

## Chapter 3 – Overview of Farming Systems

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

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

### **The concept of Stabilization Zones (Agro-climatic Zones)**

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

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

Zone 1: With annual rainfall over 350 mm the zone is divided into two areas:

- a) Those with annual rainfall over 600 mm. where rainfed crops can be successfully planted.
- b) Those with annual rainfall between 350- 600 mm and not less than 300 mm during two thirds of the relevant years i.e. it is possible to get two seasons every three years and the main crops are wheat, legumes and summer crops.

The area of this zone is 2,701,000 hectares and forms 14.6 percent of the country's area.

Zone 2: It has an annual rainfall between 250 - 350 mm and not less than 300 mm during two thirds of the relevant years i.e. it is possible to get two barley seasons every three years and in addition could be planted with wheat, pulses and summer crops. The common rotation in this zone is:

- On deep soil: wheat-pulses and forage legumes – a summer crop is planted if winter rain is sufficient, otherwise fallow will take the place of summer crop.
- On shallow soil: mainly barley, but part of the land is planted to cumin. Fallow is rare.

The area of this zone is 2,470,000 hectares and it forms 13.3 percent of the country's area.

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

7.1 percent of the country's area.

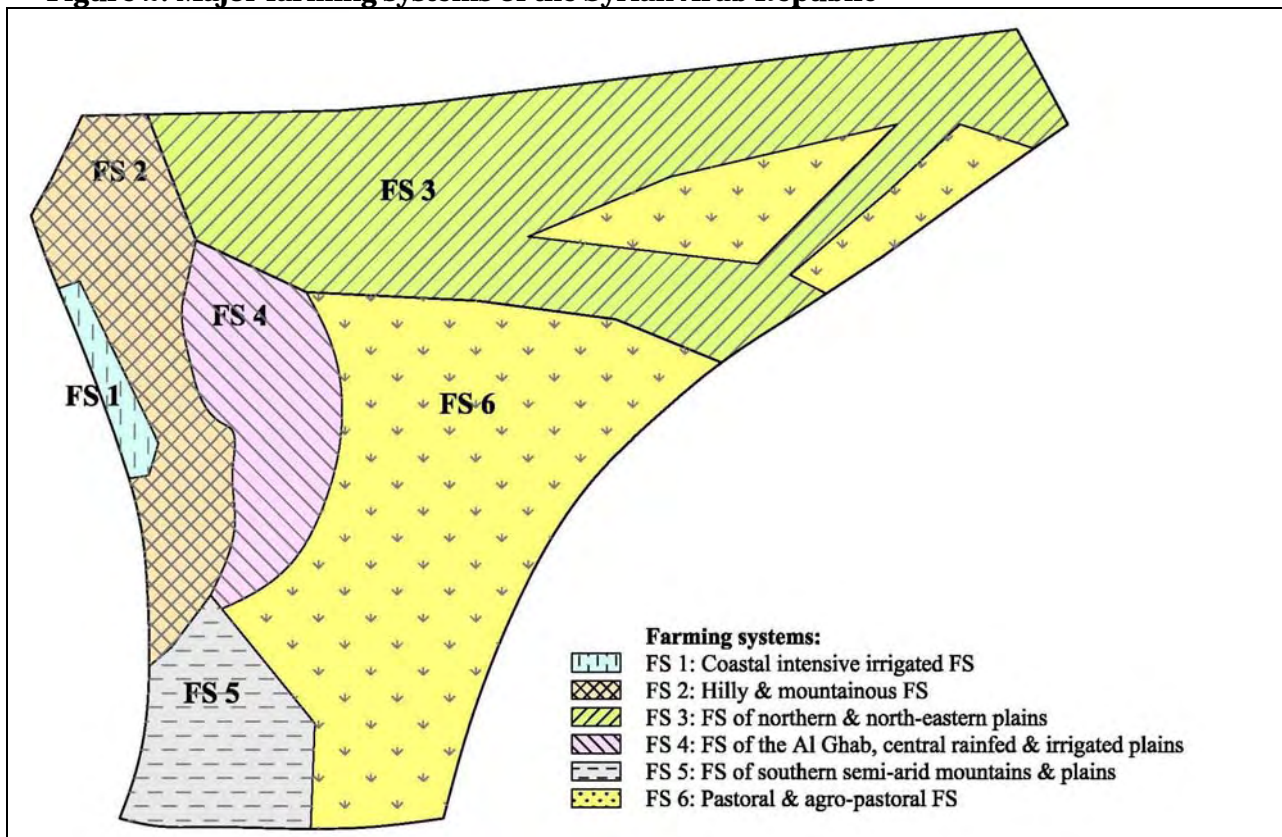
Zone 4: It has an annual rainfall of between 200- 250 mm with not less than 200 mm during half of the relevant years i.e. it is good just for barley, which in some years is grazed as the yield is too low to harvest. Fallow is practiced in case of capital shortage. The area of this zone is 1,833,000 hectares and forms 9.9 percent of the country's area.

Zone 5: (Desert and steppe) this area covers the rest of the country's land. It is not suitable for rainfed planting. The area of this zone is (10,208,000) hectares which forms 55.1 percent of the country area. It is natural grazing for sheep and camels.

Source: adapted from MAAR annual statistics.

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

**Figure 2: Major farming systems of the Syrian Arab Republic**



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

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

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

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

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

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

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

## **FS 1: Intensive Irrigated Coastal Farming System**

### *Description of the system*

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

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

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

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

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

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

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

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

Source: constructed based on MAAR statistics for 2002.

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

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

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

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

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

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

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

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

Source: constructed based on MAAR statistics for 2002.

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

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

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

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

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

#### *Southern, greenhouse based farming system*

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

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

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

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

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

### Household typology

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

#### *Northern, citrus-based farming system*

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

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

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

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<sup>9</sup> The detailed figures quoted in the text are taken from the summary table at the beginning of the chapter.

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

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

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

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

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

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

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

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

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

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

#### *Trends and development options*

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## **FS 2: Hilly and Mountainous Farming Systems**

### *Description of the system*

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

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

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

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

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

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

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

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

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

Source: constructed based on MAAR statistics for 2002.

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

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

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

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

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

Source: constructed based on MAAR statistics for 2002.

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

#### *Hilly farming system*

##### Characteristics

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

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

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

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

### Household analysis

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

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

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

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

#### *Mountainous farming system*

##### Characteristics

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

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

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

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

### Household analysis

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

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

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

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

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

#### Irrigated Pomegranate Niche System

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

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

#### Rainfed Tobacco Niche System

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

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

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

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

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

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

#### *Trends and development options*

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

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

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

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

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

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

The extremely small average holding size suggests that the production system should be oriented towards crops with a high productive employment potential and a high land use intensity (i.e. a high so-called R-Value) to generate high returns to the scarcest resource on the farm. The agro-ecologic and even more edaphic restrictions do not permit the orientation on typical crops under such circumstances, such as vegetable cultivation. Consequently, perennial crops are preferred and the seasonal labour peaks of crop management operations are complemented by seeking seasonal off-farm (agricultural or non-agricultural) employment.

#### Land market

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

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

#### Marketing issues

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

#### Labour market

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

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

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

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

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

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

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

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

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

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

<sup>13</sup> Adopted from the individual report of Firas Yassin (2004).

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

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

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

### Credit market

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

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

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

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

#### *Description of the system*

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

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

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

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

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

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

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

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

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

Source: constructed based on MAAR statistics for 2002.

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

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

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

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

### *Irrigated farming system*

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

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

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

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

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

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

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

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

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

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

**Text box: Payment by farmers for redistributed former Government land**

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

- a) Land rent: state lands are rented to farmers according to annual contracts that specify the amount to be paid. Normally, the rent is similar to that paid against renting private land, whereas squatters are obliged to pay double that amount. Hence, the fee varies between areas. In Hassakeh it ranges from 150-200 SP/du/a.
- b) Cost for land reclamation (which also applies to private held land benefiting from the process): Farmers pay an annual fee in order to cover the cost of land reclamation. The fee is set at 105 SP/du/a in Al-Rakka and at 250 SP/du/a in Der-Ezzor. The fee is supposed to be paid for a period of 30 years.
- c) Irrigation fee in public schemes: farmers using the pulic irrigation schemes pay an annual feed of 3500 SP/ha/year for summer, winter and intensive crops. In case of lack of water availability, this fee is adjusted.

Source: Hamza 2004.

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

Household types in the irrigated farming system

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

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

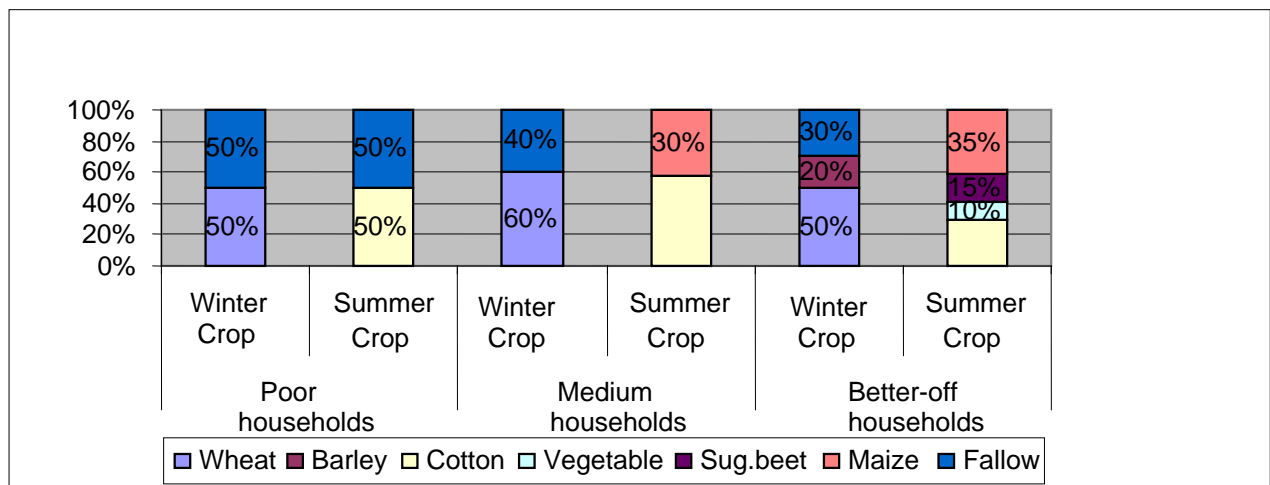
<sup>20</sup> On agrarian reform land from private original holders, the farmer pays no annual fee or land rent, but farmers have to pay for water cost (if network) and land reclamation.

one cow. The household type generates an approximate annual income in the order of magnitude of SP 50000-60000<sup>21</sup>.

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

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

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



Source: Hamza 2004

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

#### Comparison of income strategies between household types

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

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

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

### *Mixed farming system*

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

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

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

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

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

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

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

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

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

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

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

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

### Household typology

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

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

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

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

<sup>27</sup> Details about these villages are presented in the individual report, prepared by NAPC staff Raid Hamza.

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

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

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

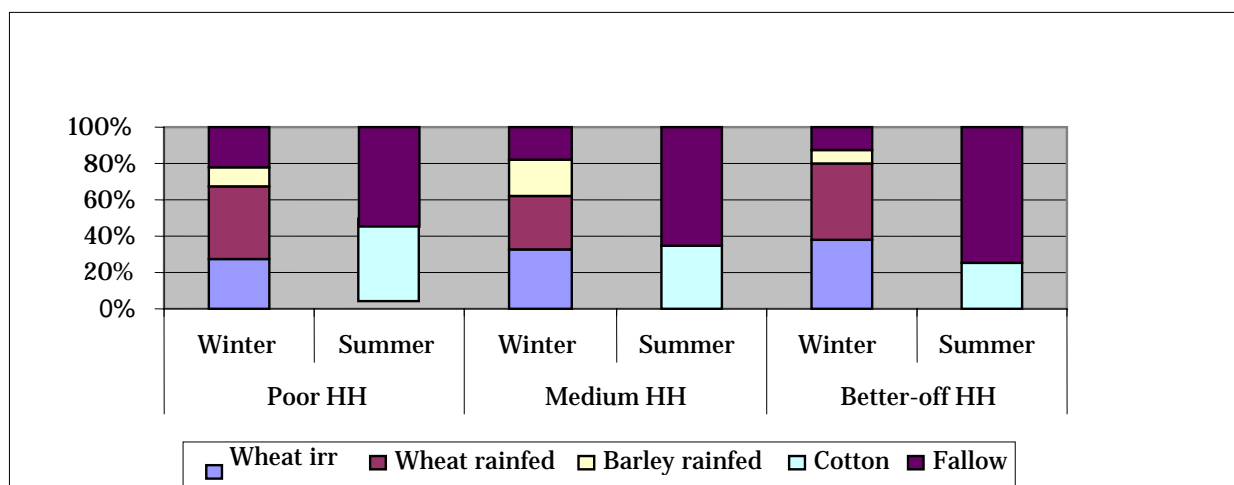
Source: Aleppo Agricultural Department, as presented by Hamza 2004.

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

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

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

**Figure 4: Cropping pattern in mixed network subsystem**



Source: Field survey

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

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

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

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

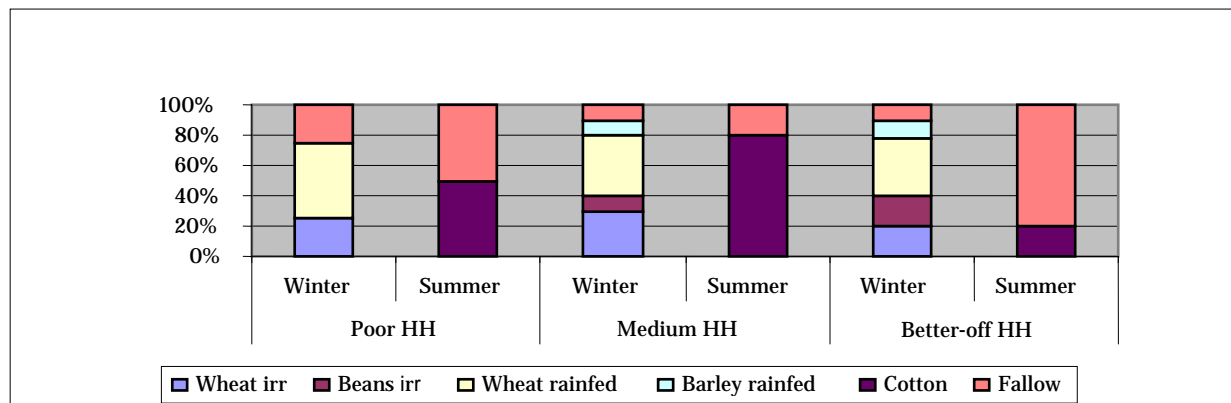
<sup>28</sup> According to the field study, the two extreme villages were Taddif with 0.5-1 hectare and Kaffer-Siby with 3-5 hectare being the typical size of poor holdings, both operating exclusively on rainfed land.

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

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

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

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



Source: Field survey

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

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

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

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

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

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

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

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

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

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

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

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<sup>30</sup> Considering an average holding of 20 dunum, cultivated equally by winter and summer crops.

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

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

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

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

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

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

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

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

#### Comparisons between household types

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Source: extracted from Hamza 2004

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

#### *Trends and development options*

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

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

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

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

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

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

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

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

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

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

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

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

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