

Ministry of Agriculture and Agrarian Reform

NAPC

National Agricultural Policy Center

TECHNICAL REPORT

Farming Systems of the Syrian Arab Republic

Horst Wattenbach

International Consultant to FAO

March 2006

With the support of

Project GCP/SYR/006/ITA



Food and Agriculture
Organization of
the United Nations

COOPERAZIONE
ITALIANA

Ministry of Agriculture
and Agrarian Reform

Acknowledgements

This document is based on the collaboration of a large number of individuals, who contributed to the concept development, practical arrangements for fieldwork, implementation and analysis of the study. The direct reference in the main chapter gives credit to the six study team members who were responsible for adjusting the overall study methodology to the specific farming system under their responsibility, but their continuous efforts in compiling information, be available for discussion and frequently adjusting their draft texts is expressly acknowledged. Without their previous professional experience across Syria, the work would have been less rich and rewarding. The efforts of Mahmoud AlAshram in supporting the team are appreciated. Mr. Pirro Tomaso Perri is acknowledged for the extensive support to the NAPC team in drafting and revising the individual Farming Systems Working Papers.

The stimulating and supportive work atmosphere at the National Agricultural Policy Centre made the long working hours always enjoyable and never tiring. The continuous professional and logistic support and encouragement of Atieh El Hindi, Director of NAPC and Ciro Fiorillo, CTA of the project GCP/SYR/006/ITA repeatedly allowed overcoming constraints to efficient implementation of the study and contributed valuable information.

Data compilation, analysis and teamwork would have been much more difficult without the preparedness of all the NAPC support staff particularly Rouba Ghanem to arrange for supplies and transport outside office hours and the project drivers Mazen Boukai and Suheil Mayla' to take the reporter to safely to remote areas on sometimes difficult roads. Ms. Asma Matar has provided valuable assistance in facilitation communication by providing English/Arabic interpretation for a number of meetings and translation of the documents.

Special appreciation is expressed for Annegret Haseley, who under pressure transformed the draft sketches into the final illustrations.

Special thanks are also due to Maria Grazia Quieti, Senior Agricultural Policy Support Officer, Policy Assistance Division and John Dixon, Senior Officer, Agricultural Management, Marketing and Finance Service, Agricultural Support Systems Division, both FAO Headquarters in Rome for their encouragement and support to apply farming systems analysis to the benefit of improved agricultural policy in Syria.

Last but not least, deep gratitude is expressed for the overwhelming hospitality and generosity of all visited farmers, without whose willingness to share information, views and experiences this document would not have been possible. May this document contribute to a better understanding of the perception of agricultural policies by the farming community as well as to an improved understanding of farmer response and their vulnerability to policy decisions.

Table of contents

EXECUTIVE SUMMARY	I
INTRODUCTION	A
CHAPTER 1 – RECENT DEVELOPMENTS IN THE AGRICULTURAL SECTOR AND AGRICULTURAL POLICIES	1
CHAPTER 2 – BACKGROUND AND METHODOLOGY TO FARMING SYSTEMS STUDIES FOR IMPROVED AGRICULTURAL POLICIES	5
Characteristics of farming systems analysis	5
Implementation of the Syria farming systems study	7
Existing farming systems zoning for Syria	10
Definition of household types	12
Development of a farm management database	12
Limitations of farming systems studies	13
CHAPTER 3 – OVERVIEW OF FARMING SYSTEMS	15
The concept of Stabilization Zones (Agro-climatic Zones)	15
FS 1: Intensive Irrigated Coastal Farming System	18
<i>Description of the system</i>	18
<i>Southern, greenhouse based farming system</i>	21
<i>Northern, citrus-based farming system</i>	24
<i>Trends and development options</i>	26
FS 2: Hilly and Mountainous Farming Systems	29
<i>Description of the system</i>	29
<i>Hilly farming system</i>	31
<i>Mountainous farming system</i>	32
<i>Trends and development options</i>	35
FS 3: Farming systems of the northern and north-eastern plains	39
<i>Description of the system</i>	39
<i>Irrigated farming system</i>	41
<i>Mixed farming system</i>	47
<i>Trends and development options</i>	56
FS 4: Farming systems of the central rainfed and irrigated plains and Al Ghab	59
<i>Description of the system</i>	59
<i>The farming system of the central irrigated plains</i>	62
<i>The farming system of the central rainfed plains</i>	64
<i>Trends and development options in the central rainfed and irrigated plains farming systems</i>	66

<i>The Al Ghab farming system</i>	67
<i>Trends and development options in Al-Ghab</i>	71
FS 5: Farming Systems of The Southern Semi-Arid Plains And Mountains	73
<i>Description of the system</i>	73
<i>Farming system of the southern Mountain</i>	75
<i>Farming system of the rainfed and irrigated southern plains</i>	78
<i>Trends and development options</i>	81
FS 6: Pastoral and agro-pastoral farming systems of the semi-arid and arid east	83
<i>Description of the system</i>	83
<i>Agro-pastoral farming system</i>	83
<i>Pastoral farming system</i>	86
<i>Pockets of irrigated farming</i>	88
<i>Trends and development options</i>	89
CHAPTER 4 – COMPARATIVE REVIEW OF STUDY RESULTS	91
Comparative characterization of farming systems	91
Household level considerations	101
Crosscutting themes and policy areas	105
<i>Factor markets</i>	105
<i>Agricultural support system</i>	111
WAYS FORWARD – CONCLUSIONS AND RECOMMENDATIONS	115
BIBLIOGRAPHY	117
ANNEX	119

List of Tables

Table 1: Conversion of administrative units to six farming systems for field assessment	9
Table 2: Selected Mantikas for field study and coverage of farming systems and niches	9
Table 3: The intensive irrigated coastal farming system (FS 1) and its sub-systems in the national context.....	19
Table 4: Sub-division of FS 1 according to their crop specialisation.....	20
Table 5: The Hilly and Mountainous Farming System in the National Context	30
Table 6: Sub-division of FS 2 according to their crop specialisation	31
Table 7: The farming systems of the northern & north-eastern plains in the national context	40
Table 8: The share of different crops in the agricultural plan.....	49
Table 9: Comparison between the main rainfed crops in the mixed farming system ...	55
Table 10: Comparison between the main well-irrigated crops in the mixed farming system.....	55
Table 11: Comparison between the main well-irrigated crops in the mixed farming system.....	56
Table 12: The Farming Systems of the Central Plains and Al Ghab.....	60
Table 13: Sub-division of the central plains of FS 4 according to their crop specialisation	62
Table 14: The farming systems of the irrigated and rainfed central plains in the national context	63
Table 15: The Farming System of the Southern Mountains and Plains in the National Context.....	74
Table 16: Sub-division of the central plains of FS 5 according to their crop specialisation	74
Table 17: The cropping pattern by household type in the mountain farming system	76
Table 18: The six farming systems and their share of total area, holders and crop water sources	92
Table 19: Share of cultivated land by crop groups and main crops by share of cultivated land in the major farming systems of Syria.....	95
Table 20: Crops with major share of national production area at main FS level	97
Table 21: Differentiation of major farming systems 4 & 5.....	98
Table 22: Relative vulnerability of major farming systems to price shocks, climatic risk and policy change.....	100

Table 23: Relative risk factors in the Syrian Farming Systems.....	101
Table 24: Average size of cultivated land per holder by farming system (ha)	102
Table 25: Comparison between livelihood sources of poor or small households by Farming System	103
Table 26: Comparison between livelihood sources of medium households by Farming System	104
Table 27: Comparison between livelihood sources of better-off households by Farming System	105
Table 28: Relative importance of agrarian reform land, absentee & part-time farming and share cropping arrangements by farming system	107

List of Figures

Figure 1: Transmission of national and international factors on the rural economy and farmer decision making	3
Figure 2: Major farming systems of the Syrian Arab Republic	16
Figure 3: Share of cultivated land by season and household type	43
Figure 4: Cropping pattern in mixed network subsystem	50
Figure 5: Cropping pattern in mixed sub-system with well-irrigation	51
Figure 6: Share of cultivated land by crop groups in the farming systems of Al Ghab, the rainfed and irrigated central plains (FS4)	61
Figure 7: Share of cultivated land under so-called strategic crops and average holding size by farming system	93
Figure 8: Share of cultivated land under major crop groups by farming system	94
Figure 9: Vulnerability of farming systems to price shock, climatic risk and policy change	100
Figure 10: Migration of casual agricultural labour between farming systems	110

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 characterized 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 dispersed 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, while 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 led 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 losing 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 subdivisions). 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 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 lose 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).

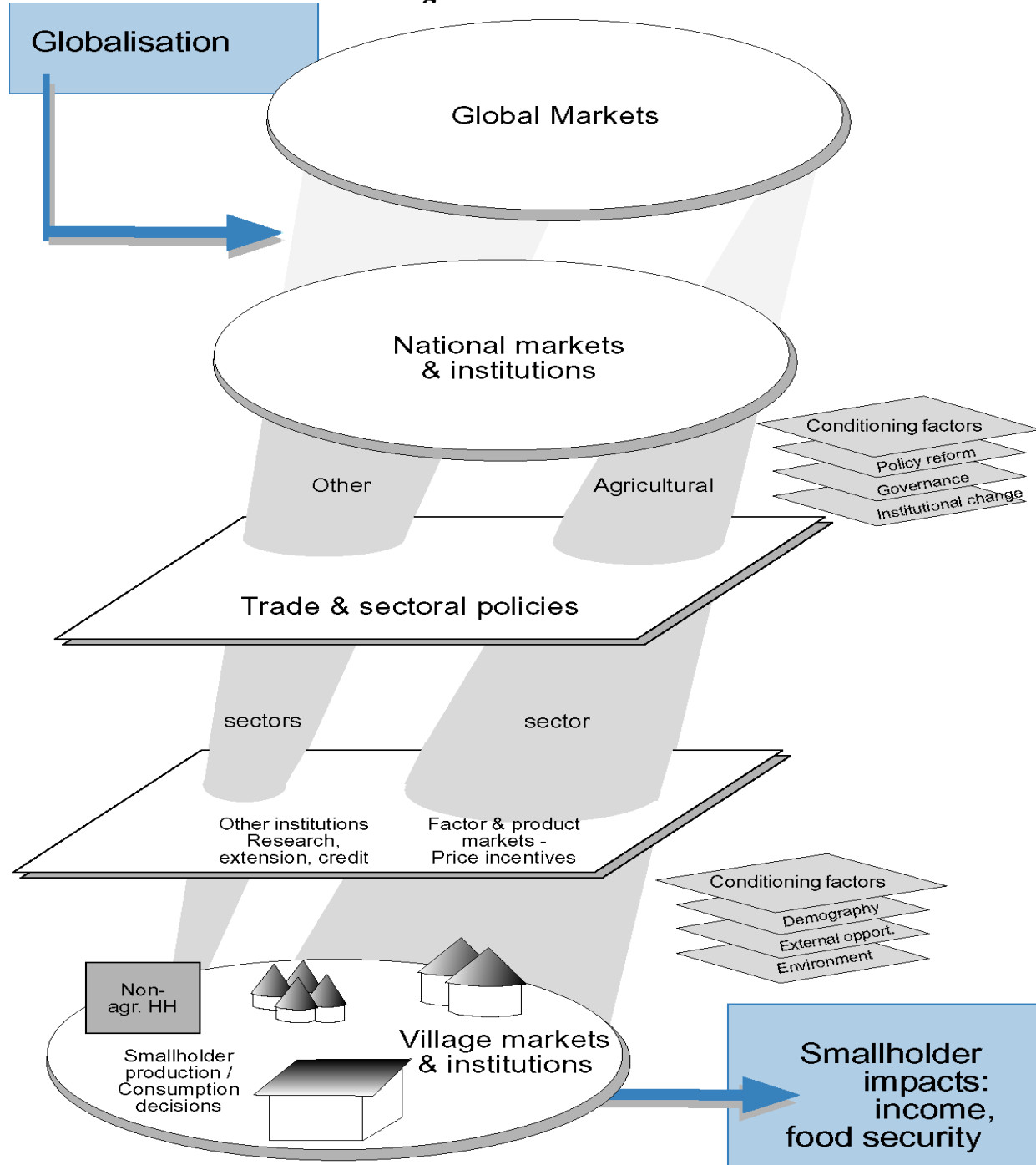
The traditional objectives of agricultural policies were directed at full utilisation of natural and human resources and securing adequate supplies for food security, processing industries and exports. They evolved over the last 15 years from strict self-sufficiency policy to broader self-reliance, based 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 centred 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: Baniyas 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 system². 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 NACP 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.