrus versus green houses) and east-west (as more olives are added towards the eastern slopes and farm sizes increase. Given the land productivity of these crops, the actual farm size limit within the poor household group varies accordingly.

Table 4: Sub-division of FS 1 according to their crop specialisation

	% of national area in FS 1	% of FS 1 in southern, greenhouse based FS	% of FS 1 in northern, citrus based FS
Irrigated Citrus	90.30	34.6	66
Greenhouses	98.2	85.4	14.6
Irrigated Tomato	11.5	25.0	75.0
Irrigated Cucumber	30.4	88.1	11.9
Rainfed Olive	6.8	58.8	41.2

Source: constructed based on MAAR statistics for 2002.

It is interesting to note that the share of the national olive production area in FS 1 is very small (6.8%) due to the small size of the FS 1, and that the share of the total olive area of FS 1 between the two sub-systems is by far the smallest among all important crops of FS 1. This is explained by the general tendency for an increasing importance of olives towards the east in the northern and the southern farming system. However, considering the crops giving the name to each of the two farming systems within FS 1 the specialisation is clearly visible in Table 4. Almost 80% of

[6] The total land size in the north is 84000 ha compared to 57000 in the southern part, but the relative similarity in the cultivated land is due to the location of most of the systems' forest in the north.

[7] The resulting figure of 44% is an overestimation, though: for consistency of calculation methods, the Mantika olive areas are distributed proportionally to the share of the total land falling into the system.

the citrus of the FS 1 are located in the northern, citrus based FS and 85% of the greenhouse area of FS 1 are located in the southern, greenhouse based FS. A similar degree of differentiation can also be observed for the two main field vegetables, tomato and cucumber.

The important criteria to classify socio-economic groups within this system are the combination of cropping pattern, holding size and the very common non-agricultural income sources. These three factors were jointly considered to reach a household classification reflecting approximate annual income. There is a noticeable coincidence between the level of education and off-farm work opportunities in the zone, which allows determining the order of magnitude of off-farm income associated with the size of agricultural holdings. This approximate off-farm income stems from public sector wages at different salary scales, which were added to the average crop income. The holding size again is taken to coincide with the education level and hence off farm income levels, leading in this system to a close relationship between socio-economic groups and holding size classification.

Southern, greenhouse based farming system

The Greenhouse dominated farming system is located in the southern coast, where the northern border of Banias Mantika can be conveniently taken as its approximate border. The high prevalence of greenhouses gave name to the system, even though their share of 5.2% of the cultivated land in the farming system appears at first sight not extremely high. Due to the high land use intensity and production potential as well as labour requirements, this area dominates the agricultural activities of the greenhouse owners. According to official statistics, almost 80% of the greenhouse areas of 2000 hectares were devoted to tomato cultivation, followed in order of importance by cucumber, green pepper and eggplant.

The highest share of the cultivated land in the farming system is under rainfed olives (47%), particularly in the wider southern part of the plain and towards the east. The second important crop in terms of share of cultivated land is irrigated citrus (11%), even though this share is only a fraction compared to the northern farming system. The share of irrigated land in the farming system is 42% (i.e. higher than in the north, where it is only 35%). These large irrigated areas are to an important share used for irrigated field vegetables, which are another characterizing feature of the farming system. The main rainfed crops are olives and field crops.

The areas under field vegetables derived from existing statistics cannot be directly related to land areas being exclusively devoted to these crops. The first reason lies in the double cropping possibility of short season vegetables, and the second reason lies in their partial cultivation as a second crop under new young tree orchards. The recorded statistics indicate eggplant and squash as the most important field vegetables, each covering with slightly above 2500 hectares almost 6.5% of the cultivated land. The five most important field vegetables (eggplant, squash, cucumber, haricot and tomato) jointly occupy slightly above 22% of cultivated land.

The average holding in the southern as can be derived from the statistics and within the limits of attributing recorded crops within the sub-system boundaries appears the following. The cultivated land per holder is just below 1.6 hectares and with the assumed share under the main crops from above would cultivate 0.74 ha olives, 0.175 ha citrus, 0.35 ha field vegetables and own 0.08 hectares greenhouse areas (leaving 0.21 ha for other crops). The average holding size in the sub-system is only one fourth of the national average per holder (1.56 ha compared to 6.03 hectares cultivable land). During the field survey, these hypothetical household were differentiated into three household types.

Livestock plays a relatively little role in the farming sub-system due to the underdeveloped milk marketing system and little on-farm resources for forage production. Small numbers of dairy exist across the farm types, but are not distinguishing feature between the household types.

Household typology

The field assessment lead to a household classification based on official holding size statistics as a starting point and discussions about them in light of production orientation and off-farm income. The resulting size limits between the three household classes are 1.8 hectares and 3.5 hectares (18 and 35 dunums, respectively). These boundaries are the upper (respectively the lower) limit for what are considered the smallholdings or large farms in the study villages. As a result, 70% of holdings belong to the small household group, 19% are medium and 11% of holdings are considered large. The average cultivated land per holder in the southern farming system is 1.56 hectares, compared to 6.3 hectares as the national average per holder.

Small holdings are the vulnerable households within the system, who rely to about one third of their income on off-farm sources. Agricultural income is derived mostly from greenhouses (above 40%) and one quarter of income derived from citrus. Field vegetables and olives play a minor role as income source in this household type. In terms of cropping pattern, on average 40% of holdings are under greenhouses, 40% citrus and 10% each under olive and field vegetable. The latter crops yield due to the small holding size little marketable surplus.

In the last decade, the share of greenhouses has increased at the expanse of olives (changing percentages of their cultivated land from 10 to 40%), while the share of irrigated field vegetables contracted from 25% to 10%. Citrus had occupied the same share of land a decade ago (25%), but expanded to 40% presently. Several forces behind these changes have been identified, which affected all household types simultaneously, but had a different impact depending on the characteristics and vulnerabilities of each household type. Relatively high prices a decade ago created a strong incentive for citrus expansion, particularly once the expansion of biological pest control methods were available and reduced production costs. Where land became scarcer and agricultural income became not secondary to off-farm income, olives were not sufficiently productive to be maintained where it was not dictated by environmental reasons. In the transition period to the expansion of citrus, the space between the young trees was initially used for irrigated field vegetables (tomato, cucumber, pepper, eggplant, beans, peanut).

Some variation in the holdings of this type depends on the population density variation in the sub-system. In the narrow plain around Banias, smallholdings are considered those below 0.6 hectares of holding size with a high reliance on greenhouses, while in the southern part holdings even of this group are at the upper group limit and olives as extensive crops occur.

Off-farm income sources are public sector employment, while some farmers also engage in skilled agricultural labour such as pruning in orchards within and in the neighbouring farming systems. The specific vulnerability of this household type lies in the low capital endowment, which limits their possibilities to counter the climatic and especially the price risks of citrus and greenhouse cultivation. The former has seen a trend to declining prices with area expansions, while the high price fluctuations of greenhouse crops make capital loss a real possibility. The developed skills cannot easily be diverted to new activities, according to the perception of the farmers and lack of information is a constraint to diversification into new markets, especially for small producers. At the same time, family labour can be employed in greenhouse cultivation with some flexibility during the day, which can be better combined with off-farm employment than field crop activities. Due to the little credit securities of the smallholders, they often face difficulties to restart their business after a year of loss, as external capital is not easily available to them. Traditional creditors (especially input traders) are said to have withdrawn from credit provision due to their inability to recover their loans with declining margins from vegetable cultivation[8]. The relative importance of citrus has increased due to the increasing areas and the lesser susceptibility of extreme price fluctuations. Smallholders are at the same time not well

[8] No detailed analysis of the vegetable trade allowing the interpretation of changing margins over time is yet available. In the context of the present study, a review of the impact of credit availability for vulnerable households would be particularly desirable.

prepared to exploit niche possibilities in marketing, classification and specialized markets such as the export market on their own.

Medium households (1.8-3.5 hectares) are the second largest group of farms in the sub-system. These households derive the most important part of their income from greenhouse cultivation (above 40%), but off-farm income remains also very important in this group (almost 30%), while citrus and olives contribute equally to the rest (i.e. approximately 15% each). Field vegetables are not significant contributors to average family income at present.

From a cropping pattern perspective, the largest share of this land is cultivated at present with olives (45%), followed by greenhouses (30%) and citrus (20%). Field vegetables are complementary on average (5%). The most significant changes in the cropping pattern over the last decade consist of the expansion of greenhouses (from 10% to 30%) and citrus (10% to 20%) at the expense of field vegetables (from 25% to 5%) and olives (55% to 45%). The field vegetable cultivation was outcompeted by the expanding cultivation on larger areas in the south of Syria (FS 5).

Some specialization in function of the relative land scarcity within the farming system can be observed and complementary crops in some areas are wheat and barley or field vegetables and open field bananas. The development of the special crops will depend on the spread of knowledge, market development as well on the availability of special inputs and credit in the future.

On-farm labour use within this household type is still family labour, but due to the higher employment potential of the larger farms, the role of off-farm income is lower than in the smallest household type. Some employment is created in this household type for peak labour and skilled operations, such as pruning of orchards or olive harvesting in the larger of the farms of this group. Irrigation is labour demanding in citrus and field vegetable cultivation, as flood irrigation is still the dominant water provision method.

Better-off household types make up approximately one-tenths of households in the sub-system. On average, they derive a relatively similar share of livelihoods from greenhouses (35%), off-farm (30%) and citrus (25%), with olives as complementary source of income (10%). This includes, however, farmers without off-farm income in the southern part of the system area as well as absentee owners in other parts. The latter reside in the urban centres of the zone and supervise farms through local agents.

The largest share of cultivated land (exceeding 3.5 hectares in that group) is under olives at present (40%), followed by citrus (35%) and greenhouses (20%). This reversal of income and area increase the land use intensity and the limited possibility of larger holdings to manage very high shares and crops characterized by high input requirements (capital and labour) as well as high risks. Citrus is suitable for this household type for the application of management skills for both local as well as export markets and specific marketing arrangements are partly sought, whereby traders buy the crops on the trees and provide even the labour for harvesting. In these cases, sorting and packaging are additional operations, which may be performed by the traders as well as some advanced farmers.

The largest shift in the cropping pattern of these households occurred by their reduction of field vegetables, which occupied a decade ago in the study villages a third of the cultivated land of better-off households, compared to 5% at present. Greenhouses doubled their share in cultivated land (from 10%), but are surpassed by citrus, which expanded from 10% to 35% over the last decade.

The reasons for these changes have been given for the other household types. The better-off households are better positioned to strive in the changing market conditions of greenhouse and citrus cultivation as the other household types. Securing credits is less of a difficulty and even in the highly fluctuating prices of greenhouse vegetables, they continue to stay in business after a

season with production losses. Price information is better accessible for these farmers and absentee owners in the urban centres can provide it directly and organize marketing. Similar business management advantages and links to traders exist for the marketing of citrus, where technical supervision of daily operations can be delegated relatively easily to local managers.

Differences between the household types are related to the type of land under their ownership, where larger farms in the rainfed areas focus necessarily on olives and field crops, as small rainfed holdings under these conditions are unviable (remembering that even large farms in the context of this farming system are relatively small). The range of holdings sizes under irrigated conditions is larger and many smallholders are engaged in the irrigated crop production. The modernization of the irrigation systems is most advanced among the large holdings.

The example of the expansion of greenhouses in the last two decades is a positive example where the state has developed support policies of investments, which had previously been successfully implemented through private sector investment. Licenses for greenhouses were introduced, but as their main practical implication was to obtain credit through the ACB for licensed greenhouses, only part of the farmers was interested in the license. Theoretically, the license also entitled to subsidized fertilizers. However, the State institutions did not deal with specialized inputs for greenhouse cultivation, so private traders mostly imported these fertilizers and pesticides. These also provided an important share of the required credits.

Plastic tunnels are a rapidly expanding cultivation practice for vegetable cultivation, as they are easy to apply with some basic technical knowledge and result in the possibility to supply the market before the bulk season of traditional field vegetable cultivation. The resulting price premium will ensure a rapid expansion, until a balanced market has resulted. Price fluctuations in the future are, however, to be expected and some negative effects and financial losses could be avoided with a functioning price information system.

Northern, citrus-based farming system

The name of the northern system is based on the 52% of cropped land being farmed with irrigated citrus and is therefore among the farming systems with the highest share of land under a single crop. A more detailed analysis obviously reveals the diversification behind the citrus category, based on the mixture of orange, lemon and other citric plants, which are further differentiated by considering the mixture of varieties and their different characteristics. Citrus cultivation is followed in terms of area by rainfed olive cultivation, which covers 40% of land under crops. The most important other crop is irrigated tomato (3.3%), while intensive cultivation in greenhouses covers only 1% of cropped land. The share of irrigated land in cultivated land is 36% in the northern sub-system.

The almost 30000 holders[9] jointly cultivate 31600 hectares, resulting in an average of 1.08 hectares of cultivated land per holder. Considering the average family size in the area, the available cultivated land per person stands presently at 0.08 hectare per person, which gives a clear indication of the limits to continued dependence on agricultural income for the population of the sub-system.

Applying the same criteria for the household typology, the three household types resulted in 75% belonging to the smallholder group, while 14% have holding sizes between 1.8 and 3.5 hectares and only 11% of holders operate larger farms. A north-south differentiation of the population coincides with the variation of the distribution of smaller and larger holdings within the sub-system.

[9] The detailed figures quoted in the text are taken from the summary table at the beginning of the chapter.

Smallholdings are mostly focussing on the cultivation of citrus and greenhouses with smaller field vegetable areas[10] and own holdings of between 0.5 and 18 dunums. The cropping pattern of a typical household for the northern sub-system includes a 50% share of cultivated land under citrus, followed by 30% greenhouses and 10% each of olives and field vegetables. This present situation is the result of importance changes for all major crop groups in the last decade. The share of greenhouses has doubled to 30% and the share of cultivated land under citrus increased from 30% to the earlier mentioned 50%. Both expansions occurred at the expense of the traditional field vegetables (25% to 10%) and olives (30% to 10%). Particularly the latter is a clear indication of the intensification of land use in this household type.

The land use intensity and the share of holdings under different crops explain the relative importance of the different agricultural income sources. The low percentage of cultivated land under minor crops combined with extremely small holding sizes leaves no relevant marketable surplus of olives and field vegetables. Farmers therefore usually did not mention them as a relevant source of income. The highest share of income stems from citrus (40%), followed by off-farm income (30%) and greenhouses (20%). Surprisingly, livestock income was mentioned as a relevant category, which did not appear in the southern sub-system.

Medium households follow a very simple cropping pattern and cultivate presently 70% of their cultivated land with citrus and the remainder with olives (30%). This is a trend similar to the smallholders and the difference is only scale. A decade ago, this group states to have had 40% citrus and 50% olive orchards and field vegetable cultivation still occupied 10% of their land.

The new cropping pattern is reflected in the composition of livelihood sources, which is dominated by citrus sales (60%), followed by off-farm income (30%) and olive sales (10%). The average picture obscures, however, the importance of absentee ownership even in the middle household type of this sub-system. In order to reduce the supervision costs, relatives are frequently managing these farms. Where the owner is not resident in the towns, farm income is complemented -particularly in the eastern part of the system- by investing in service provision to the agricultural sector, such as cars for transport or small input supply shops.

The family labour in this household type is mostly absorbed by citrus cultivation (partly because of the additional labour required for the prevailing flood irrigation), with olive occupying the second rank. A limited amount of labour is being generated for skilled casuals in this household type for the pruning for orchards, while unskilled labour for weeding is largely carried out with family labour.

The better-off households have converted an even larger part of their cultivated land to citrus orchards and have uprooted old olive orchards in the plains (now 90% citrus from 40% a decade ago compared to now 10% of olives compared to 60% in the past). As many better-off households are mostly full-time farmers, the share of income is largely identical to the production orientation. However, absentee ownership is also an issue in this group and given their higher education level, they engage in a range of different urban activities. The importance of off-farm compared to farm income is highly variable and no typical pattern could be identified.

Household differences: Given the limits to increase farm income from extremely small holdings within the present range of activities known to farmers, the perspective for the medium future (and pressure on average holding size) lies in the expansion of off-farm income. Public sector work, despite mentioned low salary levels appear to be preferred, either by lack of alternatives or partly because such employment is more commensurate with maintenance of the farms.

[10] Jableh Mantika is somehow a special case, as holdings there are particularly small and the cultivation of field vegetables under plastic tunnels has become a characteristic approach to avoid price collapse in the peak production season of traditional field vegetables.

Larger farms, especially where irrigation is available, have little available capacity for off-farm work if they are their own farm managers.

Citrus issues: Citrus cultivation was originally promoted primarily to satisfy local demand with exports being envisaged only for surplus production. The initially high prices generated considerably interest in the farming community and cultivation expanded rapidly. This initial situation allowed farmers to bear the costs of relatively high input prices, particularly for specialized pest treatments. The price decline associated with production increases was successfully balanced with the benefits from public investment in integrated pest management said to have reduced production costs. Nevertheless, the continued price decline, particularly at the peak season, tends to encourage different adoption mechanisms at the farm level. Over time, the markets for citrus became more differentiated and the originally adopted attitude to expand into any citrus crop leaves farmers relatively possibilities to react to changing markets. In recent years, farmers have tried to re-adjust their earlier choice of citrus species and varieties. The change in variety requires additional investment and the possibilities to wait for new trees to reach the production age. This compares to continued acceptance of price risks with planted varieties. Small farmers have little possibilities than to accept lower prices as they often feel unable to accept loosing production. Medium and large holdings, however, have started to shift to new crops, such as Yafawi and Nawal in the northern part as well as Lemon and Mandarin in the south.

Trends and development options

The coastal farming system is dominated by a high reliance on crops under free market arrangements, with strategic crops being of relatively little importance. This has created a farming community, which is used to dealing with the risks and opportunities of private choice in production orientation. The interest in replicating successful experiences has led the development of relatively homogenous sub-systems, stimulated in the north by Government promotion of citrus through nurseries, complemented in the south by farmers interested in applying their skill learned as employees in the greenhouse sector of Lebanon.

This process of increasing orientation on the above crops has coincided with the replacement of other crops from the system, most noticeably olives, which were at the same time expanded on the lower slopes of the coastal mountains. Important infrastructure investments by the GoS in recent decades included most noticeably public infrastructure, but also irrigation infrastructure and modern irrigation methods and technical innovations, which are reported in more detail in the individual farming system report.

Farming citrus and greenhouse crops as the main source of agricultural income has led to the specific risk exposures inherent to these crops. Both elements are relatively immune to changing price policies of strategic crops, which affect many other farming systems. The specific risks are high price volatility of vegetables in the southern part of the system, which results in high profits in one year but major losses possibly in the year after, where farmers face the difficulty of spreading risks over time. This particularly affects small farmers with one or two greenhouses. This type of producer is restricted from two factors to pursue the possible risk aversion strategies available to larger producers. Increasing the number of crops is difficult as their volume of production is becoming too small and the crop management needs would increase disproportional if hired labour is used. The reasons why this group is not systematically applying scheduled planting of their crop or the extent to which farmers relying mostly on family labour (i.e. operate without the constraint of supervision costs) cannot successfully pursue such a strategy are unclear. Nevertheless, according to the field study, capital constraints caused by earlier years with financial losses of production and lack of credit access restricts the possibility of small farmers with no private capital access to start cultivation in some years. Informal credit markets, often through input suppliers and hidden as in-kind credit against fees/commissions are frequently the sole access to working capital for poor farmers in the greenhouse dominated sub-system.

For the medium to larger holders, however, such diversification would be possible and could then later on spread to smaller producers. Such diversification of vegetable production should include new varieties and species to meet increasing consumer demand in what is now off-season production. This would prevent at the same time overproduction in the peak season. The large-volume tomato market offers considerable additional potential for differentiated production. However, it would require associated policies related to the import or local production of certified seed, among others.

In the citrus dominated northern part of the coastal farming system, a long-term decline in prices is added to the seasonal price variation, which is caused by the expansion of citrus over the years. The adjustment possibilities are limited to the shifting of harvesting periods, while the pressure to consider the shift in production is mounting. Asset fixity is the common risk in perennial crop cultivation and the gradual opening of export markets may partly reduce pressure.

The long-term trend of declining farm sizes is the common issue in all farming systems of Syria, but based on the present average farm size the situation is particularly acute in the coastal farming systems zone. Average holding sizes in the system are similar to those in Al Ghab, but the situation is better on the coast in the sense that off-farm employment opportunities are much better accessible than in Al Ghab. As the employment possibilities in the non-agricultural sector expand less rapidly than demand for it and it is expected that the expansion of employment in the public sector has reached its peak, pressure to identify productive employment possibilities will over time probably mount.

The development options of the different household type depend on the resource endowment and the underlying development trends and policy and market induced new opportunities. The underlying trends include the increase of the population resulting in decreasing farm sizes and the increased competition of traditional crops of the system with changing production patterns in other farming systems of Syria. Particularly the expansion of olive cultivation at the national level increases competition, but will affect the coastal farming system relatively little as olives have already been replaced to a considerable extent by other crops. Small households will focus on increasing the land use intensity, for which greenhouses are particularly suited. However, initial investments are high; available savings are usually insufficient and credit is therefore the main constraint to such a strategy, if off-farm employment is not available to accumulate savings. Considering the frequent unavailable title deeds and low level of collateral availability makes the investment into this option a similar constraint for greenhouses in the south as it does for investing into improved citrus varieties in the northern sub-system. In absence of policy support of credit and skills development for improved practices (including financial management skills), marginal producers will necessarily increasingly rely on off-farm income and partly need to exit the agricultural sector.

At the same time, medium and larger holdings have considerable scope of diversifying their production and improving the quality of produce, especially for that part of production destined for new international markets. These diversified products should in both household types and sub-systems include new crops and even more importantly new varieties to supply the increasingly differentiated local markets. These producer types have the available skills to benefit from technical improvements in crop management and productivity stimulating measures such as the use of liquid fertilizers and modern irrigation in greenhouses. Citrus cultivation could benefit from increased quality focus in production, including grading and closer integration with traders to respond to market opportunities more rapidly. Medium size producers are aware of the limitations for increased agricultural income due to the increasing land scarcity and commonly seek to complement farm with off-farm income, often by seeking public sector employment for increased job security.

Increased labour availability within the system will tend to reduce in the future the traditional absorption capacity for casual labour from neighbouring systems, as then a higher share of the

farm operations are performed by family labour. This is particularly the case in the small and medium holding size categories and if labour requirements for irrigation and weeding are reduced as a consequence of expanded use of modern irrigation methods (sprinkler and drip irrigation). This would increase the self-employment potential within the system, at least should the estimates of local experts about some new potential crops (avocado, banana and strawberries) hold up to more detailed analysis.

Credit access is a general concern expressed across all farming systems and the low share of strategic crops in this system exclude most crops from soft financing arrangements through the Agricultural Cooperative Bank. Procedures of commercial credit are very cumbersome and particularly land reform land is not acceptable as security, and the available informal private arrangements provide financing only on extremely expensive terms. This limits the flexibility especially of the poorer socio-economic groups to adjust to new opportunities.

From a society point of view, some environmental issues are also of increasing concern. Farmers have acknowledged the opportunities offered by commercial production of intensive crops across the systems zone. Especially the intensive cultivation of greenhouses threatens however at the same time its own long-term sustainability. The environmental impacts of the intensive use of fertilizers and chemicals needs careful monitoring. The primary risk of chemical applications in greenhouses as well as in field vegetable cultivation is the lack of consciousness of using protective clothing. A second concern relates to the deficient facilities for the proper treatment of used packaging material and cleaning of spraying equipment, which might threaten water flows. Monitoring of waiting periods after pesticide application could be a useful contribution to ensuring the access to export markets, as it could benefit the consumers. The intensive use of fertilizers could potentially become a threat to the aquifers, especially in the greenhouse-dominated part of the system, for example through the infiltration of nitrate. Indications are that the GOS has already given attention to these potential issues by envisaging the establishment of a laboratory suitable for monitoring the above issues.

In summary, the system includes a large number of relatively educated and commercially minded farmers, who can contribute to the further rural development of the coastal system through the potential for export earning generation as well as increasing linkages to the processing sector. This potential has not yet been fully exploited due to some limitations in using all the land for guaranteeing credits and the not sufficiently transparent price information for spreading the production and price risks. Poverty levels in the system are so far relatively low compared to other major farming systems zones, but the pressure will raise if off-farm employment generation will fail to absorb new generation of job-seekers.

At the same time, offered future development options need to properly consider the specific risks associated with the development strategies in the northern and the southern farming systems. While the northern focus on citrus represents asset fixity of a high share of earlier investment. In the southern system, in contrast, investments are often in technical infrastructure such as greenhouses, which allows more flexibility to use if for different crops depending on skills and market expectations. At the same time, farmers following the greenhouse strategy and hence intensive crops on much smaller areas are forced to accept high market (and weather) risk as part of the agricultural strategy.

FS 2: Hilly and Mountainous Farming Systems

Description of the system

The Mountainous and Hilly Rainfed Farming System[11] is marked by a dominance of perennial crops adapted to the relatively humid conditions with a cold winter climate. The relatively high population density results in a small average holding size and a high dependency on off-farm and non-agricultural income sources. Livestock is of relatively little importance in the farming system due to the lack of grazing areas. The system includes approximately 1.2 Million hectares (6.5% of national area) in the mountain range and adjacent hills from the Turkish border in the north to the area west of Damascus. Its 2.1 Million rural dwellers represent 15% of the national rural population and with 265000 about 28% of the total Syrian agricultural holders. The only major city falling into the system area is Idleb, which lies at its western border. Concerning the geographical position, the farming system is bordered by the coastal plain and the Lebanon Mountains in the west and the Al-Ghabs and Aleppo plains in the east.

The main traits that characterize this system are the dominance of hills and mountains, the heavy dependence on the rainfall for agricultural production and the prevalence of tree crops. In addition to the above, a factor that also contributes to distinguish this farming system from neighbouring systems is the significant share of non-agricultural income of households of average size and their generally small farm size.

The system cultivates a high share of the national area under agricultural commodities such as rainfed olive (61%), Apple (37%) and Tobacco (85%), as well as of some crops of minor importance at the national level, such as Cherries (57%), Pomegranates and others.

The share of non-agricultural families is low, which highlights the rural characteristics of the farming system, even though some are part time farmers. Table 5 shows the system's population and number of families and their respective share in the national figures as well as the area and share of cultivated land under the five most important crops, whereby the selection of these crops is based on their importance at the level of the main farming system (FS 2).

High mountains with steep slopes and moderately high hills characterize the system. Uncultivable land accounts for 51% of the total system area, which is mainly related to the high share of land under forest (one quarter of the total area), while less than 1% is covered with pastures and 20% covered with buildings and infrastructure).

All above factors have limited the cultivated area, which is approximately 0.54 Million hectares, accounts for 10% of the total cultivated area in the country and 45% of the system's total area. Moreover, the noticeable fallow area (12700 hectares) accounts for 1.5% of the total fallow in Syria and 2.4% of the cultivated area in the system. Furthermore, the dominance of narrow terraces especially in the coastal mountains and the prevalence of rainfall water source (81% of the cultivated area is rainfed land) has highly determined the nature of the agricultural sector in the farming system.

[11] This section heavily draws on the report prepared for the individual report on this farming system prepared by Firas Yassin and available as a separate working document from NAPC.

Table 5: The Hilly and Mountainous Farming System in the National Context

	Syria	% of	FS 2	% of	SZ 21	% of	SZ 22	% of
	Area	National		national	Hilly FS	national	Mountain.FS	national
Area (ha)	18,517,971	100%	1,194,849	6.45%	469,341	2.53%	725,508	3.92%
Rural Population (No.)	8,531,000	100%	1,306,728	15.32%	318,895	3.74%	987,833	11.58%
Holders (No.)	938,748	100%	265,001	28.23%	89,200	9.50%	175,801	18.73%
		Avg. Hol-		Avg. Hol-		Avg. Hol-		Avg. Hol-
		ding (ha)		ding (ha)		ding (ha)		ding (ha)
cultivable l.(ha)	5,911,020	6.30	586,205	2.21	274,518	3.08	311,687	1.77
cultivated l.(ha)	5,420,656	5.77	540,409	2.04	272,964	3.06	267,445	1.52
	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land
a) land under crops (ha)	4,590,899	84.69%	527,693	98%	270,927	99%	256,766	96%
of which rainfed (ha)	3,258,115	60.11%	438,532	81.1%	230,824	84.6%	207,708	77.7%
of which irrigated (ha)	1,332,783	24.59%	89,161	16.5%	40,103	14.7%	49,058	18.3%
b) fallow (ha)	829,757	15.31%	12,715	2.4%	2,037	0.7%	10,678	4.0%
Main crops								
Rf. Olives	460,535	8.50%	279,438	51.7%	173,676	63.6%	105,762	39.5%
Rf. Wheat	917,040	16.92%	57,410	10.6%	25,445	9.3%	31,965	12.0%
Ir. Wheat	752,488	13.88%	24,434	4.5%	16,949	6.2%	7,485	2.8%
Rf. Cherry	20,706	0.38%	11,769	2.2%	5,538	2.0%	6,232	2.3%
Rf. Apple	30,097	0.56%	11,174	2.1%	0	0.0%	11,174	4.2%
Total	2,180,866	40.3%	384,226	71.1%	221,608	81.2%	162,618	60.8%

Source: constructed based on MAAR statistics for 2002.

Analysing the dominant crops at the level of the main farming system as shares of the cultivated land results in the inclusion of three perennials among the five most important crops, i.e. olives (52%), cherry (2.2%) and apple (2.1%), the latter two are however exceeded in terms of cultivated land by wheat (rainfed: 10.6% and irrigated: 4.5%).

At the level of the sub-divided zone into two sub-units, i.e. the hilly and the mountainous farming system, indicates a much stronger share of cultivated land under olives in the hilly farming system (64%). The mountainous farming system includes all the apple area (4.2% of cultivated land there), a larger share under cherry (2.3%) and a somewhat higher share under wheat (12%).

This differentiation is clearly depicted when reviewing the share of FS 2 of these main crops located in each of the two sub-systems (see Table 6). It has to be kept in mind, that the mountainous farming system contains also 85% of the tobacco area of Syria, even though the 9281 hectares (of the 10915 hectares of Syria) amount to only 1.7% of the cultivated land, hence do not figure among the five most important crops. The majority of this tobacco cultivation occurs furthermore in the mountainous farming system (83% or 7688 hectares).

Table 6: Sub-division of FS 2 according to their crop specialisation

	% of national area in FS 2 on the country level	% of FS 2 in hilly FS on the system level	% of FS 2 in mountainous FS on the system level
Rf. Olives	60.7	62.2	37.8
Rf. Wheat	6.3	44.3	55.7
Ir. Wheat	3.2	69.4	30.6
Rf. Cherry	56.8	47.1	52.9
Rf. Apple	37.1	0.0	100.0

Source: constructed based on MAAR statistics for 2002.

The farming system is basically market oriented, the produce of which is partly exported across the borders or to Damascus. Due to considerable differences in agro-structural characteristics caused by agro-climatic conditions, the system is divided into two sub-systems and two additional niche systems. The Hilly farming system and the Mountainous farming systems are both rainfed sub-systems. In addition, two niche systems within the Mountainous sub-system have been identified and studied, i.e. the irrigated Pomegranate and the Tobacco niche system.

Hilly farming system

Characteristics

The Hilly (Rainfed) Farming System stretches from the northern border with Turkey through the coastal mountains to Rural Damascus Governorate. It is identified because of its ecological and geographical conditions, its cropping pattern and households types. This sub-system of FS 2 is characterized by rainfall dependence for cultivating the dominant perennial crops, essentially olive orchards. The area includes parts of four Mantikas (Ariha, Idleb, Haem and Ifren) in Idleb and Aleppo governorates. The prevalence of small farms on often steep slopes and the importance of non-agricultural income sources characterize the rural livelihoods in this farming system.

This farming system encompasses a total are of 470000 hectares and is therefore much smaller than the mountainous farming system in this major farming system. The 89000 holders of the hilly farming system operate on average on 3.06 hectares of cultivated land, containing no fallow land. The cultivable land per holder in this farming system is only approximately half the figure at the national level, indicating the high rural population density. Almost two-thirds (64%) of the cultivated land is under rainfed olives, while slightly less than 10% is cultivated with wheat.

Furthermore, the general characteristics of this farming system are reflected in its importance at the national level, as this area supplies the national market with 31% of the Syrian olive production, 24% of cherries and 64% of the total Syrian Kaki production.

The conditions for agricultural production, such as holding sizes, soil quality and edaphic characteristics are relatively unfavourable compared to other farming systems. The area is dominated by small holdings and plot sizes, steep slopes, narrow fields and shallow soils. Rainfed farming dominates and working capital is a constraint as credit availability is poor, particularly for the poorer population strata. In addition, the sub-system is self-sufficient in agricultural labour and the seasonality of many agricultural operations generates a high labour surplus. Therefore, the hilly farming system contributes significant seasonal labour to other systems, including skilled agricultural labour for the pruning of perennials in the coastal farming system. As these operations increasingly fail to absorb the available labour, the local population also enters the external labour markets.

Household analysis

The main criteria for the classification of households into socio-economic groups within the sub-system include the land size holding, the number of livestock, eventual other assets and annual income. Accordingly, the three household types (poor: 60%, medium: 28% and better-off: 12%) were analyzed in their living standards, changes over the last decade, farmers' future strategies and their reliance on agricultural and non-agricultural income. Within this system, poor farmers can expect to obtain an annual income of below SP 75000, compared with SP 300-500 thousand for the better-off farmers.

Given the different income sources of poor farmers, farm return and livestock production generate only 25% of their total income (of which 5% from livestock and the remainder from crops), while 35% comes from off-farm (casual work) and 30% from non-agricultural work. Another possible source of income for poor farmers is the work abroad, which offers on average about 10% of their total income. On the other side, better-off households, obtain a much higher share of their income from agriculture (40%), while non-agricultural labour obviously is negligible and trade or off-farm employment are importance contributors to income.

As a result, farmers' different sources and share of income highly affected their strategies for increasing their income and ensuring their food security. Poor farmers are oriented towards non-agriculture and off farm strategies, while better-off farmers focus on the agricultural intensification and diversification in addition to increasing their agricultural land. Moreover, in the case of poor farmers, exit from agriculture is another viable strategy, while better-off farmers still have the opportunity to acquire non-agricultural income.

Household strategies were strongly affected by the continuous changes within the broad farming system as at sub-system level. Major changes occurred in terms of cropping pattern, the livestock numbers and the importance of off-farm and the non-agricultural income. Decreasing livestock numbers and the areas planted to cherries are the main change, while non-agricultural income increased at the expense of off-farm income. In addition, increasing areas planted with olives in the sub-system and at the national level affects olive farmers due to increased marketing and pricing problems.

Mountainous farming system

Characteristics

The Mountainous (Moderate Rainfed) Farming System consists of a stretch of land extending over six Governorates, in the north from to the border with Turkey through Idleb, Lattakia, Tartous, Hama, Homs to Rural Damascus. This farming system encompasses a total are of 725000 hectares and is therefore much larger than the hilly farming system in this major farming system. The prevalence of small farm sizes is even more acute here than in the hilly farming system, emphasizing the importance of non-agricultural sources of income. The 176000 holders of the mountainous farming system reflect on average 1.52 hectares of cultivated land per holder, which is less than one-third the figure at the national level (5.77 hectares cultivated land per holder). Rainfed olives occupy in this farming system "only" 40% of the cultivated land, as it includes also more diversity in tree crops (apple, cherry, almond etc) compared to the sister-system in the hills. Wheat occupies a larger share in the cultivated land than in the hilly farming system.

The share of its typical products in the national agricultural sector reflects the importance of this farming system at the national level. It provides the national market with more than 30% of the olive production, 59% of apple production, over 80% of quince and 42% of cherries. Furthermore, this sub-system produces significant amounts of cash crops, such as 67.5% of the

total Syrian tobacco production[12]. Other important agricultural commodities like pomegranate, fig and almonds occur in small areas, in addition to crops destined for home consumption such as wheat, barley, lentil, onion, legumes, and vegetables.

Production is constraint by the small agricultural land area, the limitation to rainfed farming due to limited irrigation water sources and the unavailability of capital for many farmers (usually poor). The area is self-sufficient in agricultural labour force and contributes a significant share of the agricultural labour needs in neighbouring farming system. In order to increase the employment opportunities, particularly in the winter season, foreign labour markets play an important role in generation employment for the local population, such as in Lebanon and in the Arabic Gulf.

Household analysis

The analysis of the socio-economic structure within this farming system reveals a high share of absentees (20%), who keep their land in custody of relatives and move to the main cities or abroad in search of better opportunities. Assessing the socio-economic structure of the remaining rural population by defining three household types results in the following distribution: poor (60%), medium (30%), better-off (10%). The approximate income bracket of each household type according to local assessment indicate that poor farmers obtain approximately SP 50000-75000 per year (all income sources), compared with an average annual income of the medium household type of SP 100000-120000 and SP 200000-0.5 Million for the better-off farmers.

Given the different importance of non-agricultural income sources of poor farmers, farm returns and livestock production generate only 20% of the total income of this household type, while 40% is derived from off-farm (casual work) and 40% from non-agricultural work (including work abroad). The better-off households depend to a higher degree on agriculture (40%) and an additional 10% of income is derived from livestock breeding. The composition of farmers' income sources affects their future strategies. Poor farmers are focussed on non-agriculture and off-farm strategies, while better-off farmers are concerned with agricultural intensification and diversification. For poor farmers, exit from the agricultural sector is another envisaged strategy, while better-off farmers still consider pursuing non-agricultural complementary strategies.

The last decade saw considerable changes affecting the household strategies. In particular, major changes affected the cropping pattern, livestock numbers and the access to other economic activities with consequences for the reliance on off-farm and non-agricultural income sources. The livestock numbers decreased strongly, partly caused by a reduction of available grazing land after expansion of the areas planted with tree crops. In the cropping pattern, the most marked change is related to halving the land under apples due to increasing phytosanitary problems. Declining prices are also reported as driving forces, resulting in a shift to olive production or tobacco cultivation, depending on farmers' preferences as well as access to (tobacco) licenses. These changes affect household types differently: Better-off farmers could afford organizing access to better chemicals to protect their apple and cherry orchards, while poorer farmers often failed in attempting the same strategy. Better-off farmers likewise succeeded in organizing better planting material and used the loss of trees to improve their mix of varieties. Poorer households lacked the support necessary to compensate for their skill level, their liquidity constraints to purchase high quality inputs or to gain timely access to market information. The area under wheat has been reduced across the household types, as cereal production under the marginal agro-climatic conditions and on the slopes is uneconomic and farmers cultivated more profitable crops.

[12] Note that the above tables refer to area, while for conciseness, the production figures are not presented in this main report. They are included in the individual farming systems report.

The declining holding sizes and shifts in the cropping pattern affect the casual labour requirements both within this as well as compared to the neighbouring farming system. An increasing number of the farms are independent of hired labour and the typical casual employment has changed with the shift in cropping pattern associated by the introduction of apples approximately 30 years ago, their later reduction and the expansion of tobacco and olives. Therefore, there is a noticeable decrease in agricultural off-farm work and an increase in non-agricultural employment. Another important change is the increasing role of rural women outside agriculture at the expense of agricultural operations, caused by the particularly strong improvement of female rural education over the last decade.

Irrigated Pomegranate Niche System

The Irrigated Pomegranate Niche System is located in Idleb Governorate within Al-Shogour Mantika (Darkoush Nahia), on the banks of the Orontes River and between two steep mountains. Pomegranate cultivation is helped by the conditions of stabilization zone one, with an average annual rainfall of 600 mm and high humidity (80 % in winter and 50-75 % in summer).

According to their average annual income SP 120,000, most farmers (60%) are considered medium farmers in the context of this farming system, while the rest belong equally into the poor and better-off farmer category (20% each type). The latter farmers are characterized by annual income of approximately SP 500,000 and own pomegranate holding of more than 10 dunum, in addition to land under olive and other crops as well as dairy. Moreover, most large farmers in Darkoush Village are considered small-scale processors (home manufacturing of pomegranate juice, which called *debs*), providing an interesting example of successful vertical diversification.

Rainfed Tobacco Niche System

The Rainfed Tobacco Niche System comprises areas within Lattakia and Tartous governorates, especially in Al-Kordaha, Jableh, and Banias Mantikas at 300 m altitude above the sea level, for example, Al-Kadmous Nahia in Banias. The total area of this system is approximately 1,650 hectares distributed among several villages. Salient characteristics of this niche are the small size of cultivated land, very steep slopes with narrow terraces of in many cases only about 50 square meters surface, the rainfed production conditions and the relatively poor soil. Thus, all above criteria have directed the area towards tobacco planting, which generates high income per unit of land compared to alternative crops and provides a higher productive employment capacity. Due to the small size of holdings, most operations are carried out by family labour, as the average tobacco farm is about 1.8 dunum. Despite the small tobacco plots, however, the crop generates a high share of farmers' agricultural income by being the only suitable cash crop. In addition, the proceeds from tobacco sales are obtained during a particularly critical season, i.e. at the beginning of the school year and the winter season and hence removes an important liquidity constraint from poor farmers in that period.

Any possible new policy concerning tobacco production will hence affect first the poor farmers, who depend completely on tobacco cultivating in some areas, (e.g. in the Rainfed Tobacco Niche System). Since tobacco is their only suitable crop at present, farmers could not convert tobacco land to other crops. As a result, policies contracting the tobacco area, declining product price or increasing input prices affects tobacco farmers within the niche system. Considering the increasingly open trade arrangements, tobacco producers in the system might easily be out-competed due to their traditional technologies compared to competitors abroad.

The General Establishment of Tobacco (GEOT) belongs to the Ministry of Economy and Trade and is responsible for supervision, grading and marketing of all licensed tobacco. The development of the niche is strongly conditioned by the existence of the local processing plant. Hence, the tobacco niche provides a striking contrast to the pomegranate niche, as the existence

of the former is directly dependent on policy decisions. It is uncertain to which extent private arrangements (for their illegal status existent only on a small scale) could offer the farmers substitute markets in case policy decisions would cause a relocation of the processing plant or change the institutional arrangements governing tobacco cultivation.

Tobacco maintains the traditional market organization, implying that farmers may only sell at fixed prices to GEOT, which are reviewed annually. These prices are set according to a national average unit coast of production, to ensure that farmers are able to cover costs and make a reasonable profit. The price setting mechanism is intended to encourage farmers to produce the corresponding crops,. However, domestic tobacco prices remained constant since 1996, despite the increasing cost of production, in order to reduce the differences between domestic and international prices (SOFA 2002).

Despite of the constant nominal tobacco prices, farmers have tended to maximize tobacco areas, indicating their strong preference for a stable profit. Hence, poor farmers and large families tend to exceed their license areas. Particularly the latter attempt to increase on-farm work and sell surplus tobacco production to the private markets (assuming higher prices).

Trends and development options

The farming system is characterised by rainfed smallholder farming based on unregulated and perennial crops, a relatively minor role of livestock, combined with a very important role of casual off-farm work as well as non-agricultural employment. The relative importance of non-agricultural income sources is inversely correlated with farm size. The trends within the system depend on the degree to which past developments can be extrapolated into the future, on technical innovations and new economic opportunities.

Continued population growth at the present rate (Syria: 2.45%) would lead to a doubling of the population in the system within 25 years. Considering the present average holding size of 2.0 hectares (which is below the original land distribution of 25 dunum in the land reform process in Al Ghab, where cultivation is dominated by irrigated agriculture), there are only two alternatives for the future. Either the share of agricultural income for the majority of farmers in total family income drops considerably, or exit from agriculture will accommodate the majority of the young families to other sectors of the economy (within or outside the farming system).

Given the basic characteristics of land use, adjustments to the production structure are subject to several limitations. Firstly, the expansion of cultivated land is limited by the environmental concern to preserve the remaining forests, which are theoretically the largest land reserve. Increasing the land use intensity within the existing cultivated land is restricted by the extremely low reserve of fallow land (2.2% of cultivable land). Hence, the only available alternatives to generate additional income and employment through crop production are adding crops to orchards or a second season (intensive crop) to land under seasonal crops.

Processing of the farm output is in principle a possibility for adding value and creating local employment. Given the dominance of olives in the system, olive processing is an immediate first thought. However, quality requirements may limit the possibilities for low-cost value added processes in the oil sector to be a short-term possibility. This does not rule out catering for niche markets after careful assessment of marketing possibilities. The reputation of the olives from (part) of the systems zone indicate that if the local market develops further, branding of local low-input production appears to be a possibility to escape the emerging competition for high-volume producers in newly planted areas. Building on this existing reputation could be a first step before attempting to enter niche markets like those of ecological production lines according to international standards, due to the expensive quality assessment requirements. If through regional rural development efforts more potential buyers could be attracted to visit the zone, local marketing could allow part of the farmers' new employment opportunities, including in the off-farm local labour market (restaurants, production of typical local produce etc).

An important consideration for future developments within the zone refers to the future position of the olive sub-sector in the system. At present, 52% of cultivated land is under olives, which increases even to almost 64% within the hilly farming system. The possibilities for improved access to international markets will provide possibly additional income possibilities and offer benefits for increased efficiency and intensification of the main crop of the system. At the same time, the very successful incentives for new olive plantations outside the farming system will lead to a very rapid and continuous production increase until the new plantations will reach full production in more than a decade. Should the access to new markets not develop as envisaged, then the producers in traditional olive areas in this system will face the risk of being out-competed by new plantations under irrigation and on level land.

The small farm sizes and the lack of available grazing land limit the use of off-farm feeding resources to expand livestock production as a future option in the farming system. At the same time, the focus on olive and other tree crops restrict the possibilities for crop-livestock integration in the farming system.

The extremely small average holding size suggests that the production system should be oriented towards crops with a high productive employment potential and a high land use intensity (i.e. a high so-called R-Value) to generate high returns to the scarcest resource on the farm. The agro-ecologic and even more edaphic restrictions do no permit the orientation on typical crops under such circumstances, such as vegetable cultivation. Consequently, perennial crops are preferred and the seasonal labour peaks of crop management operations are complemented by seeking seasonal off-farm (agricultural or non-agricultural) employment.

Land market

The increasing land fragmentation due to population growth (national average: 2.4%) makes agricultural land an increasingly limiting production factor. In this system this is exacerbated by the high share of forest land. The high share of unregistered lands (agrarian reform and public lands) limits the development of an active land market in the system.

The overall effect on the holding structure is unclear. The possibilities for mechanization are limited due to the mountainous characteristics of the system, while capital availability could increase land concentration. Land consolidation of small, disperse plots could lead to reduced labour needs for crop management.

Marketing issues

Most crops within the system are traded under free private arrangements, and only 13% of the cultivated land in the system is under so-called strategic crops. The most important exception is tobacco, which is subject to the special marketing agency GEOT (the only institutional monopoly at the system level). It retained a relatively stable role in the last decade, especially in terms of pricing. The General Establishment for Cold Storage (GECS) operates in the area, but is not considered a marketing monopoly and its role has been declining in recent years.

Labour market

The employment possibilities within the system areas are relatively small, as most orchards are maintained with family labour and the small number of larger farmers absorbs only few employees and casual labour. The most influential factor for the casual labour market in the system are any decisions affecting the areas planted to cotton in the neighbouring farming system, i.e. Al Ghab, but also in the north-eastern plains. Greenhouses in the coastal areas generate the second source of employment for poor and medium households. Interview partners mentioned reduced employment possibilities outside the system area through reduced cotton areas and there are indications that local labour is increasingly sufficient in the recipient systems to cover local casual labour needs.

Text box: The Olive subsector - Farming systems interconnectedness and policy interventions

Given the particular importance of olive production in this farming system and the differentiated impact of agricultural support policies on the competitiveness of olive production in the different farming systems, this text box highlights the interconnectedness of farming systems[13].

Exporting olive oil is a complex task, particularly when focussing on the highly differentiated European market with its tight quality standards. The long focus of local traders on the national and regional markets has isolated the traders from the developments in the international markets and skills and practices have to be upgraded. Part of the problem lies at the milling and processing stages, despite the increases in the number of modern mills.

Over the last decades, a number of successful public projects stimulated the expansion of olive areas, some of which are described in the individual farming system report. Some of these projects originally focussed on land reclamation and combating degradation trends in marginal production areas. For that reason, it is expected that olive production will continually increase at least over one decade. The dangers stemming from the above difficult export position are a particular threat for poor and medium size olive farmers within this farming system, as well for farmers which depend solely on olive production (i. e. some Ifrin olive farmers). The expansion of olive production has occurred to a large extent on flat land with considerable possibilities for economies of scale, while operations in the hilly and mountainous farming system are difficult to rationalize. Luckily, there are already indications that the quality of Syrian olive oil has improved, but most of the exports were done in bulk.

The remaining threats to farmers in the farming system can be addressed at different levels. The first possible approach at the farm level could be agricultural diversification and resulting income diversification in combination with reduction of price risks associated with one single product. Government investments could contribute through infrastructure development (roads, irrigation networks and land reclamation), extension support for the introduction of new crops as well as facilitating input and credit access. The latter can be implemented through governmental loans, for example loans to invest in livestock breeding.

The second intervention could be at the olive oil processing level through new milling plants, complemented with the development of suitable storage and grading according to international standards and external markets must be identified. Successful conclusion of the association negotiations of Syria with the EU could be an important complementary step to new markets for Syria in the Arab region.

Farmers and extension units play a crucial role to improve olive oil quality. The former have to ensure rapid delivery of olives to processors as well as their good conditions. The latter must raise awareness to the role of speedy processing to obtain high quality olive oil.

Access to international markets through trade liberalisation has not yet ensured competitiveness of olive producers. However, combined efforts of all participants in the sub-sector should help to sustainably increase the income of the smallholders in this farming system.

The introduction of modern irrigation techniques is an additional constraint for the labour market, as for example drip irrigation considerably reduces labour requirements in citrus orchards.

[13] Adopted from the individual report of Firas Yassin (2004).

Credits, technical innovations and export promotion can be successful ways to improve income from the small farms and hence slow the tendency of the young generation to leave the area and add pressure to the urban labour markets outside the zone.

Non-agricultural work is gaining increasing importance within the system and the investment in good education for their children is a high priority for the population. This strategy is rational, as it anticipates future decreases in the size of the already very small average farms. As long as employment opportunities offer themselves, the role of off-farm non-agricultural income can be expected to increase from its present level of about 40% of total income for the poor and medium households.

Employment at processing plants, especially for apples, olives and citrus, expanded because of the so-called investment law no. 10 of 1991, even though the numbers have not yet met all expectations.

Credit market

The credit institution with the largest regional coverage is the ACB, which is however providing insufficient services especially to poor and medium households. This is partly due to the lack of available collateral of their smallholdings or their legal position of their agrarian reform land[14].

As a result, poor and medium farmers are forced to obtain loans from the private sector at higher interest rate, reaching 50-60% instead of the 4-5% charged by ACB (SOFA 2002, Chapter 9). The lack credit particularly harms smallholders whose investment capabilities in their lands consequently are reduced.

[14] According to Article 12 of the Law no. 252 of 1959 “Related to the State Properties”, the ban on the transfer of property was exempted in the case of its use as collateral. Even in other cases, Article 11 stipulates the ban on the transfer of ownership to apply for a period of 10 years from registration. It is unclear whether later decisions have modified this provision. The fact that the ACB tends not to accept agrarian reform land as collateral could be in this case either due to their incapacity to effectively obtain land used as collateral in case of credit failure or long delays in issuance of registration papers.

FS 3: Farming systems of the northern and north-eastern plains

Description of the system

The farming system of the northern and north-eastern plains[15] of Syria is the largest one in terms of area (4.7 Million hectares), covering one quarter of the national area, one third of agricultural holders (293000) and half of the cultivated land (2.69 Mio. hectares). From an administrative point of view, the areas in stabilization zones one to three from four Muhafazats (Der-Ezzor, Al-Hassakeh, Al-Rakka and Aleppo) lie completely within this system, as well as the areas under publication irrigation networks in stabilization zones four and five[16]. The system therefore includes both rainfed farming in the northern part, where rainfall is partly complemented by private irrigation from wells or small rivers as well as intensive irrigation from public irrigation schemes. Due to the concentration of public irrigation from the Assad Lake and along the Euphrates River (including the tributaries), large irrigation schemes show specific characteristics useful for classification (see below).

Crops considered strategic by the Government, especially wheat (27% rainfed wheat & 22% irrigated wheat) and cotton (6%) as well as barley (18%) and lentil (3%), dominate the cultivated land in the system. Olives (2%) saw a particular development caused by incentives from Government projects in the last decade and olives are mostly found in the western part of the system. Fallow land occupied in 2002 13.5% of the cultivated land in the system.

Given the large size of the system, its' major and sometimes even its' minor crops (as a share of cultivated land within the system zone) contribute a huge share of the national production and cultivation area of these crops. The most noticeable among them are rainfed and irrigated wheat (79 % and 77%, respectively) cotton (80%) and rainfed lentil (68%). A particularly good example for the effect of the size of the system is sugar-beet, of which one third of the national area falls into the system, even though it covers below 0.4% of the cultivated land in the system.

The vast size and low population density within the system give it an overall more rural structure than the other farming systems (with the obvious exception of the pastoral system), implying that public sector and other fixed employment are of much less importance here. Educational levels within this system are considered lower than at the national level (85% of the system population was estimated not to exceed basic education levels).

[15] This section is based on the individual farming systems report prepared by Raid Hamza, which is available from NAPC as a separate document.

[16] This definition affects particularly the attribution of areas between this and the agro-pastoral farming system, as well as the calculation of the associated crop areas from official statistics. The division of crop areas in stabilization zones four and five between these two systems are therefore subject to professional judgement. A refinement in the future by considering lower level administrative units and GIS data would be desirable.

Table 7: The farming systems of the northern & north-eastern plains in the national context

	Syria	% of	FS 3	% of	SZ 31*	% of	SZ 32	% of
	Area	National		national	Irrigated FS	national	Mixed FS	national
Area (ha)	18,517,971	100%	4,723,591	25.5%	159,043	0.79%	4,564,548	24.65%
Rural Popu-lation (No.)	8,531,000	100%	2,447,904	28.7%	82,421	0.97%	2,365,483	27.73%
Holders (No.)	938,748	100%	293,295	31.2%	79,521	8.47%	213,774	22.77%
		Avg. Hol-		Avg. Hol-		Avg. Hol-		Avg. Hol-
		ding (ha)		ding (ha)		ding (ha)		ding (ha)
cultivable l.(ha)	5,911,020	6.30	2,759,685	9.41	159,043	2.0	2,600,642	12.17
cultivated l.(ha)	5,420,656	5.77	2,694,991	9.19	159,043	2.0	2,535,948	11.86
	Area (ha)	% of culti- vated land	Area (ha)	% of culti- vated land	Area (ha)	% of culti- vated land	Area (ha)	% of culti- vated land
a) land under crops (ha)	4,590,899	84.7%	2,330,598	86.5%	159,043	100%	2,171,555	85.6,%
of which rainfed (ha)	3,258,115	60.1%	1,602,078	59.4%	NA		1,602,078	63.2%
of which irrigated (ha)	1,332,783	24.6%	728,520	27.0%	159,043	100.0%	569,477	22.5%
b) fallow (ha)	829,757	15.3%	364,392	13.5%	NA		364,392	14.4%
Main crops								
Rf. Wheat	917,040	16.9%	722,395	26.8%	0	0.0%	722,395	28.3%
Ir. Wheat	752,488	13.9%	583,715	21.7%	17,511	12.0%	566,204	22.2%
Rf. Barley	1185,239	21.9%	474,536	17.6%	0	0.0%	474,536	18.6%
Cotton	199,773	3.7%	158,827	5.9%	4,765	3.3%	154,062	6.0%
Rf. Lentil	120,544	2.2%	82,286	3.1%	0	0.0%	82,286	3.2%
Total	3,175,084	58.6%	2,021,759	75.0%	22,276	15.3%	1,999,483	78.4%

*: The definition of the irrigated FS within this table was based on official statistics for major irrigation schemes on the Euphrates river, which amounts to an under-estimation of the total area with basic characteristics of the irrigated FS. The report on the individual case study did not foresee a more flexible definition as this would have implied giving up the use of a clear and strict methodology for defining the system boundary. To compensate for the unavailability of data enough disaggregated to allow punctual calculation, average holding size have been estimated relying on the opinions of informed observers.

Source: constructed based on MAAR statistics for 2002.

Livestock is of medium importance in the system, with sheep having some relevance for part of the producers. Dairy covers mostly the family needs, except where large villages and cities create a local or regional market. Casual and seasonal employment are of very high importance, though, for the poorer household types.

Again caused by the large size of the system and in combination with the large average holding size attracts huge flows of seasonal casual labour from all across Syria, most dominantly from the neighbouring agro-pastoral system, but also from the mountainous and hilly as well as the central plains farming systems (Idleb, Homs and Hama areas).

As migration is the main noticeable source of off-farm income, access to land is the overriding factor determining poverty in the area. Consequently, this factor determines primarily the classification into socio-economic groups. Households with small holdings derive occasionally additional income from sheep. Livestock is however mostly contributing to household consumption through milk and dairy products. Seasonal casual labour income in the nearby irrigated areas is mostly carried out by women, provides important seasonal contributions to cash income in the household.

The particular conditions of the areas under public irrigation networks in terms of average holding size, water availability, dominant crops and tenure regime suggest treatment of these areas as separate units. In the sub-sequent treatment, the farming system is differentiated into an intensive irrigated, smaller part and the large areas were mixed rainfed and irrigated land use prevail. Specific features of each system are presented at the sub-systems level.

Irrigated farming system

The irrigated farming system, defined here specifically for the public irrigation schemes, is a relatively small area (159000 hectares[17], i.e. 3% of the system area) compared to the parts of the system operating under a mixture of rainfed and irrigated conditions. It is located mostly along the Euphrates River and partly on its tributaries (especially the Al Khabour). Approximately 80.000 holders operate on an average holding size of 2 hectares of cultivated land. The three main strategic crops presented in the description of the broad farming systems of the northern and north-eastern plains are even more prominent within the irrigated farming system[18]. A new crop, maize, figures more prominently at the level of the irrigated farming system and is particularly relevant in the Al-Rakka area.

Due to the high water availability, intensive cultivation occurs all year round, and the distribution between summer and winter crops is relatively homogenous. Furthermore, the cropping pattern is relatively stable, partly due to the stable agricultural plan but also due to the absence of modifying effects of rainfall variation[19].

The systems' most important crop in terms of employment generation is cotton, as all operations in wheat cultivation are mechanized. Especially cotton picking is the season, when this farming system attracts large working parties from other parts of the country and the neighbouring farming system. Within the farming system, there is a large employment generation for the poor households by the better-off households within the system.

Livestock plays a relatively important role for household income in this system, favoured by the high forage availability. Large sheep flocks immigrate into the system from the agro-pastoral and pastoral system, but also some households within the system keep small herds of sheep in the village as well as 1-2 cows next to the house.

The redistribution of formerly private held large holdings is of higher importance in the western part of the system, while in the eastern part the distribution of Government held land is much

[17] The figure is based in Ministry of irrigation information on the total area of the irrigation network area, including infrastructure, but still including villages and cities. Hence the mapped area appears larger than the number suggests. It contains only the recorded area under irrigated land, as the definition of land outside the demarcated area of the irrigation schemes could not be reported from the same source. Small irrigated areas as well as well irrigated areas are for that reason included in the irrigated niche of the pastoral farming system in case they fall into stabilization zone 5.

[18] A precise calculation is not possible due to the difficulties of separating statistical figures belonging to the sub-system and those belonging to the agro-pastoral system.

[19] At the margins of irrigation schemes, some fluctuation of water availability occurs in practice. Especially along the Khabour, the expansion of networks is intended to compensate for deficient water supply in the river.

more prominent. In this sense, most of the land are considered reform land with the legal provisions implied by this (for details on general land tenure issues, see Forni 2003).

Above 90% of the land in this system zone is agrarian reform land and was distributed following the 1963 reform. The standard laws and regulations for this distributed land apply, such as payment of an annual land rent or an annual fee for the land reclamation process, as well as a water fee[20]. A special situation in Al-Rakka Muhafazat is worth mentioning. In a new land distribution effort, the Government redistributed part of the land reform areas previously kept as state farms, which benefits partly former owners from the pre-reform period, but also former workers and share croppers on state farms. The allocated land is 160 dunum per holder and the applicable fee structure for these new areas is presently being defined.

Text box: Payment by farmers for redistributed former Government land

On agrarian reform land, the farmers in the systems zone pay three types of fees:

a) Land rent: state lands are rented to farmers according to annual contracts that specify the amount to be paid. Normally, the rent is similar to that paid against renting private land, whereas squatters are obliged to pay double that amount. Hence, the fee varies between areas. In Hassakeh it ranges from 150-200 SP/du/a.

b) Cost for land reclamation (which also applies to private held land benefiting from the process): Farmers pay an annual fee in order to cover the cost of land reclamation. The fee is set at 105 SP/du/a in Al-Rakka and at 250 SP/du/a in Der-Ezzor. The fee is supposed to be paid for a period of 30 years.

c) Irrigation fee in public schemes: farmers using the pulic irrigation schemes pay an annual feed of 3500 SP/ha/year for summer, winter and intensive crops. In case of lack of water availability, this fee is adjusted.

Source: Hamza 2004.

The annual plan is defined starting from the village towards the Nahia, Mantika and Muhafazat level. Subsequently, it is endorsed by the Prime Minister's Office and becomes binding. However, it can be modified in case of exceptional climatic conditions.

Household types in the irrigated farming system

The high prevalence of agrarian reform land in the irrigated farming system has led to a higher share of households belonging to the medium and better-off household types, given the high importance of agricultural income in the total household income. Nevertheless, some stratification of household types in a rural system is unavoidable. The criteria for differentiation are mostly holding size, combined with the reliance on casual agricultural employment and livestock as livelihood sources. A small but (variable share) of the families registered in the villages are pure sheep owners relying on grazing land within the village and the Badia; these were considered as outside of the household classification of this farming system.

Poor households (approximately 40%) within the systems zones are generally characterized by holdings of 7-10 dunum of irrigated land cultivated with the standard rotation of wheat as winter and cotton as summer crop. Crop income is complemented by livestock income, stemming mostly from a small number of sheep (usually less than 10 heads) and in some cases

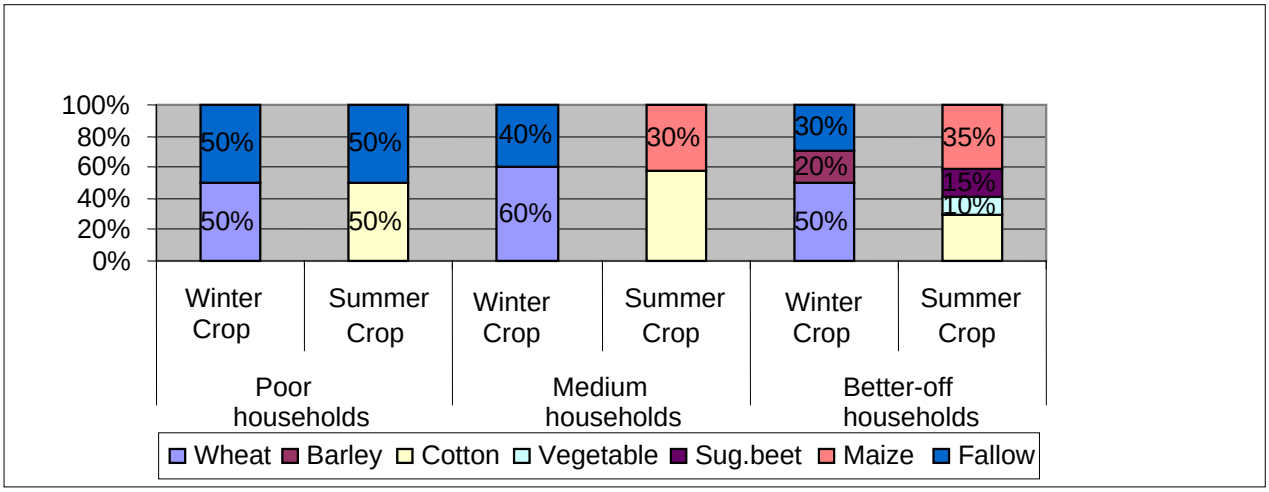
[20] On agrarian reform land from private original holders, the farmer pays no annual fee or land rent, but farmers have to pay for water cost (if network) and land reclamation.

one cow. The household type generates an approximate annual income in the order of magnitude of SP 50000-60000[21].

Poor households therefore commonly require considerable off-farm employment, often exceeding agricultural income. Non-agricultural work is available to part of the households only, while casual agricultural employment is the backbone of generating seasonal cash income. Employment in cotton production on the farms of the other two household types is the main provider of such employment opportunities.

The households of the poorest farmer group devote approximately 50% to 60% of their land to wheat cultivation. Given an approximate need of one dunum of (soft) wheat per family member for home consumption, wheat is rarely sold and in large families insufficient to cover even the own family needs. Where bakeries are in the immediate vicinity of farms, the sale of wheat and purchase of bread might be rational, though. A preference for homemade bread is nevertheless observable and a strong interest in cultivating wheat for the own bread was frequently expressed. The sole source of cash income from crop farming is in most of these farms the proceeds from cotton sales, which led them to allocate an increasing part of their land with cotton, even if it exceeds the officially licensed areas[22], standing at 25% of cultivated land (see Figure 3). Additional crops are mainly limited to areas, where so-called intensive crops are included in the cropping pattern. Al-Rakka is one of these areas, where maize is included within the rotation, hence increasing the land use intensity and additional income.

Figure 3: Share of cultivated land by season and household type



Source: Hamza 2004

Irrespective of the household type, credit for crop finance is in general available through the ACB , through a direct arrangement between farmers and the local ACB branch in case of private held land, or through the cooperative in the case of agricultural reform land. Due to the recent drought, especially poor farmer were unable to repay their debt and lost access to the ACB as credit source. Furthermore, as described above, poor households tend to exceed their licensed share of cotton as this is their only source of agricultural cash income. In this case, credit is not available even for a debt-free farmer. In both cases and especially for cotton, different credit arrangements through private traders exist. The most common one is the agreement of an

[21] This amount is equivalent to an annual family income from agriculture of approximately US-$ 1000-1200 for a family of 6 to 7 members, using the prevailing exchange rate at the moment of the study of 51 SP/US-$.

[22] The official exemption of five dunum of land from the agricultural plan does not apply to licensed crops. In other words, the area of five dunum of exempted land cannot be used to expand the areas under tobacco, cotton or sugar beet beyond the areas permitted under the plan.

advance payment by the trader against an agreed quantity of cotton to be delivered after harvest at an agreed price. This agreed price may be as low as 18-19 SP/kg instead of the official base price of 28 SP/kg in 2002. The implicit interest rate is therefore 34% in case the farmer produces exactly the agreed quantity. No quantitative information on the prevalence of these practices were available, though. The resulting implicit interest rate may vary later on, depending on the success of renegotiating a higher price in case his production exceeds the agreed quantity. If less than the agreed quantity can be delivered, though, he frequently has to accept the value of the missing quantity as an additional credit. Farmers attempt to adjust their production to prevent such expensive credits to the extent possible. However, it would be in the strong interest of society to allow defaulting farmers to re-enter formal credit markets with the necessary precautionary measures to prevent regular credit default.

Variation of water availability within the zone affected especially the irrigated parts in the tributaries of the Euphrates Rivers in recent years. The Al Khabour basin was a particular such case. Excavations in the river allowed farmers close to the river to continue cultivation, while farmers without that possibility were seriously affected in their income sources. This led to a serious loss of assets due to sales of the remaining livestock as well as the disappearance of opportunities for casual work for the poor households. The expansion of the irrigation canal to the north from the Euphrates River to compensate for the lack of water in the Khabour in dry years has created high expectations that the villages might be less affected in future dry spells. As immediate positive effect of the canal, poor households reported that land became available for share cropping arrangements and casual labour employment possibilities increased. Hence, the expansion of irrigation schemes in recent years created important additional casual employment opportunities for the poor households in the cotton areas.

The vision for the future of poor households, like all farmers living in the entire farming system, is shaped by their background of high reliance on strategic crops under state intervention. Hence, income security and stable prices for wheat and cotton are a given starting point for them, against which the future strategies are developed. However, poor households can only rely partly on these income sources, as they are even at present able to secure their livelihoods to less than half through the sale of their own production. In light of reduced farm sizes in the future, seeking flexibility and risk reduction within their livelihood strategies, farmers are surprisingly heavily focussing on sheep production as a possible strategy. This is evidenced by reports that 75% of applications for credit through the “unemployment loans” scheme in study villages are used to purchase sheep. The explications given include a higher resilience against drought, the possibility to flexibly recover the invested capital in case of need etc.

Medium households (approximately 50% of households) are a large group within the farming system. They own typically 25-40 dunum of irrigated land, complemented by 70-100 dunum in the marginal land. Livestock is a considerable asset, as they possess frequently 25-35 sheep and one to two cows. The households are often self-sufficient in basic livestock products (milk, cheese and butter) and sell the surplus to complement cash income. The sheep provide wool for home processing and manure to fertilize homesteads and small vegetable plots.

Due to their share in the population and larger holding sizes, this group produces the bulk of crops in the villages, including both cotton and wheat. Given their visibility in the village, it is more difficult for them to exceed the licensed cotton areas, which leads to a lower percentage of their land being farmed with cotton (see Figure 3). Nevertheless, the marketing risk does not force these households to cultivate according to the plan: they cultivate also approximately 40% of their land with cotton, and traders for example in Al-Koubar village offered prices very close to the official one (25 SP/kg) for the excess quantities.

Even within this household type, seasonal liquidity constraints influence the production decisions. Seasonal lack of cash was given as one of the reasons for a high share in wheat cultivation for home consumption, even though farmers consider wheat relatively unprofitable as a cash crop.

The marginal land is cultivated mostly with barley to feed the sheep, but crop failure is an obvious risk under the prevailing climatic conditions. Due to the drought years, the households considerably reduced sheep numbers, as they state to have owned about 100 heads of sheep a decade ago. The official feed distribution centres distribute the available feed in the form of per head ration and they are not able to provide sufficient feed quantities during the drought years (possibly explicable by increased demand) and parallel markets developed. Where farmers had insufficient cash to feed animals through the drought, de-stocking was the only viable alternative to animal losses.

Off-farm income is sometime sought by some families of this household type, but is much less important than for poor households. In turn, for peak operations such as cotton harvesting, this household type provides casual employment opportunities for the poor. The employment opportunities in this systems increased in recent years, partly due to the completion of additional irrigation schemes, but also due to the impact of last years higher rainfall which influenced farmers responses.

The household strategies for the future are rather balanced between crop and livestock activities, which are seen as complementary, given that wheat and cotton by-products are key to the livestock feeding and expansion strategy. Given the seasonality of crop income (wheat in July and cotton in November, depending whether it is sold privately or through official channels) as well as income from cotton picking, the spread of cash income or at least the flexibility in obtaining it through the sale of sheep are considered valuable. The social status and income also increases their hope for Government employment of one of their children and hope for a regular cash income in the family. Only for a minority of the households, expansion of their holdings is seen as a possible future strategy, while a continued reliance on traditional crops and an expansion of herd size were discussed as a possible diversification strategy.

Better-off households (10% of households) are characterized by their success in maintaining their sheep population of approximately 100 heads through the drought years, ownership of agricultural machinery (tractors) and holding sizes of 35-50 dunum of irrigated land as well as of at least 100 dunum outside the (irrigated) village land. In other words, the holdings of irrigated land are not very much higher than of the medium household type, but other assets provide access to income possibilities, as well as possibly capital availability made them less vulnerable to the drought effects. This differentiation within the village reflects positively, that concentration of land has not seriously occurred subsequent to the original land allocation.

Even the large holders exceed the agricultural plan areas for cotton by increasing the land allocated to that crop, while wheat occupies on average 45-50%. This dominance is similar in all households belonging to the system, and is especially relevant for larger holders who have a strong interest in easy marketing of their production. Within this household type, the provision of feed for the livestock is a particular concern in their strategy, and barley is cultivated as fodder crop on the marginal land.

The better-off households consider income from crop and livestock production as equally important. A detailed farm economic household model of the household types is to be left for future studies. However, it appears that value judgements about the treatment of animal feed is the key determinant to the attribution of total income between crops and livestock: given the dominance of liquidity concerns in all household types, any cash expenses are more strongly perceived than non-monetary opportunity costs. Applying this observation to the large household type implies that the sales value of crop by-products used sheep feeding is relatively small as the value of the residues per dunum of wheat is 100-150 SP, while it is 200-300 SP/dunum for cotton. An additional advantage seen in livestock keeping is the absence of labour peaks, i.e. that the animals can be managed throughout the year using family labour.

The cropping pattern increased in diversity over time. Village land used to be cultivated only with wheat and cotton, while the marginal land produced barley, complemented by well

irrigation (a specific feature of the better-off compared to the medium households). Sugar beet and maize became part of the cropping pattern over time, while a strong preference for the price guaranteed crops wheat and cotton remains. Between the two new crops, maize is in principle preferred, were it not for the practical difficulties in effectively obtaining the price according to the quality established in a transparent way. A partial constraint for sugar beet lies need for considerable manual labour.

Given that this household group is especially focussed on a sheep production strategy, the cultivation ban in the marginal lands is naturally not well received and household often to not share environmental concerns. Alternative management of marginal land to increase its productivity other than planting barley is not known to them.

Changes in the attitude of village authorities and consumers affected the better-off households and their higher reliance on sheep. In some villages, herd sizes permitted within the villages were limited to 25 heads per holder, meaning that the large holders are obliged to rely on the Badia for grazing instead of using their by-products. As the supervision costs increase, the profitability of sheep keeping decreases. Urban preference for milk and milk products with lower fat content indicates a possibly declining trend for some sheep milk products, hence the processing of milk into *ghee* declines while more milk is processed into cheese.

Off-farm employment is of little relevance for this household type, as their production activities require their full attention. In that respect, their livelihood strategies are partly more vulnerable to price variation of strategic crops than the smaller households, but of course they have much high capital available to withstand short shock periods, without loosing their assets.

Discussions about future strategies in the study villages showed a surprisingly high orientation towards investing in land outside the irrigated zone to improve the feeding base for the sheep. Barley appears to be still a strong focus in the mind of many of the better-off households, but support for the improvement of the grazing areas through improved traditional forage crops are also under discussion. With an appropriate introduction and prove of viable production and assured access to such feed, improvement of the range appears to be an alternative which could be accepted in the long term.

The importance of crop income in total household income varies, however, within the sub-zone and reaches 90% in some villages, when livestock numbers decreased in small families, as labour is more required for crop management than for the secondary farm activity.

Comparison of income strategies between household types

The relative importance of crop income for the total livelihoods is least important for the poor households, which depend primarily on income from off-farm work. In terms of cropping pattern, in contrast, poor and medium households follow a surprisingly similar pattern and differ mostly in scale.

Better-off households depend mostly on agricultural income, with dominance of the crop sector and a variable contribution from livestock income (in function of local feed availability). The success of the introduction of intensive crops such as maize promotes increasing crop livestock integration. The preference of small farmers and to a lesser degree of medium farmers is clearly on producing wheat for home consumption and as a food security crop. The main limiting factor for the increased crop-livestock integration in these households lies in the lack of capital to invest in animals.

The high reliance on cotton as cash crop should be reviewed, as its long occupation of the land limits the possibilities for intensification of land use. The same is true for sugar beet. However, any considerations of alternative crops should carefully consider the strong preference of farmers for price stability.

Mixed farming system

The northern part of the farming system, i.e. covering the vast majority (97%) of the system, relies on a combination of rainfall and irrigation for cultivation. Areas under irrigation from large public networks are per definition excluded from this system and analysed as the irrigated farming system. Therefore, irrigation water in this case is pumped mostly from small rivers or wells, partly relying on deep aquifers. No clear demarcation between the irrigated parts is therefore possible and even estimating the areas is very vague as many wells operate unlicensed and are used only for complementing deficient rains. Consequently, the share of each water source varies vastly between the years and individual farms.

The total size of the farming system is 4.6 Million hectares, i.e. almost 25% of the national area of Syria. Its cultivated land accounts for slightly more than half of that area, which is to 23% irrigated, 63% under rainfed farming, of which 14% were fallow in 2002[23].

The farming system of the areas is known for being the largest average holdings of Syria with a strong focus on few crops, especially wheat and cotton, high degrees of mechanization and relatively little importance of non-agricultural employment possibilities. Given the low population densities, market access in most parts is not very good and there are few centres of local demand, which would allow farmers to specialize in perishable crops and others requiring immediate sale to consumers.

The main crops in the system are crops considered strategic by the Government, i.e. predominantly wheat due to its role in the crop rotation (51% of cultivated land, with more than half of it rainfed). The second cash crop is cotton (6% of cultivated land, but approximately 21% of the land classified as irrigated according to the agricultural plan). A special feature from the aggregate perspective on the sub-system is the large area under olives and pistachios, accounting for jointly 80000 hectares or 3.3% of cultivated land. These two crops have been promoted by Government projects (mostly Ali Ali and Green Belt), especially in the western part of the sub-system bordering the mountainous farming systems zone. Rainfed lentil cultivation occupies only 3.2% of cultivated land in the vast farming system, but due to the importance of this farming system in terms of size, this is equivalent to 68% of the national cultivation area.

Distinguishing features within the large area are the north-south decrease of average annual rainfall marked by the parallel so-called stabilization zones. Zones 1 and 2 are the ones most suited for rainfed cultivation, but complementary irrigation is frequently applied. The area classified as rainfed (mostly durum) wheat exceeds irrigated wheat. Where the risk expectation of the farmers allows it, wheat is preferred to barley by farmers without livestock. The optimal choice of crops shifts to more drought resistant species towards the south and barley gradually replaces wheat as the lead crop. The role of livestock adjusts the agro-ecological factors at the farm level. Families who have heavily invested in sheep tend to shift more rapidly to barley cultivation to reduce the potential hazard caused by drought years. The total barley cultivation area in 2002 was recorded as 475000 hectares and so-called black barley is preferred due to its quality for sheep feeding. Since the cultivation ban in the stabilization zone 5 in 1995, the area under barley cultivation has on average declined, even though little effect on the harvested areas can be detected due to the main use of the crop for grazing in the marginal areas.

Lentil and cumin occupy jointly approximately 5% of cultivated land and are rainfed crops preferably cultivated in the northern, more humid parts of the farming system. Different varieties of lentil are used in the eastern and western part of the system, with white lentil dominating in northern Aleppo and red lentil in Al-Hassakeh. Cumin is characterized by farmers as a crop with particularly high price fluctuations and examples ranged from 35 SP/kg

[23] The statistical information presented about this system has to be taken with a grain of salt, as statistics on non-strategic crops themselves as well as their attribution to sub-systems is approximate only.

in the previous season to an estimated average of 85 SP/kg[24]. Both crops are much less mechanized than the leading cereals, hence they considerably influence labour allocation decisions and seasonal employment possibilities, especially for the harvesting operation.

The following summary is intended to put the systems variation in a nutshell. The Aleppo side of the system is more dominated by beans and cumin, with little lentil cultivation. Towards the east of Aleppo, perennials are increasingly added to the system due to the Ali Ali project (olive and pistachio, which shall expand east). The Rakka area, in contrast, is dominated by wheat, cotton and maize only, while Deir-Ezzor systems have a tendency to be structured even more simply on wheat and cotton (i.e. maize is not favoured there). In Al-Khabour, wheat and cotton dominate again in the higher rainfall or irrigated parts of the villages. In Al-Hassakeh wheat and barley complemented by lentil and cumin characterize the systems. To the north of Rakka in rainfed zone, there are some well-based wheat and cotton, which tend to contribute to the overexploitation of water, while their rainfed parts are marked by wheat and barley cultivation.

The western part of the system belongs to the traditional cultivation area of Syria and is under a much higher urban influence than the eastern part of the system[25]. Land expansion in the east occurred only over recent decades on larger scale and heavy influence of Government investment for land reclamation and water provision for large-scale irrigation and private well drilling.

In the vicinity of Aleppo, the picture is much more varied than in the eastern part of the system, and hence marketing of crops under the private price regime are relatively more interesting than far from the market. Hence, under the urban influence a larger number of crops are cultivated, which are however not part of the description of the broader farming system[26].

Six villages across the huge zone, selected with support from the local agricultural administration as being representative, resulted in the characterization of typical village and household situations[27]. The cases presented in the following section illustrate the range of situations, which allow understanding the different impact of policy change.

Household typology

The role of the agricultural plan as defined at the village level and applied at the level of household types can differ considerably, particularly where a large number of crops are cultivated in the village. This difference is demonstrated by Hamza using the village of Al-Bab Maslaha in Aleppo Governorate. The following table presents the share of land under two crop-water types (irrigation and rainfed crops). If this cropping pattern were to be implemented at the level of individual farms, minute crop areas would result, which would complicate plan supervision as well as farming operations. For that reason, farmers and administrators are

[24] No time series data were available to assess the validity of the argument, but farmers' subjective judgment is nevertheless at the basis of their cultivation decisions.

[25] This influence adds particularly perishable crops as well as those for which quick marketing depends on the access to a large number of potential buyers.

[26] The regional variation within the mixed farming system could justify the development of possibly three sub-systems and additional niches. Of these, two sub-units would be located east of the Assad Lake. Cropping systems are rather homogenous and based traditionally on wheat and cotton. Their technologies and cost structure is slightly different, as the northern sub-system has considerably higher rainfall levels, complemented by well and irrigation from small rivers. Farmers probably carry a higher if not the full share of irrigation water provision. In the southern part, farmers only pay a fraction of water costs provided through large irrigation schemes. Farm sizes in both sub-systems are relatively large. In the southern system, investment in sheep herds, but also dairy is a complementary activity. In the third, western sub-system, the cropping pattern is much more diverse and market driven, and farm sizes are considerably smaller than in the east. Niches include the special project areas on both sides of Lake Assad.

[27] Details about these villages are presented in the individual report, prepared by NAPC staff Raid Hamza.

interested to simplify matters. Hence, cultivation responsibilities at the local level are sometimes redistributed and farmers specialize in specific crops, either at the village, at Mazlaha or at co-operative level.

Table 8: The share of different crops in the agricultural plan

	irrigated crops			rainfed crops	
	water source	**Permanent well**	**Seasonal well**		
Winter crops	Wheat	67.7	51.2	Wheat	17.5
	Potato	1.7	10.0	Barley	36.5
	Beans	10.9	23.8	Lentil	7.0
	Winter vegetable	2.4	7.5	Chickpea	3.5
	Garlic	2.2	7.5	flowering	1.3
Summer crops	Cotton	9.6	-	Cumin	7.5
	Sugar beet	0.6	-	Sesame	0.9
	Onion	1.3	-	Water melon	0.2
	Tomato	0.9	-	Honey melon	0.2
	Summer vegetable	1.8	-	Winter vegetable	0.4
				Coriander	0.2

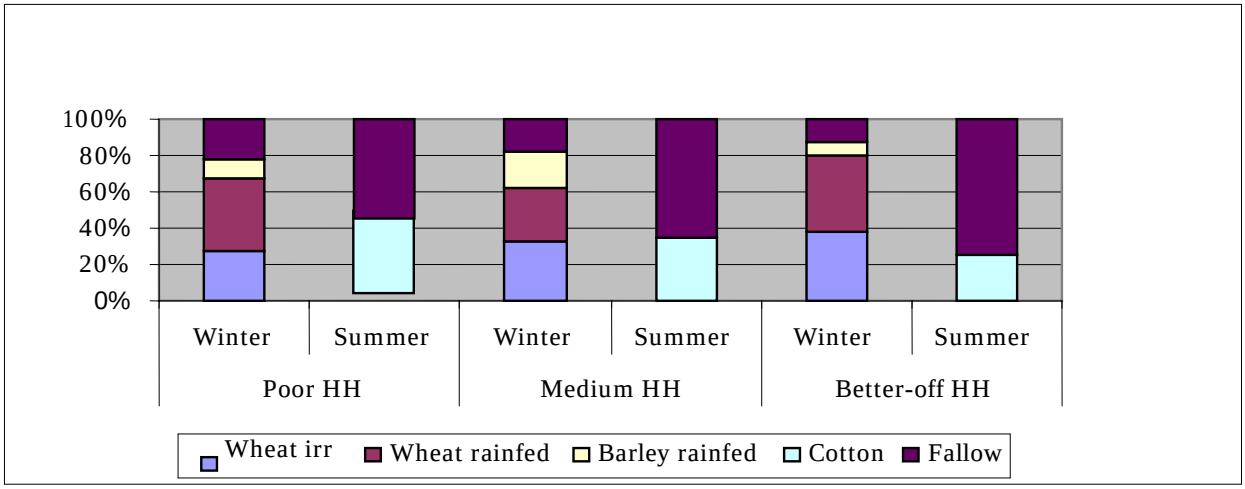
Source: Aleppo Agricultural Department, as presented by Hamza 2004.

The socio-economic stratification within a rural village depends primarily on the combination of different livelihood assets for sustainable income generation, combined with social norms and traditions. Among these, access to the most valuable fixed asset, i.e. land, is frequently stated as the major distinguishing factor. However, the availability of agricultural or non-agricultural off-farm income substantially modifies this picture. Based on the five livelihood assets, this socio-economic stratification was determined through discussions with local experts and through group discussions with farmers (admittedly mostly only male farmers).

The three-tier classification of households into poor, medium and better-off ones resulted across the system in grouping half the holders in the poor household type, 40% as typical or medium households and the remaining 10% as better-off households.

Poor households within the sub-system are those with the highest variation in livelihood sources and are most affected climatic variation between the years. Given the small average holding sizes under rainfed or irrigated land (with different limits being drawn for either type), casual agricultural employment plays a very important role for them. Lack of crop water availability in a cultivation seasons affects these households double, in that it puts their own crop production at risk and could reduce the availability of casual labour in the system at the same time. On average, these households derive 40% of family income from crop production, followed by casual off-farm agricultural work with 30%. Casual employment is seasonal in nature and is generated particularly by the labour intensive crops cotton and sugar beet. In areas where these crops are less important in the cropping calendar, weeding and harvesting of other seasonal crops play the equivalent role of employment generation. Non-agricultural income and livestock contribute equally to the remainder (15% each).

Figure 4: Cropping pattern in mixed network subsystem



Source: Field survey

A notional model for the land holding of poor households from the study villages indicates approximately one hectare of irrigated land and additional two hectares of rainfed land. This indicative figure needs to be adjusted in case of developing policy support based on poverty profiles, as the absence of irrigated land in some villages leads to the variation as presented in the individual system report. Considerable variation between villages was found, even when only rainfed land is available[28] and sharper land scarcity is found towards the old settlement areas in the west of the farming system, i.e. particularly in Aleppo Governorate.

Cultivation in the rainfed areas is limited to wheat, barley, lentil and cumin as the main crop. Irrigation availability allows the addition of especially cotton and sugar beet to the rotation, which due to the long production periods of the crop limits the possibilities to cultivate the traditional winter crops.

The rainfed based cropping pattern of small households is simple and includes approximately 70% of wheat and 30% of cumin or lentil cultivation (the decision being based mostly on local soil conditions, with a dominance of lentil in Al-Hassakeh). All the land is consequently left unplanted during the summer period.

In the mixed conditions, the irrigated part of the land is cultivated to 40%-45% with cotton as the main provider of crop income for the family, while the remaining land is kept unplanted. An additional advantage of cotton as cash crop expressed by farmers is that it offers the highest income possibilities per dunum of land as well as productive employment opportunities for family labour and little price risks. In one study village, especially poor households tripled their share of cultivated land under cotton compared to the agricultural plan (from 15% to 45%) and reduced even the wheat area. This indicates the flexibility of plan implementation at the local level and gives the apparently strict planning process a social dimension: the total production quantity considerably boosts income of marginal households, while being a small burden by generating excess cotton delivery per marginal producer[29].

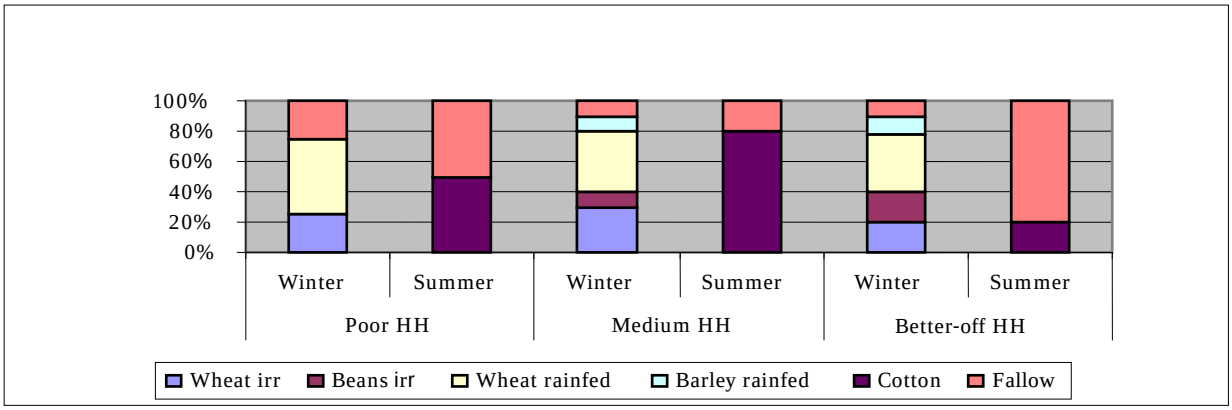
[28] According to the field study, the two extreme villages were Taddif with 0.5-1 hectare and Kaffer-Siby with 3-5 hectare being the typical size of poor holdings, both operating exclusively on rainfed land.

[29] The exceeding of planned cotton areas may be due to a lack of control possibilities by the extension units or to their inability to impose strict ceilings to the main cash providing crop for poor households.

The climatic uncertainty affecting the outcome of rainfed cultivation is partly extended to the irrigated crops, particularly in the Al Khabour basin where uncertainty about the quantity of available irrigation water affected the planning process at the extension unit level. Administrative decisions about the type of agricultural plan to be applied (rainfed or irrigated) could only be taken once certainty about water availability was reached. However, late announcements about the plan negatively affect farmers who decide their land allocation for summer and winter crops according to the expectation about irrigation possibilities. Land left fallow in the winter in expectation of planting part of it to cotton or sugar beet results in a loss if later on, no water is available to implement the agricultural plan for irrigated crops.

The availability of wells for irrigation improves the climatic risk of farmers, whereby they pursue a similar cropping pattern than under network irrigation conditions. The availability of wells therefore reduces vulnerabilities, but does not prevent environmental risks totally. During the drought years, the location of the villages coincides with different water tables and the water reliability of wells in the system is heterogeneous.

Figure 5: Cropping pattern in mixed sub-system with well-irrigation



Source: Field survey

Livestock keeping is mostly limited to two to three sheep or one cow, which reflects livestock losses during the recent drought period. In the rainfed areas, lack of plant growth on fallow land jointly with crop failures contributed to difficulties for farmers to rebuild formerly owned livestock capital. The availability of crop by-products offers additional income sources in the parts with more reliable complementary irrigation.

The household strategies for the future are strongly focussed on expected developments in the regions' land resources. Expectations of the distribution of state farms in Al-Hassakeh and Al-Rakka heavily influenced discussions about future options and farmers expressed hopes for gaining access to additional land. As an immediately available short-term development option, farmers have no alternative to off-farm income or intensification. The latter is suitable only within the limits of credit access, as own capital is notoriously deficient. A second alternative for poor households lies in diversification of income sources in order to reduce the risk of associated with too few crop species. Drought is the main risk of rainfed crops as well as the livestock income sources. The reliance on one winter crop from rainfed land or two crops (winter and summer) leads to vulnerability against market fluctuations. For example, cumin market price fluctuated between 80 SP/kg and 30 SP/kg in recent years.

The combination of livestock and cropping activities is important to buffer seasonal cash shortages, which are particularly important for poor families. Off-farm income provides an additional safety net, especially through casual labour for harvesting, which is carried out by mainly women and children.

The first major farm income source in the calendar year stems from their wheat, lentil and cumin production, which are usually sold at the beginning of July. In general, the return from

winter crops accounts approximately for 25% of total annual cash income. Summer crops (if they can be cultivated in that location and year) contribute at the most 40% of total cash income[30]. The income from summer crops (usually cotton) is mostly obtained at the beginning of November in case the cotton is unlicensed, otherwise at the beginning of December. Off-farm earnings contribute 35% to farm income through the salary obtained from cotton harvesting between August and the end of September.

Medium households in the mixed sub-system represent approximately 40% of holdings, which differ in resource endowment from poor households mostly in sheep numbers and land holding size. The latter also affects their cropping pattern. Larger holding sizes lead to a contribution of two third of household income from crop production, followed by livestock with approximately 20%. Non-agricultural work plays a role particularly in large families of the socio-economic group (10% of income) with off-farm casual work playing only a minor role (5%).

Equivalent to the situation of poor households, their share of irrigated land constitutes an important factor in the crop production with average holding size of rainfed land being obviously larger than of irrigated land. There is some correlation between irrigated land and location within the sub-system, but it is too imprecise to use it for regional differentiation.

The typical medium holdings cultivate 7 hectares (70 dunum) on rainfed land, as well as 12 hectares under mixed (rainfed and irrigated) conditions. The cropping pattern is similar to the poor households for the major crops (disregarding scale differences), but due to the larger farm size, additional crops are partly inserted into the rotation. Beans are added as a minor winter crop, even though only at smaller scales due to the high labour requirements. Lentils are cultivated in the more humid parts, but less preferred in the stabilization zone three due to the risk of late-season dry spells. The summer cropping pattern is completely dependent on the availability of exploiting additional water resources, mostly wells, but also smaller public networks. Part of the wells provide permanent, others only seasonal water. In the latter case, farmers tend to reserve this water to expand their cotton areas.

In the last decades, the main changes in the cropping pattern on rainfed land relates to changes in the rotation caused by new crops. The former fallow land tends to be cultivated with winter crops such as lentil (SZ 1 & 2) or cumin (SZ 2 & 3). Furthermore and particularly in the western part of the system, new crops such as olives and pistachios are cultivated. On irrigated land a clear distribution of land between the summer (cotton) and winter crops (wheat, sugar beat and potatoes) exists when sufficient water is available, while in water deficient years, farmers owning wells are allowed to cultivate 10% of land with cotton while the remaining ones are left with a rainfed cropping pattern. Well owners have, obviously, a strong incentive to exceed the permitted share of land under cotton, as long as they are confident about the marketing possibilities.

The household strategies are rather similar to those of poor households, however with a strong orientation on the agriculture based development options. Speculations about potential access to former state farm land is also expressed, complemented with thoughts about closer crop-livestock integration, which relies on the availability of irrigation water. Other attempts to diversify had mixed results, such as soybean cultivation. These and other failed attempts may be due to lack of extension support or may have simply been based on crops unsuitable to the local agro-ecological conditions. Further support for specific crops should obviously be based on an assessment of the marketing possibilities before being spread as extension message.

Better-off households account for only 10% of the holdings based on the criteria applied by the participants in the group discussions. Depending on the location within the farming sub-system, their typical holding sizes are given with 15 hectares under rainfed and slightly more under mixed conditions. The term “mixed” implies in this case, that such farms cultivate

[30] Considering an average holding of 20 dunum, cultivated equally by winter and summer crops.

approximately 10 hectares of rainfed and additional 7 hectares of irrigated crops. This indicates, that expected income levels of better-off households are higher where mixed water resources are available than in rainfed areas and this effect is even due to larger sizes not only production potential differences. The indications of typical holding sizes are based on the perception of farmers, that 10% of holdings are included in the assessment and sizes are typical for this group. Obviously, among the better-off households, considerably larger farm holdings exist.

Additional features of the better-off households are livestock holdings as well as asset ownership. Sheep ownership is the preferred livestock asset, and 100 to 150 heads are typical within the system (disregarding lower numbers in some villages due to local regulations). A specific indication of asset ownership is the presence of harvesters and cars, while tractors are much more widespread to qualify as criteria for classification.

The livelihoods of better-off households rely primarily on crop income, estimated to provide 70% of household income, with wheat generating most winter-crop income. Livestock generates the rest of the income in most of these farms, with a preference for lamb meat compared to milk production. Additional income from renting out owned machinery occurs on part of the farms, but is not quantifiable as source of income. Likewise, it is not possible to compare non-agricultural urban income of absentee landlords with their agricultural income.

The cropping pattern of better-off households includes the typical winter crops such as wheat (rainfed or irrigated), barley and lentil. Where marketing is easy, beans might be added. Rainfed wheat is cultivated on about 80 %, with the remainder of rainfed land cultivated to barley and the latter usually used for sheep grazing. The share of wheat to barley differs according to farmer's requirements for feeding sheep. In some cases, farmers' plant only 50% to wheat and 50% is kept fallow as a means to "avoid exhaustion of the land". Specific modifications to the general cropping pattern occur according to the so-called stabilization zones. For example, lentil and cumin play a certain role in stabilization zones 1 to 3[31].

On irrigated land, the cropping system includes additional summer crops to complement the dominant irrigated winter wheat. The latter frequently occupies at least 70 % of the entire irrigated land. In some parts, wheat is combined with beans. However, the clearly dominant summer cash crop is the same as of the other household types: cotton. The tendency to cotton cultivation is clearly due to the public pricing policy, which abolishes price risks as a factor of decision-making. Furthermore, the difficulties stated by some small farmers for cotton marketing in terms of waiting periods for crop delivery and uncertainties about the associated transaction costs are relatively easy to handle for large delivered volumes. This is heavily influencing production decisions against more difficult crops such as summer vegetables but also maize. Water scarcity sometimes constrains maize cultivation.

Livelihood strategies discussed with farmers are easily outwards oriented and involve claims to specific public investment as part of an agricultural and rural development strategies. Claims for expanded irrigation networks and water management to avoid water shortage affecting the summer cultivation on irrigated land are understandable under the impression of previous expansions of irrigation schemes. The role of this summer crop for cash income is undeniable, even though overstressed for convenience, particularly in this household type, where also wheat is clearly a cash crop. Within the presented development options, intensification in combination with secure water access are clearly favoured, and the option "intensification" was identified with improved seed and fertilization. Part of the farmers sees the relationship with increased water use efficiency as a means to avoid crop water shortages. Modern irrigation is reportedly still slow in adaptation, partly due to administrative and technical difficulties with drip irrigation technology. Runoff farming to increase water infiltration was not raised in the discussions. The diversification out of traditional crops and investment in newly established

[31] As an extreme example, it was observed that two thirds of the total rainfed area in Tourkan village (located in stabilization zone two) is grown with lentil or cumin.

orchards (olive and pistachio) are known and considered in the western part of the system. At the same time, the establishment under initiative and with project support is probably also raising expectations about similar support in other diversification efforts.

Comparisons between household types

The following comparative review of the household resource endowment and specific vulnerabilities can be summarized. Given the combination of livelihood sources, specific risks are observable for the poor households in the system, which stem from their double exposure to the negative effects of droughts. Crop loss in the case of drought affects all households equally, while casual employment in crop production (especially harvesting) on other farms is an important source of income of poor households, which likewise is affected by drought. Particularly in the present situation with the negative effects of capital loss during the drought period, many marginal households have very little working capital and often lost credit-worthiness with traders and public institutions. The recovery from the drought effect is critically slowed down if in the early years with good rains areas need to be reduced or cropping intensities are to be kept below desirable levels for lack of access to working capital. Medium and particularly better-off households in turn are affected by drought risk, but their recovery from loss is made easier by a broader capital basis and better institutional credit access. This is particularly the case where holders are in possession of title deeds to use them as collateral[32].

Apart from the possibilities to recover from crop losses on rainfed land, the mix of other livelihood assets determines the overall household vulnerability. Casual income has already been discussed, leaving livestock ownership, off farm employment and social capital. As in the present sub-system, livestock ownership increases parallel with the social strata, livestock capital coincides with social strata. The risk exposure to droughts affecting grazing quality is similar between livestock holding sizes, but capital to complement deficient natural grazing is more readily available among better-off households. Parallel to this, marketing possibilities through better information access and transport facilities make their reaction in drought cases easier. Social relationships and higher social capital (education) clearly reduce the vulnerability of better-off households.

In terms of adjustment and modernization, the lower vulnerability, better working capital endowment and education levels of better-off and medium households make them potential promoters of modernized agriculture. Prime candidates for modernization are technologies for increasing water use efficiency, as this would provide not only savings of a scarce resource for the society, but also would allow them to invest into expanding their irrigated areas at the same time. The incentive system misses opportunities to promote such investment, as water use charges are not sufficiently differentiated to provide the right economic incentives. A detailed assessment of the key water issues is presented in a recent NAPC study (Varela-Ortega and Sagardoy 2003).

The socio-economic household types allow the differentiation of a few crop management issues. In conformity with expectations, better-off households operate with the highest capital intensity and mechanization, as reflected in the applied technology level: most better-off households mechanize all input applications such as seeds, fertilizer and herbicides as they usually own the machinery. Poor households, in contrast, focus on expenditure avoidance and self-employment in most circumstances and apply seed and fertilizer by hand. Along the same line of argument, land preparation differs insofar, as poor households often plough the land once, while the better-off carry it out twice. Possible explanations are that this reduces weed and herb growth and lead to higher productivity or improve soil water management.

[32] Information on the prevalence of title deeds across holding types is presently not available, but it is generally assumed that the registration process is more advanced for larger land holdings.

Text box: Comparison of gross margin analysis of main rainfed and well irrigated crops grown in the mixed farming system

This box provides an example of the gross margin analysis being carried out in complementation of the farming systems study. These data have been primarily used for the comparative advantage study of NAPC and will be used in the preparation of a gross margin database. This section draws on the analysis carried out by the author of the individual farming systems report, in which a more detailed discussion is carried out.

Gross margin analysis compares the gross output with the variable costs of cultivating a standard unit of land, i.e. one hectare, whereby the resulting return to family labour is an important factor determining the production decision of poor farmers.

The main compared crops are rainfed wheat, lentil and cumin (see Table 9). The variable costs of production are seed, fertilizer, machinery costs and labour. Wheat cultivation amounts in total to the highest variable costs of the three crops, but also generates the highest gross output value (2220 SP/ha), while the gross output from lentil and cumin cultivation is quite similar (1620 SP/ha). Due to the low labour requirements of wheat associated with the high degree of mechanization, the gross margin before and after labour are almost identical and the gross margin per labour unit is extremely high, making wheat cultivation the most suitable crop for large scale producers.

The labour cost in lentil and cumin cultivation stems mostly from the manual harvesting operations, generally performed by family labour to reduce the cash expenditure. However, the table below also indicates that the return to family labour is quite similar between the two crops and lies between 28 and 31 SP/labour unit.

Table 9: Comparison between the main rainfed crops in the mixed farming system

Crop	Output value (SP/ du)	Variable cost (SP/ du)	GM before labour (Sp/hr)	GM after labour (SP/hr)
Rf. wheat	2,219	1,067	1,172	1,152
Lentil	1,617	892	1,259	1,059
Cumin	1,619	935	894	699

The well-irrigated crops in this system consist mostly of cotton and wheat, but in the case of Aleppo, some additional crop is cultivated. Beans are the second winter crop grown after wheat. The Table 10 shows the most important gross margin indicators for these crops. The total variable cost is higher in cotton crop compared to bean and wheat, while it is similar between wheat and bean. The higher variable cost of cotton is the result of hired labour as illustrated by the difference in the gross margins after hired labour. In addition, the total labour use per dunum is highest in cotton compared to the other two crops, which is the consequence of manual harvesting.

Table 10: Comparison between the main well-irrigated crops in the mixed farming system

Item / Crop	Output value (SP/du)	Variable cost (SP/ du)	GM before labour (Sp/ du)	GM after labour (SP/ du)	Total Labour (hours)
Beans	7,451	1,828	6,192	5,623	50
Cotton	8,860	4,758	6,074	4,102	121
Wheat	4537	2007	2565	2530	11

However, labour and water cost of cotton affect the total output value, and considering the high water requirements of cotton explains the low gross margin per unit of irrigation water (see Table 11). The return per cubic meter of water is five times as high for beans as for cotton, and is still double the cotton figure for wheat.

Table 11: Comparison between the main well-irrigated crops in the mixed farming system

Item / Crop	Output value (SP/ du)	Variable cost (SP/ du)	GM before labour (SP/ du)	GM after labour (SP/ du)	Total water (m3)	GM/ m3 (SP/m3)
Beans	7,451	1,828	6,192	5,623	375	15
Cotton	8,860	4,758	6,074	4,102	1563	3
Wheat	4537	2007	2565	2530	455	6

Source: extracted from Hamza 2004

Given the different volumes of produced crops, marketing differences between the holding sizes exists. Larger farms (associated generally with better-off households) market their production at market places, while small farmers market their production at the farm gate or directly from the field. Traders understandably charge additional premiums for this service. To some extent, statements about exploitative marketing conditions for smallholders are voiced. Such statements have in similar occasions frequently been exposed as being false if the effective marketing costs for small trading volumes, dispersed smallholdings and additional services have been taken into account. A detailed study about the economics of marketing arrangements is missing and no conclusive answer can be provided here. However, the mixture of marketing arrangement with credit provision by traders may provide an entry door to asymmetric bargaining power. Particular exposure of farmers lies in those years, when water availability (rainfed or for deficiencies in irrigation water delivery) depresses yields and consequently farmers fail to offer the quantity agreed when requesting the credit. It was mentioned, that credit provision is in some cases the primary objective by the traders for entering marketing arrangements.

Trends and development options

The general trend of population growth leads over time to declining farm sizes. However, in contrast to many other farming systems, this trend starts on average from a very high level in the mixed sub-system, while the situation is quite diverse in the irrigated sub-system. In the latter, landlessness is already an issue, and off-farm income and engagement in sharecropping arrangements is an important part of the strategies of poor households. The available land under irrigation in the irrigated farming system as well as the irrigated component of the mixed farming system, the irrigated land will decline at a much faster rate than remaining rainfed farm land. The availability of irrigation water is a determinant not only for the income levels of landowners, but also for the employment opportunities for the local poor and the large number of immigrants into the system.

At present, the irrigated farming system is marked by a high dependency on so-called strategic crops, especially of cotton from irrigated land. In terms of contribution to household income, it is also high in the mixed farming system. Wheat as a cash crop is most relevant for the larger holdings, while poor households consider it mostly as a crop for home consumption. Mixed land shows an increasing variation in the cropping pattern of the northern section, where cotton is unlicensed on a large share of cultivated land and higher rainfall facilitates crop diversification.

In Hassakeh and Rakka, farmers have observed the redistribution of state farmland, which raised the hope of farm expansion as a development option through future land distribution. Alternatively, the future option to convert large areas of rainfed land into irrigated areas is a second development option from the farmers' perspective, but highly depends on either providing state funds for developing irrigation infrastructure or resolving technical problems associated with modern irrigation technology.

From the perspective of an external analyst, additional development options must consider more strongly the economically feasible alternatives, even though these are based on expert judgement and not on modelling or investment analysis.

As a short term development option, farmers have no alternative than focussing on off-farm income or intensification within the limits of credit access or the availability of own capital. The issue of water efficiency in irrigated farming has received considerable public attention due to the high public expenses associated with irrigation development. The agricultural authorities actively pursue the promotion of drip and sprinkler irrigation, even though within both farming systems under review in this chapter, technical constraints await a solution.

There is, however, an underutilized potential for increasing water use efficiency through water harvesting techniques, not only in complementary irrigated but also in rainfed agriculture. The development of appropriate methods of rainwater harvesting received so far almost no attention and the potential for risk reduction and efficiency increases in rainfed agriculture is so far unexplored. The economic potential of the different water harvesting techniques must be carefully assessed, as initial declines in the returns to family labour could be considerable. In such cases, adoption rates might be low, even if the techniques if profitable from the farm level perspective and precious surface water could be productively used. In the rainfed part of the system, studies about runoff farming should be carried out in order to increase the productivity of rainfed crops without resorting to complementary irrigation from both licensed and unlicensed seasonal wells as the only means. This seems to be particularly possible, as the large mechanized farms are suitable for covering relatively rapidly large areas with mechanized systems for increasing the water infiltration rate (e.g. Vallerani ploughs etc). Presently, FAO is preparing a document on the economics of water harvesting, which includes a brief guide for technical staff on the assessment of water harvesting systems.

The development considerations at the crop production level must be assessed considering crop rotation aspects. Cotton and sugar beet limit (due to their long cropping season) the possibilities for intensifying land use. From an economic perspective, the Government should consider that the benefit of investment in irrigation infrastructure used for the cultivation of these crops must be compared to the possibility to cultivate several short season crops (with the overall effects on employment generation, farm income generation and water use efficiency).

The FAO has pointed out in a recent study (Koohafkan and Stewart 2005 (forthcoming) p. 72), that the wheat dominance in the Mediterranean countries is expected to continue in the agro-climatic zones with above 300 mm rainfall, but that at the regional level there is a strong trend to the expansion of fruit tree production. In this respect, the strong focus of the Government policy to promote olive cultivation around Aleppo (Green Belt Project) is in tune with this general tendency. Despite the competition of olive production between several major farming systems of Syria for the olive market, it has to be noted that a potentially positive contribution could lie in the higher absorption capacity for casual labour. Especially wheat cultivation is more suited for mechanized and large-scale farming, while olive harvesting would create employment for unskilled and pruning even for skilled labour. It should be explored, though, whether the focus on irrigation of the olives is the most efficient use of groundwater in these new olive areas, or whether water harvesting would not be a more suitable technology from the perspective of the society and would free water resource for the production of higher value crops.

In the future, a further subdivision of this vast zone would be desirable, especially focussing on the east-west variation of market integration and market access. This would especially highlight the influence of the Aleppo markets and reduced transport cost on the development of a more varied cropping structure. In the eastern part of the system, rural development policies in association with the improvement of market access should be pursued to open the prospect for more diversified farming and differentiated rural income.

The present absorption capacity of this farming system for surplus casual labour from other parts of the country is likely to decline, as farm sizes shrink and labour intensive activities particularly in the irrigated farming system can increasingly be carried out with local labour.

A number of policy issues are particularly important for the farming system. The extreme reliance on strategic crops throughout the system characterizes the system (with some variation in the type of regulated crops; cotton and sugar beet. Wheat is more important as a cash crop for the better-off farmers, who are able to benefit from economics of scale, while poor and medium households depend much more on cotton due to their higher return to land and high production employment possibilities. Poor households depend even more on the casual employment generation on farms of the other household types than on their own cotton cultivation, if the local administration does not show flexibility in permitting exceeding the permitted share of cultivation of cotton. Medium households employ only complementary casual labour, but devote a high share of self-employment for the production of the labour intensive crops. These factors determine the different exposure of the three household types to policy decisions on the price level of these crops or the strictness with which agricultural plans are being implemented.

Land tenure issues are conceptually similar to all the farming systems, but are here particularly relevant in the land reform land and restrictions connected to land granted to farmers after irrigation development.

Policy decisions and research orientation should particularly consider their impact on the average land use intensity and water use efficiency within the system. The high reliance on long season annual crops leads to surprisingly low land use intensities for a system with huge public investment in irrigation development. Complementary crops, which would allow increasing crop-livestock integration and soil fertility management need to be considered. However, the farmer reliance on crops offering price security needs to be carefully considered in policy decisions.

FS 4: Farming systems of the central rainfed and irrigated plains and Al Ghab

Description of the system

The farming systems of the central rainfed and irrigated plains and Al Ghab[33] cover an area of approximately 1.16 Million hectares, equivalent to 6.25% of the national area, along the central section of the international road, which also connects Aleppo and Damascus. Due to its long settlement tradition and historic cities, its infrastructure has been regularly upgraded in recent decades, creating overall very good market access to large urban markets, combined with relatively good rainfall levels and water resources.

The western part of the system receives a rainfall average exceeding 350 mm (stabilization zone 1), which decreases towards the eastern boundary to 200 mm according to the north-south direction of the isohyets in central Syria.

The combination of a relatively favourable temperate climate with the good market access has led over time to a varied cultivation pattern with a number of local niche systems. The common feature is, however, a relatively modern, almost 162000 holders (17% of the national total) strong farming community with a very diverse cropping pattern (including a number of specialized pockets of production). Land use in the system is fairly intensive, frequently also including pump based irrigation.

95% of the cultivable land in this broad farming system is already cultivated. The importance of the system to the national crop production is best highlighted by pointing to the regional specialization in production. From the perspective of the share of the cultivated land, relatively typical crops at the national level, such as wheat, barley and lentils, dominate the cultivated land within the farming system (irrigated wheat: 14%, rainfed wheat 10%, barley 20%, olive 7%, cumin 5% and lentil 4% of cultivated land respectively).

The farming system has a particular importance in the national context for a number of products, such as pistachio (41% of the area of irrigated pistachio and 86% of rainfed pistachios are found there), almonds (68% share of the national land under the crop), potato, rainfed grapes and sugar beet (69%, 43% and 48% of national cropped area, respectively). These specialized products are far more important for income generation in their niches and sub-systems, but across the entire farming system occupy relatively small shares of cultivated land.

The high rural population density is indicated by a holding size of 4.54 hectares of cultivated land, but nonetheless varies widely within this broad farming system, particularly as it includes the special case of Al Ghab. After exclusion of this special zone, the holding size of 5.4 ha of cultivated land is almost identical to the national average (5.8 hectares). The small area of Al Ghab in contrast has a registered average holding size of 2.1 hectares.

[33] This section is based on the individual farming systems report prepared by Ahmed Sadiddin, which is available from NAPC as a separate document.

Table 12: The Farming Systems of the Central Plains and Al Ghab

	Syria	% of	FS 4 Al Ghab	% of	FS 4	% of	FS 4	% of
	Area	National	& central plains	National	central plain	national	Al-Ghab	national
Area (ha)	18,517,971	100%	1,155,945	6.24%	1,015,146	5.48%	140,799	0.76%
Rural Population (No.)	8,531,000	100%	1,723,164	20.20%	1,427,448	16.73%	295,716	3.47%
Holders (No.)	938,748	100%	162,187	17.28%	120,904	12.88%	41,283	4.40%
		Avg. Holding (ha)		Avg. Holding (ha)		Avg. Holding (ha)		Avg. Holding (ha)
cultivable l.(ha)	5,911,020	6.30	772,628	4.76	685,322	5.67	87,306	2.11
cultivated l.(ha)	5,420,656	5.77	736,096	4.54	648,790	5.37	87,306	2.11
	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land
a) land under crops (ha)	4,590,899	84.7%	663,226	90.1%	575,920	88.8%	87,306	100.0%
of which rainfed (ha)	3,258,115	60.1%	466,393	63.4%	459,385	70.8%	7,008	8.0%
of which irrigated (ha)	1,332,783	24.6%	196,833	26.7%	116,535	18.0%	80,298	92.0%
b) fallow (ha)	829,757	15.3%	72,870	9.9%	72,870	11.2%		
Main crops								
Rf. Barley	1,185,239	21.9%	144,391	19.6%	144,221	22.2%	170	0.2%
Ir. Wheat	752,488	13.9%	101,816	13.8%	60,561	9.3%	41,255	47.2%
Rf. Wheat	917,040	16.9%	71,150	9.7%	67,449	10.4%	3,701	4.2%
Rf. Olives	460,535	8.5%	54,760	7.4%	53,162	8.2%	1,598	1.8%
Rf. Cumin	130,133	2.4%	39,730	5.4%	39,618	6.1%	112	0.1%
Total	3,445,435	63.6%	411,847	56.0%	365,011	56.3%	46,836	53.6%

Source: constructed based on MAAR statistics for 2002.

The latter is a special region marked by high Government investment in public infrastructure and particularly intensive irrigation and influence of the agricultural plan. This Al Ghab-region represents therefore a separate farming system, which is treated at the end of this chapter.

Considering the most important crops by their share of cultivated land in the central plains (excluding Al Ghab), the above picture changes slightly from the above, but based on the relatively small size of the Al Ghab farming system, its exclusion is only noticeable where huge differences in share of cultivated land under certain crops exist. This is the case for rainfed barley and cumin (both almost inexistent in Al Ghab).

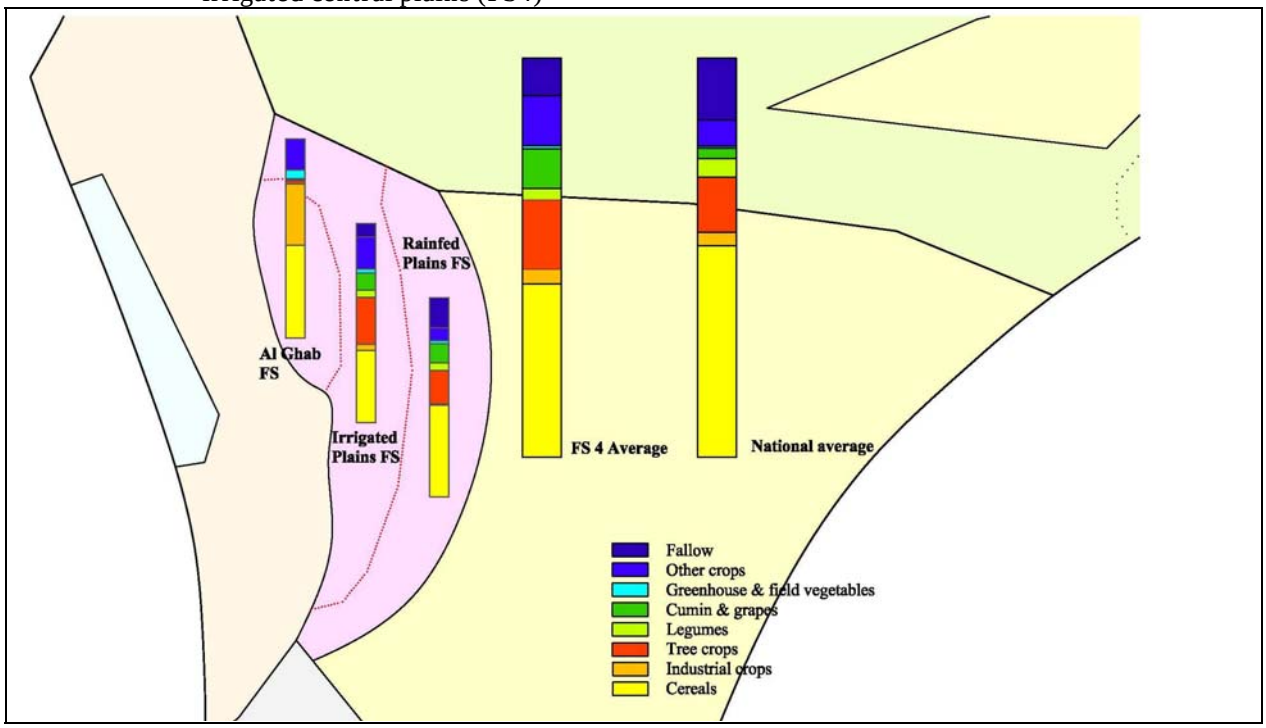
The less intensively cultivated parts outside al Ghab, i.e. the rainfed and irrigated plains have the following characteristics. They stretch over the stabilization zones on to three and cover partly or completely eight Mantikas in three Governorates: Homs (which includes Homs, Al-Rastan, Al-Kuseir and Mukharram), Hama (which includes Hama, Mhardeh, and Salamyyah) and Idleb (including only Maa'rat Numan Mantika).

This area is surrounded by four other farming systems. To the west by the coastal hills of Tartous governorate, which belong to FS 2 (part of the Mountains and Hills Rainfed Farming System), and by Al-Ghab Plain (the Intensive Irrigated Farming System of Al-Ghab) in Hama Governorate. To the east, it borders the agro-pastoral farming system (the limit being defined as the border to stabilization zone 4, but touches the pastoral farming system in the south), and Idleb Heights (belonging to FS 2) to the north.

Important public interventions over the last four decades (the construction of public canals and the Green Belt Project) influenced the systems' development. The former occurred in form of the construction of dams for irrigation development using water from the Orontes River. The second and ongoing so-called "Green Belt Project" started in 1980 with a focus on the establishment of orchards (pistachio, olive, almond, and grape). The major activities of this project focused on stabilization zones 2 and 3. As external effects of this project, the interest in pistachio and olive planting has spread into other stabilization zones.

The presence of two big cities (Homs and Hama) within this farming system jointly with the international north-south road created good market access, which supported non-agricultural activities such as trade and industry development, particularly since coming into force of Investment law No 10 in 1991. Therefore, the relative importance of agriculture in the livelihood system of a significant portion of households in this zone has declined, which was exacerbated by the drought of the last decade on agricultural profitability.

Figure 6: Share of cultivated land by crop groups in the farming systems of Al Ghab, the rainfed and irrigated central plains (FS4)



Private ownership is the dominant land tenure regime in this system. However, there is a small share of agrarian reform land, which had been distributed from *absentee land owners* (mostly living in Homs and Hama) to former sharecroppers of this land. The third land tenure regime relevant in this system is sharecropping, concentrated particularly in the eastern part of Hama Governorate, whereby in this case farmers have permanent sharecropping contracts protected by the *Agrarian Relations Law*.

In order to better represent the regional differentiation in the central plains, the area has been analyzed in two separate farming systems, i.e. the rainfed as well as the irrigated central plains, distinguished by the prevalence of irrigation use, hence a more intensively irrigated western part and a dominantly rainfed eastern part. Furthermore, several niche systems have been identified, such as pistachio cultivation in Mourek as an example of successful vertical integration and market development.

Table 13: Sub-division of the central plains of FS 4 according to their crop specialisation

	% of national area in central plains of FS 4	% of FS 4 in irrigated FS	% of FS 4 in rainfed FS
Rf. Barley	12.1	14.4	85.6
Ir. Wheat	8.0	82.7	17.3
Rf. Wheat	7.4	50.2	49.8
Rf. Olives	11.5	51.3	48.7
Rf. Cumin	30.4	31.2	68.8

Source: constructed based on MAAR statistics for 2002.

Table 13 supports this sub-division at the level of the crops, which at the level of the broad farming system (FS 4) contribute the highest share to the cultivated land. Among these, the largest differentiation occurs as expected by the dominance of irrigated wheat in the irrigated system, while 86% of the barley in the central plains belongs to the rainfed farming system of the central plains. In addition, a number of irrigated perennials occur almost exclusively in the zone defined as the irrigated farming system, notably irrigated apricot, grape, pistachio and apple. The most important perennial in the rainfed system is rainfed almond, which even exceeds the cultivated land under olive (27000 ha). As this differentiation is the result of a geographical division between the zones, followed by a calculation of the crops within these systems (and not vice versa) clearly supports this differentiation of farming systems.

The farming system of the central irrigated plains

Characteristics of the irrigated farming system

The *Irrigated Farming System* has benefited from public investment for the construction of the public irrigation schemes and canals, resulting in 32% of cultivated land being irrigated. This farming system includes all the land of the central plains located in stabilization zone 1 and part from stabilization zone 2, hence rainfall exceeds 300 mm and reaches up to 450 mm. The 474000 hectares under this system include 77000 holders, i.e. on average 3.7 ha cultivated land. Hence the system includes 2.6% of the national area, but accommodates 8% of the holders. Of the almost 286000 hectares of cultivated land, 266000 hectares are under crops, of which again 174000 hectares are rainfed. Only 7% of the cultivated land is fallow and therefore considerably less than the national or the central plains average (see Table 14[34]).

[34] The distribution of crop areas between the rainfed and the irrigated part of the system is only an approximate distribution in absence of more disaggregated statistical information. Not all inconsistencies in the allocation of irrigated land between this and the rainfed farming systems can be removed with the available information, but these are sufficiently small to present the system characteristics. As a consequence, the table indicates for the rainfed system a negative figure of irrigated land.

Table 14: The farming systems of the irrigated and rainfed central plains in the national context

	Syria Area	% of National	FS 4 central plain	% of national	SZ 41 Irrigated	% of national	SZ 42 Rainfed	% of national
Area(ha)	18,517,971	100%	1,015,146	5.48%	474,185	2.56%	540,961	2.92%
Rural Population (No.)	8,531,000	100%	1,427,448	16.73%	1,079,444	12.65%	348,004	4.08%
Holders (No.)	938,748	100%	120,904	12.88%	76,617	8.16%	44,288	4.72%
		Avg. Holding (ha)		Avg. Holding (ha)		Avg. Holding (ha)		Avg. Holding (ha)
cultivable l.(ha)	5,911,020	6.30	685,322	5.67	295,424	3.86	389,899	8.80
cultivated l.(ha)	5,420,656	5.77	648,790	5.37	286,494	3.74	362,297	8.18
	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land
a) land under crops (ha)	4,590,899	84.7%	575,920	88.8%	266,324	93.0%	309,596	85.5%
of which rainfed (ha)	3,258,115	60.1%	459,385	70.8%	173,791	60.7%	285,594	78.8%
of which irrigated (ha)	1,332,783	24.6%	116,535	18.0%	92,533	32.3%	24,002	6.6%
b) fallow (ha)	829,757	15.3%	72,870	11.2%	20,170	7.0%	52,701	14.5%
Main crops								
Rf. Barley	1,185,239	21.9%	144,221	22.2%	20,822	7.3%	123,400	34.1%
Ir. Wheat	752,488	13.9%	60,561	9.3%	50,105	17.5%	10,457	2.9%
Rf. Wheat	917,040	16.9%	67,449	10.4%	33,869	11.8%	33,580	9.3%
Rf. Olives	460,535	8.5%	53,162	8.2%	27,254	9.5%	25,908	7.2%
Rf. Cumin	130,133	2.4%	39,618	6.1%	12,380	4.3%	27,238	7.5%
Total	3,445,435	63.6%	365,011	56.3%	144,429	50.4%	220,582	60.9%

Source: constructed based on MAAR statistics for 2002.

36% of cultivated land in this system is under cereals, most (29%) of which is wheat. The second most important crop group (1/3 of cultivated land) are trees, of which olive is dominant across the system, but others (such as pistachios and almonds) are extremely important in their specialized pockets of cultivation. The creation of these large areas of tree crops is also to be seen under public promotion of perennial crops under a number of special programmes, such as the Green Belt Project or the Ali-Ali Project (details are specified in the individual farming systems report), even though they focussed mostly on the neighbouring irrigated farming system. Special field crops are furthermore cumin, which occupies over 4% of the cultivated land.

Typical households

The household stratification in the irrigated system is mostly based on access to irrigated land, but depending on the pockets of production orientation, size limits vary. The calculation of an average household derived from published statistics would be particularly wrong in this system, as it would result in a very large number of crops, each supposedly cultivated in very small areas. Therefore, the reader particularly interested in details about this system should refer to the full farming systems report, while the following is only an illustrative example.

Poor households are those with less than 2 hectares of holding, which represents approximately 50% of households. They can be considered almost part-time farmers, as low-level employment or casual income is more important for their livelihoods than farm income.

Medium households operate 2-5 hectares with relatively good access to irrigation water and comprise 30-40% of the population. Off-farm employment does play a role for their livelihood system, but plays a relatively lower role than for the poor households. However, water availability and climatic risk on their rainfed part of land makes their agricultural income prone to risk.

Better off households are those with more than 5 hectares of cultivated land per holder, and due to their social status, these 10-15% of the population can rely on generally good access to irrigation water sources. Agricultural income is commonly their main source of livelihood and relatively stable based on the relatively large holding size.

It is interesting to observe that field data suggest that the better-off farmers of the irrigated system have a higher tendency to cultivate regulated crops (wheat, cotton, and sugar beet), while the poor and medium farmers have more focus on fruits, vegetables, and some spices such as cumin and anis. Poor farmers almost disregard regulated crops to concentrate their production on fruit and vegetables, in addition to some spice crops such as cumin and anis. Therefore, the better-off farmers are likely the ones who benefit from Government subsidies the most, since their production is concentrated on the regulated crops, which have fixed prices ensuring good stable profit margins.

One of the objectives of pricing policies of regulated crops (wheat, cotton, barley, and sugar beet) is to achieve equitable and stable, reasonable income for farmers. This objective was incompletely achieved due to some gaps in the administrative procedures of the production delivery to the relevant Governmental institutions (for cotton and wheat only). Credit access is a difficulty in this system, even though to a lesser degree than in in Al-Ghab.

The presence of two big cities connected by the international road in this system created good market access for the majority of farmers, resulting in a big variation in the cropping patterns of the system and high off-farm income especially in the irrigated sub-system. However, the field survey results suggest that the better-off farmers of the irrigated farming system have higher tendency to cultivate regulated crops (wheat, cotton, and sugar beet), while the poor and medium farmers have more focus on fruits, vegetables, and some spices such as cumin and anis.

In the central plain system, i.e. including both this irrigated as well as the rainfed farming system, the research findings suggest that small (poor) farmers devote a major share of their production to home consumption (especially wheat, vegetables, and dairy products, the former through *burgul* and wheat flour). Hence, independently of the official wheat price is, small farmers income generates relatively low benefits compared to better-off farmers.

The farming system of the central rainfed plains

Characteristics of the rainfed farming system

The *Rainfed Farming System* is located to the east of the broad farming system and covers approximately 540000 hectares. The ban to expand well drilling out of environmental concerns restricts further expansion of the neighbouring irrigated farming system into it. Nevertheless, 6.6% of the cultivated land of 362000 hectares is irrigated (i.e. 24000 ha), rainfed land accounted for 78% of the invested land, out of which 18% was left for fallow in 2002 (a high rainfall year). The lower crop productivity in the drier eastern part of the central plains explains why the barley area exceeds wheat by 3:1. Tree crops play a role in the system, but almond exceeds olive areas (jointly 15% of cultivated land) in this farming system. Cumin is an important cash crop (7% of cultivated land), but at lower productivity levels than in the FS3. The Green Belt Project supported the establishment of a part of the perennial crops in the system.

The average holding size of 8.2 ha of cultivated land exceeds the national average and appears relatively large, but has a relatively low income generation potential due to the low average annual rainfall, reflected also in the focus on dry cereals, e.g. one third of the cultivated land

being under barley cultivation. Other major crops include rainfed wheat, cumin and olives (9.3%, 7.5% and 7.1% respectively; see Table 14).

Off-farm income sources in the rainfed farming system depend mainly on casual agricultural or non-agricultural labour. The reasons are mainly the low yields of agricultural crops due to the rainfed cultivation in area of low rainfall (less than 250 mm per year on average), coupled with the scarcity of other income sources. The rainfed cultivation is the consequence of the Government policy to prevent drilling wells in that area due to water conservation concerns.

Typical households

The criteria for household classification into the three household types were determined during the village survey and somewhat differed between the representative villages. In most cases, farm size was the dominant classification factor, complemented by the share of land under rainfed and irrigated cultivation as well as the relative importance of livelihood sources (including off-farm and non-agricultural income). However, farm size is interestingly consistent with the importance of off-farm income, i.e. large farms have also higher off-farm income.

Better-off farmers are those with a total farm size exceeding 60 dunums (more than half of which planted with fruit trees) or over 100 dunums regardless of the presence of fruit trees. They form about 10% of the farmers and are those with shallow wells, from which they cultivate some irrigated crops, especially in the good rainfall years.

Medium farmers in this farming system are those with a total farm size between 30 and 60 dunums (again more than half of which planted with fruit trees) or between 50 and 100 dunums regardless of the presence of fruit trees. About 30% of the farmers fall into this category.

Poor farmers are those with a total farm size below 20 dunums if more than half of it is planted with fruit trees. Farmers with less than 35 dunums likewise fall into this group, if they own few or no fruit trees. Approximately 60% from the farmers fall into this category.

Poor and medium farmers have many similarities, in that they form the casual agricultural labour force in this sub-system; therefore, they usually suffer from low income levels in combination with high income variability, i.e. both households are vulnerable, even though to a different degree.

The household classification in this farming system differs as a function of the prevalence of fruit trees between areas. In two selected villages, there are a few specialized sheep keepers, whose lifestyle resembles those of Bedouins as they follow a seasonal migration pattern. They move with their sheep flocks to Al-Badia for winter and spring grazing and return to the village with other Bedouins to graze their animals on wheat and barley stubbles. These households were excluded from the household analysis of this farming system, also because their sheep flocks are considered in the official statistics of MAAR as a part of Al-Badia flocks and they are registered in sheep keepers' cooperatives there.

Recent changes

The major reported recent changes in the farming system are the expansion of barley and cumin at the expense of the wheat area. Wheat occupied ten years ago about 50% of the total cultivated area, while it occupies presently no more than 20% in good rainfall years. This has been mainly the consequence of drought. Farmers started decreasing their wheat area due to its heavy yield depression in the low rainfall years and they shifted to barley or cumin for their lower yield depression under such conditions.

A second consequence of the drought is the decreased livestock (mainly sheep) number, both because of direct and indirect drought effects. The direct effect refers to the scarcity of the pastures in the agro-pastoral and the pastoral systems zones, while the indirect effect refers to the decreased barley grain and straw yield, which farmers use as winter

feed for their sheep. Consequently, farmers sold sheep to save them from starvation and to avoid high expenses caused by high prices of barley and straw.

Trends and development options in the central rainfed and irrigated plains farming systems

Several cross-cutting themes will influence the further development of this large and diverse farming system: Population growth will predictably increase pressure on land resources and reduce the average farm size, unless off-farm jobs opportunities absorb the excess labour outside of the agricultural sector. Constraints in the land market prevent adjustments in the holding structure. Inflated land prices in the irrigated farming system render land purchases unfeasible for most holders. Some sub-division of land goes unreported in statistics, while the families effectively divided it. The *Agrarian Reform Law* makes such approaches a necessity, while in the other two farming systems it occurs due to slow administration of the cadastral system. The backlog of issuing updated land titles causes difficulties even on private land.

One of the objectives of pricing policies of regulated crops (wheat, cotton, barley and sugar beet) is to achieve a stable, reasonable farm income and has been a long instrument in agricultural policy of Syria similar to many OECD countries. Farmers eagerly grasped these stabilizing possibilities, even though the income supporting effect of the pricing policies are in reality only partly achieved due to administrative procedures for the delivery of cotton and wheat to the Establishments. Part of poor farmers even in the irrigated plain farming system is unable to obtain credit even for regulated crops due to accumulated debt with the ACB (even though this is most serious in Al-Ghab). Consequently, these farmers resort to private credit at high interest rates and part of the subsidies is transferred to the traders who provided the credit. In both central plains farming systems, small (poor) farmers devote a major share of their production to home consumption. This refers particularly to wheat, vegetables, and dairy products, although surplus sale occurs in good rainfall years. Hence, administratively increased wheat prices result in marginal additional cash income for small farmers compared to large ones.

Due to the increasing integration into international markets, price reductions of the strategic crops wheat, cotton, and sugar beet are likely to occur. These reductions in turn would probably have a negative impact on the profit margins of farmers, which mainly affects better-off farmers in the irrigated farming system, as poor and medium farmers there focus more on fruit and vegetable production.

Farmers' reaction to such changes would differ between farming systems and household types. Poor and medium farmers in the entire broad farming system are likely to diversify production, including into dairy keeping or expanding crops such as peanuts or cabbage. However, if the markets for such products do not develop, these adjustments could slow down or might not occur at all. Underdeveloped urban milk markets are probably behind an under-utilized potential of dairy production.

The negative impact of the policy change upon better-off farmers is probably lower in both systems, due to their higher flexibility in adapting to new conditions. Part of the flexibility is due to the relatively good liquidity situation, which allows them to operate and make their decisions depending on their own financial resources. In the absence of well-developed capital markets, this possibility gives them a large advantage to take up arising commercial opportunities, which include the adoption of new cost-saving technologies.

In order to support the income generating possibilities of poor farmers, Government policies should focus more on intensifying and increasing the value of products such as fruit and vegetables. Syria has a comparative advantage for these products, which in this system is mainly produced by poor and medium farmers. Government policy towards better-off farmers should focus more on increasing their efficiency.

The land use intensity in both plains farming systems is relatively low (R-value almost 1). Therefore, increasing cropping intensity could have a positive impact on farmers' incomes

especially after consideration of the potential of crop-livestock integration. The latter can be encouraged through the introduction of fodder crops in the crop rotation, coupled with an enabling environment for improved markets for local livestock products. Both changes would improve soil management and soil fertility, land use intensity and a higher return to the public investment in irrigation infrastructure.

In the rainfed farming system, water scarcity has caused the cropping pattern to be rather simple (compared to that of the irrigated sub-system), as farmers have fewer cultivation options. Moreover, water scarcity causes the crop yields to be low (the entire sub-system is located in stabilization zones 2 and 3). Such a constraint results in very low-income levels for the majority of people, even though some cultivate barley (a regulated price crop). Barley is only harvested about once every five years and is usually grazed in the others.

Low yields are also a concern in olive and almond production, which represent the main two perennials in the rainfed system and are often affected by late winter frosts. Furthermore, their cultivation represents a price risk for producers even in the good yield years since they are as unregulated crops subject to marketing risks. Taking into account the low education levels in most areas, most people (especially poor and medium households) highly depend on off-farm income sources, among which casual agricultural labour is of special importance.

Public investment, particularly in irrigation canals, shaped the distribution of the production systems, without reaching so far its full potential in these farming systems. Among the most important barriers for further development are the low irrigation efficiency and limited credit access especially for poor farmers. Their removal would increase production intensity, conserve water and lead to productive employment creation for the increasing population. More attention should further be given to the potential of using rainfall runoff for increased crop production. Runoff farming increases crop yields and reduces yield variation, as has been reported by an ongoing FAO study. However, the selection of promoted technologies should be based on a combination of technical as well as economic analysis, as some techniques lead to decreasing returns to labour in the initial years, which poor households will find difficult to accept.

The Al Ghab farming system

Characteristics of Al Ghab

The Intensive Irrigated Farming System of Al-Ghab Plain (Al-Ghab farming system) represents as a separate unit in the agricultural statistics of the Ministry of Agriculture and Agrarian Reform (MAAR) and is characterized by intensive irrigation, coupled with the intensive cultivation of three crops considered strategic by the Government: wheat, cotton and sugar beet. This farming system comprises approximately 141000 hectare, which makes it similar in size than the coastal farming system and a population of almost 300000 inhabitants, all of which considered rural. The very high population density, indicated by an average holding size of 2.1 hectares, compared to 5.8 hectares per holder as the Syrian average is another characteristic.

This system has been target to a huge Government investment in draining the swamps since 1960 and by the construction of large public canals that form its main irrigation water source. In addition, most of Al-Ghab was the target of the *Agrarian Reform Law*, which also explains the relatively homogenous holding sizes and land tenure regime. For that reason, and in combination with factors such as its settlement history and the natural conditions, Al Ghab represents the most homogenous among all the farming systems. A special feature is the high share of strategic crops in the overall cropping pattern: Wheat, cotton and sugar beet jointly cover 86% of cultivated land in the system. In terms of relevance at the national level, its importance at national level is relatively highest in case of sugar beet, of which 32% of the total area in the country was located in 2002 in Al Ghab and which produced 35% (532000 tons) of the total national harvest (see individual farming systems report for details).

Over 11% of the cultivated land in Al Ghab are under with sugar beet (2002), representing over 33% of the national cultivation area. The contribution of cotton from Al-Ghab to the national cotton area is obviously less, but still the almost 14% of cultivated land under cotton represent close to 6% of the 2002 cotton area. The latter figures have to be seen in the context to the small size of the farming system (0.8% of the national land area and 1.5% of its cultivated land).

Topographically, Al Ghab is a large basin surrounded in the west by the coastal mountains and is limited on the other sides by undulating hills, which are dominated by perennial cultivation. The Orontes River was the main river bringing drainage water from the surrounding mountains. As the plain lacks proper natural drainage, it was considered for centuries a natural pasture area and had the characteristics of a swamp prior to its drainage. This process started in the 1970ties, followed by land reclamation conversion from pastoral to agricultural land. After reclamation, the new land was distributed within the favoured institutional form of socio-economic organization, i.e. the co-operative structure. Until the present day, more than 90% of the land is held according to the Agrarian Reform Law, which includes many villages completely, while particularly in the south, part of the farmers own private land in addition to their of agrarian reform land.

Socio-economic stratification in Al Ghab

As mentioned earlier, the land reform process had a strong impact of the starting point for the natural trend for socio-economic stratification in this farming system. The original land attribution per holder was set to 25 dunums, i.e. 2.5 hectares.

Given the prevalence of agrarian reform land in the farming system, average holding sizes are relatively homogenous. Privately held land from the pre-reform period as well as location within the system are the two factors leading to some variation in holding sizes. In the northern part, where land was considered rainfed during the agrarian reform process, 50 dunum of land were originally assigned per holder compared to 25 dunum in areas considered irrigated from the onset. Some variation in average holding sizes also occurs in villages, where holders owned land outside the land attributed in the agrarian reform process and hence originally had two sources of access to land. Apart from these smaller parts of the system with variation in holding sizes, the household status generally varies more based on the water access, i.e. location along the canal, as well as livestock availability and off-farm income. Particularly the latter is of high importance for income generation, and employment is sought both for peak labour operations within the system as well as in neighbouring regions.

Poor households

Poor farmers, comprising 80-85% of local farmers, are defined as those cultivating less than 25 dunum, or holders with farmers managing between 25 and 50 dunum and poor access to irrigation water. Household income depends in these cases more on casual agricultural labour than on income from own agricultural land, which makes them vulnerable to extreme poverty due unstable casual income and low wage rates. The latter is particularly important in the north-west of Al Ghab, where farm income is particularly low due to salinity-induced low yields. Instead, for the farmers with livestock (usually 1-3 dairy cows) casual labour is less important (since livestock, when exists, forms about 10% of the family income).

Overall, this household type is a main provider of casual agricultural labour within Al-Ghab as well partly to other areas such as Hama (especially for cotton and sugar beet) and the coastal areas (e.g. for olives and citrus harvest).

Ten years ago, crops and livestock had a higher relative importance for income generation, resulting from two factors: firstly, the decreased area of labour-intensive crops (cotton and sugar beet) and the increase in crops with low labour requirements (wheat) in combination with decreasing yields. Secondly, the declining livestock numbers, caused by losses in grazing areas, increasing feeding costs and low milk prices.

The cropping pattern of poor households is dominated by wheat, cotton, and sugar beet, complemented by small areas of intensive crops. The latter are usually cultivated on wheat land plots after its harvest, if water is availability. In some southern areas, peanut is also of relevance for this household type. However, the precise cropping pattern differs between villages, as is illustrated in more detail in the individual farming systems report. Cotton is more important in the south than in the north, even though the wheat importance is similar in both regions. This is possible, because farmers of the south cultivate cotton and wheat in the same year, harvesting the latter as *freekeh*, which sufficiently reduces the cultivation period to accommodate the second crop. Farmers usually successfully sell the cotton produced in these often unlicensed areas through an overestimation of cotton yields by the extension units in the *cotton certificates of origins*. The latter is used by ACB to differentiate licensed and unlicensed cotton prices.

Several changes occurred to the cropping patterns of this household type during the last decade. The share of wheat has increased considerably in the north at the expense of cotton and sugar beet, which formerly occupied 30% and 35% of the total farm area. This change resulted from decreasing water availability through deficiencies in the irrigation water availability and the stricter application of the agricultural plan, which reduced unlicensed cotton areas. Peanut was introduced in the south of the system during the last decade on suitable soils after water became available through deep wells drilled during the last decade. Beans and cucumber are cultivated in small areas intensively after wheat, but their importance differs according to water availability. Their importance according to the area is small, but they offer potential for future strategies. Most farmers of this type cultivate up to 5% of their land with vegetables (tomato, cucumber, eggplant, etc), but given the small holdings, this represents only up to 1 dunum and therefore destined only to home consumption.

Livestock in this farming system has become less important in the last decade and since poor farmers' posses at most a few animals, they generate very little income. For poor households, the regularity of such potential income is quite important, though, especially at the beginning of winter when liquidity becomes a crucial issue to cover school expenses and to purchase fuel. It also improves nutrition security of children.

Exit from agriculture is a relatively highly ranking strategy of poor farmers of this farming system, even though its importance differs for economic and social reasons between villages. The low returns to land are associated with low productivity stemming from poor soil management. The situation is worsened by the prospect of increasing population pressure. The increasing orientation towards off-farm income occurs across the farming system. Casual agricultural labour was already important in the past, generated about half of farm income, and is expected to gain more importance due to a lack of other work opportunities.

Diversification is the most different strategy for small farmers in several villages and the distribution is consistent with the land productivity by villages. It was further noticeably stronger in the south, due to more favourable climatic and soil conditions (see peanut discussion). Apart from the crop diversification (e.g. peanut, onion, apple, olive, and peach), expanding livestock is a second diversification path, even though one requiring considerable capital. The intensification is mentioned by poor farmers most homogeneously across the system (10-20%) in the sense of reclaiming land (especially in villages with the least fertile land by adding manure and soil taken from other places in addition to cultivating intensive crops such as beans, watermelon, peanut after wheat.

Medium farmers

Medium farmers include 15-20% of the local farmers and operate between 25 and 50 dunums with good access to irrigation water. Agricultural land forms the main income source (usually more than 50%). Non-agricultural income sources (Government employment mainly) are also important and lead to higher income stability compared to the poor.

The livelihood sources for these households are similar to the poor farmers, with the main difference in the lower importance of income from casual agricultural labour. The latter results from the higher productive employment potential on own land and crop production is the most important for income source. Ten years ago, crops and livestock were much more important for income generation than poor farmers. The general trend in livelihood sources over time is relatively similar to poor farmers. The importance of casual agricultural labour was negligible ten years ago for this household but already had some importance for the poor household.

The cropping pattern of this household type is similar to that of poor farmers and likewise differed between south and north of the system. These farmers principally cultivate wheat, cotton and sugar beet in the entire system. Wheat has approximately the same share of the entire land of these farmers, while the share of cotton is much higher in the south that in the north. Peanut is relevant in the south and onion is cultivated on a small share of the land (mostly for home consumption). The importance of such crops relative to the main crops is small since they are not state-controlled, so their prices fluctuate according to the market circumstances. Consequently, they cannot assure stable income. In addition, their areas vary widely with the annual water availability.

Strategies of medium households in Al-Ghab generally exclude the option to leave the agricultural sector, as it provides the main source of income. Simultaneously, there is no possibility of expanding agriculture due to financial constraints. Therefore, the only available strategies for these households are intensification, diversification and increased off-farm income. Intensification for medium farmers in the south can only be pursued by increasing land use intensity. However, in the north, farmers can reclaim the land by adding manure to increase its productivity. Diversification is the most important strategy of medium farmers in the south, but this is not the case in the other part of the system. This strategy has two aspects: to diversify the cropping patterns of the land and to raise livestock. The first aspect is the one that makes the difference in the magnitude of this strategy among medium farmers from different villages. In the south, farmers have the possibility to diversify because they have more access to irrigation water, so they can cultivate more irrigated crops (e.g. peanuts). It is noticeable that farmers restart raising local cow breeds, despite being less productive, since the cost for raising them is much lower and they are accustomed to local conditions, i.e. can graze the hard remains of cotton (which are usually discarded after sheep grazed the leaves). There is no tendency for these farmers to leave the agricultural sector, but there is a strong tendency to increase off-farm income. In spite of the main role of farms in income generation, this strategy is of special importance because farm income has become insufficient (especially when considering the population increase and the resulting land division). The possible sources of increasing the off-farm income are casual agricultural labour, state- employment, and small shops.

Better-off households

Better-off farmers, i.e. 1-2% of the farmers, are those whose total farm size exceeds 50 dunum with good access to irrigation water. Agriculture is the most important and in some cases the only income source (especially very large farmers in the south). Relevant non-agricultural income sources of this group are trade, fishery, and other activities related to their higher education level.

The livelihood sources of this household type are dominated by agricultural income from their large cultivated land (70-80% of income). The remainder stems from mainly Government employment, trade or private business. Some of these farmers are *absentee land lords* residing mainly in Hama and they contract farm managers. During the last decade, no significant change adjusted the relative importance of income sources, although the economic returns of agricultural activities have slightly decreased.

Farmers of this household usually cultivate only state-controlled crops, so their cropping pattern is very simple compared to that of poor or medium households. Regional differences in the importance of the main three crops between households of this type follows are similar pattern to the one discussed above. The only difference is that farmers of the north cultivate some vegetables, which are almost negligible in the south. In addition, sugar beet area is relatively larger in the north as it is substituted by cotton in the south. A decade ago, the three main crops were allocated equally in the field. Recently, the share of each crop began to differ between villages, caused by differences in water availability, as reflected in the agricultural plan. This decrease affected above all the north of Al-Ghab, resulting in increased wheat and reduced sugar beet and cotton areas. In the south, water availability changed little, while the agricultural plan imposed stronger restrictions: farmers had to reduce sugar beet in favour of wheat.

The only excluded strategy for those farmers is "leaving the agricultural sector", while farmers of this group are the only ones who consider an expansion strategy. Between the other strategies, their relative importance depends on individual investment preferences: some prefer non-agricultural activities due to the relatively low economic returns of agriculture compared to industry and trade. However, this strategy is related to diversification and increased off-farm income, e.g. by expanding the total area of the farm or cultivating new crops suitable for processing such as tomato, or investing in livestock. Intensification can only be achieved by adopting new technologies, either new varieties to increase yields or to reduce labour cost, e.g. by adopting harvesting machines especially for cotton. The latter is the main interest of rich and concern of poor farmers in the south of the system zone.

Recent changes in Al Ghab

Several changes have occurred in the system zone during the last decade. The strict application of the agricultural plan, coupled with a considerable decrease in the available water especially in the late nineties, has changed the relative importance of the three strategic crops in the cropping patterns. This resulted in a declining cotton and sugar beet area in favour of wheat. However, the expansion of the irrigated area in the southern part of the system, which was the result of drilling deep wells, has partly offset the change, where the area of cotton increased at the expense of wheat (which had been rainfed crop before). Furthermore, the cultivation of cotton and sugar beet (which are overexploiting crops), accompanied with land mismanagement by farmers, caused considerable soil deterioration especially in the northern part of Al-Ghab. This phenomenon, in turn, resulted in decreasing yields and farm income.

Trends and development options in Al-Ghab

The degree of land pressure varies within Al Ghab slightly, but this is only a temporary relief and a relative difference in the degree of urgency with which the further development of the agricultural potential in the area and land scarcity problems need to be addressed. One generation after the original land attribution and because of intensive agricultural use, the system is experiencing at presence a series of internal challenges:

- Legal inflexibility leads to complex land management structures, as the land remains registered in the name of the original holder, even if the original agrarian reform beneficiary has passed away;

- Increased effective land fragmentation due to raising pressure on the scarce land resources has led to a situation, where effective landlessness becomes a concern as well as situations where entire villages fall on average below the limit of viable farm sizes. The decision making process in the farming families becomes increasingly difficult;

- Increasing soil fertility problems in part of the area due to intensive land use, irrigation with deficient concern for proper drainage;

- Water scarcity is increasingly becoming an issue in parts of the system;
- High dependence on strategic crops, mostly only wheat, cotton and sugar beet.

Due to the increasing integration of the Syria into international markets, the internal challenges are combined with external ones and economic costs and international agreements might result in a modified Government policy with regard to the three strategic crops (wheat, cotton, and sugar beet) and lastly in a price reduction. This would directly affect farm income, especially in Al-Ghab, while it would mainly affect the surplus of better-off farmers in the irrigated sub-system, where poor and medium farmers focus more on fruit and vegetable production.

Farmers' reactions would probably vary according to the three farming systems and by household types. Most likely, poor and medium farmers in the entire broad system would diversify their agricultural activities by raising dairy cows. Another option could be expanding crops cultivated presently in small areas, such as peanut and cabbage. However, the income effect of such changes might be small if market access for the new products does not improve. This would be particularly important for dairy products, where internal marketing efficiency as well as limits to total demand could be constraints to production development. Changing consumer preference for dairy compared to small ruminant-based milk products would possibly only compensate for part of this production expansion.

The negative impact of the policy change upon better-off farmers is expected to be lower in the Al Ghab farming system, due to their higher flexibility in adapting to new conditions and in combination with the absence of liquidity constraints, they can operate independent from credit.

The increase in the land use intensity could have a positive impact on farmers' incomes especially if crop-livestock integration is considered. The latter can be encouraged by introducing fodder crops into the cropping pattern, coupled with encouraging livestock production. These two activities are likely to protect the soil and improve its fertility. However, the strong focus on crops considered strategic has slowed the adjustment processes and prevented a full consideration of the farm level benefits of a focus on increased land use intensity. Given the strong interest of farmers in crops providing access to credit and income security has lead them to accept the negative impact associated with the long cultivation season of cotton and sugar beet, as long as extremely small holdings (informal sub-division of already small farms) did not force farms to increase returns to land considerably.

Finally, Government investment shaped production systems mainly through the construction of public canals for drainage and irrigation. However, the farming system offers additional improvement potential, as indicated by the low cropping intensity in combination with the high irrigation potential. Market access is not as good as from some parts of the neighbouring central system, which benefits from the presence of two big cities (Homs and Hama). Therefore, the key barriers preventing the achievement of Government objectives should be addressed, i. e. low irrigation efficiency, tenure inflexibility and market access and constraints to credit especially for poor farmers. In addition, efforts should be made to identify feasible economic solutions to these issues mainly through increasing the production intensity and improving the environment as a whole to create new job opportunities.

FS 5: Farming Systems of The Southern Semi-Arid Plains And Mountains

Description of the system

The "farming systems of the southern semi-arid plains and mountains"[35] cover an area of almost 1.1 Million hectares and contain a rural population of 1.64 Million and 115000 agricultural holders. They are bordered by the agro-pastoral farming system to the east and north-east, which is characterized by only very marginal cultivation possibilities and dominance of grazing land. Jebel Sheikh, which belongs to the hilly farming system of FS2 (i.e. the coastal mountains), borders the system towards the north-west.

The farming system is characterized by a highly market integrated production structure, good market access to the main national market in Damascus as well as a strong tradition of export to neighbouring countries. Crops under private production and marketing arrangements dominate cultivation, which benefits from generally good rainfall conditions and is in the west complemented by a large number of private wells. The latter are increasingly receiving licenses.

The cultivable land in the system totals 670000 hectares of the area of the broad farming system, of which in 2002, 79% are cultivated and of this, 66% is rainfed, 13% is irrigated and 21% fallow. The irrigated area greatly increased since 1998 due to the rapid increase in the number of drilled wells after the 1998 to 2000 drought period. The following table shows the major land use categories of the system and its respective share of the total country. It is noticeable, that the farming system has an important share of the national production of some crops, which vastly exceeds its share of cultivated land (8%). Most noticeable are rainfed chickpea (56%), field tomato and cucumber (rainfed tomato 19%, irrigated tomato 38% and rainfed cucumber: 35%), irrigated grapes (35%) and apples (37%).

Within the farming system, a closer and more detailed analysis suggests a sub-division into two units, which are used for analyzing in the remainder of the report the major characteristics of the system, its trends and development options. These sub-systems are the hill and the plain farming systems, which are described separately in the following sections.

The FS 5 is most important in terms of its contribution to products to the national production as specified in Table 15f below. It is noticeable that only chickpeas appear among the five crops with the highest share in cultivated land as well as in the contribution of FS 5 to the national agricultural sector. In total, FS 5 contributes 56% of all chickpea area (almost equally located in the mountain FS and the plains FS).

[35] This section is based on the individual farming systems report prepared by Samira Al Zoghbi, which is available from NAPC as a separate document.

Table 15: The Farming System of the Southern Mountains and Plains in the National Context

	Syria Area	% of National	FS 5	% of national	SZ 51 Mountain	% of national	SZ 42 Plains	% of national
Area(ha)	18,517,971	100%	1,079,290	5.84%	342,036	1.85%	737,254	3.98%
Rural Population (No.)	8,531,000	100%	1,639,115	19.21%	219,000	2.57%	1,420,115	16.65%
Holders (No.)	938,748	100%	114,698	12.22%	37,231	3.97%	77,467	8.25%
		Avg. Holding (ha)		Avg. Holding (ha)		Avg. Holding (ha)		Avg. Holding (ha)
cultivable l.(ha)	5,911,020	6.30	668,493	5.83	196,411	5.28	472,082	6.09
cultivated l.(ha)	5,420,656	5.77	433,654	3.78	153,050	4.11	280,604	3.62
	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land	Area (ha)	% of cultivated land
a) land under crops (ha)	4,590,899	84.7%	341,371	78.7%	121,784	80%	219,587	78.3%
of which rainfed (ha)	3,258,115	60.1%	283,359	65.3%	119,144	78%	164,215	58.5%
of which irrigated (ha)	1,332,783	24.6%	58,012	13.4%	2,640	2%	55,372	19.7%
b) fallow (ha)	829,757	15.3%	92,283	21.3%	31,266	20%	61,017	21.7%
Main crops								
Rf. Wheat	917,040	16.9%	81,415	18.8%	30,008	19.6%	51,407	18.3%
Rf. Chickpea	101,103	1.9%	56,447	13.0%	28,334	18.5%	28,113	10.0%
Rf. Barley	1,185,239	21.9%	38,603	8.9%	19,818	12.9%	18,785	6.7%
Rf. Olives	460,535	8.5%	31,173	7.2%	7,033	4.6%	24,140	8.6%
Ir. Wheat	752,488	13.9%	19,250	4.4%	251	0.2%	18,999	6.8%
Total	3,416,406	55.36%	226,888	52.3%	85,444	55.8%	141,444	50.4%

Source: constructed based on MAAR statistics for 2002.

Table 16: Sub-division of the central plains of FS 5 according to their crop specialisation

	% of national area in FS 5	% of FS 5 in Mountain FS	% of FS 5 in Plains FS
Rf. Chickpea	55.8	50.2	49.8
Ir. Tomato	38.4	14.6	85.4
Rf. Apple	37.4	96.3	3.7
Rf. Cucumber	35.5	63.7	36.3
Ir. Grape	35.2	1.0	99.0

Source: constructed based on MAAR statistics for 2002.

All four crops following in rank (by importance in their share of the national production area) are extremely specialized in their agro-climatic requirements and therefore indicative of the two sub-systems of FS 5. All of them contribute between 35% and 40% of the national production and are crops under private marketing arrangements. The plains farming system produces the irrigated crops field tomato and grapes, while the mountain FS produces particularly rainfed apples as well as rainfed cucumber (whereby rainfed cucumber is overall much less important than irrigated cucumber, which is not important in FS 5 in the national context).

Farming system of the southern Mountain

The Mountain near the city of Sweida is located in the eastern part of the system. The corresponding farming system is completely located in Sweida Governorate and some smaller parts belonging to Salkhad and Sha'ba Mantikas. The largest part of the this farming system lies at altitudes ranging between 700 and 1000 meters and are cultivated with rainfed apple, grapes, and other perennials. Based on the difference in land use along the catena, the villages on the upper part of the western side of the Mountain were included in the mountain and those below (approx. 800 meter above sea level) in the plain farming system. The mountains farming system covers in total approximately 342000 hectares. Agro-geographically, it is a marginal production area due to the dominance of basalt rock and cold winters, but due to large public investments, the former small pockets of perennial crop cultivation could be expanded considerably. Towards the borders, such investment was unprofitable due to decreasing rainfall levels and marginal cereal cultivation is the only possible land use. Towards the east, with rapidly decreasing rainfall levels, the cereal-dominated part of the system is more based on a combination of average annual rainfall and low water retention capacity than rainfall alone.

As a farming system, the area is most renowned in Syria for its production of grapes and apples, while the marginal cereal area is much less in the consciousness of the general public. The famous perennial crop cultivation is focused on the western slopes receiving above average annual rainfall levels. Towards the drier eastern and southern part of this zone, marginal cereal cultivation occupies an increasing share of agricultural land. Rock outcrops seriously hamper agricultural production, which explains while draft animals provide most of the farm power. Off-farm income and the proceeds from migration are of high importance in the entire farming system, the higher education levels under influence of the higher population density make higher-level employment more prevalent in the orchard dominated part.

An area of low productivity cereal cultivation surrounds the intensive orchard cultivation on the upper western part of the mountain. The limits to cultivation are in this case more determined by soil conditions (rock) than by rainfall. Consequently, the boundaries of this system are skewed to the west compared to the stabilization zone, which otherwise would mark the boundary to the agro-pastoral/pastoral farming system neighbouring in the east.

The mountain farming system contains market oriented orchards with a high prevalence of off-farm income, while the marginal cereal production in the south and east of the sub-system is basically a basket case region. Most poor households inhabit the basket case region of that system, with exception of a few marginal households from the orchard-based part of the mountain. The majority of families from the orchard-based part are in the middle and better-off household group.

Household typology

A simple calculation of extension unit information used for constructing an average household would result in a 40-dunum holding, cultivating in winter 20% with wheat, barley and chickpeas, 60% used as fruit trees orchard (apple, grapes, pears and olives) and 20% of marginal, uncultivated land. This average household would further own one to two cows for home consumption of milk and seek off-farm work as an important source of income.

The author of the individual farming systems report developed three household types, which reflect the socio-economic variation within the system (see Table 17).

Table 17: The cropping pattern by household type in the mountain farming system

Marginal/poor HH		Medium HH		Better-off HH	
25-30% of HH		60% of HH		10-15% of HH	
Less than 10 dunum, mostly located in the marginal zones of the Mountain		10-50 dunum, mostly located in the western parts of the Mountain		More than 50 dunum, mostly located in the western parts of the Mountain	
Marginal/poor HH		Small Medium HH		Better-off HH	
Winter	Summer	Winter	Summer	Winter	Summer
30% uncultivable land		20% uncultivable land		10% uncultivable	
40% rainfed wheat & chickpeas	40% fallow	20%) field crops (wheat, barely & chickpeas)	20% fallow	5% rainfed wheat	5% fallow
Up to 30% marginal orchards (almond)		60% fruit trees (apple, grapes & pears with some olives)		85% fruit trees (apples, grapes, olives, and pears)	
No livestock		1-2 cows 40% of the total cow's number in the sub-system is owned by the medium HH..		More than 2 Cows 60% of the total cows number in the sub-system is owned by the better-off HH.	
Production of marginal cereals as a type of poor producer.		Production of variety of perennials and cereals as a type of medium producer.		Production of specialized variety of perennials and cereals as a type of large producer.	

Source: Al Zoghbi 2004

Marginal/poor households include in the more fertile part of the mountain households with less than 10 dunum of cultivated land and represent 25-30% of the families. They occasionally obtain income from cereals (40% of land under wheat and legumes, which are fallow in summer), while their almond trees (up to 30% of land) provide little income due to their old age and low production, particularly in dry years. The productivity of cereal crops is low due to low rainfall and low soil fertility in the area. Agricultural employment possibilities for casual agricultural labour are limited, leaving migration and remittances to the farms the dominant non-agricultural income source (50% of income). Remittances are the main source of income for marginal households, as the milk is used for home consumption, if cows are owned at all. Livestock is on average the second source of income (30%) and crop production the least importance livelihood source (20% of income).

Marginal/poor households own not only small, but also fragmented plots of land. The steep and rocky land implies that mechanized agriculture is difficult and the soil is prone to erosion. Current agricultural plans attempt to reduce the share of land under wheat, which is insufficient to generate a relevant household income, in favour of a greater use of legumes, also aiming at soil fertility restoration.

Vulnerable households in the dry, marginal eastern slope of the mountain depend mostly on their income as employees in administrative centres, where they hold low-level employment and obtain salaries of up to 6000 SP/month. These families often have a high dependency ratio. Remittances from relatives working abroad represent the second most important source of income, which mainly stem from unskilled labour in construction. Agriculture does not provide a sufficient and sustainable source of income for these households, due to the rocky terrain and the very low productivity of the eroded soil, on which wheat yields do not exceed 40kg/dunum during the good seasons. The land is left fallow during the dry season. Only few households in this category are able to keep livestock for agricultural work.

The perception of farmers about the returns to their main production factors determines their interest in pursuing future household strategies. These main factors are family labour, land and capital, where the subjective perception of scarcity is an important consideration in the decision making process. The detailed results from the gross margin calculations performed as part of the fieldwork are presented in the individual farming systems report.

Regarding the poor farmers, in terms of returns and returns per dunum, apples are the most important crop. The apple output reaches more than 1500 kg/du with an average price of 17 SP/kg. However, farmers mentioned apples jointly with pears as the most risky crop, as they can suffer from heat, wind and frosts, all of which are rather common in the area. Both crops are in addition subject to price risk and not all farmers are used to the price differentiation by product quality. Farmers often consider the marketing margins excessive. In 2004, high production resulted in capacity constraints for refrigerated storage, with a strong price decline of the fruit sold immediately. Farmers highlighted the heavy cash needs of grape cultivation for chemical control and fertilizers. Livestock was mentioned as entailing some risk if cash is required at critical periods in case of veterinary emergencies.

Medium households typically own between 10 and 50 dunum of land and include 60% of the agricultural population. They cultivate 60% of their land with trees, which also provides one third of their agricultural income. In addition, medium households see in livestock and off-farm work a major source of income. The balance of the land is distributed between field crops for home consumption and uncultivable land (20% each). They earn, however, income from livestock (approximately 10%), while off-farm work generates the main income (almost 60%).

On average, 70% of the area under trees is planted with apples, followed by pears (20%) and grapes (10%). Medium households own approximately 30% of the total number of cows in the sub-system and generate some income from the sales of surplus diary production, even though the bulk is destined for household consumption. Furthermore, cattle is rented to other families in the village for draft power in ploughing and other agricultural work on the difficult terrain.

Discussions with the farmers of the medium household type revealed the following points with reference to the return to production factors. The highest return to land is provided by apple orchards, followed by pears and livestock (field crops were mentioned last). Livestock requires the highest labour input, while apple and pears show the highest price risk. Grape for wine production is considered safe from price risks, while it high for table grapes. The latter are also sensitive to price differentiation according to different qualities and seasons.

Better-off households comprise approximately 15% of the holders in this system, who own over 50 dunum of land each. The presence of better-off households within the farming system is not homogeneously distributed, as their prevalence depends on the unevenly distributed favourable natural conditions. Kanawat is a village on the northern peak of the mountain, in which this household type is well represented. Among the livelihood sources of this household type, dairy production and off-farm work (migration and the governmental employment) contribute each approximately 20%. This particular village is known for its high share of educated people that allows finding job opportunities inside and outside the village. Trees are on average, however, the main source of income and provide approximately 60% of the livelihoods. For that reason, the cropping pattern is very simple, as ¾ of the agricultural land of the better-off are devoted to relatively well-maintained orchards, while cereals dominate the remaining quarter in winter, which is left fallow in summer.

Better-off as well as medium households regard off-farm work as their main income source, which is exacerbated by their education, allowing them access to non-agricultural formal employment. The second most important income source is agriculture (apple orchards and dairy). Remittances are least important for household income because opportunities to work abroad have recently declined.

Better-off farmers also mentioned apples and pears as the best crops in terms of returns to land and overall profitability, but also require most family labour. Better-off farmers suffer from apple and pear price instability overall quite strongly, particularly if heavily invested in them. These two crops in combination with table grapes are most sensitive because of the need for speedy marketing after harvesting.

Strategies for the future

The strategies and plans for the future depend on the household type, but the perspective also changes whether a family is large or small, as it defines the number of children between which traditionally a holding will be divided. *Ceteris paribus*, farmers of all types hope to expand their agricultural land (expansion strategy); however, this option is not accessible for most of the poor and medium households. Better-off households may pursue expansion more realistically, but also address intensification as a pursued strategy. In contrast, only 10% of medium and better-off farmers intend to diversify and plant new crops in order to increase their income. Off-farm work is the most important strategy for poor households, which is an extrapolation for the already extreme dependence on casual income (90% of their income at present). The younger generation belonging to the poor household type expresses a strong focus on public sector employment compared to casual employment according to the perception of the elder generation in the poor households.

The medium and the better-off households chose similar future strategies: intensification and diversification, especially in response to the scenario of regular transfers of small amounts of money. Instead, access to larger quantities of money is preferably invested in land expansion in consideration of their children. None of the farmers in this system can conceive exit from agriculture due to a strong attachment to their land. However, the young generation wishes to work for the public sector for its higher and secure income as off-farm activities.

Main changes within the Mountain farming system in the last decade

In the last decade, medium and better-off households implemented a substantial shift in their orientation of crop cultivation: The area allocated to apple trees increased from 20% to 80% of the total trees, while the area under grapes decreased simultaneously from 80% to 20%. New land was reclaimed by the Southern Regional Development Project and was planted mostly with apple and pears, which contributed to the relative reduction of grapes, parallel to the diffusion of the pest “Floxera”. The areas under field crops were reduced and better-off farmers do not rely on crop production any more. During the last decade, dairy production decreased drastically, since sheep grazing on the mountain was forbidden. Overall, the past opportunities to work abroad in non-agricultural employment (mainly Gulf countries) decreased, as did the importance of both casual work and non-agricultural work as source of income.

Farming system of the rainfed and irrigated southern plains

In the farming system of the rainfed and irrigated southern plains encompasses the larger part of the broad farming system and has a total area of approximately 740000 hectares as well as the larger part of the holders (77000 of the total 115000). Of the total plains area, 58% is rainfed, 20% is irrigated and 22% were fallow in 2002. This distribution between rainfed and irrigated parts is not homogenous, but within this farming system, there is a differentiation between the cereal oriented plains and the irrigated vegetable part[36]. Both have medium and better-off households, which are in both cases different in scale. Between cereal and irrigated vegetable producers there is a difference in production orientation. Investors in agriculture, which play such an important role in the plains farming system are mostly engaged in horticultural crops under irrigation and engage in share-cropping arrangements for doing so.

[36] Feek Mantika falls into this zone, but the corresponding figures are not included in the total area under crops in the system. Due to its inclusion in the system because of its similarities, the general cropping pattern information, based on percentages, is nevertheless valid.

Investors are less likely to engage in cereal production, where large land ownership therefore is the major distinguishing factor.

This Horan Plain is located in the western part of the broad farming system, stretches from the western slope of the Mountain and covers part of Sweida Governorate, all Daraa Governorate, and Quneitra Governorate to the Palestinian border in the west. It is characterized by a long agricultural tradition. The relatively fertile soils and flat terrain make it suitable for cereal cultivation using the winter rains of 300-600 mm (from east to west of the system). Specialized commercial agriculture has evolved in the Plain farming system and is highly diversified as well as mechanized: wheat dominates the rainfed areas, complemented by chickpea and other minor crops. In the irrigated part, a commercially oriented farming community grows field vegetables (most importantly tomato, cucumber and eggplant).

Modern irrigation technique is relatively prevalent in the zone. Within the western part of the farming system, i.e. under intensive agricultural production, there is a noticeable process of differentiation between the villages, where some increasingly commercialize farming and the community is actively seeking investment opportunities in neighbouring villages. This includes the purchase of land in neighbouring villages with a high importance of returnees.

Non-agricultural households in villages focussing on agricultural production are very rare, while due to the differentiation of commercial activities within the region, other villages contain a high percentage of non-agricultural population, where families sell their land. Examples of selling villages are Sheikh Meskin and Dael, while Tafas and Ebta are investing villages, which were visited during the field study.

Household types

This farming system and particularly its irrigated part present an extreme case of commercialisation of farming, but also of differentiation at the transition of an agricultural towards a diversified economy. Returnees play an important role, insofar, as in some village, farming is considered unattractive and the land sold, while other have a strong mentality to invest in agriculture, backed by the savings to do so.

Capital ownership was stressed more than asset ownership as a criterion for the household typology. During the field study, the group discussions with farmers resulted in the household classification using “owner” compared to “investor” as labels and to characterize farming attitudes and status. However, the term “investor” for the farmer applies likewise to farmers without own land property as to farmers expanding their cultivated land through renting additional land. A special feature in the irrigated part is the phenomenon of renting wells for intensifying land use on own and on rented land.

Investors or their family may traditionally own small holdings and seek new investment opportunities or they may be sons of large families seeking to expand their holdings. This group mostly invests in vegetable and crop cultivation except in tree orchards. Where holdings exceed the management capacity of the owner, partly if children found other employment, all or part of the land is rented to these investors. Alternatively, holders who lack labour often engage in sharecropping arrangements, which reduces supervision costs. Owners provide capital and inputs for either the fourth or the third of the output at the end of the season. These farmers plant trees (grapes and olives) and crops in the smaller areas.

The owners (only) do not exceed 30% of the households, while the investors are the majority (70%). The average holding of large owners (10% of farmers) is 4-7 ha, but frequently considerably exceeds this range. 60% of their land is allocated for trees (olives and grapes), 30% of their land is for wheat, and 10% is under tobacco and intensive vegetables on wheat land. A wheat-legumes-fallow rotation (rainfed parts) or a double rotation without fallow is applied. Farm income stems mostly from vegetable production. Drip irrigation has reached 90% in the study villages (which is probably above the average of the system).

Even though the preferred classification offered by the farmers during the field assessment, the traditional, asset based classification was attempted. Under these circumstances, large owners were said to include 10% of farmers. The average holding size within the group was given at 40-70 dunums, but frequently considerably exceeds this number. Interestingly, investors are not seen as belonging into this group, as for large owners expansion of farm size is an unnecessary strategy. Large owners cultivate approximately 60% of their holdings with trees (olives and grapes), 30% wheat, 10% tobacco and vegetables on wheat land in summer.

The second group includes medium and small owners as well as investors. 90% of farmers are considered in this group. They cultivate below 40 dunum of land, being either owned or rented. Approximately one third of their land is rainfed, however not due to any strategy but as a result of the lack of water in some years. Wherever possible, the irrigated area is expanded and can reach 100% on some farms, especially in good years. A rotation pattern is applied on rainfed parts (wheat, legumes, fallow) and dual rotation without fallow. The income of this groups stems mostly from vegetable cultivation, whereby the dominant irrigation type was drip irrigation, which reached 90% in the study village (probably above average in the system). Owners who own less than 40 dunums are 20% of holders, while 70% are owners and investors.

Landless residents are not considered a problem in the area, due to the high education levels and the active emigration to non-agricultural employment. Sharecropping is part of the systems structure, as they cultivate the land for which the investors provide the capital, in order to reduce supervision costs for seasonally employed labour. Most sharecropping arrangements are sought for by seasonally immigrating labourers, which are therefore important contributors to sustaining the agricultural production. The latter also includes seasonal sharecroppers, who would be considered among the poor if they were included in the local household typology. They are taking part of the production risk, but according to the local arrangements they do not provide capital inputs into the field vegetable cultivation. Working in the south is known to be attractive to landless from e.g. FS 2 compared to alternative areas.

The Plain farming system changed in the last 20 years with a rapid expansion of well drilling, creating the basis for the now dominant irrigated cultivation. The originally formally illegal practice was not sanctioned at the time and the wells are becoming licensed in recent years. New crops entered the system due to new irrigation technologies, especially drip irrigation, more productive varieties and new experiences of the farmers.

In conclusion, the southern plains farming system is at present amongst the most dynamic ones in Syria and attracts considerable private investment, which includes land purchases and the renting of wells for the irrigation of intensive crops. These processes are at the same time highly diverse, as in some villages returning workers from abroad exit the agricultural sector and sell their land, while in other villages available capital is heavily invested in land expansion.

Wheat is the most profitable crop for large holdings, particularly as it offers a calculable return due to fixed prices and the relatively good climatic conditions in the farming system. At the same time, wheat also generates the highest returns to irrigation water compared to vegetables. The main disadvantage of the latter is the price risk. Tomato and other vegetables are less profitable due to the unstable prices and the absence of storage possibilities. Livestock is kept for its return to family labour and price stability. Land expansion is permanently present as a strategy among investors, as they consider it a profitable investment for the future, even if they need to engage in sharecropping arrangements to reduce supervision costs.

The plain farming system is a recipient of seasonal agricultural immigration. The outside workers come from the northern governorates of Syria in the summer for the high wage rates. Sharecroppers are part of the system structure, as they are the ones who cultivate the land for which the investors provide the capital. A particular social component of these sharecropping arrangements compared to the alternative employment in the construction sector in Lebanon is that the entire family can stay united and is employed in vegetable cultivation.

Particular development concerns of the plain farming system are the high volume of water extraction from deep aquifers, which contributes to declining water tables. Larger local involvement in water use management could increase the awareness and acceptance of water conservation measures. Legal and institutional constraints associated with attempts to reduce the average crop-water demand needs further study. Market-related problems due to saturation of the local market with the varieties of some kind vegetables add insecurity to the development of the farming system. Further differentiation of market demand in terms of new vegetable varieties and species could reduce the risks associated with excessive degrees of specialization in the system on a small number of vegetables.

Crop-Livestock integrated farming system in Duma Mantika:

Douma Mantika is famous for its combination of small-scale dairy farming integrated into the crop production system and is at the same time an important trading post as well as equipped with a canning industry. Its development in the present form is partly due to the vicinity to the markets of Damascus and availability of processing possibilities.

The Duma Niche-System is located in the northern part of Rural Damascus and commercial intensive cattle rearing and dairy production are its special features. The system has evolved under the market conditions of available specialized public and private milk processing factories and the vicinity of the urban market. It is an example of a close crop-livestock integrated system, including forage production, which is otherwise still rare in Syria.

Trends and development options

Commercialisation of agriculture and increasing rural livelihoods differentiation is among the dominant features of the ongoing trends in the commercial farming area of the irrigated and to a somewhat lesser degree the rainfed plains. The land market is very active, including between villages, as the interest in agriculture is low in some of them (with high degrees of residents returning from international migration). Agricultural investment in this system is relatively independent from formal credit markets, as even small farmers do not rely on credit to finance their activities. The highly capitalized agricultural production reflects the very dynamic rural economy with differentiated consumer markets even at the village level, which also testifies to the high average income levels.

In the rainfed part of the plains farming system, large owners are investing in addition in sheep production, for which they employ shepherds from the Bedouin community.

In the mountain orchard system, there is a high dependence on Government employment which complements agricultural production income. Orchards intensified and shifted over time from a primarily grape based system into an apple based system for a large share of producers. Overall, the mountain orchard system represents a successful technical innovation by the Southern Regional Development Project. This statement does not imply an overall economic evaluation of this investment and expansion of such public expenditure should in any case be preceded by a thorough economic analysis.

Poverty profiling has a clear geographical dimension on the mountain. The zone of marginal cereal cultivation on the southern and eastern part of the slope of the mountain is characterized by such poor production conditions, that only the few individuals who succeeded in investing in perennials on pockets of better soil stand out of the poor cereal producers. The younger generation, where available, sought opportunities outside the system and transfer income into the community are an important source of annual income.

The development options in the plains farming systems operate presently with relatively little Government interventions, as industrial crops play a marginal role and the farming community is strongly oriented towards crops under private production conditions and marketing arrangements. Investment capital is available to rapidly adjust to arising market opportunities and even population growth appears not to affect the agricultural sector negatively, as part of

the producers withdraw from agriculture and sell their land. Given the high prevalence of modern irrigation systems, the chance for improved water use efficiency appears favourable. However, the high importance of field vegetables is nevertheless based on water intensive crops. The potential to further regulate water consumption and the willingness of the population to accept changes in the water pricing policy, if it is focussing on sustaining long-term resource sustainability, should be assessed.

In the mountains farming system, the production orientation on perennial crops will determine the farming systems, but in recent years, farmers claim to face the negative impact of asset fixity when their apples must be sold at depressed prices due to a lack of storage facilities. This claim deserves substantiation and investigation, but considering the high availability of investment capital within the farming system suggests that storage facilities could possibly also be build through private funding. In the marginal production areas of the mountain farming system, social policies and support to exit from agriculture might be only viable long-term option, should investment in expanded land-reclamation prove to be uneconomic.

FS 6: Pastoral and agro-pastoral farming systems of the semi-arid and arid east

Description of the system

The pastoral and agro-pastoral systems represent slightly over half (ca 10 Mio ha, i.e. 55%) of the total area in Syria, which makes it its largest farming system in terms of size. According to estimates from Al Badia directorate, the system includes slightly above 1 Million inhabitants, who jointly raise the far majority of the 12 Million sheep. Of the broad farming systems, 1 Mio hectares or roughly 10% are cultivable land. 30% of cultivated land was fallow in 2002 (a high rainfall year) and 46% of cultivated land (432000 hectares) is cropped with barley.

The farming systems cover most of the area located in the so-called Stabilization Zone 5, marked by land unsuitable for rainfed cultivation, an average annual rainfall below 200 mm (after exclusion of the parts under irrigation schemes, mostly along the Euphrates River), high rainfall variability and the associated sparse natural vegetation. Furthermore, these farming systems include most of the Stabilization Zone 4, defined as rainfall of up to 250 mm, characterized by cereal cultivation under high risk of failure of the grain harvest. Given the high to exclusive reliance of the population on sheep (and occasionally camel) raising, the frequently absence of barley grain is not perceived as a failure but part of the natural cultivation conditions in the system. Pockets of irrigated farming from oasis and wells have a long tradition and often are located in small areas.

This entire zone is marked by considerable Government intervention in terms of settlement policy of its population, social organization (promotion of co-operative organization of Bedouins), provision of social services and subsidized feed and intervention in the grazing rights of the traditional social groups. Definition of boundaries for the legal cultivation of the fragile environment and the permit system for the establishment of wells are important policy decisions influencing the development of the systems.

Within the above area, the composition of livelihoods, development options and policy interventions suggest the definition of three farming systems, of which two are defined geographically, while the pockets of irrigated farming are subject to special regulations and disperse in nature. Presenting the distribution of population and sheep between the farming systems is not feasible due to the migratory nature and the fact that the registration of residence provides little information on the source of livelihoods.

Agro-pastoral farming system

The agro-pastoral farming system is characterized by the combination of livestock husbandry combined with marginal cereal cultivation, predominantly of barley. Given the cultivation ban within the formal Badia boundaries (demarcated along the border between stabilization zones four and five), the farming system covers approximately 1.56 Million hectares. In reality, the band of agro-pastoral land use is much broader, based on the above defined characteristics of the system and of natural conditions of the system. The latter refers to a gradual transition between the pastoral and agro-pastoral farming systems, with a strong tendency to encroach on the Badia with barley cultivation. Despite considerable success by the agricultural administration to impose the legal provisions, they do not succeed against the strong conviction of part of the farmers that cultivation is the best way to use the Badia, a lack of clearly definable boundaries and lack of practical capabilities of the administration to monitor compliance.

The agro-pastoral farming system is a transition between the traditional grazing areas of the pastoral farming system and the crop-based farming systems in the north and the west of the country. The agro-pastoral system is mostly located in the so-called stabilization zone four (200 – 250 mm average annual rainfall), as rainfed farming is permitted, but rainfall is too low and insecure for crop-based livelihood strategies. The system is characterized by the close sheep-

barley integration, but faces high risks to produce a grain harvest due to the rainfall variation, for not only the wheat, but also even the dominant barley. The frequent use of the crops for grazing instead of grain production is an inherent part of the system and is not perceived a failure by the herd owners is it is by agronomists. Off-farm income and casual employment is a frequent element of the livelihood strategy in the farming system. The agro-pastoral farming system is relatively free of large-scale policy interventions and exposed to climatic risks as well as private marketing of its produce.

The socio-economic reason for the inability to define a clear boundary for the agro-pastoral farming system is the transhumant nature of part of the livelihood system of its inhabitants. This implies a partial (seasonal) reliance on feeding resources within the pastoral zone as well as the feeding on by-products in the agricultural zones.

The criteria for developing household types include herd size, but also the size of cultivated land, off-farm income and asset ownership. Poor households depend mainly on agricultural or non-agricultural casual labour (50%). The preferred employment is often as a herdsman, as skills can be directly applied against a fixed wage without changing the lifestyle. Many households lost the majority of their sheep during the drought and they have found no possibility to recover the loss. Consequently, sheep income contributes at present only 20% of family income, compared to half before the drought. The capital loss and lack of credit partly reaches levels that they rent their land to investors, who provide the capital as they are able to face the production risk. After each consecutive crop failure, the investor enters a new agreement based on the condition that for the new attempt to cultivate, the share of output is adjusted in his favour. The better educated members of these households pursue an exit strategy from the system, while people with lower education seek possibilities to re-invest in sheep. Medium households were not defined in this system, as the number of combinations of the different income sources did not result in a clear picture. The share of households according to the local population not belonging into either the poor or the better-off category was very small, i.e. the effect of the drought years had led to a rather clear polarization of the rural population and left only two household types.

The better-off households are characterized by high (30-50%) off-farm income from agricultural or non-agricultural sources, while sheep provide only 10-20% of income. Cultivation provides only approximately 10% of income. A special development occurs in the western part of the system, where experiences from the green belt project have been transferred into the agro-pastoral farming system and farmers invest in establishing olive orchards. In addition, capital is invested in poultry farms, which permit a quicker recovery of capital than crops. The latter strategy is only available to those with access to credit or capital available from other income sources. These new strategies document a considerable shift in livelihood strategy, as in the study villages, half of the income in that group was said to be obtained from sheep a decade ago.

The agro-climatic conditions in the agro-pastoral farming system lead to a very simple cropping pattern. Rainfed barley is the lead crop, even though with low average grain yield and a large yield variation. Wheat plays a relatively minor role due to its higher susceptibility to low rainfall. In the western part of the farming system, specifically in the areas around Aleppo and on the western, north-south rim of the farming system, perennials gained increasing importance in the last decade. Particularly olive orchards expanded dramatically, partly driven by the incentives given in neighbouring farming system by the Green Belt Project.

This agro-pastoral strategy represents a combination of a risk reduction strategy, where cultivation allows in dry years at least to produce fodder for the sheep and offers a possibility for additional cash income from barley sales in particularly good years. Low grain yields are in most cases used for winter-feeding of the sheep, where crop production and sheep ownership are in the same hands.

The drought of the late 1990s resulted in a serious blow for the population of the agro-pastoral zone, as its extent exceeded the tolerance for acceptance of failing crop farming (which in

principle is an inherent part of the strategy). Many of the poorer households in the system lost the capital and therefore their capability to re-invest in their traditional livelihood system. It was observed that in some villages, many and particularly the small landowners started to rent out their land in a share cropping arrangement to urban businessmen who possessed sufficient capital to accept the risk of barley cultivation. As this sharecropping refers to low-input, mechanized crop, the contribution of the landowner consists exclusively in the provision of land, while the investor organizes for tractor ploughing, seeding and harvesting. The agreements follow an intricate arrangement, whereby the share the landowner in the yield is stepwise increase with each failed crop. In other words, should the investor obtain a harvest in the first year of the arrangement, the landowner receives 30% of the harvest. Should the harvest fail in that initial year, the investor may plant a second time in the subsequent year and in case of a grain harvest receives a share of output of 75%, i.e. the landowners share is decreased to 25%. Fails the second season as well, and the investor decides to plant again, his output share in the third attempt increases to 80%[37] and the landowner receives only 20% of the output.

New strategies were implemented in response to different external influences: The Green Belt Project, even though primarily focussing on the more humid agro-climatic zones, introduced the strategy to start olive cultivation further in the east. Farmers with sufficient funds to engage in new investments after losing their sheep launched small poultry units and an increasing number of farms copied their initial success. However, given the capital requirements or credit worthiness, only established and farmers that are more successful are able to pursue this new development and market access is an important determinant of the possibilities for the poultry component. For that reason, this dual approach to modernization was found in the western part of the agro-pastoral farming system, with relative good market access to Homs and Hama, but not in its less densely populated northern part. The replicability and expansion of this strategy has clear limitations and market risks for the poultry strategy will increase with the number of replicants. This example is nevertheless a clear indication of the willingness of the farmers to pursue new opportunities.

The present study did not focus to assess the degree to which overstocking from earlier stages has contributed to resource degradation and the seriousness of the present problem. The ban on barley cultivation in the drier parts of this formerly broader band of marginal barley cultivation is clearly necessary for environmental conservation.

The development options within the present resource based livelihood system are quite limited. Livelihood production within the farming system is threatened by drought years, which entail for farmers a high risk of loosing their accumulated livestock assets, which goes much deeper than income loss in crop production under similar events. Reducing the risk of livestock loss or spreading the drought consequences over longer periods might be important entry points to improve livelihood security and promoting a higher return to productivity-increasing complementary measures, such a stronger selection, mineral and salt feeding as well as selective complementary feeding. Credit for re-stocking or (area based) insurance-based systems are feasible options, but the long record in grant provision and direct support under such circumstances imply that long term relationships between public institutions for credit repayment or the development of functioning insurance mechanisms will take time to evolve. Marginal producers will depend on income support, if they should remain within the farming system, as casual income or the occasionally available share cropping arrangements in the neighbouring irrigated farming system will not allow them to accumulate capital to invest in their future.

The potential of improved crop production through improved crop water availability should be carefully assessed. Under similar agro-climatic conditions in the equivalent farming systems in

[37] The specific percentage is subject to negotiation and might differ within the farming system on the number of investors and land owners willing to rent their land.

North and sub-Sahara Africa, water harvesting has proved feasible to reduce yield variability and increase average yields considerably. Proper design of such systems and their potential for mechanisation should be carefully determined in order to address the otherwise potentially low initial labour productivity in the establishment years. The so-called Vallerani plough might be suitable to improve natural re-vegetation by increasing initial growth of forage plants.

The carrying capacity of this farming system is mostly exhausted, so the system has very little potential to accommodate a growing population and emigration will be unavoidable. Small niches in livelihood development might be feasible, such as nature friendly tourism, particularly near historic sites.

Pastoral farming system

The pastoral farming system represents the traditional land use type in Al-Badia, based on a livelihood system adjusted to the fragile and highly variable environmental conditions. Taking the stabilization zone 5 as indication, this farming system covers approximately 8.6 Million hectares (including the cultivated niches). Migratory cycles to provide the sheep, goats and camels with their feeding requirements were established on negotiated grazing areas with other tribes and detailed movements are adjusted at the lower levels of social organization, i.e. the clans and families.

The annual movement cycle involves grazing in the Badia in spring and early summer, followed by migration to cultivated areas were sheep feed on crop residues, starting with cereal stubbles (or dry plants) followed by cotton residues. In irrigated areas, other crops such as maize and vegetable fields or legumes are grazed. In the winter, the families return to Al-Badia and feed their animals on concentrated feed, part of which is provided at subsidized rates through the co-operative system. Hence, the migrations traditionally include moving beyond the farming system into the cultivated areas to graze crop residues, particularly in the irrigated and rainfed crops in the north and the west of Syria. The length of these migration cycles depends on the quality of forage within the system, while their general direction is more a function of family ties. Apart from the income derived from sheep products (milk and meat), off-farm income and self-employment are the only available livelihood sources. Most of the sheep milk is processed, partly by the family or traditional processors (*Jaban*), while wool processing is increasingly limited to the family needs.

The Badia has been subject to cycles of expanding and contracting cultivation encroachment, with noticeable damage to the natural habitat. Cultivation in SZ 5 has been banned for that reason. Over the last decade, the Government established a large number of forage reserves on land under the jurisdiction of the Badia Department and partly on co-operative land. These grazing reserves proved the technical feasibility of range improvement through regulated access. The local and decentralized management responsibility of the local communities has so far not been sustainable and been hampered by events of the past drought years. The provision of subsidized feed was established to buffer feed shortages in drought years and their provision support the winter feeding by reducing feeding costs. Co-operatives as a social organization, including management of designated grazing areas, have been tested, but the exclusive use of co-operative land was granted only in exceptional cases. Grazing boundaries for most co-operatives were abolished during the recent drought and open access is the standard situation.

The differentiation of household types in the pastoral population depends only on the combination of livestock with off-farm income sources. Poor households make up about 60% of holders, who have small ruminant herds below 200 heads (typically up to 100), many of which are village-based. They rely heavily on off-farm or transfer income and partly seek employment as herdsmen. The capital loss in drought years affects them very seriously, as they have no access to credit to re-stock. Some minimum livelihoods are guaranteed by local and state transfers at a low level, which do not permit exit of the situation. Access to employment possibilities even in the irrigated farming system (cotton harvesting) are limited for this

household type, as contracts for cotton picking are partly given with preference to families from within that system, who have experience in cotton farming.

About 30% of holders are classified as medium households, who typically own 200 to 500 heads of sheep and partly complement their income through casual labour. The larger owners in the group may employ a herdsman, but these cases are unusual for the household type.

The better-off households own large herds (above 500, but herds above 1000 are exceptional) and derive all their livelihoods from it if they are not absentee herd owners. Capital access and connections to urban relatives for transfer make them less vulnerable as they can more easily buy feed in case of drought and can recover more easily than the poor can. Off-farm employment is unimportant for the better off, who more regularly employ herdsmen. Their good access to the social network provides them with information on market opportunities, improved feed access and considerable economies of scale. Camel Bedouins are relatively few in number, but are generally considered part of the better-off households.

The structure of the system allows only two strategies within the system. The first one is to expand herd sizes to build capital and be prepared for crises or to rebuild herd sizes after it. Timely information and proper knowledge of market constellations provide the means to reduce losses. Alternatively, employment can be sought, which is available as herdsmen, in casual employment or outside the farming system. The possibilities for income generation through processing are largely limited to milk processing and they are largely exploited. The household possibilities to explore the different strategies are obvious when considering the asset and skills available in each household type.

NGOs and Government programmes often focus on traditional weaving and Bedouin handicrafts in promoting opportunities for increased self-employment. Marketing these items is frequently a constraint and the opportunities for higher sales margins by the Bedouin families are related to the general development of tourism in the country. Additional income generation could stem from the involvement of Bedouins in the tourism sector, either through provision of accommodation, guided tours to explore the natural scenery or wildlife sights. At present, some initial developments are observable, but they are confined to the Palmyra area and mostly organized by Hotels. Additional and largely unexplored potential exists near other historic sites (such as Resafah), but their development requires careful development and possibly international assistance.

The co-evolution of the farming system with its' harsh ecologic environment resulted in livelihood strategies, which have shown high resilience to stress conditions. Policy change is one factor, which could add stress to the system. It cannot be expected that the acceptance of policy signals intended to guide the development of the farming system (e.g. on grazing management regulations or water access regulations) is a rapid process. Too frequent and sporadic policy change leads to mistrust in the institutions identified with these measures. In case the confidence to institutions is lost, a second driving force derived from a harsh ecological system might otherwise be applied, which is the rapid exploitation of new opportunities without entering long-term commitments.

Such behaviour is not backwards or reminiscence to the past, but an asset: once range management strategies become engrained in the society, they have the chance to become resilient - if sufficient flexibility for local range management decisions is permitted. The pastoral farming system can only then contribute to valorisation of the steppe areas, if its livelihood system can survive the stress from the natural and the institutional framework. Locally managed and socially acceptable range management strategies are a key to its success, such as are stable and predictable policies influencing the pastoral farming system. Range policies have not always provided incentives, which encouraged social groups (co-operatives or traditional forms of social organization) to reap the benefits from improved management of the range.

The trends and development options within the pastoral farming system are relatively limited, as long as water resources do not allow the sustainable complementation of livestock production activities with crop production (e.g. near oasis or special permits for well-based sustainable crop production). Nevertheless, the almost total reliance on sheep grazing within the farming system and the high risk associated with the rainfall variability can be reduced to some degree. The earlier expansion of crop farming into the dry season grazing areas of this farming system, which partly belong to the agro-pastoral farming system but also the some areas now under intensified land use based on irrigation expansion, should be recognized as one of the factors increasing the pressure on this farming system. From the perspective of analysis of the land use profitability of these areas these land use changes are possibly beneficial, but the sustainability of some of these areas might have been overestimated in the past.

However, even within the remaining areas, not all the development potential is presently being realized: There is still considerable scope to promote the improved local management of natural resources. Pasture rehabilitation has been attempted and often failed, but the absence of consistent and transparent policies on who should reap the benefit of improved range management has contributed to the failures. The drought effect offered from a short-term perspective an understandable excuse for intervention in grazing policies, but has serious long-term impacts on the willingness to co-operatives or other forms of local organization (including the traditional tribal structure) to improve grazing management.

Under-utilized is furthermore the potential for runoff water use (surface water harvesting) for improved forage production, which could increase the survival rate of newly seeded fodder shrubs (which is more cost-effective than replanting) and improve the productivity of existing ones.

Lamb fattening could become a viable diversification strategy within the pastoral faming system and despite the need for capital investment (minimum for complementary feedstuffs), could improve the overall resource use efficiency in terms of meat production for local or export markets. Fattening cooperatives or individual fattening attract investors in the agro-pastoral farming system, but the potential for the average population within the farming system to participate in the activity depends on their capital availability and the absence of liquidity constraints which often forces medium household to sell their animals prematurely.

Pockets of irrigated farming

Apart from marginal farming within stabilization zone four and illegal cases of continued rainfed barley cultivation within the Badia itself, a third agricultural land use type exists in small areas: irrigated farming.

The pockets of irrigated farming are based on licensed wells and are developed either in oasis or in newly licensed well areas near the Euphrates River. Cultivation restrictions for water conservation apply to these areas as well, but sheep are frequently an important component of these systems. To the extent possible, farmers cultivate regulated crops such as cotton and wheat with reportedly high yields. There are indications, though, that apart of these new permits, they may not be used by the intended beneficiaries. Where accumulated debt prevents them from cultivating the land themselves, they might rent it to investors instead.

Policies affecting the pastoral and agro-pastoral farming systems relate to the marketing conditions, input pricing and resource management. Major changes have occurred in all of these issues, which are discussed in the main report. Changes in the meat export policies in 2000 have supported income generation from exploiting the preference for Awassi meat, particularly in the Arabian countries, which could be further exploited if combined with policies on the feed provision side aimed at encouraging increased returns per head of sheep and per grazing-day in the Badia. Investors from outside the farming system presently carry out most fattening. Support to the engagement of traditional breeders in fattening of lambs should be explored, as it generates additional income while reducing pressure on the range. Furthermore, the promotion

of creating emergency feed resources would prevent particularly medium holders from loosing their herds (i.e. capital stock) in drought situations. The role of traditional social organization or co-operatives (particularly where the tribal structure coincides with co-operative affiliation) in the supervision of improved rangelands deserves strengthening, but its success would depend if they can be confident to benefit from their management without external interference.

There are technical possibilities to increase forage production in the traditional run-off areas in Al-Badia (*Faydat*) instead of the barley cultivation, which occurred in these flood plains prior to 1992. Experiences for area-based insurances for breeders could be explored, but careful implementation in a socially adjusted manner and a long horizon for slow implementation would be indispensable to be accepted and sustainable. Policies allowing particularly poor and medium holders to recover from their loss of capital should be pursued, which would involve allowing careful re-stocking, but also working capital provision of rainfed producers in the agro-pastoral system to prevent the long-term resource use of these lands by external investors. The development of additional income sources besides sheep breeding will nevertheless be indispensable to raise the living standards of a growing population, but increased resource use efficiency and income generation within the farming system could considerably reduce this pressure.

Trends and development options

The recent drought seriously affected the agro-pastoral as well as the pastoral farming system through the loss of capital and subsequent credit default of livestock and crop producers. A frequent consequence is the focus on new income sources, i.e. land rented out to commercial producers and investors. Other examples on new developments include olive and chicken enterprises, as is observable east of Salamiya, or the focus on casual work and migration (partly with the hope on restocking lost sheep in the future) north of the Euphrates.

A wealth of international literature has proven that the natural vegetation is the best cover and vegetation type for the arid land of Syria, commonly known as Al Badia. Specific improvements increasing the productivity of natural grazing species have been successful. Livestock grazing, especially by sheep, are the best direct use of these areas for the benefit of humans and are sustainable if properly managed. The management of range areas may be carried out through different organizational forms, including private property, individual use rights and common property management. There is no clear superiority of one arrangement over the other and the earlier mis-interpretation of the so-called Hardin theorem has been mostly put to rest. The most tragic situation for the management of common property resources are situations of uncertainty and free access and not the common property arrangement as such. In other words, it is the clarity of use rights and management responsibility against outsiders, which is the most important success criterion for common property arrangements and not private property as one specific way of arranging it.