# Supply and Demand Prospects for the Major Syrian Agricultural Products

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# Acronyms

| | |
|---|---|
| ASA | Annual Agricultural Statistical Abstract |
| CMO | Cotton Marketing Organisation |
| CBS | Central Bureau of Statistics |
| DAE | Directorate of Agricultural Economics, MAAR |
| DPS | Directorate of Planning and Statistics, MAAR |
| GCB | General Company for Bakeries |
| GCM | General Company for Mills |
| GESILOS | General Company for Silos, Feed Mills and Seed Plants |
| GEC | General Establishment for Consumption |
| GECPT | General Establishment for Cereals Processing and Trade |
| GEF | General Establishment for Feed |
| GESM | General Establishment for Seed Multiplication |
| GOS | General Organization for Sugar |
| GFTOCF | General Foreign Trade Organization for Chemicals and Foodstuffs |
| MAAR | Ministry of Agriculture and Agrarian Reform |
| MSIT | Ministry of Supply and Internal Trade |
| NAPC | National Agricultural Policy Centre |
| SAC | Supreme Agricultural Council |
| SADB | Syrian Agricultural Data Base of NAPC |
| SP | Syrian Pound |

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# Foreword

By Carlo Cafiero

The work presented in this report started as the assignment that FAO requested from me as part of the Terms of References for a set of consultancies to project GCP/SYR/006/ITA, Phase III " Sustainable consolidation of the NAPC", which designated me to be the Thematic Advisor of NAPC's AgroFood division.

Pretty soon, it became apparent to me that the most valuable resource I could provide to contribute to the objective of sustainable consolidation of NAPC capacity was trust. Trust towards the current and potential abilities of members of NAPC's AgroFood division in performing high quality, valuable research in the field of agricultural economic and policy analysis. In performing my activities as an advisor, my main objective was therefore to assist a group of valuable and dedicated professionals in building the self-confidence needed to work in a highly demanding professional environment.

I sincerely believe that expectations were well founded, as it is witnessed by the amount of work that Samir Grad, Basima Atiya, Moudad Karkout, Ahmad Sadiddin, Mahmoud Al Shareef, Nouman Ammouri, and, more recently, Fayez Mansour, have produced over the years, and, most important, by the quality of that work, which is proudly presented by the AgroFood division to the wider audience in the latest edition of the State of Food and Agriculture in Syria report (NAPC, 2008). I would like to believe that my effort has contributed, even if just a little, in making their achievements possible, but I know that most, if not everything, is due to their commitment towards the Institution they have chosen to be part of as their personal contribution towards the most rapid and successful economic and social development of Syria.

It has been a challenge, there have been some difficult moments, but it is my opinion that we have been able to demonstrate, to ourselves first, but to the wider Syrian and International community, that NAPC has reached the status of an internationally respectable research institution, and as such it should be widely recognized.

In trying to assign the merits for a successful endeavor which is the result of many people's effort one is always at risk of paying an injustice to somebody, but this is a risk that we have to take anyhow, given that it would be an even greater tort not to thank all of those who have been more directly involved in the project.

First, Mr. Pirro-Tomaso Perri, current Chief Technical Advisor (CTA) and former Officer in Charge of the Project must be duly recognized as the true architect of the overall success. Tomaso received a challenging inheritance from the former project's CTA, Mr. Ciro Fiorillo, and succeeded in the task of improving on an already excellent design. His professional abilities, and above all his personal devotion towards FAO, the Project and all the people involved, were of the utmost importance to overcome the difficulties that had to be faced during a delicate transition from Phase II to Phase III of the Project in a way that was almost never even felt by all those, like me, who needed to focus on their demanding day-by-day activity.

Then, Mr. Atieh El-Hindi, director of NAPC, whom, with laudable farsightedness and extraordinary managerial experience, was able to govern the creation, evolution and consolidation of a new

institution which needed, in many ways, to be different and innovative compared to those already existing in the Country. He did so with success and for this needs to be thanked by all of us.

Finally, we all know that what has been accomplished would have not been possible without the vital contribution of each and all of the past and present Project's and NAPC's staff. To all of them goes my deepest gratitude.

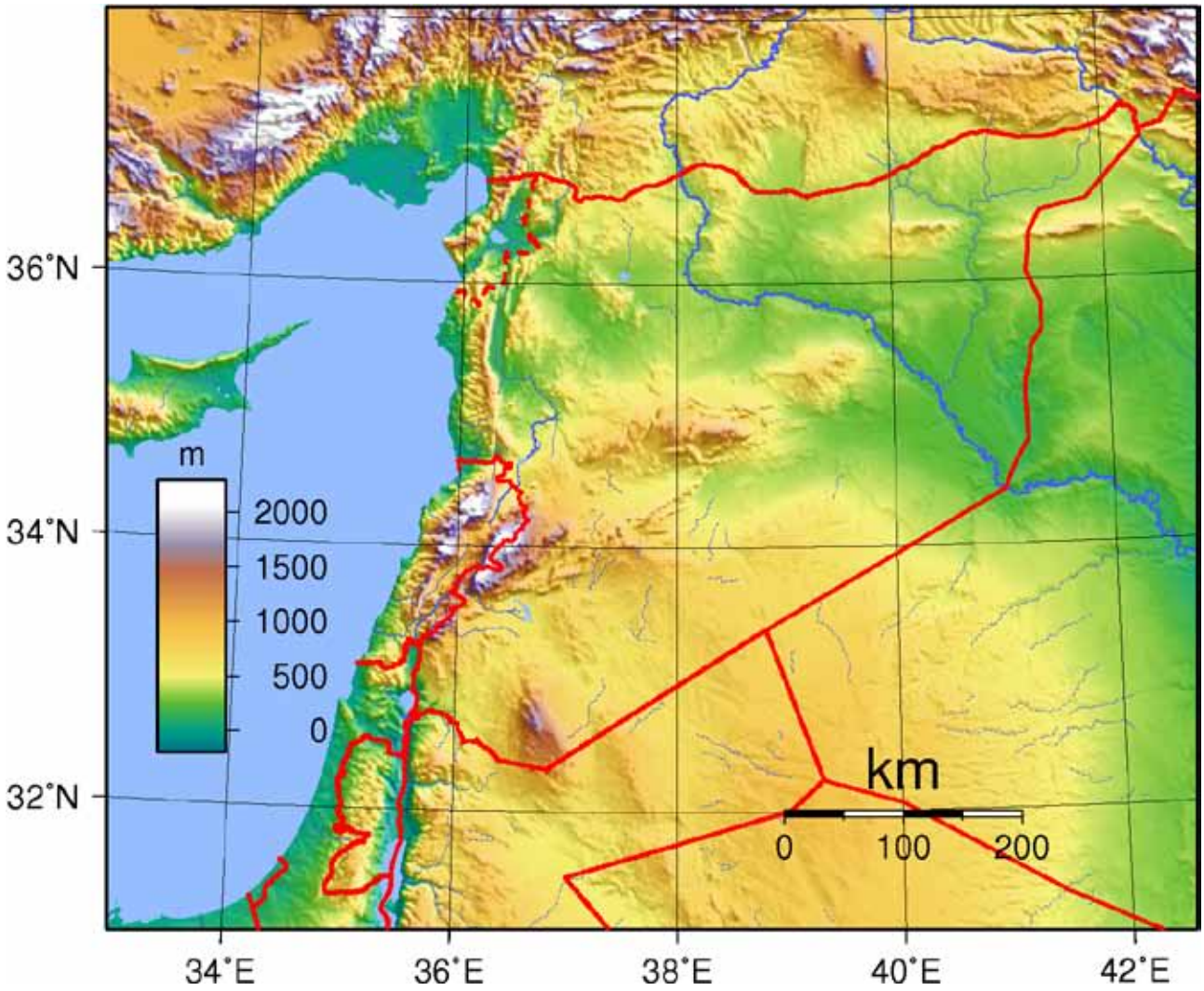
Berkeley, April 1, 2009

Carlo Cafiero

# Maps of Syria

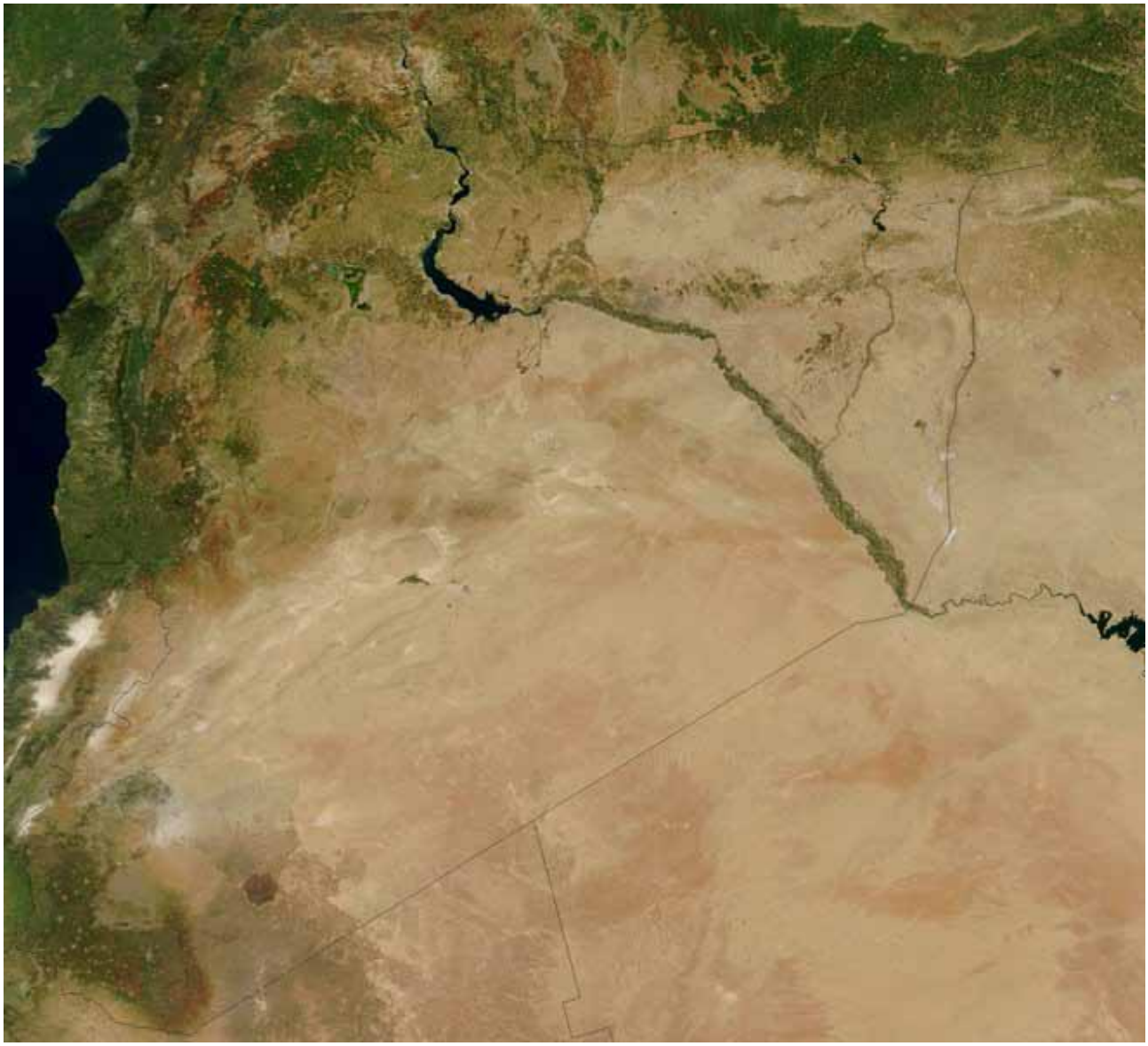
**Figure 1 Boundaries, roads and main cities of Syria**

**Figure 2 Orography of Syria**




Source: Sadalmelik (http://commons.wikimedia.org/wiki/User:Sadalmelik)

**Figure 3 Satellite image of Syria**



Source: NASA

**Figure 4 Administrative boundaries (Governorates) in Syria**

# I. Introduction

Four years ago, when it started, the task of completing this report appeared to be easier than it has proven to be at the end. At that time, we were still in a period of relatively stable conditions on the international food markets, with global agricultural real prices moving along a declining trend that was lasting at least since the mid nineties. Signs of incoming changes could be detected from phenomena like the increasing interests that institutional investors were devoting to agricultural commodity markets, and the change in energy policy that was occurring in Europe and the US, with increased attention towards biofuels caused by the surging oil prices. However, no one had anticipated an inversion in the real term of trades for agriculture, and the major focus in Syria, as in other emerging countries, was mostly on how to promote technical innovation in agriculture and to exploit comparative advantages, to the aim of increasing competitiveness on international markets.

Also from the domestic policy perspective, it seemed that one could take for granted the gradual but continued process of market liberalization in agriculture that was occurring in Syria, and the primary motivation for many analyses was precisely that of assisting the Government of Syria (GoS) in predicting where these changes might lead the rural economy, in terms of income growth and development, and possibly to assist in guiding the process.

As time went by, however, signals of incoming changes become more and more evident. In the fourth National Agricultural Policy Workshop held in Damascus in 2007, the analysis presented by Professor Hartwig DeHaen started pointing everybody's attention to the rising agricultural prices, led by corn and soon to be followed by other grains, and raising a number of question about the adequacy of current policies and the need for response measures. Not all was good news, and a renewed concerns for food security issues started to take centre stage in the discussions on agricultural policy and development throughout the World.

The period since then has been a very interesting one for those concerned with the study of agricultural policy and agricultural market, although a very difficult one for those, like me, engaged in the endeavor of trying and make predictions for the future. Price forecasts were revised regularly one month after the other, only to be contradicted by the evidence that would come available the next month. The fast growth of prices of basic food grains such as wheat and rice drove attention on agriculture as never before in recent history. A series of forums were created to concentrate attention on the consequences that the "food price crisis" would have on food security throughout the developing World. The ability of Governments and Institutions to actually "govern" food markets was put under serious challenge and many started to question the received view that de-regulated global markets where the solution to the development problem.

The impression has been that many institutions, including FAO, were requested to "do something" even before was clearly what was exactly that had to be done, thus making the task of predicting how the institutional landscape would be in the future even more difficult than before.

By the time the last draft of this report has been completed, the "crisis" seems to be cooling down, in that agricultural prices are reverting to levels closer to what the "fundamentals" would suggest, although it is too early to call it ended. The period ahead of us is still an interesting one, and the consequences of the financial crisis that is involving insurance, banks and other financial institutions worldwide are not yet been fully experienced, and it can be reasonably expected that more changes are

to come. How they will affect international equilibriums on commodity markets is everything but clear. We can do no more, at this juncture, that be alert and see.

Despite the questionable reliability of the assumptions on the future evolution of the international agricultural markets, we think the material presented in this report has relevance on its own. As it will be already clear from reading even the first few pages, attention has been put especially on the analysis of the *fundamentals* of supply and demand determination. Data from the past have been scrutinized more from a qualitative point of view to try and detect structural elements of the Syrian agricultural economy that are likely to remain crucial in the future, but whose configuration is likely going to change in the near future (think for example to the price policy for some crops, or to the constraints imposed by water availability). It was clear, since the beginning, that econometric techniques based on available time series data would be of little help in a moment of predictable change in many fundamental determinants of agricultural supply and demand.

Efforts have been made to use these fundamental elements to set the bases for the development of a comprehensive analytical model of the Syrian agricultural sector, but this is a long term endeavor, although preliminary results (presented in section III.2 below) are very encouraging. More efforts will need to be made in the future by NAPC and other institutions to obtain first-hand data on farms and other enterprises organization in order to refine some of the modeling assumptions,[1] but the results so far confirm that this is a worthwhile endeavor.

From the demand side, detailed consumer surveys results conducted in the past by the Syrian Statistics Bureau have been used to confirm patterns of consumer expenditure which are consistent with the prediction of Engels' Law, according to which the income elasticity of food expenditure is lower than one, and that therefore less than proportional expansion in per capita food expenditure is to be expected following the increase in per capita income. More than through the effect of *per capita* income growth, however, it is because of *population growth* that Syria will likely be still in need of a steadily increasing agricultural production to cope with its growing food demand. This is not to say that the circumstances of income growth and distribution are not relevant to predict future food demand in Syria, quite the contrary. Although incomes might not be growing at paces comparable to those we have been witnessing in other emerging economies, such as China or India, in Syria, as in other emerging economies there is a continued migration from rural areas towards urban centers. with the share of urban population increasing fast. Although average income *levels* may not be so different between the two groups, the *composition of the expenditure* is likely to be greatly different, with an increased relevance of procesed and convenience foods among urban consumers. This poses a challenge to the Syrian food industry that needs to be rapidly restructured to respond to domestic new demand, and, in turn, to the farm sector, which will need to become ready to supply food processors, with their distinctly different requirements in terms of product quality. The pressure that is coming from the urban markets for food in Syria is likely to become an opportunity for both the food industry and the farming sector. If they are capable of "run ahead" and invest in new technologies intended to respond to the higher standard required by wealthier importers such as European and Gulf countries, in a few years Syria may establish itself as a major provider of high value fresh and processed food in the Mediterranean and Near East Regions.

[1] Particularly precious to this respect, will be the elementary data of the Agricultural Census conducted in 2004, when they shall be made available.

But, with no further ado, let us enter into the details of the study. It is organized around two main chapters, analyzing supply of the major agricultural products in Syria and demand of the major food groups, respectively, followed by a chapter on the mid-term outlook of the prospects for Syrian agricultural products, and one chapter introducing the preliminary efforts made in setting up a comprehensive model of the agricultural sector in Syria. A concluding chapter closes the report.

The materials included in here relies heavily on a series of working papers and reports that have been produced by the National Agricultural Policy Center (NAPC) in the past few years, all of which readily available through NAPC's web site at http://www.napcsy.org.

The attempt made here, rather than repeating what has already been included in those papers and reports, is that of putting the wealth of information made available there under a coherent light, to the aim of deriving possible indications on where Syrian agriculture is bound to be in the medium term of five to ten years from now.

We hope that the readers will learn at least a fraction of what we have learned in the process of assembling the report.

# II. Supply

## II.1. The main factors conditioning current and future agricultural production in Syria

Many factors contribute to shape Syrian agriculture the way it appears today to the careful analyst. Despite problems and various difficulties that have characterized Syrian farming in the past decades, agriculture is still one of the predominant sectors in the economy and one which the Country has to count on in the future for its social and economic development.

Of these conditioning factors, the **natural environment** (and in particular the water resources), the **social and economic conditions** of rural areas, and the wide spectrum of **public policies** affecting the sector can be singled out as the major categories, and to them we shall devote our attention in this section of the Study.

### II.1.1. Natural environment

Syria territory is included between the 32° and the 37° latitude North and between the 36° and 42° longitude East, in the Southwest part of the Asian continent (Figure 1). It ranges from the Mediterranean coastal areas to the West, to the desert area bordering Iraq and Jordan to the South and South-East, including highly diversified territories in terms of temperature, rainfall, soil characteristics and water resources.

The total area of about 185 thousand square kilometers ($km^2$), includes little more than 5.5 million hectares (ha) of "invested" land, that is land that is potentially suitable for agricultural production, 26% of which (equivalent to about 1.4 million ha) can be irrigated (Table 1).

From an administrative point of view, the Syrian territory is divided into 13 Governorates (Figure 4). The Al-Ghab area, currently at the center of increased attention regarding its development, though administratively included in the North-Western part of the Hama Governorate, is distinctively characterized by the quality of agricultural resources.[2]

For these reason, and given that most Government planning activity is carried on at Governorate level, it will prove convenient to carry most of the analyses in this study by reference to 14 administrative areas (the 13 Governorates plus the Al-Ghab area, administratively part of the Hama governorate).

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[2] Al-Ghab is located between the Coastal Mountains in the west and Jabal Al-Zawiya in the east. Its length from south to north is about 90 km, its width between 8 and 12 km, and its elevation above sea level is between 170 and 200 m. It slightly slopes toward the north like the Orontes River that traverses it to the northwest of Hama. Its yearly rainfall averages 500 to 700 mm, but it receives other sources of water, notably from the Orontes River, which is rejected back into it by the basaltic bedrock of Qarqar in the north. Before 1954, Al-Ghab was intersected by swampland, infested by malaria, and covered by reeds used for catching its celebrated catfish.
Within two decades after 1954, the landscape of Al-Ghab changed dramatically as a result of the drainage of its swamps, the building of dams, such as the ones at Al-Rastan, Maharda, and notably Al-Asharina, to regulate its irrigation, and the creation by the Syrian government of a number of projects in it. Of its total area of 55,000 ha, 17,000 ha are irrigated by river flooding and dam water, 30,000 ha depend on rainfall, and the remaining parts are turned into farms. In 1969, land in al-Ghab was distributed by the government to about 11,000 beneficiaries according to the Law of agrarian reform. To encourage the cultivation of land, fifty-two cooperatives providing services were established there. Other projects include a cattle farm, fisheries, and a sugar factory at the village of Salhab.
(see Abdul-Karim Rafeq, http://www.answers.com/topic/al-ghab)

### II.1.1.1. Agro-climatic zones

Because of its diversity and of the importance that agro-climatic conditions have on agriculture and other human activities, from a planning point of view Syria has been traditionally divided up in five major **agro - climatic zones** often referred to as **settlement zones** (See Wattenbach, 2006. See also Table 1 and Box 1).

As it can be expected, the distribution of agricultural land by quality and quantity is not proportional to the total area included in each agro-climatic zone. The national average share of agricultural land over total area, equal to 30%, is made of the combination of higher shares in zones 1 to 4, and a very low share of 3.55% for Zone 5, which is the largest in terms of total area, but it is mostly made of rangeland and pastures.

Corresponding to the highly diversified territory, a similarly diversified agricultural producing sector has evolved over the years. In a recent study, 6 different major **farming systems** were identified as typical of Syrian agriculture (Wattenbach, 2006), ranging from the coastal highly intensive irrigated productions typical of the western coast, to the pastoral rainfed systems of the arid east, and including the intensive irrigated farming system of central and Al-Ghab plains, those of the southern semi-arid plains and mountains, the semi-humid and irrigated farming systems of the northern and north-eastern plains and the mountainous and hilly rainfed farming systems.[3]

**Table 1 Characteristics of agro-climatic zones in Syria (2005)**

| Agro - Climatic Zone | Rainfall class (mm) | Area (km2) | Invested land (ha) | Share of invested land over total | Irrigated land (ha) | Share of irrigated land over invested | Rainfed land (ha) | Average rainfall (mm) (1985-2005) |
|---|---|---|---|---|---|---|---|---|
| **1** | > 350 | 26,958 | 1,570,959 | 58.27% | 461,803 | 29.40% | 1,077,968 | **753** |
| **2** | 250-350 | 24,444 | 1,808,-129 | 73.97% | 369,981 | 20.46% | 1,217,866 | **299** |
| **3** | 250 | 13,185 | 828,169 | 62.81% | 128,138 | 15.47% | 543,488 | **249** |
| **4** | 200-250 | 18,419 | 992,234 | 53.87% | 141,978 | 14.31% | 589,944 | **208** |
| **5** | < 200 | 102,173 | 362,865 | 3.55% | 323,911 | 89.26% | 17,448 | **152** |
| **Syria** | | **185,179** | **5,562,356** | **30.04%** | **1,425,811** | **25.63%** | **3,446,714** | |

Source: Syrian Agricultural Data Base (SADB), NAPC.

Agricultural land is mostly concentrated in zones 1, 2 and 3 and the governorates of Aleppo, Al Rakka, Al Hassakeh account for more than 65% of the total. These areas, together with the coastal intensive production systems, makes the fundamental backbone of Syrian agriculture.

**Box 1 Agro-climatic zones in Syria**

**Zone 1**: with an average annual precipitation of more than 350 mm. The total area of this zone (2.7 mil ha) represents 15% of the total area of the country and includes 1.57 million ha of cultivated land (about 28% of the total) and 60% of pastoral land. It is subdivided into two sub-zones:

- a sub-zone with annual rainfall greater than 600 mm, where rain-fed crops are grown without any risk;
- a sub-zone with rainfall between 350 and 600 mm where only two seasons out of three are, on average, suitable for rainfed cultivation with no risk.

This zone can be mainly cultivated with wheat, legumes, and summer crops ( cotton, potato, tomato);

[3] For a thorough description of the identified Farming Systems, see the comprehensive study by Wattanbach (2004) and the individual Working Papers produced at NAPC, in particular Yassin (2004),

**Zone 2**: with average annual rainfall between 250 and 350 mm. Two out of three seasons are secured in this zone. Its total area (2473 thousand ha.) represents 13% of the total country's area and includes 30% of the total cultivated land. The actual cultivated area in this zone in 2006 was 1,571 thousand ha, out of which 225 thousand ha were planted with fruit trees and 1,346 thousand ha with field crops (mainly barley, wheat, legumes, and summer crops); The common rotations in this zone are: (a) 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; (b) 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**: with average annual rainfall greater than 250 mm in more than half of the seasons. The total area of the zone is 1306 thousand ha representing 7 % of Syria's total area. In 2006 the actual cultivated area in this zone was 613 thousand ha, of which 76 thousand ha were devoted to fruit trees while the remainder was planted with field crops (barley, lentils, and chickpeas); 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**: with average annual rainfall between 200 and 250 mm in more than half of the seasons. The area under this zone is about 1833 thousand ha representing 10% of the total country's area. The actual cultivated area in 2006 reached 665 thousand ha, out of which 37 thousand ha were planted with trees and 685 thousand ha were planted with field crops (maize, wheat, barley, lentils, and chickpeas); 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**: with an average annual rainfall of less than 200 mm distributed in more than half of the seasons. It consists of rangelands and desert areas and covering 10 208 thousand ha representing about 55% of the total area of the country). This zone includes 86% of the pastoral land is not suitable for rain fed cultivation. It is natural grazing for sheep and camels.

## Table 2 Total Area by Agro-climatic zone and by geographical regions and governorates (ha)

| | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | All Zones |
|---|---|---|---|---|---|---|
| **Southern region** | | | | | | |
| Dar'a | 63,727 | 195,151 | 89,046 | 17,564 | 7,512 | **373,000** |
| Al-Sweida | 32,714 | 234,774 | 74,548 | 96,580 | 116,384 | **555,000** |
| Quneitra | 186,096 | | | | | **186,096** |
| Damascus City | | | 4,432 | 7,412 | | **11,844** |
| Damascus Rural | 102,398 | 162,255 | 112,903 | 109,879 | 1,314,378 | **1,801,813** |
| **Central region** | | | | | | |
| Homs | 161,843 | 112,995 | 113,653 | 174,066 | 3,528,458 | **4,091,015** |
| Hama | 157,366 | 215,144 | 134,578 | 79,652 | 291,700 | **878,440** |
| Al-Ghab | 140,799 | | | | | **140,799** |
| **Coastal region** | | | | | | |
| Tartous | 189,620 | | | | | **189,620** |
| Lattakia | 229,689 | | | | | **229,689** |
| **Northern region** | | | | | | |
| Idleb | 453,301 | 106,848 | 49,561 | | | **609,710** |
| Aleppo | 404,810 | 745,411 | 267,205 | 177,863 | 254,711 | **1,850,000** |
| Al-Rakka | | 179,800 | 214,760 | 459,779 | 1,107,247 | **1,961,586** |
| **Eastern and North-eastern region** | | | | | | |
| Deir-ez-Zor | | | | 206,900 | 3,099,100 | **3,306,000** |
| Al-Hassakeh | 573,482 | 492,078 | 257,813 | 512,219 | 497,767 | **2,333,359** |
| **Syria** | **2,695,845** | **2,444,456** | **1,318,499** | **1,841,914** | **10,217,257** | **18,517,971** |

Source: our elaboration form SADB data

## Table 3 Uncultivated land (uncultivable, pastures and steppe) by Agro-climatic zone and by geographical region and governorates (ha)

| | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | All Zones |
|---|---|---|---|---|---|---|
| **Southern region** | | | | | | |
| Dar'a | 25,235 | 64,524 | 51,855 | 9,106 | 7,372 | **158,092** |
| Al-Sweida | 13,832 | 115,699 | 55,667 | 96,344 | 116,384 | **397,926** |
| Quneitra | 157,933 | | | | | **157,933** |
| Damascus City | | | 4,077 | 6,212 | | **10,289** |
| Damascus Rural | 81,760 | 128,670 | 87,588 | 84,957 | 1,273,761 | **1,656,736** |
| **Central region** | | | | | | |
| Homs | 62,576 | 32,591 | 41,602 | 97,911 | 3,515,732 | **3,750,412** |
| Hama | 75,991 | 65,190 | 54,444 | 37,747 | 291,367 | **524,739** |
| Al-Ghab | 53,491 | | | | | **53,491** |
| **Coastal region** | | | | | | |
| Tartous | 69,116 | | | | | **69,116** |
| Lattakia | 134,573 | | | | | **134,573** |
| **Northern region** | | | | | | |
| Idleb | 224,594 | 19,226 | 16,092 | | | **259,912** |
| Aleppo | 143,147 | 157,028 | 60,531 | 74,474 | 237,470 | **672,650** |
| Al-Rakka | | 6,291 | 24,724 | 106,723 | 1,007,644 | **1,145,382** |
| **Eastern and North-eastern region** | | | | | | |
| Deir-ez-Zor | | | | 150,600 | 2,953,591 | **3,104,191** |
| Al-Hassakeh | 82,638 | 47,108 | 93,750 | 185,606 | 451,071 | **860,173** |
| **Syria** | **1,124,886** | **636,327** | **490,330** | **849,680** | **9,854,392** | **12,955,615** |

Source: our elaboration form SADB data

## Table 4 Agricultural land by Agro-climatic zone and by geographical region and governorates (ha)

| | | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | All Zones |
|---|---|---|---|---|---|---|---|
| **Southern region** | | | | | | | |
| Dar'a | Agricultural land | 38,492 | 130,627 | 37,191 | 8,458 | 140 | **214,908** |
| | Irrigated | 10,335 | 20,613 | 2,123 | 750 | 61 | **33,882** |
| | Rainfed | 23,985 | 73,546 | 21,160 | 4,755 | - | **123,446** |
| | Fallow | 4,172 | 36,468 | 13,908 | 2,953 | 79 | **57,580** |
| Al-Sweida | Agricultural land | 18,882 | 119,075 | 18,881 | 236 | - | **157,074** |
| | Irrigated | 363 | 1,520 | 74 | - | - | **1,957** |
| | Rainfed | 17,778 | 82,703 | 9,641 | 118 | - | **110,240** |
| | Fallow | 741 | 34,852 | 9,166 | 118 | - | **44,877** |
| Quneitra | Agricultural land | 28,163 | | | | | **28,163** |
| | Irrigated | 4,682 | | | | | **4,682** |
| | Rainfed | 22,001 | | | | | **22,001** |
| | Fallow | 1,480 | | | | | **1,480** |
| Damascus City | Agricultural land | | | 355 | 1,200 | | **1,555** |
| | Irrigated | | | 355 | 1,200 | | **1,555** |
| Damascus Rural | Agricultural land | 20,638 | 33,585 | 25,315 | 24,922 | 40,617 | **145,077** |
| | Irrigated | 11,958 | 12,154 | 12,727 | 7,175 | 35,644 | **79,658** |
| | Rainfed | 7,938 | 20,551 | 11,342 | 12,601 | 3,818 | **56,250** |
| | Fallow | 742 | 880 | 1,246 | 5,146 | 1,155 | **9,169** |
| **Central region** | | | | | | | |
| Homs | Agricultural land | 99,267 | 80,404 | 72,051 | 76,155 | 12,726 | **340,603** |
| | Irrigated | 28,348 | 10,031 | 9,050 | 1,940 | 8,752 | **58,121** |
| | Rainfed | 70,796 | 65,410 | 48,333 | 52,521 | 19 | **237,079** |
| | Fallow | 123 | 4,963 | 14,668 | 21,694 | 3,955 | **45,403** |
| Hama | Agricultural land | 81,375 | 149,954 | 80,134 | 41,905 | 333 | **353,701** |
| | Irrigated | 34,301 | 27,702 | 6,680 | 5,799 | 333 | **74,815** |
| | Rainfed | 46,550 | 105,670 | 55,893 | 25,196 | - | **233,309** |
| | Fallow | 524 | 16,582 | 17,561 | 10,910 | - | **45,577** |
| Al-Ghab | Agricultural land | 87,308 | | | | | **87,308** |
| | Irrigated | 79,871 | | | | | **79,871** |
| | Rainfed | 7,437 | | | | | **7,437** |
| **Coastal area** | | | | | | | |
| Tartous | Agricultural land | 120,504 | | | | | **120,504** |
| | Irrigated | 27,054 | | | | | **27,054** |
| | Rainfed | 92,815 | | | | | **92,815** |
| | Fallow | 635 | | | | | **635** |
| Lattakia | Agricultural land | 95,116 | | | | | **95,116** |
| | Irrigated | 30,592 | | | | | **30,592** |
| | Rainfed | 60,567 | | | | | **60,567** |
| | Fallow | 3,957 | | | | | **3,957** |
| **Northern region** | | | | | | | |
| Idleb | Agricultural land | 228,707 | 87,622 | 33,469 | | | **349,798** |
| | Irrigated | 44,705 | 8,086 | 3,760 | | | **56,551** |
| | Rainfed | 184,002 | 79,259 | 27,400 | | | **290,661** |
| | Fallow | - | 277 | 2,309 | | | **2,586** |
| Aleppo | Agricultural land | 261,663 | 588,383 | 206,674 | 103,389 | 17,241 | **1,177,350** |
| | Irrigated | 27,749 | 76,862 | 38,621 | 38,938 | 13,308 | **195,478** |
| | Rainfed | 233,323 | 455,024 | 129,710 | 36,322 | 91 | **854,470** |
| | Fallow | 591 | 56,497 | 38,343 | 28,129 | 3,842 | **127,402** |
| Al-Rakka | Agricultural land | | 173,509 | 190,036 | 353,056 | 99,603 | **816,204** |
| | Irrigated | | 46,252 | 10,793 | 50,810 | 87,194 | **195,049** |
| | Rainfed | | 115,838 | 130,844 | 207,381 | 12,409 | **466,472** |
| | Fallow | | 11,419 | 48,399 | 94,865 | - | **154,683** |
| **South-East** | | | | | | | |
| Deir-ez-Zor | Agricultural land | | | | 56,300 | 145,509 | **201,809** |
| | Irrigated | | | | 3,600 | 145,509 | **149,109** |
| | Rainfed | | | | 46,000 | - | **46,000** |
| | Fallow | | | | 6,700 | - | **6,700** |
| Al-Hassakeh | Agricultural land | 490,844 | 444,970 | 164,063 | 326,613 | 46,696 | **1,473,186** |
| | Irrigated | 161,845 | 166,761 | 43,955 | 31,766 | 33,110 | **437,437** |
| | Rainfed | 310,776 | 219,865 | 109,165 | 205,050 | 1,111 | **845,967** |
| | Fallow | 18,223 | 58,344 | 10,943 | 89,797 | 12,475 | **189,782** |
| **Syria** | **Agricultural land** | **1,570,959** | **1,808,129** | **828,169** | **992,234** | **362,865** | **5,562,356** |
| | **Irrigated** | **461,803** | **369,981** | **128,138** | **141,978** | **323,911** | **1,425,811** |
| | **Rainfed** | **1,077,968** | **1,217,866** | **543,488** | **589,944** | **17,448** | **3,446,714** |
| | **Fallow** | **31,188** | **220,282** | **156,543** | **260,312** | **21,506** | **689,831** |

Source: Our elaboration on NAPC's SADB data

Despite the diversification in different farming systems, however, a large share of the value of agricultural production is still due to a limited number of major crops. This situation is the result of many years of strategic centralized planning by the Government of Syria (GoS) which pointed to wheat, cotton and few other crops as the backbone of agricultural production in the Country (Westlake, 2001; SOFAS, 2003; SOFAS, 2005).

The definition of agro-climatic zones is at the core of the approach followed by the Government of Syria (GoS) to define classes of land use suitability, with implications for the legal position of farming, support services and the delineation of intervention areas of Government supported projects. The mapping of the agro-climatic zones and hence definition of land in the different classes is subject to periodical revisions by Government committees.

In any particular season, the observed cropping patterns are thus the result of a centrally determined agricultural plan, released by the GoS after extensive consultation between the local civil authorities and the representative bodies of the farming community. The decision on where to grow what is not only based on strict agro-climate factors but also on other criteria related to national objectives and policies, such as self-sufficiency in staple food commodities, and adequate supplies of raw materials for existing agro-processing plants. This fact limits the possibility of deducing, from changes in the observed cropping patterns, the existing incentives to agricultural production, as it would be possible, instead, if cropping decisions were freely taken by farmers. In turn, this limits considerably the potential usefulness of econometric analyses of past data on production. One other consequence of this is that productions have not been obtained necessarily on the most suited territories, and therefore natural resources (especially water) have arguably been utilized to less than their full potential.

#### II.1.1.2. Rainfall and irrigation

Syrian territory is prone to large rainfall variation both within any given season and across the years. With the exception of the coastal and north-eastern areas, usually the levels of average annual rainfall are too low to allow fruitful agricultural production without recourse to irrigation.

Only one-third of the total 18.5 million hectares of land is considered productive (arable and forest areas), with the remainder two thirds classified as steppe areas (*Al-Badia*).

The difference in rainfall level and distribution across the five agro-climatic zones determines different irrigation requirements by the possible crops if they are to express their maximum potentials in terms of yields. The same irrigated crop, in general, will require more irrigation water when moving from zone 1 to zone 5.

During the summer, the cultivation is almost impossible for any crop without irrigation, given the Syrian amount and time-distribution of rainfall even in the highly raining areas (e.g. the coastal mountains). On the other hand, winter crops are easily grown without irrigation in the areas with higher rainfall (zones 1 and 2), but their reliance on irrigation becomes considerably high in zones 3, 4, and 5. If grown rainfed, the yield of winter crops become considerably lower when moving from zone 1 towards zone 5 ( See Table 5).

## Table 5 Consequences of the climatic variation on yields of the most important crops

| | Average yields 1996/2005 (ton/ha) | | | | | Coefficient of variation of yields 1996/2005 (ton/ha) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Irrigated crops** | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 |
| Barley Irrigated | 2.38 | 2.66 | 2.39 | 2.19 | 2.11 | 0.48 | 0.26 | 0.21 | 0.23 | 0,40 |
| Chickpea Irrigated | 1.63 | 1.03 | 0.05 | -- | 0.27 | 0.20 | 0.62 | 3.16 | -- | 1,64 |
| Cotton | 4.29 | 4.16 | 4.07 | 3.74 | 3.37 | 0.05 | 0.09 | 0.07 | 0.10 | 0,10 |
| Eggplant Autumn | 18.16 | 19.01 | 14.96 | 11.00 | 3.01 | 0.14 | 0.55 | 0.59 | 1.07 | 2,25 |
| Eggplant Summer | 24.23 | 24.23 | 22.65 | 18.13 | 16.94 | 0.05 | 0.11 | 0.25 | 0.15 | 0,20 |
| Lentil Irrigated | 1.21 | 1.17 | 0.65 | 0.23 | 0.35 | 0.63 | 0.54 | 0.73 | 2.13 | 1,66 |
| Maize Irrigated Summer | 3.05 | 3.57 | 3.06 | 3.01 | 3.06 | 0.34 | 0.26 | 0.32 | 0.22 | 0,21 |
| Potato Irrigated Spring | 24.42 | 23.31 | 19.45 | 18.85 | 19.79 | 0.19 | 0.19 | 0.22 | 0.35 | 0,18 |
| Potato Rainfed Spring | 11.10 | -- | -- | -- | -- | 0.21 | -- | -- | -- | n.a. |
| Tobacco Irrigated | 2.58 | 2.86 | 2.26 | 0.10 | -- | 0.05 | 0.15 | 0.14 | 3.16 | n.a. |
| Tomato Irrigated Autumn | 36.81 | 49.53 | 39.76 | 10.77 | 0.00 | 0.40 | 0.47 | 0.76 | 1.11 | n.a. |
| Tomato Irrigated Spring | 26.85 | 25.41 | 27.16 | 26.97 | 6.75 | 0.06 | 0.26 | 0.14 | 0.15 | 1,24 |
| Tomato Irrigated Summer | 39.97 | 56.56 | 42.78 | 26.47 | 25.21 | 0.25 | 0.28 | 0.24 | 0.24 | 0,06 |
| Wheat Irrigated | 3.80 | 3.63 | 3.41 | 3.88 | 3.88 | 0.13 | 0.13 | 0.13 | 0.14 | 0,14 |
| Averages irrigated | | | | | | 0.23 | 0.30 | 0.53 | 0.75 | 0,73 |
| **Rainfed crops** | | | | | | | | | | |
| Barley Rainfed | 1.76 | 1.07 | 0.58 | 0.30 | 0.22 | 0.31 | 0.48 | 0.68 | 1.09 | 1,35 |
| Chickpea Rainfed | 1.00 | 0.50 | 0.21 | 0.13 | 0.02 | 0.13 | 0.37 | 0.73 | 1.53 | 3,16 |
| Cumin Rainfed | 0.73 | 0.53 | 0.42 | 0.21 | 0.02 | 0.19 | 0.28 | 0.29 | 0.82 | 3,16 |
| Lentil Rainfed | 1.05 | 0.82 | 0.54 | 0.43 | 0.03 | 0.33 | 0.34 | 0.45 | 0.62 | 3,16 |
| Peanuts | 2.70 | 3.19 | 0.15 | 0.17 | 2.09 | 0.18 | 0.13 | 3.16 | 3.16 | 0,13 |
| Tobacco Rainfed | 1.11 | -- | -- | -- | -- | 0.10 | -- | -- | -- | n.a. |
| Tomato Rainfed Spring | 7.56 | 2.81 | 0.75 | -- | -- | 0.12 | 0.23 | 1.31 | -- | n.a. |
| Tomato Rainfed Summer | 6.44 | 3.13 | -- | -- | -- | 0.24 | 0.70 | -- | -- | n.a. |
| Wheat Rainfed | 1.80 | 1.03 | 0.64 | 0.32 | 0.21 | 0.29 | 0.44 | 0.67 | 1.23 | 1,32 |
| Average rainfed | | | | | | 0.21 | 0.37 | 1.04 | 1.41 | 2,05 |
| **Averages** | | | | | | **0.22** | **0.33** | **0.71** | **0.97** | **1.20** |

Source: our elaboration from NAPC's SADB data

The distribution of crops and trees by agro-climatic zones is reported below in Table 6 . As expected, the composition of the prevailing cropping patterns changes from zone to zone: winter crops (essentially cereals such as wheat and barley) prevail everywhere, either as the only type of crop, or because they enter in rotations with summer crops, in which case they are irrigated too. Summer crops are truly relevant only where irrigation is available.

## Table 6 Major crops by agro-climatic zone (ha, 2005)

| Zone 1 | area | % of total |
|---|---|---|
| **Total Invested land** | 1,571,000 | 100% |
| **All major field crops** | 1,050,662 | 66.88% |
| *Wheat* | *658,360* | *41.91%* |
| *Lentils* | *81,001* | *5.16%* |
| *Cotton* | *66,107* | *4.21%* |
| *Barley* | *28,596* | *1.82%* |
| *Other crops & fallow* | *216,598* | *13.79%* |
| **Fruits and tree crops** | 520,338 | 33.12% |
| *Olives* | *393,482* | *25.05%* |
| *Other Fruits* | *68,151* | *4.34%* |
| *Citruses* | *31,578* | *2.01%* |
| *Grapes* | *17,370* | *1.11%* |
| *Nuts and Pistachio* | *9,757* | *0.62%* |

| Zone 2 | area | % of total |
|---|---|---|
| **Total Invested land** | 1,808,000 | 100% |
| **All major field crops** | 1,590,903 | 87.99% |
| *Wheat* | *723,030* | *39.99%* |
| *Barley* | *395,250* | *21.86%* |
| *Cotton* | *75,946* | *4,20%* |
| *Lentils* | *55,839* | *3.09%* |
| *Other crops & fallow* | *340,838* | *18.85%* |
| **Fruits and tree crops** | 217,097 | 12.01% |
| *Olives* | *96,658* | *5.35%* |
| *Other fruits* | *49,759* | *2.75%* |
| *Nuts and Pistachio* | *43,759* | *2.42%* |
| *Grapes* | *26,795* | *1.48%* |
| *Citruses* | *126* | *0,01%* |

| Zone 3 | Area | % of total |
|---|---|---|
| **Total Invested land** | 829,000 | 100% |
| **All major field crops** | 762,748 | 92.01% |
| *Barley* | *381,715* | *45.98%* |
| *Wheat* | *164,624* | *19,86%* |
| *Cotton* | *19,929* | *2,43%* |
| *Other crops & fallow* | *197,022* | *23.77%* |
| **Fruits and tree crops** | 66,252 | 7.99% |
| *Olives* | *27,082* | *3.27%* |
| *Fruits* | *31,519* | *3.80%* |
| *Grapes* | *5,807* | *0.70%* |
| *Nuts and Pistachio* | *1,824* | *0,22%* |
| *Citruses* | *20* | *0,00%* |

| Zone 4 | area | % of total |
|---|---|---|
| **Total Invested land** | 992,000 | 100% |
| **All major field crops** | 956,988 | 96.47% |
| *Barley* | *498,282* | *50.23%* |
| *Wheat* | *165,934* | *16,73%* |
| *Cotton* | *25,267* | *2,55%* |
| *Other crops & fallow* | *267,505* | *26.97%* |
| **Fruits and tree crops** | 35,012 | 3.53% |
| *Olives* | *13,127* | *1.32%* |
| *Other fruits* | *18,613* | *1.88%* |
| *Grapes* | *2,660* | *0.27%* |
| *Nuts and Pistachio* | *607* | *0.06%* |
| *Citruses* | *5* | *0,00%* |

| Zone 5 | Area | % of total |
|---|---|---|
| **Total Invested land** | 363,000 | 100% |
| **All major field crops** | 333,697 | 91.93% |
| *Wheat* | *191,787* | *52.86%* |
| *Cotton* | *50,519* | *13.92%* |
| *Barley* | *23,894* | *6.58%* |
| *Other crops & fallow* | *67,406* | *18.57%* |
| **Fruits and tree crops** | 29,303 | 8.07% |
| *Olives* | *14,304* | *3.94%* |
| *Fruits* | *9,372* | *2.58%* |
| *Nuts and Pistachio* | *4,227* | *1.16%* |
| *Grapes* | *1,344* | *0.37%* |
| *Citruses* | *56* | *0.02%* |

### II.1.1.3. Water resources

In terms of water resources, Syria territory is classified as semi-arid. There are 16 main rivers and tributaries in the country, of which 6 major international rivers:

- the Euphrates (*Al Furat*) is Syria's largest river. It enters Syria from the Turkish border to the North and flows south-eastward to Iraq. Of the total length of 2,330 km, 680 km are in Syria;
- the Afrin in the north-western part of the country, which comes from Turkey, crosses Syria and flows back to Turkey;
- the Orontes (Al-Assi) in the western part of the country, which comes from Lebanon and flows into Turkey;
- the Southern Al-Keabir with sources in Syria and Lebanon and which forms the border between them before flowing to the sea.
- the Yarmouk in the south-western part of the country with sources in Syria and Jordan and which forms the border between these two countries before flowing into the Jordan river;
- the Tigris, which forms the border between Syria and Turkey in the extreme north-eastern part.

The natural average surface runoff to Syria from international rivers is estimated at 28.73 billion $m^3$/year. However, the natural runoff of the International rivers is affected by the decisions of other countries, therefore the actual runoff is sensibly lower than the natural. If we consider the figure of 15.75 billion $m^3$ of water entering with the Euphrates, according to the temporary agreement signed in 1987 between the two countries and 0.43 billion $m^3$ of water entering with the Orontes, as agreed with Lebanon, the total actual runoff becomes 18.11 billion $m^3$/year. The Tigris, which is the second most important river in the country, borders the country to the east and has a mean annual flow of 18 billion $m^3$, 9 of which could be considered available to Syria.

Total natural average outflow from Syria is slightly less than 32 billion $m^3$/year, most due to the Euphrates that flows into Iraq. The actual outflow is much lower, considering that an agreement exists with Iraq that sets the outflow from Syria to 9.2 billion $m^3$/year.

According to these calculations, the actual surface water resources for Syria can be estimated at 17.91 billion $m^3$/year (27.11 billion $m^3$/year inflows minus 9.2 billion $m^3$/year out flowing to Iraq).

A breakdown of surface water entering, bordering and leaving the country is given in the Table below.

**Table 7 Major rivers entering, bordering and leaving Syria**

| Name of river | Inflow into Syria (billion $m^3$ /year) | | | Outflow from Syria (billion $m^3$/year) | | |
|---|---|---|---|---|---|---|
| | from | natural | agreed | to | natural | agreed |
| **Euphrates*** | Turkey | 26.29 | 15.75 | Iraq | 30 | 9 |
| **Tributaries of Euphrates** | Turkey | 1.74 | 1.74 | - | - | - |
| **Afrin** | Turkey | 0.19 | 0.19 | Turkey | 0.25 | - |
| **Orontes, Al Keabir** | Lebanon | 0.51 | 0.43 | - | 1.2 | - |
| **Yarmouk** | - | - | | Jordan | 0.4 | 0.2 |
| **Baniyas** | - | - | | Palestine occ. terr. | 0.125 | |
| **Sub-total** | | 28.73 | 18.11 | | 31.975 | 9.2 |
| **Bordering Tigris** | 50% of total | 9 | 9 | | | |
| **Total** | **Inflow** | **37.73** | **27.11** | **Outflow** | **31.975** | **9.2** |

* Turkey has unilaterally promised to secure a minimum flow of 15.75 km³/year at its border with Syria, while an agreement exist with Iraq that sets a minimum flow entering Iraq of 9.2 km³/year
Source: FAO AQUASTAT (http://www.fao.org/nr/water/aquastat/countries/syria/index.stm)

It can be estimated that water resources generated from rain falling within the country amount to 7 billion $m^3$/year. Groundwater recharge is about 4.2 billion $m^3$/year, of which 2 billion $m^3$/year discharges into rivers as spring water. Total groundwater inflow has been estimated at 1.35 billion $m^3$/year, of which 1.2 billion $m^3$ from Turkey and 0.15 billion $m^3$ from Lebanon. Although not quantified, the amount of groundwater flowing into Jordan may be significant.

### Domestic rivers

In addition, Syria has several domestic rivers that source in the country and flow either to other rivers or to the sea. The most important among them are:

- Al-Khabour river, it sources from the extreme north-east of Al-Hassakeh governorate, it flows to south towards Deir-ez-Zor City where it flows into the Euphrates River,
- Al-Balikh river, it sources from the north of Al-Hassakeh Governorate, some 100 km to the east of Al-Khabour source, it flows to the south where it flows to the Euphrates River near the city of Al-Rakka.
- The Northern Al-Kabir river, it sources from the coastal mountains in Lattakia governorate, and flows into the Mediterranean.
- Barada river, which sources from the mountains to the west of Damascus City, it flows to the east towards Al-Ghota region, where it ends in form of small streams used in irrigating the farms,

However, all the rivers but Northern AL-Kabir are currently experiencing substantial water deficits either due to intensive use of water in agriculture (as the case of Al-Khabour and Al-Balikh) or due to the growth of population that leads to increased water demand for human consumption (as it is the case of the Barada river).

### Dams and lakes

There are 141 dams in Syria with a total storage capacity of 15.8 billion $m^3$. The largest dam is located at Al-Tabka on the Euphrates. It forms the Al-Assad lake with a storage capacity of 11.2 billion $m^3$. Medium-sized dams include the Al-Rastan (225 million $m^3$), the Mouhardeh (50 million $m^3$) and the Taldo (15.5 million $m^3$). There are some 20 dams classified as small, the largest of which is the Dar'a, with a storage capacity of 15 million $m^3$. The majority of these dams are located near Homs and Hama.

Apart from the Al-Assad lake, there are five lakes in Syria, the largest being lake Jabboul near Aleppo with a surface area of about 239 $km^2$. Lake Qattineh near Homs is the main perennial lake in Syria.

### Water withdrawal

Total annual water withdrawal in Syria in 2001 was estimated at 19,200 million $m^3$/year, of which agricultural use accounted for 82% (3.7% is withdrawn for domestic use and 1.9% for industrial use). The assessment of agricultural water use is based on the assumption that the maximum water requirement is about 13,450 $m^3$/ha per year. The treatment of domestic wastewater is carried out mainly in the towns of Damascus, Aleppo, Homs and Salamieh. The total amount of treated wastewater was estimated at 0.37 $km^3$/year in 1993, which represents 60% of the total produced volume of 0.61 billion $m^3$/year. All treated wastewater is reused.

### Box 2 International rivers and agreements

The Syrian and the Turkish Government agreed in 1987 that Turkey would secure a minimum flow of 500 m³/s (15.75 billion m³/year) for the Euphrates river to enter Syria, and negotiations are still on-going toward the reach of a permanent agreement.
According to an agreement between Syria and Iraq (1990), Syria agrees to share the Euphrates water with Iraq on a 58% (Iraq) and 42% (Syria) basis, which corresponds to a flow of 9 km³/year at the border with Iraq when using the figure of 15.75 km³/year coming from Turkey.
Up to now, there has been no global agreement between the three countries concerning the Euphrates waters.
An agreement was signed in 1955 between Syria and Jordan regarding the allocation of the water of the Yarmouk river, and was further revised in 1987.
A recent agreement between Lebanon and Syria on the Orontes river has led to a share of 80 million m³/year for Lebanon and the remainder for Syria.

Source: FAO Corporate Document Repository (http://www.fao.org/docrep/w4356e/w4356e0t.HTM)

All water basins in Syria suffer from deficits except Al-Sahel (coastal) basin, which witnesses a significant surplus. This may lead to conclude that potentials to expand irrigation is highly limited in the country, unless a considerable conversion to modern irrigation techniques is going to take place in the few following years, given that the current irrigated area by modern schemes is about 17% of the total irrigated area despite all the efforts made by the Government to encourage this conversion. This conclusion is emphasized by the fact that the major part (on average 82%) of water used in Syria goes to agriculture. The actual percentage of agricultural water ranges from a minimum of 62% in the Barada and Al-Aawag basin, to a maximum of 94% in the Al Khabour and Tigris basin. This poses some challenges for future water management policies, in the sense that any reduction in agricultural water use may be offset by increased water use in other sectors, given the currently high population growth rate (about 2.5%) and the government ambitious plan for industrial development in the northern and north-eastern regions of the country, whose basins are witnessing high deficits (Euphrates and Al-Khabour basins).

The only area that have a considerable surplus is the Al-Sahel basin, where expansion of agricultural land is unlikely by the scarcity of suitable land and constrained by the hilly and mountainous topography of the region that would make the installation of irrigation schemes cost-ineffective.

## Figure 5 Syrian water basins


## Table 8 Water balance per basin (million $m^3$)

| Basin name | Water availability | Water use | Water balance |
|---|---|---|---|
| **Euphrates and Aleppo** | 7,471 | 9,878 | **- 2,407** |
| **Al Khabour and Tigris** | 2,388 | 3,655 | **- 1,267** |
| **Al-Sahel** | 2,335 | 742 | **+ 1,593** |
| **Al-Assi** | 2,717 | 3,005 | **- 288** |
| **Barada and Al Aawag** | 850 | 928.6 | **- 78.6** |
| **Yarmouk** | 447 | 487 | **- 40** |
| **Total without Al-Badia** | 16,208 | 18,695.6 | **- 2,487.6** |
| **Al Badia** | 343 | 1,044.6 | **- 701.6** |
| **Total** | **16,551** | **19,740.2** | **- 3,189** |

Source: adapted from Somi 2002 and GCASR 2006

## Table 9 Proportions of water use by sector and basin (%)

| Water basins | Agricultural water use* | Industrial water use** | Domestic water use** | Evaporation** | Total uses (calculated) |
|---|---|---|---|---|---|
| **Euphrates and Aleppo** | 80 | 1 | 3 | 16 | 100 |
| **Al Khabour and Tigris** | 94 | 1 | 1 | 4 | 100 |
| **Al Sahel** | 75 | 11 | 11 | 2 | 100 |
| **Al Assi** | 79 | 8 | 8 | 5 | 100 |
| **Barada and Al Aawag** | 62 | 8 | 29 | 1 | 100 |
| **Yarmouk** | 70 | 8 | 16 | 6 | 100 |
| **Total without Al-Badia** | 81 | 3 | 5 | 10 | 100 |
| **Al Badia** | 94 | 0 | 4 | 1 | 100 |
| **Total** | **82** | **3** | **5** | **10** | **100** |

* numbers refer to the crop year 2005-2006; ** numbers refer to the year 2001-2002
Source : Somi, 2002 ; GCASR, 2006

Table 10 shows very interesting figures. From one side it shows that underground water availability is generally less than that of surface water; however, the proportions of irrigated land from both sources are so different from those of their water availabilities. While (e.g.) surface water availability from underground forms only 4% of the total water availability in Euphrates basin, it irrigates 36% of the total irrigated land (these numbers become 20% of available water to irrigate 78% of the land in Al-Khabour basin). This poses several questions about the distributional aspects of irrigation policy, that is maybe one cause of increasing the water deficit in several basins, as a high proportion of the available surface water is wasted while underground water is over-utilized (Table 10). Utilization proportions given in Table 10 suggest exhaustive drawings of underground water in three basins, which are the ones who experience the highest deficits.

**Table 10 Proportions of available water resources and irrigated areas by basin and water source**

| Basin name | Surface water | Underground water | Area irrigated from surface water | Area irrigated from underground water |
|---|---|---|---|---|
| **Euphrates and Aleppo** | 96% | 4% | 64% | 36% |
| **Al Khabour and Tigris** | 80% | 20% | 22% | 78% |
| **Al Sahel** | 88% | 12% | 75% | 25% |
| **Al Assi** | 83% | 17% | 44% | 56% |
| **Barada and Al Aawag** | 68% | 32% | 100% | 0 |
| **Yarmouk** | 60% | 40% | 50% | 50% |
| **Total without Al-Badia** | 88% | 12% | 44% | 50% |
| **Al Badia** | 49% | 51% | - | - |
| **Total** | **87%** | **13%** | **N.a.** | **N.a.** |

* in Barada and Al Aawag basin, farms use both water sources
Source: GCASR, 2006

**Table 11 Water utilization breakdown by basin**

| Basin name | Utilisation percentage for surface available water | Utilisation percentage for underground available water | Utilisation percentage for total available water | Proportion of agricultural water use to the total use |
|---|---|---|---|---|
| **Euphrates and Aleppo** | 87% | 534% | 105% | **80%** |
| **Al Khabour and Tigris** | 42% | 547% | 144% | **94%** |
| **Al Sahel** | 21% | 46% | 24% | **75%** |
| **Al Assi** | 50% | 270% | 88% | **79%** |
| **Barada and Al Aawag** | 135% | 135% | 135% | **62%** |
| **Yarmouk** | 59% | 103% | 77% | **70%** |
| **Total without Al-Badia** | **64%** | **339%** | **97%** | **81%** |

Source: elaborated from GCASR, 2006

Indicators of water use efficiency can be drawn from this table. For example, less quantity of water used per hectare may indicate a more efficient use. However, this should be combined with the cropping patterns as some crops demand more water than others. From the information we have here we cannot make precise conclusions about economic efficiency as this requires knowledge of the gross margins of the crops. But at least we can draw some conclusion about the technical efficiency, through making crosses between Table V and Table VI.

## Table 12 Per-hectare utilized water of irrigated land and irrigated cropping area by basin

| Basin name | L surface water (thousand $m^3$/ha) | L underground water (thousand $m^3$/ha) | C surface water (thousand $m^3$/ha) | C underground water (thousand m3/ha) |
|---|---|---|---|---|
| **Euphrates & Aleppo** | 16.87 | 7.91 | 12.71 | 7.56 |
| **Al Khabour & Tigris** | 7.67 | 7.24 | 7.67 | 7.09 |
| **Al Sahel** | 8.92 | 8.41 | 7.89 | 7.77 |
| **Al Assi** | 9.52 | 8.47 | 8.85 | 7.92 |
| **Barada & Al Aawag** | | 13.84 | | 13.19 |
| **Yarmouk** | 9.06 | 10.56 | 8.56 | 9.83 |

*L is per-hectare utilized water with respect to the area of irrigated land
*C is per-hectare utilized water with respect to the irrigated cropping area.
Source: elaborated from GCASR, 2006

## Table 13 Areas of most important irrigated crops by basin in 2005 (ha)

| Crop | Euphrates & Aleppo | Al Khabour & Tigris | Al Sahel | Al Aassi | Barada & Al Awaj | Yarmouk |
|---|---|---|---|---|---|---|
| **Wheat** | 338,373 | 344,500 | 6,027 | 130,550 | 19,918 | 16,508 |
| **Cotton** | 119,415 | 85,412 | 0 | 32,941 | 0 | 0 |
| **Summer vegetables** | 17,023 | 3,830 | 6,651 | 11,619 | 2,371 | 6,126 |
| **Sugar-beet** | 14,323 | 0 | 0 | 11,676 | 0 | 0 |
| **Barley** | 5,704 | 7,267 | 0 | 4,928 | 2,678 | 15 |
| **Potato** | 8,165 | 2 | 834 | 18,299 | 884 | 827 |
| **Citruses** | 102 | 0 | 30,739 | 747 | 8 | 79 |
| **Olive trees** | 11,601 | 306 | 459 | 18,524 | 12,197 | 6,373 |

Source: approximated values calculated from SADB data

## Table 14 Water balance in Syria

| | Unit of measure | Barada and Al Awaj | Yarmouk | Al Badia | Orontos (al Asi) | Coastal | Al Khabour and Tigris | Euphrates and Aleppo | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Water resources** | | | | | | | | | |
| (surface) | million $m^3$ | 12 | 88 | 49 | 666 | 1,246 | 315 | 6,818 | **9 194** |
| (underground) | million $m^3$ | 490 | 131 | 54 | 964 | 622 | 640 | 2,494 | **5 395** |
| Total | | 502 | 219 | 103 | 1,630 | 1,868 | 955 | 9,312 | **14 589** |
| Utilization rate | % | 90 | 85 | 60 | 85 | 65 | 95 | 98 | |
| Actually available | million $m^3$ | 452 | 186 | 62 | 1,386 | 1,214 | 907 | 9,126 | **13 332** |
| Domestic a nd industrial waste water | million $m^3$ | 257 | 50 | 8 | 214 | 0 | 36 | 130 | **695** |
| Agricultural drainage | million $m^3$ | 568 | 36 | - | 231 | 43 | 428 | 725 | **2 031** |
| **Total Available** | million $m^3$ | 1 277 | 272 | 70 | 1,831 | 1,257 | 1,371 | 9,981 | **16,058** |
| **Water uses** | | | | | | | | | |
| Irrigated area | ha | 75,429 | 34,299 | 3,871 | 253,427 | 72,132 | 404,075 | 432,835 | **1 276 068** |
| Irrigation requirements | $m^3$/ha | 16,000 | 10,500 | 11,000 | 9,100 | 6,000 | 10,600 | 16,700 | **12 429** |
| Irrig. water use | million $m^3$ | 1,207 | 360 | 43 | 2,306 | 433 | 4,283 | 7,228 | **15 860** |
| Population | millions | 4.09 | 0.94 | 0.11 | 2.53 | 1.83 | 0.67 | 4.10 | **14.28** |
| Req.t per person | $m^3$ per capita | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | **2 000** |
| Dom. water use | million $m^3$ | 298 | 69 | 8 | 185 | 134 | 49 | 300 | **1 042** |
| Ind. water use | million $m^3$ | 77 | 18 | 2 | 48 | 35 | 13 | 78 | **315** |
| Evaporation | million $m^3$ | 5 | 31 | 15 | 148 | 16 | 132 | 1,643 | **1,990** |
| **Total uses** | million $m^3$ | 1,588 | 478 | 68 | 2,687 | 617 | 4,477 | 9,249 | **19,162** |
| **Water balance** | **million $m^3$** | **-311** | **-206** | **2** | **-856** | **640** | **-,3,105** | **732** | **-3,104** |

Source: adapted from Varela-Ortega and Sagardoy, 2001

### II.1.2. Social and economic conditions

#### II.1.2.1. Agricultural labor market and migration[4]

Syrian population is currently estimated at slightly less than 20 million, with a labor force of 5 million and a half, 19,2% of which employed in agriculture. If we add the agricultural based industry and service, the relevance of agriculture for employment is evident.

Most of the farms are operated by the owners and their families.

The intensity of farm labor depends on the crop and the relative degree of mechanization of farm operations. Cereal production is almost fully mechanized (with exception in small areas of wheat cultivation for home consumption on steep slopes). Cereal cultivation is therefore irrelevant for the rural employment. In contrast, beets and oilseeds provide small employment opportunities on larger farms, while most small farmers will not engage higher labor for these crops.

Industrial crops are the largest providers of agricultural casual employment, and among them the large cotton producing areas attract during the picking season large flows of casual labor across the country. Given the labor intensity of picking, which is mostly carried out by female laborers, even medium and small sized farms often employ additional labor to complement available family labor especially at the harvest seasons.

The second main provider for seasonal employment in the agricultural sector is the fruit tree crops' sub-sector, with emphasis on harvesting for unskilled agricultural labor and for puning for skilled agricultural labor. The third major element in Syria's agricultural casual labor market is vegetable cultivation, especially the seasonally available employment in harvesting of field vegetables. The southern plains (in Dara'a governorate) are famous among the poor in many farming systems for their employment possibilities.

In several areas of the country, many poor families (landless in particular) engage in sharecropping arrangements with investors for specific crops, such as cucumber and tomato cultivation. Given the lack of cash from the side of the sharecropper, the contractual arrangements tend to be very simple with all inputs being provided by the investor, while the sharecropper guarantees high quality supervision of the crops, as he lives in a tent next to the field for one season. The quality of irrigation and prevention of theft are important additional duties. Sharecropping arrangements are more prevalent in the irrigated parts of the country, since labor requirements per hectare are higher for irrigated crops and the relative saving on supervision cost is larger compared to rainfed crops.

**Mobilization and organization of labor force[5]**

The source of labor engaged in agricultural production differs from one region to the other in the country. In the coastal areas and mountains, agriculture depends mainly on family labor, and when hired casual labor is needed, it is very likely that they come from the same or the neighboring villages. Labor from other regions of the country only come during the harvesting seasons of olive and citrus. The same observation can be said about the internal central plains of Syria (Homs, Hama, and Al-Ghab). All of the above mentioned areas are known to be remarked by high population density and small average farm

[4] This section is based on results presented in Wattenbach (2006)
[5] This section is based on Sadiddin (2004)

sizes. However, poor farmers are landless are easy to find in Hama and Al-Ghab, from which many seek to work in other areas of the country.

The target region of labor migration sometimes depends on social factors. For example, the people of the western areas of Al-Ghab usually go to the coastal areas because they have historical relations with the residents there. In contrast, the people of the eastern and southern parts usually go to Hama and Homs Governorates for the same reason. This labor migration increased during the last decade due to the increase of the population and then the increase in labor supply, coupled with the decrease in agricultural land returns, which was the main source of income for the majority of the agricultural labor families.

Poor farmers and landless rural people are the basic providers of the casual agricultural labor, whose organization and mobilization function in accordance with the local demand in one area or another. Traditional contractors, the *chaweshes*, perform these functions. They organize labor system whereby labor demand and supply meet. They pool labor from areas of excess supply and make it available in different areas according to the market demand, which increases significantly in autumn, when the harvest seasons of several major crops in the country (cotton, sugar-beet, olive, etc.)

Each *chawesh* organizes 25 to 30 workers, mainly women. He assumes all risks connected to labor identification and employment. Therefore, he organizes travel and residence when away from home usually in tent. He is also responsible for paying the workers who have no direct dealings with the employing farmers. This issue makes the effective wage that the laborers receive less than the real wage paid by farmers, which is about SP 125 per workday, in which the *chawesh* takes a commission from each employee about SP 25 per workday. In addition, he has a daily wage of SP 200-300 from the farmer. The commission he receives from employees should be in theory equivalent to the cost of housing and transportation he guarantees for them.

### The role of women

Agrarian relations from a gender perspective indicate that, on the field, women usually take the responsibility of weeding and harvesting and men do other activities such as irrigation, tillage, etc. Increasing feminization of agriculture has recently become a general phenomenon because men usually enter non-agricultural activities. This may from the one side increase the burden on women, but on the other side, it increases their participation in decision-making inside household.

In the sheep breeding farming systems, which generally characterizes the Bedouin society, women are responsible for important and difficult chores. They perform the major tasks of herd management. During the milking season, they perform everything related to milking and milk processing whether for sale or for home consumption (in form of ghee or cheese). In addition, they are responsible for feeding the sheep, bringing clean water for the family and the animal consumption and wooding. When the family moves from one place to the other, women are also responsible for unfastening the tents and reconstructing them in the new place. In fact, they also tailor them, usually with specific cloth bought from the market. (Sadiddin , Al-Mujahed and Al-Sayyed 2004)

### II.1.2.2. Credit market[6]

Liquidity is among the primary constraints of poor and medium household and influences the production decisions in most farming systems. Constrained access to crop finance has a serious impact on their possibilities to improve agricultural incomes. Frequent failure to repay earlier credit leaves many poor household excluded from formal credit trough the ACB. At present, their possibilities to invest in agricultural production depend on informal credit access. These informal credits are expensive and the high figures suggest cases of abuse by traders and input providers. However, such credit necessarily contains a risk premium, as the enforcement possibilities of the credit given outside the formal legal framework are low and risks for the creditor are high as not guaranteed though a collateral.

Diversification of poor farmers would be made easier, if better credit access makes them less reliant on arrangements of combined credit and advance-sales of crops (particularly for cotton). Clear policies on dealing with drought-caused credit failure are needed in order to permit drought stricken systems to recover. It is often overlooked that livestock loss in the pastoral and agro-pastoral farming system is not only equivalent to the loss of a harvest in a crop based farming system, but is equivalent to the loss of farm assets such as land or machinery.

Many farmers borrow from friends or relatives living outside the country, mostly other Arab countries (Lebanon and Gulf States). Furthermore, machinery suppliers are a common source of finance for purchase of equipment. The procedures are short and simple, although interest rates are high (they vary from about 20% up to 40%). Interest on such deals is generally made a part of the price. Farmers are aware of the higher cost incurred by this route of financing but do not mind such additional cost for the sake of saving time and avoiding inconvenience.

For production expenses, the alternative sources of credit are the input suppliers, output dealers, exporters and cold storage units' owners. Input suppliers are generally small traders and do not have the capacity to extend credit covering the whole crop duration. They usually provide fertilizers, seeds, and plant protection chemicals. Farmers are generally anxious to apply chemicals to protect the crop and the expenses they have already incurred on the land and for this reason consider agro-chemicals to be of higher priority over other inputs. Consequently, they are well motivated to keep good relations with agro-chemical dealers by repaying loans relatively more punctually.

Output dealers, exporters' agents and cold storage units' owners are active in fruit and vegetable growing areas. Their involvement in credit provision takes several forms. Direct payments ahead of the season are given usually with an agreement on the unit price at which the output would be purchased. Farmers are then under obligations to sell the crop to the dealer at a pre-negotiated price, given that they have to repay the loan, they are likely to be at the weaker end of the bargain. Another form of financing by the output buyer is to agree on a lump sum to be paid to the farmer for the entire output. The lump sum is paid in suitable installments to enable the farmer to meet production expenses. The expected yield is estimated by the contractor in such a way that he recovers interest at a fairly high rate and makes also a profit, which is often quite high, taking full advantage of the farmer's financial needs. To meet difficult conditions caused by environmental factors, farmers are often forced to liquidate their assets. When the need is large, they may be also forced to sell the house and equipment. Smaller farmers often sell their animals.

[6] This section is based on Wattenbach (2006.)

Given the above, it seems that the current credit system favors to some extent the so-called strategic crops particularly wheat, cotton, tobacco, and sugar-beet. Farmers who cultivate these crops have relatively easier access to credit provided in kind by the ACB in form of seeds and fertilizers. This encourages farmers facing a liquidity problem to cultivate these crops.

The possibility to access these informal sources of credit depend mainly on cultivating the crops that have stable prices and are easy to trade, which are, once again, wheat and cotton. In such cases, a trader buys the production of wheat or/and cotton in advance at prices lower than the official ones. The trader gives the money to the farmer when needed according to pre-agreed arrangements between them. After the production is delivered to the trader, he manages to sell it to the relevant governmental establishment. Sometimes, the production is sold through the cooperative of the village by the trader using the name of other farmers, although is the trader that takes the revenue. Such activity is usually protected by social norms and traditions even though it is illegal. Therefore, when a farmer is caught in debt with the private traders, it is very likely that it goes on cultivating cotton and wheat to keep on the informal credit source.

#### II.1.2.3. Marketing organization

Farmers face serious problems in marketing crops for which the Government intervention is minimal. Crops such as fruits and vegetables as well as a large group of legume, cereals (other than wheat and barley), oilseed, and other crops are marketed through the private sector channels and their prices are determined through the interactions of supply and demand. (Wattenbach 2006)

The absence of any stabilization policy leaves the determination of prices to be very much affected by seasonality of outputs, resulting in fluctuating prices that expose farmers to a higher level of price risk.

Farmers' attitudes towards risk influence the way they prefer to market their output. Aiming at coping with risk, many farmers prefer to sell their crops on the field at the fixed price pre-agreed upon with the buyer, who is a kind of traditional guarantor, called *dam'man* in Arabic. In this way, farmers express their willingness to sacrifice, on average some margin for securing a minimum level of revenues and, and at the same time to avoid the complications associated with transporting the outputs to the main wholesale markets. Not surprisingly, this practice is very common for crops that suffer the most from price fluctuations as they are perishable lacking long-period storage facilities, such as grapes, onion, and garlic. (Wattenbach 2006)

Some crops that are easy to store in the open field, such as cumin, anis, and black seeds are marketed on the field. Farmers harvest the produce and then sell it to traders specialized in such activities and usually involved in export activities or at least linked to some exporters. The nature of such crops assist farmers in coping with the price risk; however, they usually sell their output under unfavorable conditions due to their lack of liquidity needed for other production activities or for consumption purposes.

Most fruits and vegetables are marketed in wholesale markets, called *Souq El Hal*, which exists in each governorate capital. In Damascus' *Souq el Hal* operate around 400 traders, half of which as commissioners and the other half as wholesalers or semi-wholesalers. Ninety-five percent of the trade is for wholesale, although there is some retail. The market lacks a system to monitor access of products on the market. It is estimated that, during the peak season (two months in summer), some 300 to 500 tons may arrive in the market, more than 50% of which is tomato.

Officially, the commission to be paid for the sale of the output on behalf of farmers is 5% (maximum fixed by the former MSIT), although real commissions are reported to be between 20% and 30%. Sometimes, commissioners anticipate loans to farmers, in cash or in kind (fertilizers, seeds, etc). This fact, and the personal knowledge and trust, have the consequence that normally one farmer is linked to a specific commissioner, or eventually to a few commissioners, one in each destination markets. The commissioner can sell to the semi-wholesaler or the retailer either cash or on credit, with payment occurring usually from one week up to one month later, depending on the market condition (sale on credit is more common when there is a product surplus). Wholesalers and commissioners are not specialized by product, due to the seasonal pattern and the need to operate continuously. However they are often, more or less, specialized by region, which determines also a partial product specialization.

Between the agricultural producers and the final consumers there is often a long chain of intermediate operators. In a not well integrated agricultural sector, these operators represent the only way to ensure an adjustment between demand and supply. The government, which in other cases exerts a very strict control over the economy, is in this case almost absent.

In addition, fruits and vegetables production has allowed degree of either horizontal or vertical integration. Cooperatives, which nevertheless exist, are very seldom engaged in marketing or in pre-marketing operations (such as sorting, grading, packing), while state establishments are absent at the production level and have small presence at the procurement and marketing levels. At the other end of the chain, traditional retailers dominate the market, and large retailers or hotels generally procure their produce through buyers that operate on the wholesale markets, which remains the major transit point for most of the products. There is no publicly available information either on quantities or prices. In these conditions, middlemen are the real strategic pivot of the sub-system (Rama, 2000).

#### II.1.2.4. Land market[7]

The importance of land markets varies considerably among different areas of the country, and sometimes within on area. The long-term effects of land reform are a critical issue in some parts of Syria, since the population growth led over time to increased pressure on agricultural land resulting in considerable land fragmentation (this is very much relevant in Al-Ghab, Hama and Idleb). The sale of land obtained through land reform used to be illegal, but the constraints has been released somehow, so that now, under some condition, such sales can be authorized.

In some cases, the law of agrarian relations has led to the effective transfer of land to former sharecroppers, which obtained continuous land use rights, after sharecropping it for many sequential years. However, they are nevertheless obliged to pay a proportion from the total output to the original owner. This proportion differs according to the sharecropping arrangements agreed upon between the two parties, in which the share of the owner does not exceed 20% in case of providing the land only.

In the northern eastern areas of the country, part-time farming is relatively common in the larger holding group, whereby owners visit the farm for important operations to supervise them and return to their urban base. Furthermore, old (un-revocable) sharecropping arrangements are relatively common.

The lack of updated titled deeds generally presents for many farmers a constraint to access credit through the formal channels and hence reduces investment. Slow administrative procedures related to

[7] This session is heavily based on results of a comprehensive survey conducted by NAPC AFD division in 2006 and 2007.

the land registration affects tenure arrangements. Legal and practical restrictions on changing ownership of agrarian reform land aggravate the situation. An increasing number of holders will operate on land with title deeds issued in the name of deceased parents. The resulting restricted credit access will affect production and farm income. The regulations governing the transfer of registered land and issuing updated title deeds require for that reason urgent attention. The development of parallel arrangements is otherwise the only viable solution for farmers, but these will tend to favor the stronger negotiation partner at the detriment of the weaker one, i.e. the poor (Wattenbach, 2006).

In rainfed part of agro-ecological zone 4, the role of the sheep co-operatives in access to land and grazing resources has undergone repeated changes over time. Individual access to grazing land in the marginal production conditions is not a feasible and viable solution and has rightly not been on the policy agenda in Syria. The changes between traditional tribal structures, co-operatives and intervention of the Government bodies in defining access to grazing land has lead to considerable confusion among the sheep herders. In principle, arrangements at different levels are possible but the resilience of the natural resources against overgrazing is insufficient to allow unregulated access to the Al-Badia (the Syrian steppe). The policy decisions to grant open access to improved range areas near Palmyra, which had been established as a model of co-operative level management of improved Al-Badia land was detrimental to the confidence of local populations to have secure access rights following improved resource management (Wattenbach, 2006).

### II.1.3. Public policies

Many policies affect the quality and the quantity of agricultural production. While a detailed description of the overall government agricultural policy is available in other sources (Westlake 2001), this chapter is, however, devoted only to describe and discuss mainly the policy instruments that affect the decisions making processes of Syrian farmers, whose aggregate outcome forms the national supply of agricultural outputs. For the sake of this study, these policies can be classified under the following subheadings:

- Price and delivery policies of outputs
- Planning and licensing policy
- Input pricing and distribution policy
- Credit policy
- Irrigation and other related policy

#### II.1.3.1. Price and delivery policies of outputs

From a policy viewpoint, crops in Syria can be classified into strategic crops and other crops. Strategic crops are those whose prices are affected directly by government price policy, either through administering fixed prices or through setting floor prices. Crops considered strategic in Syria are seven: wheat, barley, cotton, sugar-beet, tobacco, lentil, and chickpea. The GOS annually sets prices for all strategic crops at which public agencies and establishments will buy the products. These prices are applicable throughout the entire country. In addition, they are all determined based on presumed costs of production, with the objective of ensuring that farmers are able to cover the costs and make some

profits. Such a way of price setting explicitly has the aim of isolating farmers from market forces and motivating farmers to produce specific crops (Westlake, 2001).

For cotton, sugar-beet, and tobacco, the officially administered prices are the only ones at which farmers can sell, as the state-owned establishments are the sole buyers of these crops.

This is not the case for wheat, barley, lentils and chickpeas, since farmers can also sell them to private buyers. For these crops, the Government maintains a floor price by committing to buy whatever it is supplied at that price. However, reportedly farmers on occasions sell to traders at less than the Government's floor price, because the trader is able to offer a purchase package that the farmer finds more attractive than the alternative offered by the GoS establishments, due for example, to more attractive payment terms. In addition, the official prices of lentils and chickpeas have been for several years much lower than those prevailing in the markets, which imply that farmers who produce these two crops do not usually sell them to governmental agencies (Westlake, 2001).

The official price of **wheat** has been, until recently, set at SP 11.8 for durum wheat and SP 10.8 for soft wheat per one kilogram, but it also differs according to some quality characteristics in the sense that this price is the maximum that a farmer can get for his output. In reality most farmers get a price that slightly fluctuates around SP 11.5 per one kilogram.

**Cotton** price also differs according to quality, but it also differs according the delivery date of output to motivate farmers for early harvesting to avoid the bad impact of early rainfall on cotton fibre. The maximum prices a farmer can get are 30.75, 26.25, and 19.75 SP/kg respectively for the following delivery periods: until November 15$^{th}$, from November 16$^{th}$ to November 30$^{th}$, from December 1$^{st}$ and on (Westlake, 2001). The average price farmers get fluctuates around 27.5 SP/kg.

The price of **sugarbeet** was set at an average of 2.25SP/kg, based on a sucrose content of 16%, with positive or negative premiums based on the actual sucrose content.

The pricing system for **tobacco** is much more complicated than those of the other strategic crops and there is no reason to describe it in detail here. It might suffice to say that the gross margin calculations performed over the research showed that the price of tobacco fluctuates around SP 120 per kilogram.

Also for **barley**, **lentils**, and **chickpeas** there used to be floor prices respectively of SP 7, 16, and 17.8 per kilogram. The principle of price differentiation based on quality applies to them too.

In 2008, the Government undertook a series of actions among which the most important was to raise the price of diesel to 25 SP/litre (an increase of about 235%). This decision was followed by three decisions aiming at compensating the farmers for the increased costs of production (Decisions No. 27, 31, and 80 issued by the MAAR in 2008). Consequently, the prices of strategic crops became as follows:

- Wheat: 20 SP/kg for durum and 19.5 SP/kg for soft
- Barley: 16 SP/kg
- Cotton: 41 SP/kg (the decisions do not state any price differentiation according to delivery dates as before)
- Sugar beet: 3.75 SP/kg
- Lentils: 23 SP/kg
- Chickpeas: 25 SP/kg

In addition, a subsidy of 30 thousand SP/ha is given to producers of cotton irrigated from private wells.

The prices of **other crops** are mainly determined through the interactions of supply and demand without heavy intervention from the Government.

In terms of output delivery, one can classify crops in Syria into two main categories: those whose marketing is heavily subject to government intervention (strategic crops), and those whose marketing activities are totally carried out by the private sector with a minimal government intervention that is confined to setting up some floor and ceiling prices to protect farmers and consumers respectively.

Strategic crops, in turn, can be distinct in two categories depending on whether or not private processing may occur. Cotton, sugar-beet and tobacco are those whose output must be totally submitted by farmers to the relevant state establishments, since they are processed by state-owned processing plants, while wheat, barley, lentil and chickpea need not to be sold exclusively to state establishments which procure their need at a minimum floor price.

The General Establishment for Cereal Processing and Trade (GECPT) operates 140 collection centers for the purchase of wheat from farmers. As Barley is used principally for animal feed, producers can retain it for their own livestock, sell it to neighboring farmers, traders and private feed millers, or sell it to the General Establishment for Feed (GEF), which continues to act as a buyer of last resort.

For lentils and chickpeas, the GECPT and the General Company for Mill (GCM) own a total of seven lentil processing and splitting plants. Many private factories process lentils and chickpeas for a fee, and such market is highly competitive.

As for barley, the GEF continues to act as a buyer of the last resort. The relative throughput of the public and private sectors varies markedly from year-to-year, with the GEF buying a substantial part of the crop when its buying price is above export parity, but buying very little when world prices are high and private traders bid up the domestic price.

Cotton farmers must deliver their output to the Cotton Marketing Organization (CMO), which has 16 saw ginneries. The CMO purchases from farmers immediately after harvest and then processes its resulting stock of seed cotton over a period of some ten months. This long processing period results in very high stock financing costs for the CMO. These exceed all its other costs and amount to some 0.2% of GDP.

Farmers must sell their entire sugar-beet crop to the General Establishment for Sugar Industry (GESI), which has seven sugar factories, six of which process beet. Beet is moved up to ten times the distance normally considered to be the feasible maximum, resulting in high transport costs and losses in sucrose content. The present formula for setting the producer prices of beet of different qualities encourages farmers to produce beet of low sucrose content as the incentive is mostly focused on beet absolute yield rather than on sugar content. This is highly inefficient, leading to the wasteful overuse of nitrogen fertilizers and to inflated beet transport and sugar processing costs. This led to the need to a stricter enforcement of the beet's minimum sucrose content at delivery.

As for cotton and sugar-beet, tobacco's producers must also their total output to the General Establishment for Tobacco Monopoly (GETM), which has processing and cigarette manufacturing plants in Lattakia, Hama, Aleppo and Damascus.

### II.1.3.2. Planning and licensing Policy

The annual agricultural plan of the MAAR is the core operational vehicle of the national planning system in the agricultural sector. Its aim is to direct farmers towards a particular pattern of land use perceived by policy makers as best able to achieve the national objectives. This plan also serves as a framework at the beginning of each cropping year to guide the provision of credit, inputs and other services to farmers directly through the Agricultural Cooperative Bank (ACB) or indirectly through the agricultural cooperatives. In addition, it is used as a guide to plan the subsidy services (Westlake, 2001.)

While a detailed description of the planning and licensing systems is available in other sources (Westlake 2001), the relevant part to this policy is the one related to the licensing systems of certain crops.

For sugar-beet, tobacco and cotton, farmers are not allowed to cultivate these crops in excess to the areas allotted under the licensing systems, if they are to get the official supported price for their produce.

These licensing systems are set according to the following mechanism. According to the shares of strategic crops set in the plan, committees from the directorates of agriculture of each governorate discuss the previous production plan and identify the new irrigated areas in coordination with the extension units of the relevant villages. Then the directorates of agriculture propose a new production plan and send the tables of the irrigated areas with the expected production and yield to the MAAR to be discussed in the Presidency of the Ministers Council (PMC). The final approval to the plan is made by the PMC. Then the MAAR sends the plan to the directorates of agriculture in the different governorates, which distribute it to the agricultural *maslahas* to be diffused to the extension units and the peasant cooperatives to be finally performed (NAPC, 2005).

The distribution of these three crops among different areas of the country depends on several factors. For tobacco and sugar-beet, the cropping production is mostly concentrated in areas close to the processing factories of these two crops, whose locations were mostly the result of decisions made in the seventies in which the country had witnessed a remarkable industrial growth. These decisions aimed at boosting the economic development through integrating agricultural outputs with industrial activities in the contest of a highly centralized economic planning. This also applies, at least partly, to cotton. However, the latter has gained special importance over time as a major provider of foreign currency, which made its production to expand into the newly irrigated areas especially in Al-Hassakeh governorate ( which be came virtually specialized in cotton, producing alone more than 40% of the national cotton output) regardless of the distribution of the ginning factories over the Country.

Agro-climatic conditions have also a role to play in determining the distribution of crops among different governorates in the agricultural plan. Humid climate is, e.g., not suitable for cotton justifying the concentration of its production in the internal areas of the country that are far from the seaside. Other climatic factors can be discussed about cotton distribution but that are beyond the interest of this research, but it may be of interest to mention that the General Establishment of Seed Multiplication (GESM) produce cotton seeds of different varieties, each is considered to be ecologically adapted to a specific area of the country. On the other hand, tobacco production is concentrated on the mountains parallel to the coast, as it needs relatively cold weather.

Each farmer is entitled to plant a fixed percentage of its land to any of these three crops (cotton, sugar-beet, and tobacco) according to the land area and the water resources to which he has access. Any farmer that holds at least one hectare of agricultural land can apply for a production license, provided

he can prove his right to access the land through some formal document. If the source of irrigation water is a well, the farmer should also provide a document stating that the land he has access to includes a licensed well. For farmers who have unlicensed wells, the MAAR nominates special committees to ensure that the well is appropriate, so the farmer can obtain the production license even if the well is still unlicensed (NAPC, 2005).

#### II.1.3.3. Inputs price and distribution policy

Prices of fertilizers that are approved for local production and for imports are those at which the ACB, the major distributor of fertilizers to farmers, pays for supplies from both sources. The ACB averages these costs along with costs of carry-over stocks to arrive at a uniform ex-warehouse selling price to the farmers. Onward costs from the warehouse are borne by the buyer (either single farmers or their cooperatives). Given the above, it must be expected that the costs of production vary from year to year due to increases in some items and decreases or increases in the way the fixed costs are absorbed by quantity produced. In addition, imported costs also would not remain the same. However, fertilizer prices have remained the same over the last 15 years – that is 5 400 SP per ton for ammonium nitrate, 7 700 SP for urea, 8 300 SP for TSP and 12 100 SP for potash sulphate (Parthasarathy, 2000).

The same fundament is also applied to the seeds of some strategic crops (mainly cotton, wheat, and sugar-beet). Plant protection chemicals are traded by the private sector and their prices are determined through the supply and demand.

#### II.1.3.4. Credit policy

The Agricultural Credit Bank (ACB) is the main public provider of credit in the rural areas, which makes it perhaps the most important institutional instrument of the government to promote agricultural production and to protect the standard of living of the rural population.

Credit offered by the ACB can be classified into short-term, medium-term and long-term loans with different interest rates. The credit policy was recently exposed to considerable reform due to the Legislative Decree No. 30 issued in 2005. The reform touched all elements of the credit policy: interest rates, credit terms and the range of eligible activities. The ACB used for a long time to offer credit only for pure agricultural activities, but now it can provide credit for various development projects (agricultural, industrial and constructional), on the condition that they all serve the process of rural development through employment creation and strengthening the linkages among the various economic sectors in the rural areas. It is believed according to this viewpoint that strengthening such linkages whether they are of production or consumption types would enhance the flows of labor and capital from the agricultural sector to the other sectors (or vice versa), which in turn, is expected to assist in achieving a comprehensive development in the Syrian countryside. The following table summarizes the new types of loans offered by the ACB with the new interest rates.

**Table 15 interest rates adopted by the ACB according to loan term and activity**

| Term | sector | Activity sector | Interest rate |
|---|---|---|---|
| Short | Public and collectively cooperative | All | **6%** |
| | Cooperative on behalf of members | | **7%** |
| | Private and co-joint sector | | **8%** |

| | | | |
|---|---|---|---|
| Medium | Public and collectively cooperative | Agriculture | **7%** |
| | | Non-agriculture | **8%** |
| | Cooperative on behalf of members | Agriculture | **8%** |
| | | Non-agriculture | **9%** |
| | Private and co-joint sector | Agriculture | **9%** |
| | | Non-agriculture | **10%** |
| Long | Public and collectively cooperative | Agriculture | **8%** |
| | | Non-agriculture | **9%** |
| | Cooperative on behalf of members | Agriculture | **9%** |
| | | Non-agriculture | **10%** |
| | Private and co-joint sector | Agriculture | **10%** |
| | | Non-agriculture | **11%** |
| Interest rate of delay in repayment | | | **12%** |

Short-term loans aim to cover farm expenses such as those required to plough, harvest, irrigate, to buy fuel and other inputs, small tools and animal feeds and veterinary medicines. In addition, they cover the costs of maintaining agricultural machinery and pumping sets as well as the costs of storing agricultural products. Such loans have to be repaid in a period of one year maximum, and it is offered in cash and in kind (usually in form of fertilizers and seeds). Loans provided to fund the farms expenses are subject to the seasonality of agricultural activities in which it is not possible to obtain any credit before the dates specified in " requirements' tables" special for this purpose. These tables include also the inputs required by one dunum for each cropping activity, and the dates of loan repayments. Short-term loans provided for non-agricultural activities are confined to the variable inputs of technical professions and industries related to rural development, and they are given over the year.

Medium term credit is granted for more than one year but not exceeding five years. It covers the needs related to the purchase of machinery and tools required for agricultural production and land reclamation. They also fund the purchase of livestock and the establishment of fish farms as well as digging wells and irrigation canals. Moreover, they cover machinery needed for chicken industry and sorting and packaging machines as well as fans for combating frost and maintenance stations and others. They cover, furthermore, projects of animal feed processing and the manufacturing of both plant and animal agricultural products in addition to projects of grain processing and manufacturing of cans needed for the packaging of agricultural products.

Long-term credit, on the other hand, is for periods of more than five years but not exceeding ten years and it is aimed at financing the construction of stores, land improvement, forestry projects, fruit tree plantations, cold storage facilities, modern irrigation schemes and plant and animal product processing plants.

The ACB provides the loans according to the following mechanisms

- Loans provided in form of physical inputs (in-kind loans),
- Cash loans provided on the basis of a contract between the by the borrower and the ACB or a bond signed by the borrower to the command of the ACB with the amount of the loan,
- Loans according to a current account opened by the borrower at the ACB, then the borrower can withdraw cash when needed.

The ACB also offers some services such as discounting the bills of purchase presented by the borrower and extending guarantees for payment on the due date against supplier credit if the supplier is a third party. The combination of these functions makes the ACB perhaps the most important institutional instrument of the government to promote agricultural production and to protect the standard of living of the rural population.

Each farm household must have a crop license as a prerequisite to obtain credit and/or to purchase inputs from the ACB. The crop license is issued every year and contains details of farm size, agro-ecological zone, whether the crops are irrigated or rainfed, which are the crops "allowed" to be grown in the following agricultural year, and the recommended requirements of fertilizers, seeds and chemicals. However, for farmers who are members of cooperatives, it is the latter that performs all the procedures needed to access credit on behalf of their members.

For medium and long-term loans, the access procedure is more protracted. Many farmers complain about the dissatisfaction over long procedural delays in the processing of the applications for such loans. Many others have the impression that the bank does not give long-term loans, a finding that stresses the importance of diffusing information within the farming community, so that farmers can make full use of the available credit opportunities. Property collateral is essential for eligibility to medium and long-term loans Authorized appraises along with the other documents connected to the short-term loans must be submitted. It is also necessary to submit documents of technical design about the project prepared by specialist technicians and approved by the relevant public institutions, in addition to submitting a report of economic feasibility studies. Some other conditions exist for some specific projects. However, the loan is taken up for consideration only after receiving the report of a special inspection committee (Parthasarathy, 2001).

Farmers find it difficult to obtain loans for machinery like harvesters and tractors. They have the impression that lower priority is given by the ACB to medium and long term loans. This precludes important activities like land reclamation and fruit tree replanting (Parthasarathy 2001).

In addition to what is mentioned above, the ACB plays an mediator role between several public projects and commissions from one side and farmers and rural people from the other side. Such projects usually aim at supporting rural and agricultural development through the provision of loans and banking services to their beneficiaries such as the loans of Unemployment Combating Commission. Another example is the National Project for Conversion to Modern Irrigation (NPCMI) which belongs to the MAAR and was created by the MAAR Decision No. 86/t of 2006. The project is promising and has the ambition of converting all irrigated areas in the country to modern schemes, and it will be discussed in details below.

#### II.1.3.5. Irrigation and other related policies

Speaking about irrigation policy means, in general, policies related to the provision of irrigation water at the farm level. However, the scope of this section extends beyond that. It also aims at describing other kinds of policies that affect all kinds of water accessibility by farmers and to determine the type of water costs that farmers need to incur (whether fixed or variable) as well as the magnitude of these costs. In this respect, one can categorize irrigation water sources available to farmers in Syria into three types: public nets, rivers and springs, and private wells (Sadiddin and Atiya 2009).

Over the last three decades, the GoS has built a large number of irrigation canals that drain water from dams and make it available at the farm level. Most of the maintenance cost for these projects is borne

by the Government. Farmers who have access to public nets usually pay an irrigation fees per land unit on annual or seasonal basis, which are expected to contribute only slightly to these costs, since they are relatively very low. The annual fee is SP 3500 per hectare, but it goes down to 600 if irrigation is confined to winter cropping. Such fees are paid annually regardless of the amount of water used. They are paid when the land is officially classified as irrigated (even if the water endowment is not enough to irrigate the entire farm, as it might happen during drought years).

Farmers who use water from rivers and springs for irrigation do not pay any kind of fees to the Government. They either pump the water directly from the source using a private pump, or they organize themselves in formal or informal cooperatives to purchase one large engine that serves all members. The choice usually depends on their location relative to the water source and on their financial capacity. Formal cooperation is very common in Deir-ez-Zor. In case of cooperation, pumping costs are shared among members proportionally according to their total land area. Farmers who access public nets may also incur some pumping costs if the system does not allow water to be driven by gravity into the fields, as it applies to most farmers in Al-Ghab.

Pumping costs become very significant when farmers use private wells as the water source. Such costs increase as the depth of the wells increases, but they also depend on the capacity and vintage of the pump-set used. Most pump-sets in Syria work on diesel-fueled engines, while some are electrical. Diesel fuel and electricity used to be highly supported. For example, in recent years the consumer price of diesel in the neighbouring countries such as Lebanon fluctuated from 25 to 35 SP/liter, following the world price fluctuations, while it was kept constant in Syria at 7.40 SP/litre. As a consequence, also the consumer cost for electricity used to stay relatively stable, given that many power generating stations in Syria still use diesel.

The recent price policy of diesel and electricity served two objectives. The first one was to support consumers, as most Syrians use diesel for house heating. The second one was to stimulate agricultural and industrial development through providing a cheap source of energy. However, the policy become less effective when the increase of international prices caused the smuggling of large quantities of diesel from Syria to the neighbouring countrieswhere prices are in line with the international ones.

This problem has recently urged the GOS to revise the policy and amend it by increasing the consumer price of diesel to 25 SP-liter, while allowing a quota of 1,000 liter per family per year at a supported price of 9 SP/liter) (Sadiddin & Atiya, 2009).

Moreover, the awareness towards the need to reduce the use of water has raised attention to the importance of adoption of modern irrigation. The agricultural sector absorbs about 89% of total water supply in the country. This issue has become more relevant after several waves of drought have beaten the country. As mentioned above, this led to establishment of a specific Department within the NPCMI, (Legislative Decree No. 91 issued on 29/09/2005 by the President of the Republic) which mandates the creation of a national Fund for the conversion to modern irrigation, under the responsibility of the Minister of Agriculture and Agrarian Reform, and funded with a total capital of SP 52 billion over ten years.

The executive instructions of the Decree were issued by the MAAR decision No. 47/t dated 26/02/2006, which stated the terms and conditions for access to subsidized credit. The credit is without interest and is to be repaid in annual installments, whose maturity depends on the timing of the main crops cultivated by the beneficiary. Personal and banking collaterals are accepted if the total sum of the loan does not exceed one million SP, and this might noticeably facilitate access to the credit. If the loan exceeds one million SP, a real estate collateral is necessary.

The Department of NPCMI has branches in all governorates and it targets all farmers of irrigated areas who still use traditional flood irrigation methods. The loans are coupled with extension and training programs to assist farmers on technical aspects of the use of modern irrigation techniques. Potential beneficiaries will be classified in groups. Priority will be given to small and poor farmers. Furthermore, priorities will be given to areas most suited to modern irrigation, or to areas where the dominant cropping patterns are more appropriate for the adoption of modern irrigation, considering both technical and economic aspects.

## II.2. The current situation

Agricultural production in Syria is highly diversified in terms of variety of both field and tree crops. The relative importance of the various products, however, is vastly different across products, with very few products playing a dominant role in terms of total value of agricultural production. Wheat, Barley and Cotton account for the vast majority of cropped land, while Olive trees are by far the most common trees and agricultural tree crop. (See Table 6 on page 18.)

Public policy of the GoS has traditionally given predominance to a limited number of strategic crops (most notably wheat and cotton) which have therefore dominate agricultural production in recent years. In the following paragraphs, we shall discuss the current status of production of the major crops and fruit products.

### II.2.1. Wheat[8]

Wheat is one of the major crops in Syria, and certainly the one that has the most political relevance due to the implications in terms of food security in the Country, and the traditional role of bread in the local culture, which means that sufficient availability of wheat for human consumption will always be one of the top priority in any agricultural political agenda in Syria.

In 2005 wheat has been cultivated on slightly more than 1.9 million ha, corresponding to 34% of total agricultural land and 10.39% of Syrian total land[9]. It is cultivated in all governorates and all agro-climatic zones of the Country, although it is particularly relevant in Zones 1, 2, and (as an irrigated crop) zone 5, where it occupies respectively roughly 42%, 40% and 53% of total agricultural land. In zones 3 and 4, the corresponding percentages are of 20% and 16% respectively. In terms of geographic distribution, the vast majority of wheat production in 2005 has been concentrated in the three governorates of Al-Hassakeh, Aleppo and Al-Rakka.

In Al-Hassakeh and Al-Ghab wheat covers slightly less than 35% of total agricultural land, with peaks in zones 1 and 2 of Al-Hassakeh, where the percentage of agricultural land devoted to wheat in 2005 has been of 62.4% and 63.3% of the total. This area, in the North-East part of the Country, is the most important wheat producing region in the Country, with a total of 668 thousands hectares in 2005, followed by the area in zone 2 of the Aleppo governorate, where more than 200 thousands hectares of wheat have been cultivated in 2005. These three zones together accounted for roughly half of Syrian wheat production in 2005.

[8] This section relies heavily on unpublished reports by Sadiddin (2006a)
[9] By agricultural land, we mean here what the Ministry of agriculture calls "invested" land.

## Figure 6 Wheat producing regions in Syria (2005)


Key:

One symbol corresponds to about 100 000 ha, while one to about 50 000 ha

## Table 16 Distribution of wheat cultivation in Syria (ha) (2005)

| Governorate | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Total all zones |
|---|---|---|---|---|---|---|
| **Al-Hassakeh** | **357,942** | **311,269** | 57,781 | 57,065 | 27,689 | **811,746** |
| **Aleppo** | 73,637 | **203,039** | 47,684 | 29,717 | 6,205 | **360,282** |
| **Al-Rakka** | | 69,906 | 31,770 | 63,518 | 54,792 | **219,986** |
| **Idleb** | 57,425 | 31,218 | 11 305 | | | **99,948** |
| **Deir-ez-Zor** | | | | 7,600 | 88,048 | **95,648** |
| **Hama** | 31,030 | 30,101 | 3,212 | 6,024 | 62 | **70,429** |
| **Dar'a** | 15,231 | 36,895 | 2,667 | 353 | | **55,146** |
| **Homs** | 34,136 | 10,122 | 2,902 | 366 | 3,526 | **51,052** |
| **Al-Ghab** | 48,337 | | | | | **48,337** |
| **Al-Sweida** | 1,553 | 24,642 | 2,727 | | | **28,922** |
| **Damascus Rural** | 2,021 | 5,838 | 4,576 | 1,291 | 11,556 | **25,282** |
| **Tartous** | 18,766 | | | | | **18,766** |
| **Quneitra** | 11,116 | | | | | **11,116** |
| **Lattakia** | 7,166 | | | | | **7,166** |
| **Total all Governorates** | **658,360** | **723,030** | **164,624** | **165,934** | **191,878** | **1,903,826** |

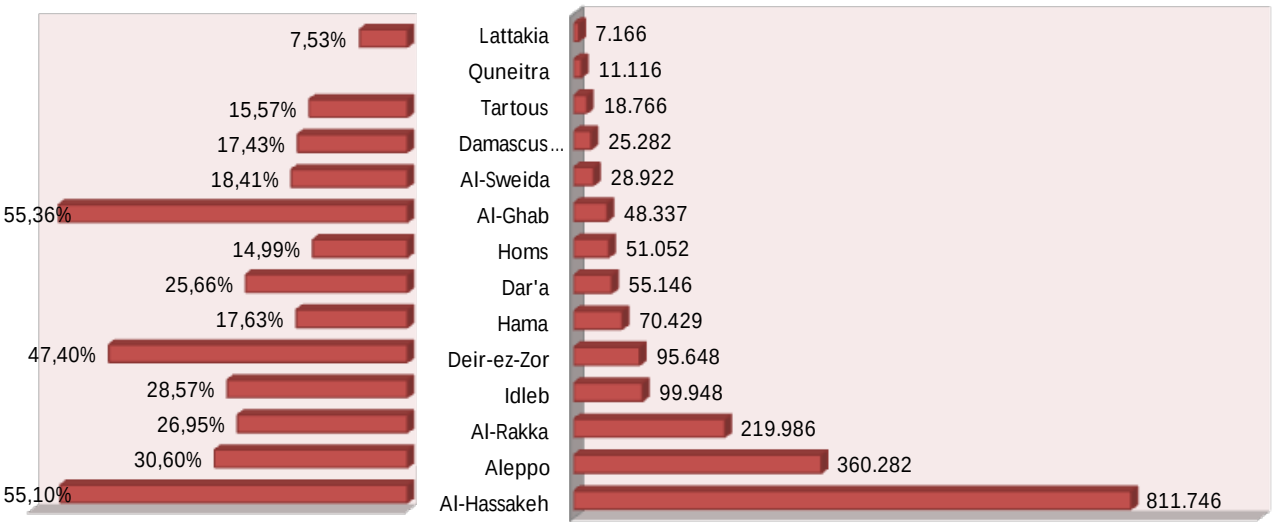
## Table 17 Incidence of wheat cultivation on total agricultural (invested) land in each governorate and agro climatic zone (2005)

| | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Total all zones |
|---|---|---|---|---|---|---|
| **Al-Hassakeh** | **72.92%** | **69.95%** | 35.22% | 17.47% | **59.30%** | 55.10% |
| **Aleppo** | 28.14% | 34.51% | 23.07% | 28.74% | 35.99% | 30.60% |
| **Al-Rakka** | | 40.29% | 16.72% | 17.99% | 55.01% | 26.95% |
| **Idleb** | 25.11% | 35.63% | 33.78% | | | 28.57% |
| **Deir-ez-Zor** | | | | 13.50% | **60.51%** | 47.40% |
| **Hama** | 38.13% | 20.07% | 4.01% | 6.87% | 18.62% | 17.63% |
| **Dar'a** | 39.57% | 28.24% | 7.17% | 4.17% | 0.00% | 25.66% |
| **Homs** | 34.39% | 12.59% | 4.03% | 0.48% | 27.71% | 14.99% |
| **Al-Ghab** | **55.36%** | | | | | 55.36% |
| **Al-Sweida** | 8.22% | 20.69% | 14.44% | 0.00% | | 18.41% |
| **Damascus Rural** | 9.79% | 17.38% | 18.08% | 5.18% | 28.45% | 17.43% |
| **Tartous** | 15.57% | | | | | 15.57% |
| **Quneitra** | 39.47% | | | | | 39.47% |
| **Lattakia** | 7.53% | | | | | 7.53% |
| **Total all Governorates** | **41.91%** | **39.99%** | **19.89%** | **16.01%** | **52.88%** | **33.96%** |

## Table 18 Incidence of wheat cultivation on total land in each governorate and agro climatic zone (2005)

| | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Total all zones |
|---|---|---|---|---|---|---|
| **Aleppo** | 18.19% | 27.24% | 17.85% | 16.71% | 2.44% | 19.47% |
| **Al-Ghab** | 34.33% | | | | | 34.33% |
| **Al-Hassakeh** | 62.42% | 63.26% | 22.41% | 11.14% | 5.56% | 34.79% |
| **Al-Rakka** | | 38.88% | 14.79% | 13.81% | 4.95% | 11.21% |
| **Al-Sweida** | 4.75% | 10.50% | 3.66% | 0.00% | 0.00% | 5.21% |
| **Damascus Rural** | 1.97% | 3.60% | 4.05% | 1.17% | 0.88% | 1.40% |
| **Dar'a** | 23.90% | 18.91% | 3.00% | 2.01% | 0.00% | 14.78% |
| **Deir-ez-Zor** | | | | 3.67% | 2.84% | 2.89% |
| **Hama** | 19.72% | 13.99% | 2.39% | 7.56% | 0.02% | 8.02% |
| **Homs** | 21.09% | 8.96% | 2.55% | 0.21% | 0.10% | 1.25% |
| **Idleb** | 12.67% | 29.22% | 22.81% | | | 16.39% |
| **Lattakia** | 3.12% | | | | | 3.12% |
| **Quneitra** | | | | | | |
| **Tartous** | 9.90% | | | | | 9.90% |
| **All governorates** | **26.23%** | **29.58%** | **12.49%** | **9.01%** | **1.88%** | **10.39%** |

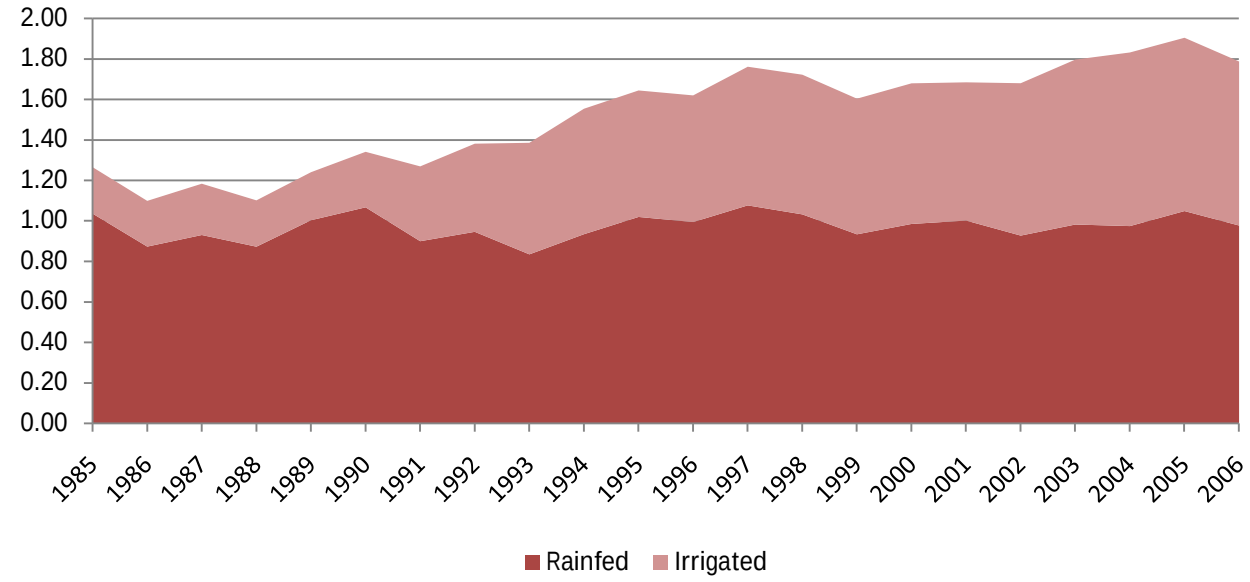
## Figure 7 Distribution of wheat cultivation in Syria by Governorates




Note: The bars on the right measure the total area in hectares, the bars on the left measures the percentage of each governorate/province total agricultural land cultivated with wheat
Source: our elaboration on NAPC's SADB data.

Syria produces both 'hard' and 'soft' wheat over the winter season. Hard wheat is mostly cultivated on rainfed land, whereas soft wheat is cultivated on irrigated land. In facts, wheat is the dominant irrigated crop in Syria, accounting for roughly 52% of all irrigated land, 58% of the irrigated land devoted to annual crops, and 70% of the irrigated land devoted to the strategic crops. The area of irrigated wheat has increased steadily from 1988 to 2003, from 229,000 ha to 800,000 ha (Figure 8). Not the result of efficiency consideration by farmers, this expansion has followed the planning activity of the GoS.

## Figure 8 The evolution of wheat area in Syria (million ha)



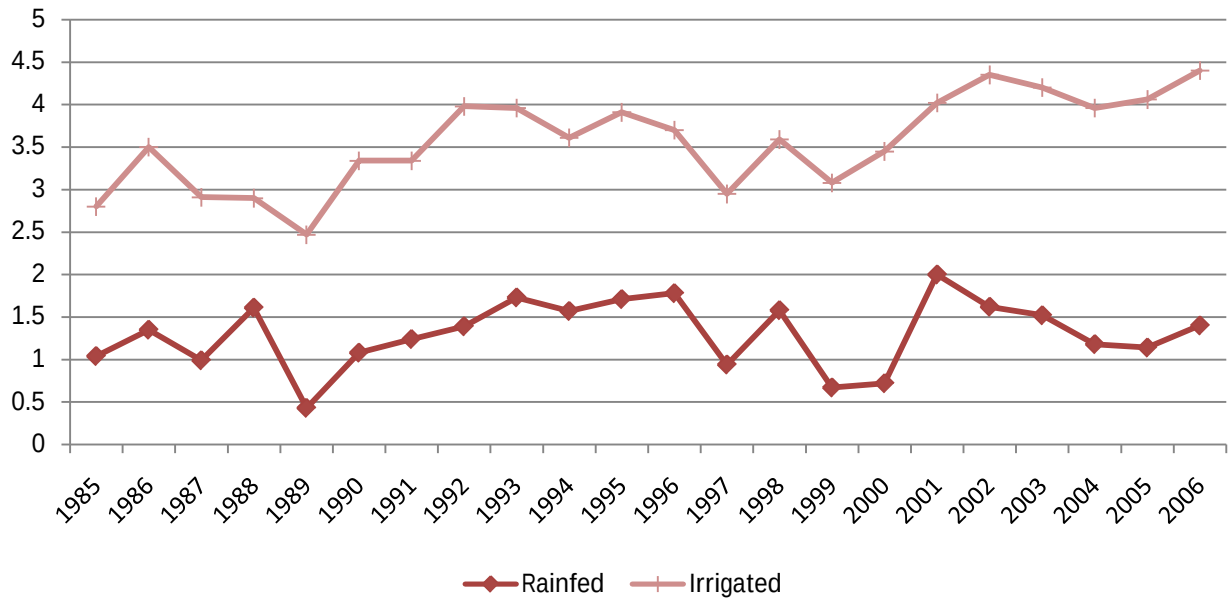

Source: our elaboration from NAPC's SADB database

As can be expected, wheat yield in Syria is dramatically different depending on the type of land. Rainfed wheat yields tend to be low and highly unstable, with a national average ranging from less than 0.5 tons per ha in a drought year to over 1.7 tons per ha in a year of good rainfall. By comparison, irrigated yields are relatively less unstable, with the national average ranging from some 3.0 tons to 4.4 tons per ha (Figure 9).

Trends in rainfed per-hectare yields are difficult to identify due to the instability in annual production. The 1990's have witnessed a small general improvement in irrigated wheat yields over the levels recorded in the 1980s, although annual yields in 1997, 1999 and 2000 have fallen short of the 3.9-4.0 ton per ha levels recorded in 1992, 1993 and 1995, to then steadily increase up to the current levels of 4-4.5 tons per hectare.

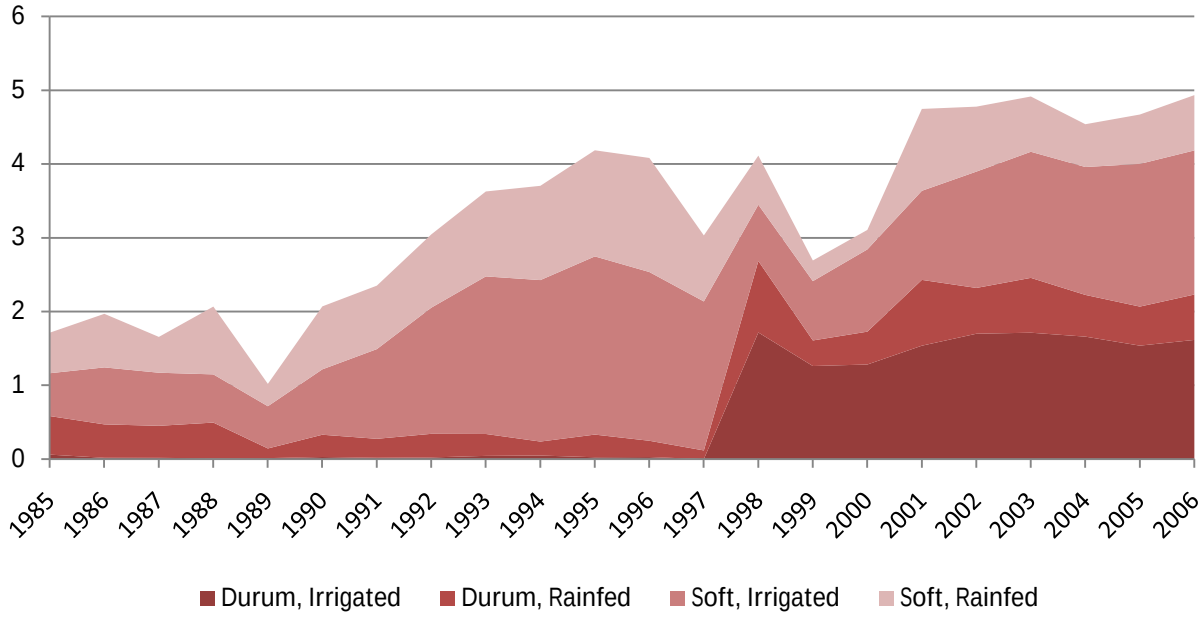
In terms of total production, recent figures have ranged between (figure 1.3).

**Figure 9 The evolution of aggregate wheat yield in Syria (tons/ha)**




Source: Our elaboration from NAPC's SADB database

**Figure 10 The evolution of wheat production by type (1985-2006) (million tons)**




Source: Our elaboration from NAPC's SADB database

In 1999/2000, the drought conditions and the resulting low output from rainfed land resulted in that about 80 percent of total national production was derived from irrigated land.

It is interesting to note from both figures 1.2 and 1.3 that the yield and consequently the production have faced a shock in 1997 and in 1999. This was due to the heavy drought that beat the country during the cropping season 1999/2000.

### Labor use

Most wheat in Syria is mechanized in most agricultural operations. The labor annually needed for one hectare of wheat is 99 man-hr for irrigated wheat and 2 man hr. for rainfed wheat. The labor is used for planting, fertilization, hoeing and weeding, controlling, harvesting and irrigation. The amount of labor used for wheat increased from 64 million man hr. in 1995 to 69 million man hr. in 2004.

### Capital

As for all farmers of Syria, the ACB is the only permanent formal source of credit for wheat producers. The ACB offers in-kind and in-cash loans through the cooperatives of the villages for the farmers who are cooperative members with an interest rate of 6% for collective loans and 7% for individual members. Non member farmers get the same loans directly from ACB with higher interest rate (8%). The in-kind loans are seeds and fertilizers offered only for state-controlled crops that are wheat, cotton and sugar-beet. All of those loans are seasonal (short-term).

In addition, there is a big and significant informal market for credit. The main source relevant to wheat production is the informal traders of wheat and cotton. Farmers who depend on traders are those who have accumulated debt with the ACB and thus lost their right to its credit. This usually occurs after farmers have suffered from a significant production loss caused by a drought or a pest, or in cases of having to afford additional expenses for personal reasons. They are usually the poorest ones, trapped in a vicious circle depending on traders to access credit at a very high implicit interest rate (these farmers

forward sell their product to traders, and are paid in advance at a price 30 to 40% lower than the expected price)

The trader gives the money to the farmer when needed according to agreed arrangements between them (usually half of the money at the beginning of the winter season and the rest in installments). After the production is delivered to the trader, he manages to sell it to the relevant governmental institution. Sometimes, the production is sold through the cooperative of the village for the trader using the name of other farmers. Such activity is usually protected by the social norms and traditions even though it is in principle illegal. (FSS, Sadiddin, 2005).

### Production Systems

As said, wheat in Syria is cultivated either rainfed or irrigated. The irrigated wheat area has increased from around 200,000 ha in 1985 to about 800,000 ha in 2006. Over the same period, the rainfed wheat area has fluctuated around an average of 1,000,000 ha (Figure 8.) The increase in wheat irrigated area has been the result of the expansion in irrigation especially in Euphrates and Al-Khabour Basins, due to the increased number of private well as well as the construction of new dams.

Rainfed wheat is concentrated in the high rainfall areas such as Agro ecological Zones 1 and 2, given that in other areas there would be no production without irrigation. Where possible, irrigation to wheat is intended as a supplement to rain, and in many areas of the country it is not used every year. As a result, the amount of irrigation water devoted to wheat differs from year to year according to the quantity and intra-year distribution of the rainfall.

Two techniques are used to irrigate wheat in Syria: flood and sprinkler. Sprinkler irrigation is only used where the water is source from wells, given that it would be difficult to install sprinkler schemes when water is sourced from open public canals or rivers.

Given the high value of water, one question to be asked is whether there are viable alternatives to wheat production on irrigated land. The possible alternative irrigated crops differ from one region to another due to the differentiation in climatic conditions, water availability, Government policy, etc. For example, in Al-Hassakeh, where about 40% of Syrian cotton is produced, cotton is the most important crop cultivated beside wheat where water is available in sufficient quantity, and the cotton-wheat rotation is by far and large the most common cropping pattern. In other governorates such as Al-Rakka, Deir-ez-Zor, Aleppo, and Al-Ghab, sugar-beet is also an important crop, besides wheat, on irrigated land, due to the Government policy that concentrates the production of sugar-beet in those governorates through the agricultural plan of the MAAR. In Homs and Hama, some winter crops such as onion, cabbage, peanut, potato, carrot, and others are found beside wheat. The same applies to the southern area of Syria (Dar'a and Al-Sweida), while wheat is a negligible crop in the coastal areas where the dominant crops are citrus, olive and greenhouse vegetables.

Rainfed wheat, on the other hand, is massively cultivated in Agro-Ecological Zones 1 and 2, where relatively high rainfalls guarantee reasonable yields without irrigation. In spite of the cultivation of some areas with rainfed wheat in Agro-Ecological Zones 3 and 4, its importance, in these two zones, remains lower compared to barley, which is preferred by farmers due to its higher resistance to drought. In Agro-Ecological Zone 5, rainfed wheat cultivation is not allowed.

### Assessment of Production Costs

Wheat costs of production differ from one area to the other and from farm to farm in the same area. The most important factor that causes the variation of wheat production costs is the cultivation type

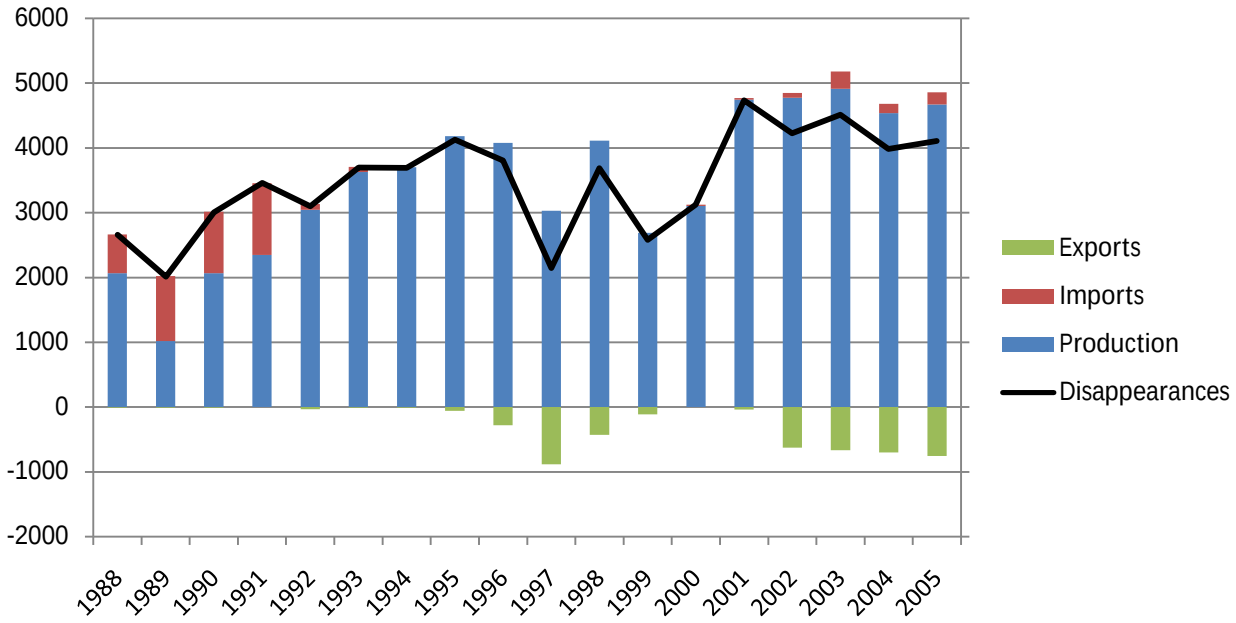
whether rainfed or irrigated. Of course, production costs of wheat per hectare are much lower for rainfed wheat than the case for irrigated wheat. This is due to the water costs that are absent in the case of rainfed wheat and due to the increase in the input use (especially fertilizers) that should accompany the increase in irrigation. However, the cost per unit of wheat (kg e.g.) might not be different due to the differences in yields since irrigated wheat has in general higher yields. In addition, yields of rainfed wheat differ according to rainfall in terms of quantity and timely distribution, affecting the per-unit cost of wheat production. Furthermore, water costs of irrigated wheat differ from region to region and from year to year due to the differentiations in rainfall distribution and to rainfall fluctuations.

The findings of the FSS provide us with a good base of data about production costs through the gross margin calculations, although there are some areas that were not covered by the FSS survey and need to be completed.

### Aggregate Supply

The aggregate supply of wheat comprises domestic production and imports. Figure 11 traces the evolution of aggregate wheat supply from 1982 to 2005. As it can be seen, imports have not been a sizeable component of aggregate supply, mostly the result of a policy that, have aimed at achieving food security mostly through self sufficiency. If agricultural development has to be promoted in the future such a view will need to be revised. For sure, wheat is the most important food item in Syria, and therefore guaranteeing sufficient availability of wheat is expected to remain a priority, although this should be done while ensuring that land and water be made available for the production of other more remunerative crops. The lack of comparative advantages in production of wheat on irrigated land is one element that will need to be taken in more serious consideration than in the past, and effort must be made to redistribute the production of wheat inside the Country according to relative comparative advantages among the various regions..

**Figure 11 Evolution of aggregate wheat balance (1985-2006) (000 ton)**



### II.2.2. Cotton[10]

Cotton has been cultivated on 238 thousand hectares in Syria in 2005, corresponding to roughly 1.3 percent of total agricultural land. Given the high water requirement, the incidence of cotton is particularly large in areas with good water availability, such as the region of Al-Ghab, where cotton covers more than 13% of total agricultural land, and the area included in Zone 1 and 2 of the Governorate of Al-Hassakeh, where the corresponding incidence over total agricultural land are of 5.8% and 8.8% respectively, and zones 3 and 4 in the governorate of Aleppo (4.1% and 5.2%) (See Table 20).

**Table 19 Distribution of cotton production in Syria (2005)**

| | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | All Zones |
|---|---|---|---|---|---|---|
| **Al-Hassakeh** | 33,174 | 43,517 | 4,557 | 1,718 | 2,446 | 85,412 |
| **Al-Rakka** | | 16,442 | 3,121 | 14,266 | 20,130 | 53,959 |
| **Aleppo** | 4,519 | 12,766 | 10,945 | 9,283 | - | 37,513 |
| **Deir-ez-Zor** | | | | - | 27,943 | 27,943 |
| **Al-Ghab** | 18,521 | | | | | 18,521 |
| **Idleb** | 5,111 | 1,194 | 651 | | | 6,956 |
| **Hama** | 4,193 | 1,947 | 619 | - | - | 6,759 |
| **Homs** | 589 | 80 | 36 | - | - | 705 |
| **Total** | **66,107** | **75,946** | **19,929** | **25,267** | **50,519** | **237,768** |

Source: our elaboration from NAPC's SADB data

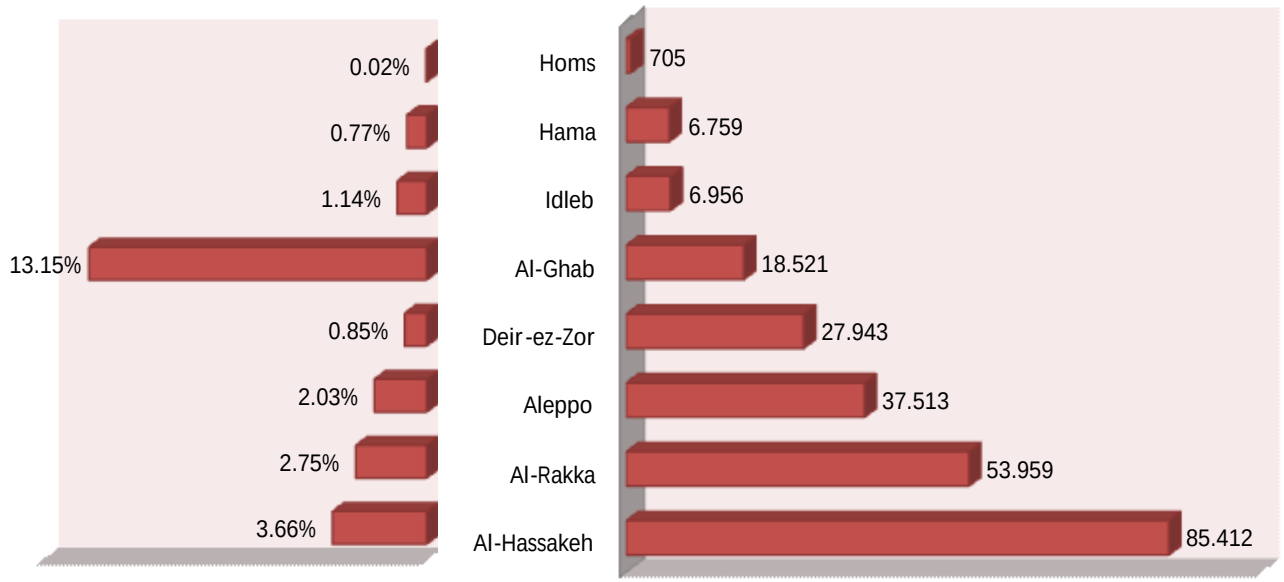
**Table 20 Incidence of cotton on total agricultural land by governorate and agro-climatic zone**

| | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | All zones |
|---|---|---|---|---|---|---|
| **Al-Hassakeh** | 5.78% | 8.84% | 1.77% | 0.34% | 0.49% | 3.66% |
| **Al-Rakka** | | 9.14% | 1.45% | 3.10% | 1.82% | 2.75% |
| **Aleppo** | 1.12% | 1.71% | 4.10% | 5.22% | 0.00% | 2.03% |
| **Deir-ez-Zor** | | | | 0.00% | 0.90% | 0.85% |
| **Al-Ghab** | 13.15% | | | | | 13.15% |
| **Idleb** | 1.13% | 1.12% | 1.31% | | | 1.14% |
| **Hama** | 2.66% | 0.90% | 0.46% | 0.00% | 0.00% | 0.77% |
| **Homs** | 0.36% | 0.07% | 0.03% | 0.00% | 0.00% | 0.02% |
| **Total** | **2.63%** | **3.11%** | **1.51%** | **1.37%** | **0.49%** | **1.30%** |

Source: our elaboration from NAPC's SADB data

[10] This section relies on reports by NAPC, in particular, Shweih (2006) and AA.VV. (2005)

**Figure 12 Distribution of cotton cultivation in Syria by Governorate**




Note: The bars on the right measure the total area in hectares, the bars on the left measures the percentage of each governorate/province total agricultural land which is cultivated with cotton

### Land

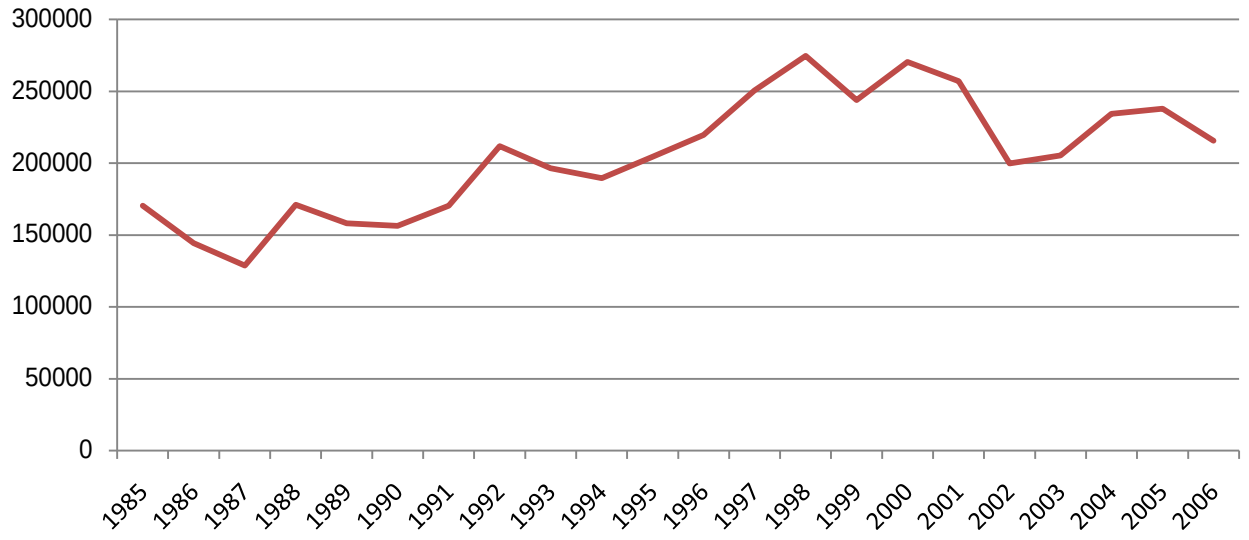
In Syria, farmers begin planting cotton in the second half of March, but the greater part of cultivated area is planted in April. Planting dates differ according to the governorate and the mantika. It starts at the end of March and lasts until mid April in Homs and Hama Governorates (including Al-Ghab) in addition to Euphrates area (*Sareer*) in Al-Rakka and Al-Tebni and Al-Jathrat in Deir-ez-Zor. However, it starts at the beginning of April and lasts until April 20-25 in the rest of the country.

**Figure 13 Syrian cotton producing areas**


One symbol corresponds to about 10 000 ha.

Cotton cultivated area has been substantially expanded in the 1990s from 156,000 hectares, in 1990, to a peak of 275,000, in 1998, as a result of the increase in irrigated land in Syria resulting from the increased use of water from the Euphrates Dam (commissioned in 1974) and from dams commissioned in the early 1990's in Al-Hassakeh. From 1998 on, the area licensed to cotton dropped again to about 200,000 ha in 2002 and 2003, because of the drought and the associated shortage of irrigation water in those seasons.

**Figure 14 Evolution of Cotton cultivation area in Syria (hectares)**




Source: our elaboration from NAPC's SADB data

The MAAR is encouraging cotton farmers to adopt standard rotations of wheat/cotton that lead to a typical cultivation of cotton once in every three years on suitable irrigated land. However, If there were sufficient water, the maximum that cotton could be cultivated without causing serious disease and soil fertility problems would be once every two years (Westlake 2001).
Cotton is cultivated in Syria in the following governorates: Al-Hassakeh, Al-Rakka, Deir-ez-Zor, Aleppo, Hama, Idleb, and Homs. The other crops cultivated beside cotton differ in their planting harvesting dates and their areas according to the different governorates and *mantikas*. Wheat is cultivated beside cotton in all governorates, however, since it is a winter crop while cotton is a summer crop, so wheat cannot be, in principle, considered a competing crop to cotton in the agrarian rotation. Nevertheless, the overlapping of the two crops' seasons (cotton planting is in March while wheat harvesting is in June) makes the cultivation of cotton after wheat harvest unfeasible within the same season. Therefore, cotton can only be planted once every two years on the same land plot. Thus, technically speaking, cotton can occupy 50% of the land plot every year, while wheat can occupy the remaining 50%.

However, some summer crops are cultivated in other parts of the country and they are competing crops to cotton such as sugar-beet and potato. These two crops are cultivated in February and harvested in July, so they cannot be cultivated as intensive crops after wheat harvest in the same plot; consequently, they are competing crops to cotton. Sugar-beet plays a significant role in this context due to the large Government intervention in its cultivation through setting pricing and licensing systems similar to those of cotton. In addition, the big involvement of the para-statals in its marketing makes it desired by farmers since because this involvement reduces the risk of price fluctuations, from which the unregulated crops suffer like vegetables.

To determine the agrarian rotations prevailing in cotton farms, precise field survey should be done, but the available data from the statistical abstract of the MAAR are useful to present a general picture. In Al-Hassakeh, cotton is the only important summer crop in terms of area cultivated, but sugar-beet is also important in each of Al-Rakka and Deir-ez-Zor Governorates. In the remaining governorates (Aleppo, Idleb, Homs, Hama, and Al-Ghab), potato is also an important crop in the rotations pursued by farmers.

Areas cultivated with these three crops (cotton, sugar-beet and potato) are constrained by several factors, most important are: the total area of the farm, the agrarian rotation requirements, water availability, and the licensing system for each crop. The latter is considered a big constraint that limits the expansion of cotton and sugar-beet cultivation since the marketing of these two crops is confined to the para-statals. Nevertheless, the statistics of the MAAR clarifies that many farmers cultivate cotton in excess of the licensed areas. This is explained by the existence of informal market for cotton. However, water scarcity in several areas makes the expansion in the cultivation of these three crops very difficult especially that they are water-intensive crops. In addition, the agrarian rotation requirements limit the area of the three crops in total to only 50% of the farm area since these crops are soil-exhausting crops and should be followed by less exploiting crop (wheat) in the next season or left poor.

### Water

Syrian cotton is a summer irrigated crop that occupies about 20% of the country irrigated area,[11] consuming some 3-4 billions of cubic meters of water which corresponds to about 25% of domestic annual available water (Somi, 2001).

Most of farms have been applying the flood irrigation system. Whereas, the Government through the Ministry of Agriculture and Agrarian Reform (MAAR) encourages farmers to apply new efficient technology like drip irrigation mode through the provision of extension advice and loans that reach an amount approximately equal to about SP75, 000 /ha (Westlake-2001).

Irrigation is considered one of the most important factors that affect quantity and quality of cotton production. Therefore, some studies suggest that delivering sufficient quantities of water at the corresponding dates can increase the yield by 50% (Somi, 2001).

Cotton water needs vary according to the differentiation in the ecological conditions (humidity, rainfall, soil quality, etc) of the different areas in which cotton is cultivated. Table 21 shows that water need of cotton varies between 7 771 m3/ha in Al-Ghab and 12 408 $m^3$/ha in Al-Hassakeh, taking into consideration that these quantities differ inside each governorate according to the differences in growing period and the soil quality.

**Table 21 Cotton water needs by governorates**

| Governorate | Homs | Hama | Al-Ghab | Idleb | Aleppo | Al-Rakka | Deir-ez-Zor | Al-Hassakeh |
|---|---|---|---|---|---|---|---|---|
| **Water need ($m^3$/ha)** | **8,556** | **9,561** | **7,771** | **9,744** | **9,887** | **10,289** | **1, 408** | **11,075** |

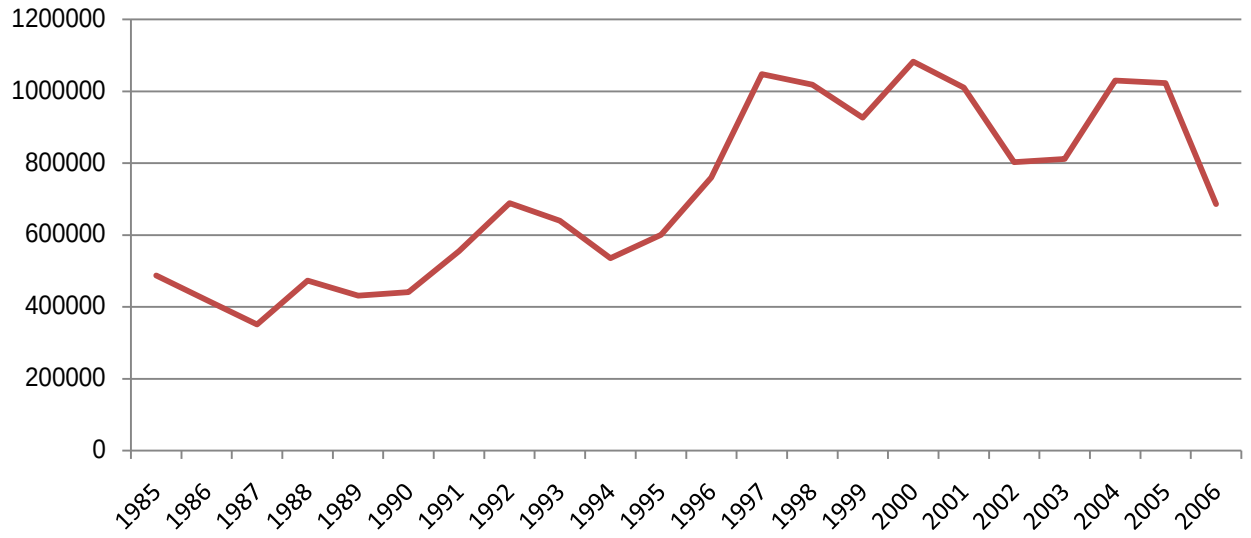
Source: Somi, 2001

Furthermore, it is known that water needs are affected by the irrigation efficiency which is, in turn, affected by the used irrigation technology.

After adopting irrigated cotton mode in 1983, yield per hectare has risen substantially, from 2,800 kg/ha, in 1985, to about 4,000 kg/ha and more, in 2003-05, and the production has risen from about 500 thousand ton, in 1985 to, more than one million tons, in 2001, then it dropped to reach about 700 thousand in 2006 (Figure 15).

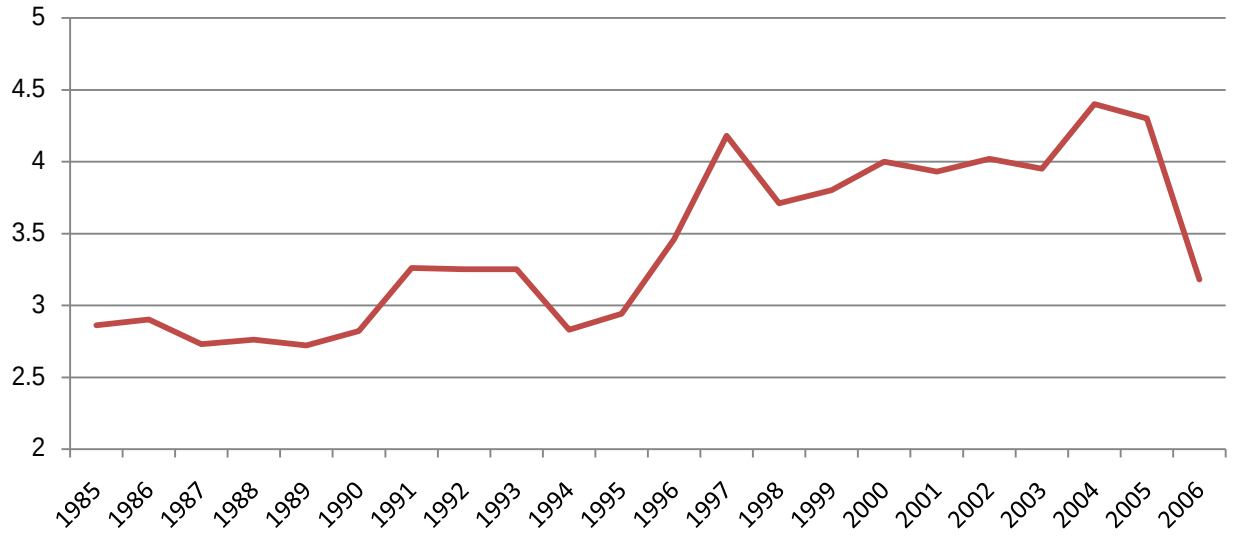
[11] There are roughly 1.3 million hectares of irrigated land in Syria (Westlake-2001).

**Figure 15 Seed-cotton production in Syria (1985-2006) (tonnes)**




Source: calculated from the NAPC database

**Figure 16 Seed-cotton yield in Syria (kg/hectare)**




Source: calculated from the NAPC database

This yield increase has resulted from the following factors:

- The development and adoption of new, environmentally adapted varieties as Al-Rakka 5, Aleppo 90, Deir-ez-Zor 22, etc. which increased cotton production by 40%;
- Adoption of furrow planting (that gives a 20% higher yield than flood planting) and improved irrigation techniques;[12]

[12] In spite of the big importance of watering sources and the limitation of these sources, the efficiency of its use, in agricultural sector, are stile poor, and the losses at field level are the biggest ones, at which flood irrigation mode has been used in most irrigated land, without taking into account economic water requirements, and the fit relation between water and soil (Westlake, 2001).

- Improved agricultural extension;
- Increasing of farmer's agricultural knowledge.

### Labor and mechanization

Syrian cotton is handpicked. Harvest season starts when 60-70% of the bolls open, then farmers pluck the first harvest (this harvest is the best one in terms of quality). When most of the remaining bolls open, farmers pluck the second harvest. Sometimes, there is a third harvest if the weather remains warm without any rain; however, quantity of the last harvest is very small, and the major part of the farmers does not sell it to the Cotton Marketing Organization (CMO).[13]

The beginning of the harvest differs according to the soil character, cotton variety, planting date, irrigation mode, and other agricultural operations. In general, harvesting season lasts until the end of October (sometimes until the middle of November). Harvesting is the costliest operation, and it needs considerably more labor than any other operations. Most farmers thus depend at least partly on hired labor to perform this operation in time in order to obtain the highest price for their production, since cotton price in Syria depends partly on the delivery date.

Given the seasonality of the agricultural employment opportunities, a part of the labor force that works in cotton harvesting comes from relatively distant areas especially in Al-Hassakeh Governorate (the main cotton producing region of the country), where most casual agricultural laborers come from other areas namely from Idleb, Aleppo, and the eastern parts of Homs and Hama Governorate. Labor wage in cotton harvesting is not based on work time, it is rather based the achievement. On average, each laborer takes from SP 3.5 to Sp 4.5 for harvesting 1 kilo of cotton in the first harvest when cotton density is high. The cost of harvesting 1 kilo of cotton increases in the second harvest to reach SP 7 to SP 10 depending on the field density. Farmers usually do not perform a third harvest due to its high cost compared with its revenue, which makes it uneconomical.

Although cotton is still mostly hand-picked in Syria, mechanization plays a significant role in cotton production since some important operations such as ploughing, seeding and distribution of fertilizers (the last two are performed manually in huge areas especially at the small farms in which family labor is sufficient). Mechanized harvesting, although tried, has not been introduced in Syria due to two reasons: the first is technical, meaning that the CMO does not accept the mechanically harvested cotton because it includes a lot of imperfections.

### Capital

The Agricultural Cooperative Bank (ACB) is the only formal source of credit for Syrian farmers. In addition, the Government depends on it for the performance of some of its agricultural policies especially those related to the strategic crops from which cotton is of special importance.

Based on the license issued to the farmer, the ACB issues loans in money and in kind at two different times of payments. The **first payment** (from February to April) is granted to farmers as an in-kind loan and monetary ones. The in-kind loans are usually in the form of seeds and fertilizers. The decision No. 24, on April 30, 2001, issued from the SAC, stated that the chemical fertilizers should be sold at the real

[13] This may partly explain the difference between the estimated production of MAAR and the real quantities delivered into the CMO.

cost price of each season that, annually, is reconsidered if there is any change in its cost. The monetary part of this payment is equal to about SP1000 per dunum.[14]

The **second payment** (from August to November) is also granted to farmers as in-kind loans and monetary loans. The in-kind loans are in form of jute bags provided by the ACB (usually it is about 2.5 bags per dunum). The interest rate that farmers have to pay is 6% for collective loans made to cooperatives, 7% for loans made to individual farmers that are members of a cooperative, and 8% to single farmers, not members of a cooperative.

Since cotton is a water-demanding crop, the Government has always encouraged cotton farmers to adopt drip irrigation by offering specific loans through the ACB, as discussed in section II.1.3 above on credit and irrigation policy.

### Production Systems

In Syria, cotton production systems differ according to various criteria: technology, region, agrarian rotations and others. In some cases, some of these criteria overlap with each other to determine one production system. Different regions usually result in different irrigation water sources (private wells, rivers and public nets). Furthermore, water sources affect irrigation techniques pursued in cotton cultivation (drip or flood). For example, drip irrigation is only possible if the water source is private wells, while flood irrigation dominates land irrigated from rivers or public nets.

Region also plays an important role in determining water needs of cotton. The latter increase in Syria when moving from north to south and west to east due to the increase in average temperatures and the decrease in average rainfall. In addition, agrarian rotation pursued in each area affects the production systems. The agrarian rotations that cotton farmers follow are different from one area to another due to several reasons, from which farmers' experience, the agricultural plan of the MAAR and differing climatic conditions are the most important.

In Al-Hassakeh Governorate, the predominant rotation in cotton farms is wheat/cotton rotation. In Al-Rakka, Aleppo and Deir-ez-Zor, sugar-beet is an important crop beside cotton and wheat. In the central governorates of Syria (Homs, Hama, and Idleb), more crops are cultivated beside cotton and wheat. Examples are potato, union, and some vegetables.

Cotton costs of production differ from one area to the other and from farm to farm in the same area. The most important factor that causes the variation of cotton production costs is the source of irrigation water. Since cotton is a water-intensive crop and requires much water, the latter forms a significant share of the costs. For example, cotton irrigated from public nets generally costs less than cotton irrigated from wells. However, other factors play an important role in determining the production costs of cotton, which are mostly related to the local conditions of the producing areas such as differences in labor wages among different areas, differences in soil and other ecological conditions that require different levels of input use, and differences in management levels and technologies that result from differences in farmers' levels of education.

[14] One dunum is approximately one tenth of a hectare.

### II.2.3. Barley[15]

Barley is one of the most important crops in Syria and is by far the major crop cultivated in rainfed areas, where often it is the only viable alternative. The relevance of Barley is linked to the livestock production sector by being the major source of feed grains, and for this reason is considered a very important strategic crop for Syria. The average annual production (over the last 10 years) is of about 1 million tons, over an average area of about 1.4 million hectares (equivalent about 27% of total Syrian cropped land), which imply an average yield of about 0.68 tons per hectares.

Total production, however, is subject to high variability due to the strong dependence of yield from climatic conditions. In 2005, for example, total production has been of only 767 thousand tons, roughly half of the long term average of the latest ten years.

Land is allocated to Barley mainly in the Climatic Zones 2, 3 and 4, (Table 22 and Figure 17) with most of the harvested production concentrated in Zone 2 (59.2% of the total in 2005) and Zone 3 (23.6%), given the very low yield that can be obtained in Zone 4. (see Table 23 for production and yield in 2005).

**Table 22 Barley cropped area by Agro-climatic zone and by administrative regions (2005)**

| | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | All Zones | Percentage |
|---|---|---|---|---|---|---|---|
| **Al-Rakka** | | 72,764 | 106,796 | 176,858 | 15,995 | **372,413** | **27.39%** |
| **Al-Hassakeh** | 11,662 | 53,703 | 69,022 | 177,789 | 5,857 | **318,033** | **23.39%** |
| **Aleppo** | 2,438 | 179,248 | 100,881 | 32,187 | 1,163 | **315,917** | **23.23%** |
| **Hama** | 2,824 | 44,654 | 49,089 | 26,211 | 127 | **122,905** | **9.04%** |
| **Deir-ez-Zor** | | | | 42,000 | 25,000 | **67,000** | **4.93%** |
| **Homs** | 2,081 | 9,520 | 18,641 | 35,604 | 226 | **66,072** | **4.86%** |
| **Idleb** | 4,213 | 17,866 | 13,522 | | | **35,601** | **2.62%** |
| **Dar'a** | - | 3,520 | 13,694 | 4,131 | - | **21,345** | **1.57%** |
| **Al-Sweida** | 160 | 11,410 | 6,602 | 118 | - | **18,290** | **1.35%** |
| **Damascus Rural** | 193 | 2,648 | 3,463 | 5,145 | 4,723 | **16,172** | **1.19%** |
| **Quneitra** | 2,841 | | | | | **2,841** | **0.21%** |
| **Tartous** | 2,030 | | | | | **2,030** | **0.15%** |
| **Al-Ghab** | 503 | | | | | **503** | **0.04%** |
| **Lattakia** | 556 | | | | | **556** | **0.04%** |
| **Damascus City** | | | 5 | 51 | | **56** | **0.00%** |
| **Syria** | **29,501** | **395,333** | **381,715** | **500,094** | **53,091** | **1,359,734** | **100.00%** |
| | **2.17%** | **29.07%** | **28.07%** | **36.78%** | **3.90%** | **100.00%** | |

Source: our elaboration on NAPC Syrian Agricultural Database data

**Table 23 Area and production of barley in Syria by Agro-Climatic Zones (2005)**

| | Total Planted Area (000 ha) | | Production (000 tonnes) | | Yield (ton/ha)(1) | |
|---|---|---|---|---|---|---|
| **Zone 1** | 29 | 2.2% | 46 | 6.0% | 1.62 | 279.3% |
| **Zone 2** | 395 | 29.1% | 454 | 59.2% | 1.15 | 198.3% |
| **Zone 3** | 382 | 28.1% | 181 | 23.6% | 0.48 | 82.7% |
| **Zone 4** | 500 | 36.8% | 58 | 7.5% | 0.12 | 20.7% |
| **Zone 5** | 53 | 3.9% | 28 | 3.7% | 1.17 | 201.7% |
| **Syria** | **1359** | **100.0%** | **527** | **100.00%** | **0.58** | **100.0%** |

(1) The percentage is calculated with reference to the Country's average.
Source: Our elaboration from MAAR Database data

[15] This section relies heavily on Grad and Karkout (2007) and Al-Shareef (2008), both of which are based on data originally presented in Sadiddin (2006b)

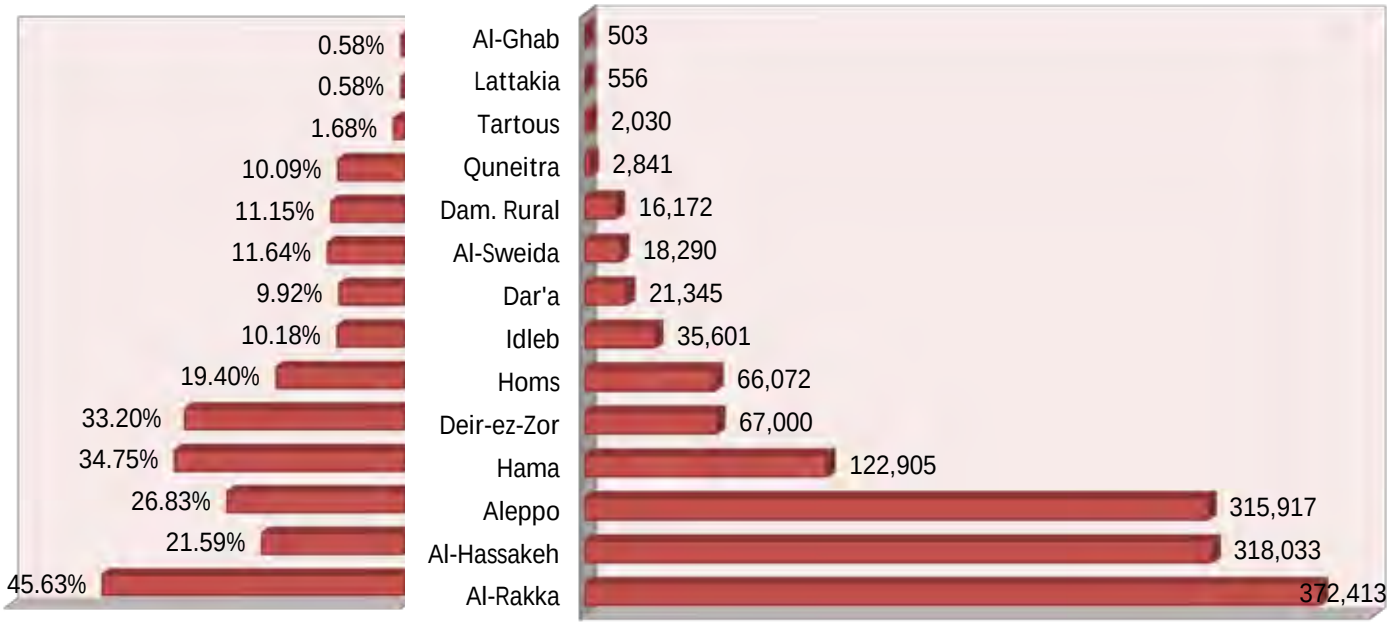
**Figure 17 Geographic distribution of barley production**


**One symbol = about 50 000 ha**

**One symbol = about 25 000 ha**

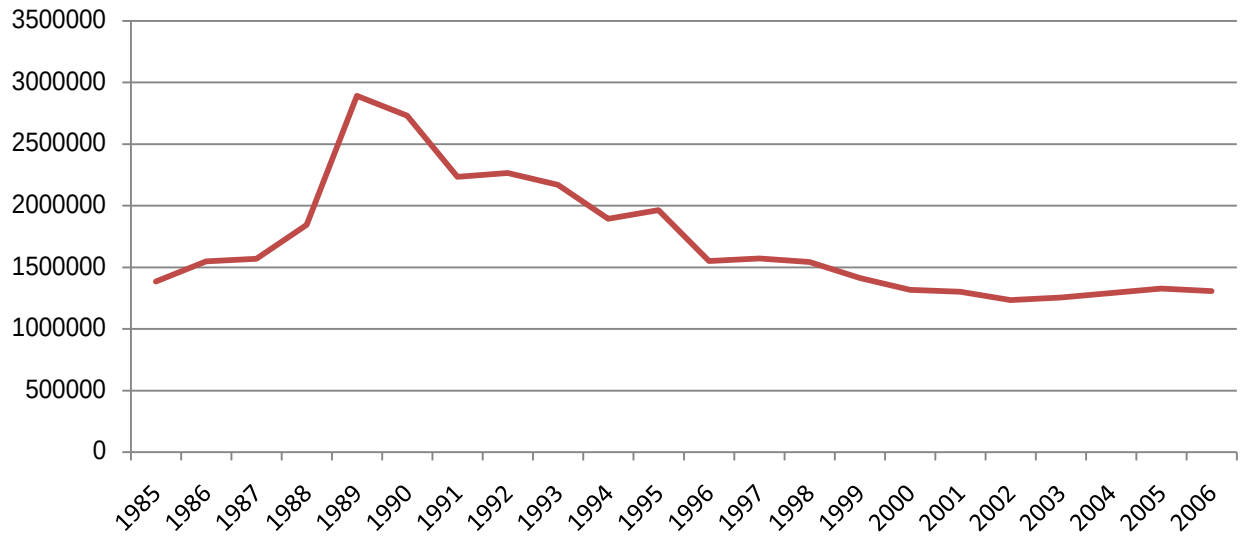
In 2 005, t he t otal a rea, i rrigated a rea an d rain-fed ar ea o f ba rley amounted t o 1 327, 2 0, an d 13 07 thousand hectares respectively accounting for respectively about 27% of the actual cultivated land, 1.4% of the irrigated area under crops and 48% of the rain-fed cropped area. During the period 2000-2005 the cropped area of barley witnessed a slight increase from 1 317 thousand hectares in 2000 to 1 327 thousand hectares in 2005 with an annual growth rate of 0.16%. There was also a notable increase in the area from 2004 to 2005 (+2.8%). Figure 19 below traces the evolution of the cropped area of barley from 1985 through 2005. It indicates a peak in 1989 and a gradual decline thereafter. The increase in the area devoted to barley in the eighties was mainly due to the encouragement of barley plantation in the Syrian steppe (Al-Badia) by the Government. However, these area were soon dismissed following the banning of barley plantation in Climatic Zone 5, fo r water conservation reasons. In 2000, the national barley areas fell due to the drought-effect of the 1999/2000 crop year.

**Figure 18 Relative importance of barley cultivation by governorate**




Note: T he b ars o n t he r ight measure t he t otal a rea in h ectares, t he b ars o n t he l eft measures t he p ercentage o f each governorate/province total agricultural land cultivated with barley

**Figure 19 Evolution of the cropped area of barley (1985-2005) (hectares)**




Source: Elaborated from the NAPC Database

Other for grain production, Barley is cultivated also as a grazing crop. The area of grazing barley was about 33 thousand hectares in 2005 (slightly more than 2% of the total area devoted to Barley) almost all of which irrigated.

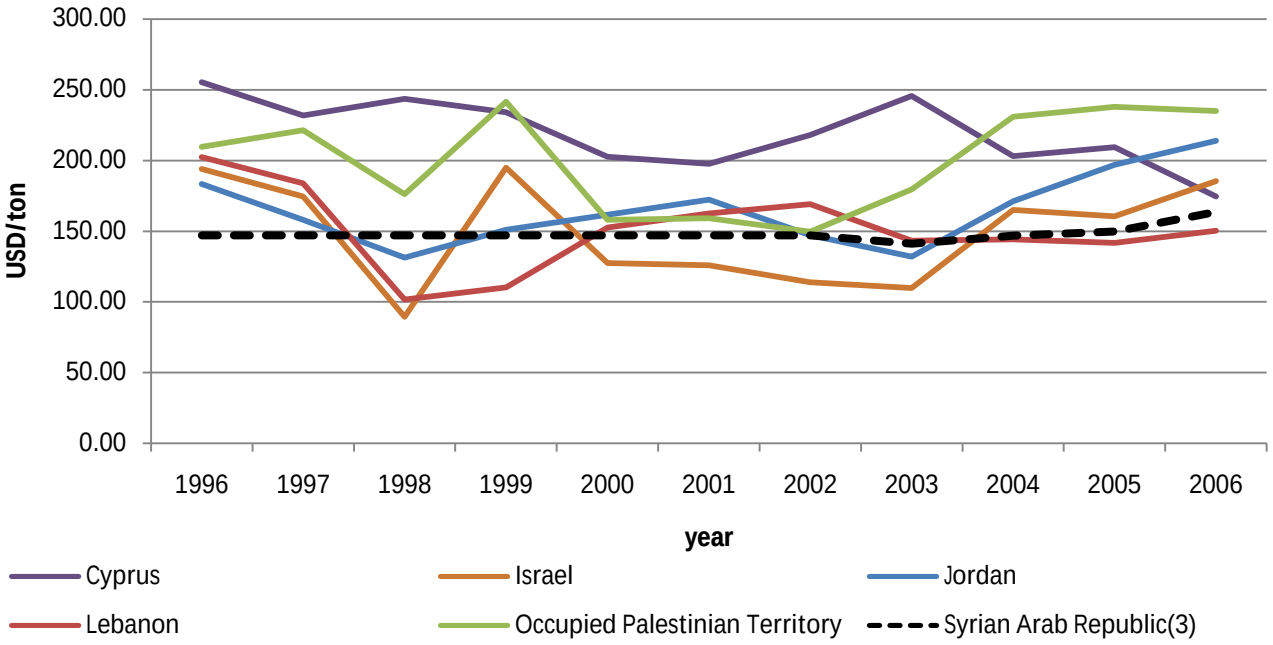
### Prices, market policies and trade

The market for Barley in Syria has been typically affected by government policy in the past, which aimed at balancing the contrasting interests of farmers and livestock keepers (see Cummins, 2000). Currently,

a producer floor price scheme is in place, where producers can deliver their product to the General Establishment for Fodder (GEF) and receive a known fixed price. Up to 2005, this price was equal to SP 7 500.00 per ton (equivalent to about 147.0 USD/ton at the prevailing exchange rate of 51 SP/dollar).

GEF buys barley and other feed crops from farmers at supported price to sell it to livestock keepers through the Agricultural Cooperative Bank (ACB). In 1999, the trade of barley was partly liberalized with the removal of imports restrictions and of the barley tax levy, although GEF continued buying barley at supported price. In 2000, GEF sold barley to breeders at a price that was 17% below the procurement price. Currently, GEF controls a limited share of total barley trade in the country.

**Figure 20 Barley price in Syria and neighboring countries**




Source: our elaboration on FAOSTAT data

In the last two years, the domestic market price of barley has been significantly above the floor price (Table 24), which thus encouraged farmers, once they were authorized to do so, to sell most of their production on the free market. This has caused a reduction in the total share of barley production purchased by the GEF. The rapidly emerging private market for Barley shows the signs of vitality that one would expect for such an important crop, although it points, once again, to the needs for effective income risk management strategies by the involved farmers.

Apart from considerations related to the traditionally uncertain yields and to the increasingly variable prices, the risk considerations for barley production are also related to the possibility that barley producers have to access credit. As a result of both the high risk and the limited formal credit access, it comes as no surprise that there exist a significant informal credit market. The main source of credit to barley producers is represented by the traders. Usually, a trader gives the money to the farmer when needed according to agreed arrangements between them, usually half of the money at the beginning of the winter season and the rest in installments, taking the crop as a collateral (Sadiddin, 2004).

## Table 24 Summary statistics of the monthly prices of barley by Governorates in 2005 (SP/kg)

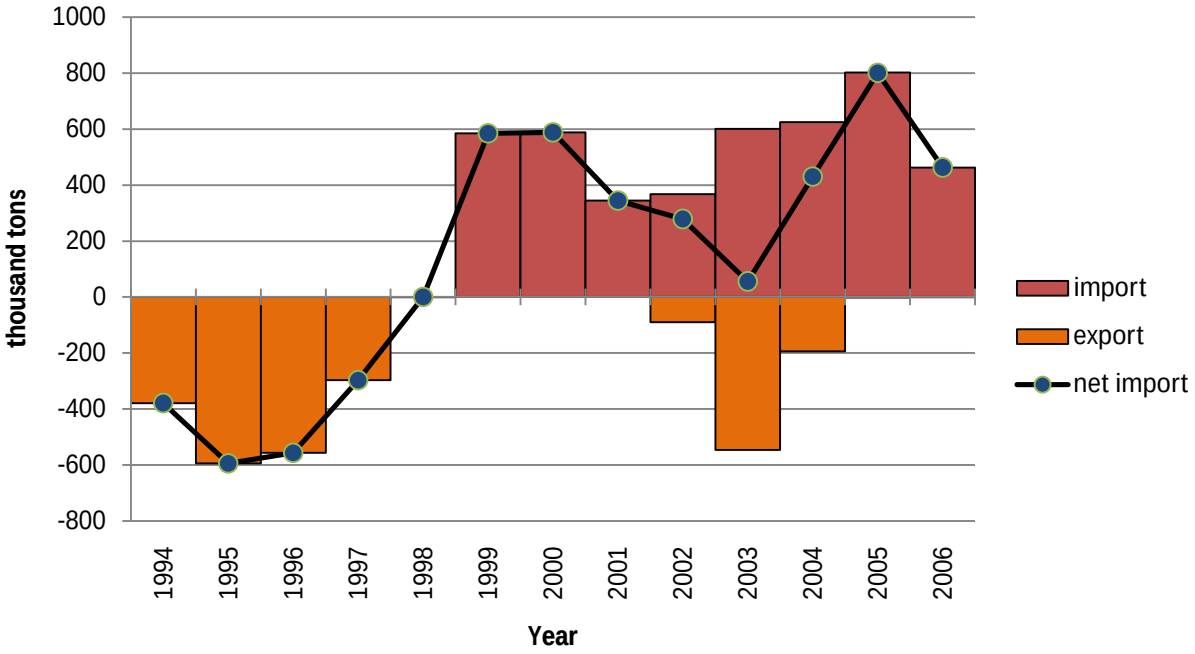
| Item | Wholesale price | | | | Retail price | | | |
|---|---|---|---|---|---|---|---|---|
| | Mean | Minimum | Maximum | CV %* | Mean | Minimum | Maximum | CV %* |
| **Al-Sweida** | 10 | 7 | 12 | 18.6 | 11.4 | 10 | 12 | 8.5 |
| **Dar'a** | 5 | 5 | 5 | 0 | 8 | 8 | 8 | 0 |
| **Damascus** | 11 | 11 | 11 | 0 | | | | |
| **Homs** | 10.9 | 10 | 12 | 4.7 | 11.5 | 10 | 15 | 12.5 |
| **Hama** | 11.6 | 10 | 17 | 17.4 | 13.5 | 11 | 19 | 15.6 |
| **Lattakia** | 9.6 | 8 | 10 | 8.4 | 12.2 | 9 | 13 | 13.1 |
| **Tartous** | 9.3 | 9 | 10 | 5 | 10.5 | 10 | 12 | 8.8 |
| **Idleb** | 10.5 | 9 | 12 | 8.6 | 12.5 | 11 | 14 | 7.2 |
| **Al-Raqqa** | 11.3 | 9 | 13 | 11.1 | 12.1 | 10 | 14 | 9.9 |
| **Dair-Ezzor** | 13.7 | 11 | 17 | 22.4 | 14.7 | 11 | 20 | 32.2 |
| **Average** | **9.8** | **8.9** | **10.6** | **4.8** | **11.5** | **9.4** | **13.9** | **9** |

Source: Elaborated from MAAR Database, * CV: Coefficient of variation

Syria is still far from being self sufficient in Barley production, and it has been continuously engaged in active international trade. Up to 1997, official data report net exports, mostly towards Jordan, whereas from 1999 on, Syria has become a net importer, earlier from France, and lately from Countries such as Ukraine and Turkey (Figure 21.)[16]

According to the most recent MAAR forecasts, the projected domestic production and demand for barley until 2010 are of 1,317 and 1,908 thousand tons respectively, indicating a projected deficit of 591 thousand tons that will need to be imported, if the efforts at improving yields will prove ineffective.

## Figure 21 Syrian trade in Barley




Source: our elaboration on Syrian Agricultural Database 2007 data

[16] Import, but especially export of grains is strongly dominated by operation of the GECPT. The data reported for 2003 where there has been both large imports and exports of barley, in fact, do not conform to standard prediction of free trade models, and can be explained by other consideration by those responsible of public stock management. The large exports to Jordan might be the consequence of the GECPT dismissing its strategic stocks, in a way that was intended to limit the consequences on the domestic markets, although, given the available information, this is little more than a conjecture.

As a consequence of the existing unbalance, the current Syrian Agricultural Strategy and Tenth Five year Plan pose high expectations on the possibility of increasing barley production, mainly through increase in yield (what is called "vertical" expansion). According to the authors of the plan, such expansion could be mainly achieved by agronomic innovation, which include better rotations, with the introduction of legumes and better use of inputs such as fertilizers. The fact remains that the yield of barley is highly dependent on weather conditions, and that therefore no set of agronomic innovation alone might be sufficient to guarantee the necessary stability to farm households' incomes.

Until recently, feed distribution was mainly operated by the GEF, a governmental institution. The relationship between the GEF and livestock keepers was maintained by sheep keepers' cooperatives. The cooperative obtains the feed by GEF and then distributes it to its members based on the size of the flock: the larger the flock the larger the amount of barley a sheep keeper gets. The quantity devoted to each sheep head is a feed mixture of about 20 kg, 25-30% of which is barley. In the critical periods of drought, the cooperatives provide larger quantities of the subsidized feed, which may reach twice the quantity distributed in normal times (Sadiddin et al., 2005).

Since the GEF does not purchase imported barley and private feed mills utilize little barley, most imported barley is sold directly to farmers. Private importers specialize in importation and do not get involved in domestic distribution other than when a large farm is prepared to buy at least one standard truckload of 13-15 tons, for example. They typically sell it to traders at the port of Lattakia and normally seek to sell a minimum of 50 to 100 tons. Traders then sell the barley that they acquire from importers directly to farmers. Most barley is shipped through Aleppo, with Al-Hassakeh being the most important consuming governorate. The result of such arrangements is that the market for barley in Syria is quite segmented, with the GEF selling principally to licensed livestock breeders on the basis of their registered flock size, and with little competition between the private and public sectors. However, this only covers a limited share the private trading of barley is well developed and competitive with an effective informal price information mechanism. Given the competitive nature of the trading and the observation that many traders do have stocks, one would expect a better price smoothing effect due to the possibility of arbitraging through storage management. Possibly, still transportation, logistics and other transaction costs along the commodity chain prevents the full price stabilization effect of competitive storage to manifest itself, and this is an important issue to be explored, given the relevant implication of price variability in terms of farmers' risk exposure.

The evolution of barley market over the years has also being likely affected by the operation of public storage. Up to 2003, the GECPT used to maintain a strategic stock of barley for use at times of shortage. In 2003, all excess barley held by the GECPT was either sold to the GEF or exported. The GEF, in turn, acquired barley only through the GECPT.

The GEF strategic stock was, in effect, used to stabilize the national availability of barley, with the quantity acquired and sold annually by the GEF being inversely related to annual barley production. In most years, the majority of the barley acquired by the GEF was sold directly to livestock producers: roughly 90% of it through cooperatives and 10% directly to individual breeders. When world prices, and therefore the demand for subsidized domestic barley, were high, the quantity provided through GEF was insufficient, and the public establishment would give priority to registered breeders. In recent years, the GEF has no longer regulated the quantities of barley that can be bought by breeders who therefore are served on a first-come-first-serve basis. Sales are never officially made to traders, on the grounds that traders may sell it to farmers at exploitative prices.

In 2004, and due to the increase in barley prices in local market, no barley was sold to the GEF, given that farmers preferred to sell their barley output in the open market, and the GEF had to procure its barley from private sector traders at market prices. This eventually led to the current situation where the GEF now acts as a "buyer of last resort", able to buy barley at the stated price, which is usually below the one prevailing at the market, but at the risk of having to ration the amount of feed its distributed to registered livestock keepers.

### II.2.4. Olives and olive oil

Olive trees are one of the Syrian territory landmarks, occupying about 60% of the total fruit trees area of the Country. As in all Mediterranean areas, production occurs over the hilly territories with no irrigation, and the presence of Olive trees plays a positive role in the ecological balance of the territory (SOFA, 2005).

The total area cultivated under olive trees has increased rapidly and steadily in the past, from about 300 thousand hectares in the mid eighties, to the current more than 550 thousands. A sizeable area of 50 thousand hectares is currently irrigated, concentrated in the central plains of Syria (Homs and Hama Governorates) where the average rainfall is of only around 300-400 mm/year. Farmers in these areas usually use sprinkler schemes to supplement natural water supply with two to three irrigation doses per year (FSS, Sadiddin, 2005).

**Figure 22 Olive trees area in Syria**


Source: our elaboration on NAPC's SADB data

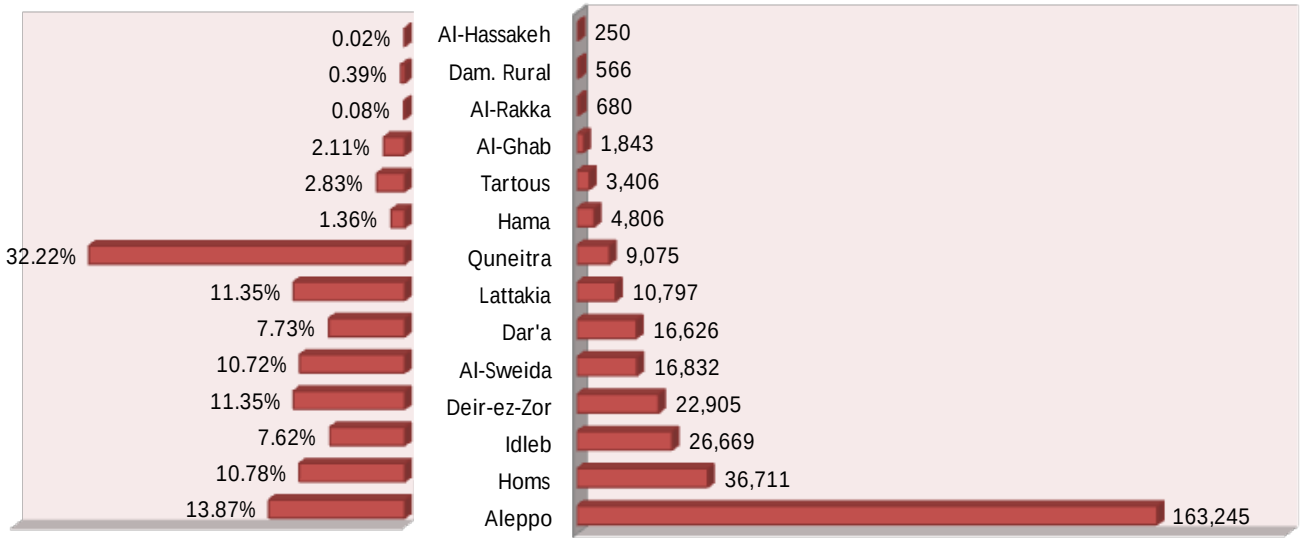
Rainfed olive production, on the other hand, is concentrated in the coastal mountainous areas where the average rainfall is around 800 mm and above (Zone 1). In addition, there are some rainfed areas of olive in Ecological Zones 2, 3, and 4 where average rainfall is relatively low (less than 250 mm). These areas are concentrated in the eastern parts of Homs and Hama Governorates and their cultivation had occurred with the assistance and the supervision of the Green Belt Project (see below).

### Table 25 Olive-tree area by Zone and by Governorate (hectares, 2006)

| Governorate | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | Total |
|---|---|---|---|---|---|---|
| **Aleppo** | 121,102 | 41,356 | 3,507 | 546 | 9 | **166,520** |
| **Al-Ghab** | 2,046 | | | | | **2,046** |
| **Al-Hassakeh** | 73 | 94 | 33 | 66 | 56 | **322** |
| **Al-Rakka** | | 394 | 236 | 2,313 | 6,207 | **9,150** |
| **Al-Sweida** | 3,242 | 5,310 | 106 | | | **8,658** |
| **Damascus City** | | | 128 | 570 | | **698** |
| **Damascus Rural** | 1,997 | 4,451 | 2,020 | 4,610 | 3,942 | **17,020** |
| **Dar'a** | 6,252 | 16,678 | 3,856 | 916 | 52 | **27,754** |
| **Deir-ez-Zor** | | | | | 767 | **767** |
| **Hama** | 15,737 | 14,612 | 8,664 | 1,179 | 241 | **40,433** |
| **Homs** | 27,514 | 12,054 | 12,726 | 3,916 | 3,289 | **59,499** |
| **Idleb** | 107,694 | 7,871 | 1,290 | | | **116,855** |
| **Lattakia** | 44,783 | | | | | **44,783** |
| **Quneitra** | 3,398 | | | | | **3,398** |
| **Tartous** | 67,034 | | | | | **67,034** |
| **Total** | **400,872** | **102,820** | **32,566** | **14,116** | **14,563** | **564,937** |

Source: our elaboration on NAPC's Syrian Agricultural Database data

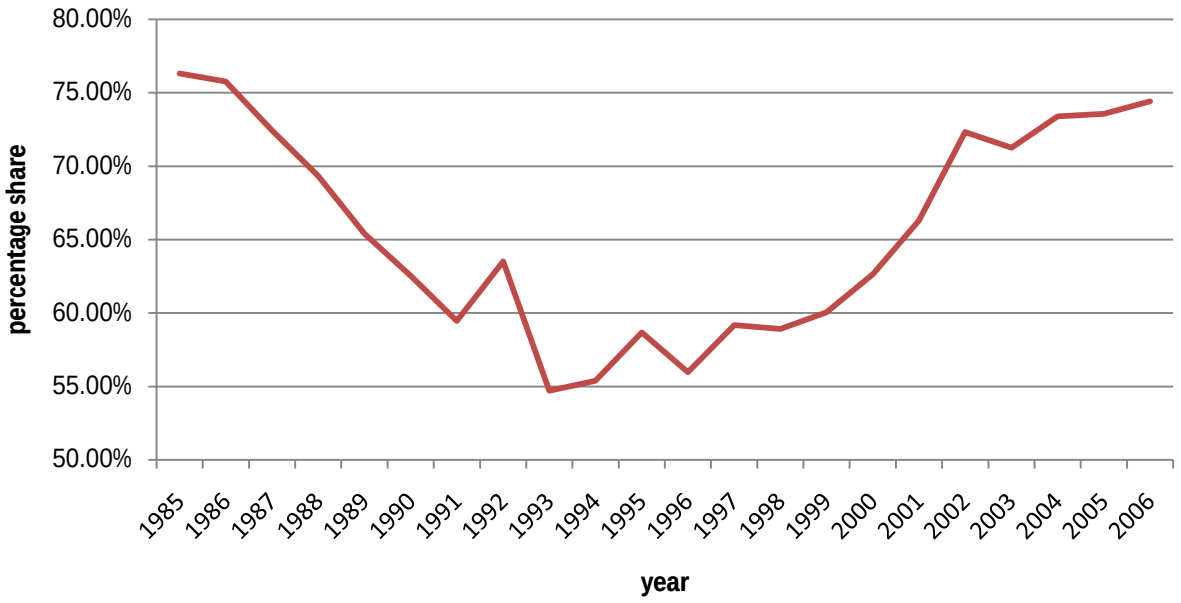
### Figure 23 Distribution of Olive trees areas by Governorate (2005)




Note: The bars on the right measure the total area in hectares, the bars on the left measures the percentage of each governorate/province total agricultural land which is devoted to olive trees
Source: our elaboration on NAPC's SADB data.

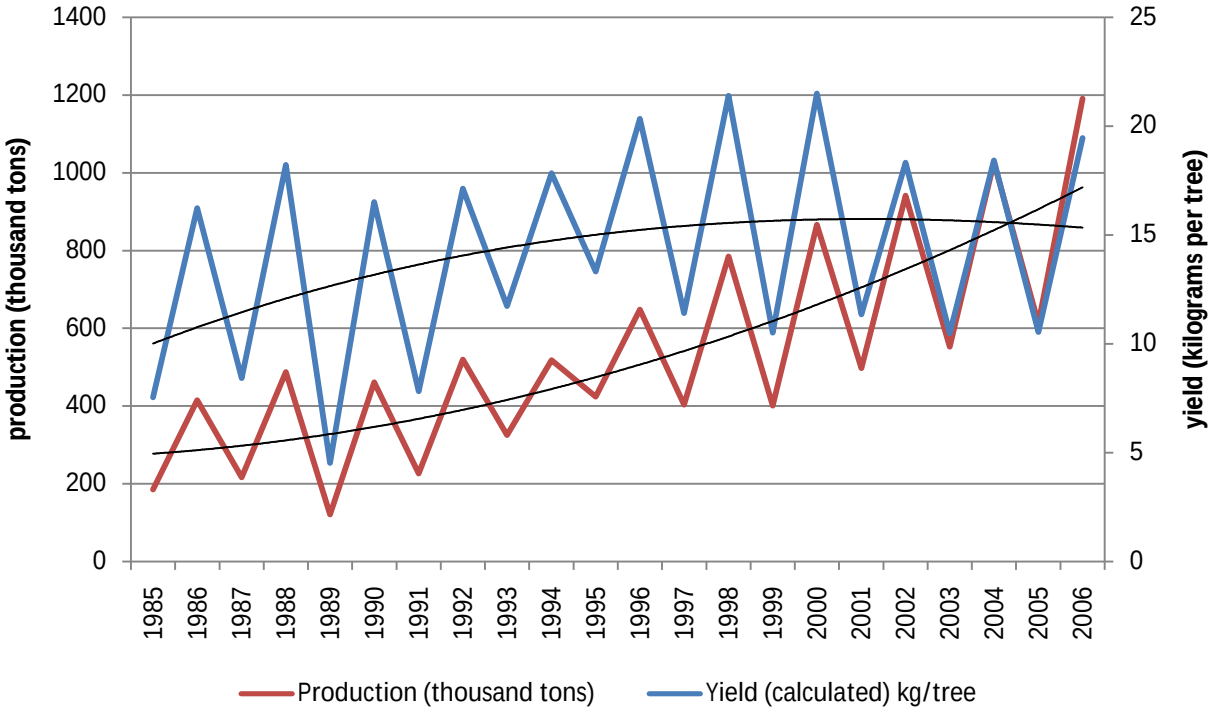
Analysis of data on the share of fruit bearing trees over total number of trees reveals that there has been a large renovation of the olive tree population starting in the eighties (so that the share of fruit bearing trees on the total started falling) and ending in the early nineties (when the share started growing again, as each year, the number of new trees starting bearing fruits exceeded the number of newly planted ones), which is now reaching its full expression (Figure 24.)

**Figure 24 Share of fruit bearing olive trees 1985- 2006**




Source: our elaboration on NAPC's SADB data.

**Figure 25 Olives: production and yields (1985 – 2006)**




Source: our elaboration on NAPC's Syrian Agricultural Database data.

Total olive production varies from year to year due to the alternation bearing phenomenon, although the trend in total production is an increasing one (Figure 25). The yield (expressed as olives per tree) has also been increasing in the past, although it now seems to have reached a plateau, due to the stabilization of the share of fruit bearing trees, as many plantations have likely reached maturity.

### Public policy

Regarding olive cultivation, the government involvement is less intense than in other agricultural sub-sectors. The major public activities are in reclaiming land, distributing olive seedlings at subsidized prices, providing extension services free of charge and promotes application of Integrated Pest Management (IPM) on olive trees in order to reduce pesticide residuals.

One of the major initiatives to promote the development of olive tree cultivation is the standing "Green Belt" Project. The project provided the farmers who accepted to cooperate with it by long-term and low interest rate loans with some free services to achieve land reclamation needed before planting the trees. This had been accompanied with free food aids to motivate them to cooperate, since they had to give up a significant part of the income generated from cultivating the land with seasonal crops for several years ( Sadiddin, 2006a). According to recent press release by the director of the project, Mr. Moahmmed Masalmeh, "the reclaimed lands in the framework of the project, since 1983, have reached 78 400 acres (31.7 thousand hectares), out of a plan to reclaim about 124 740 acres (50.5 thousand hectares). The areas in which trees already have been planted have reached 75 045 acres and the number of the planted trees have reached so far 1 million and 200 thousand trees of which 95 percent are olive trees and the rest are Almond, pistachio ,figs and grapes." (A.N. Idelbi, Syrian Arab News Agency. Accessed Dec 30, 2008)

### Labor

Olive and olive oil productions provide income and job opportunities to a large number of people in the rural areas. Olives in Syria are mostly hand-picked. Farmers usually pick-up olives in October, right after the occurrence of the first rain that gives olives the humidity suitable for oil extraction. In the rainfed coastal hills and mountain surrounding Damascus, families usually provide all the needed labor, with recourse to hired labor only at the time of harvest, when locally available workforce is usually sufficient. (Yassin, 2004)

In the interior hills of the Hama and Homs governorates, where If needed, casual laborers may come from relatively distant areas, especially from the eastern part of the Homs and Hama Governorates. Traditional contractors, the *chaweshes*, perform the function of labor organization and mobilization as they do for other crops. They organize the labor whereby labor demand and supply meet. They pool labor and make it available in different areas according to the market demand, which increases significantly in autumn, when the harvest season of olive is (FSS, Sadiddin, 2005). In any case, only richer farmers, who hold larger estates, use hired labor for Olive picking.

### Capital

Olive cultivation requires a significant amount of money for the initial investment, and credit is essential given the long gestation period of olive trees, which take from 10 to 15 years to reach the stage of full production. The first 3 to 6 years might yield no production at all, depending on water availability and management level. Olive trees having already reached full production stage were planted 15 years ago or more. Given the lack of formal credit to promote plantation, most olive tree cultivation have been self financed by farmers. It must be noted, however, that large areas recently cultivated with olive trees, were developed under the mentioned Green Belt Project.

### II.2.5. Fruits, vegetables and spices

Fruits and vegetables are an important component of agricultural production in Syria, and potentially one of the most promising subsectors for agricultural development in several areas of the Country.

A large number of fruits and vegetables, including Apples, Pears, Oranges, Mandarins, Lemons, Table Grapes, Apricots, Cherries, Peaches, Watermelons, Tomatoes, Cauliflowers, Cucumbers, Early potatoes, Onions, Cabbages, etc are produced in the irrigated areas of the coastal and northern plans of the Country. (see Table 6 on page 18 for fruits, and Table 26 below for vegetables.)

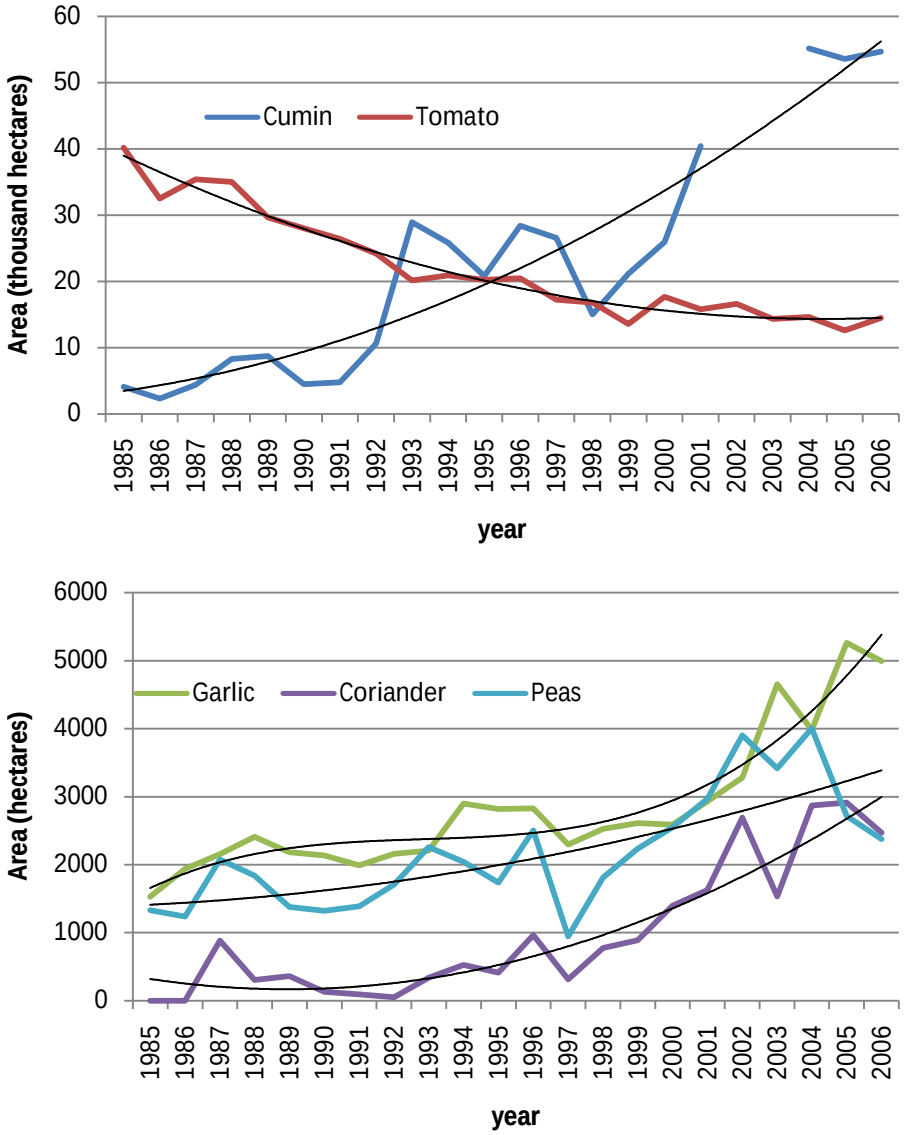
In terms of cropped area, the major vegetables are potato, watermelon, tomato, cucumbers and onions, reflecting the kind of vegetables and spices that are most common in the Syrian eating habits (See Table 26.)

An interesting information can be derived from comparison of the average areas cultivated in the early nineties with the most recent data. While the area cropped to tomatoes has been constantly falling (from a three-year average of more than 26 thousand in 1990-92 to slightly less than 14 thousand hectares in 2004-06), with most of the reduction occurring in agro climatic zone 1, recently, cultivation of rainfed spices have become a relevant component of the agricultural production in the Country, especially cumin, which has reached an area of more than 55 thousands hectares in recent years increasing its area by an astonishing 721% over the 20 year period. Similarly impressive is the increase of coriander cultivation, which from being negligible has now reached areas of close to 3 000 hectares countrywide. Also noticeable is the increase of peas (+106%) and garlic (+126%) (Figure 26 and Table 26)

The evolution of the total area devoted to tomato production, however, does not tell the full story, given that, over the same period, total production has not decreased parallel to the area. By looking at the graphs in Figure 27, we notice that, starting at the end of the nineties, production has been increasing while cropped area has continued falling, although at a slower rate than in the past. Such a dramatic increase in the average yield has been obtained by a combination of improved production techniques and an increased share of irrigated tomato over the total (Figure 28). In particular, green-house production, from being virtually absent in the 1980's, represents now close to 40% of total tomato production (See Atiya, 2006, Figure 2.4)

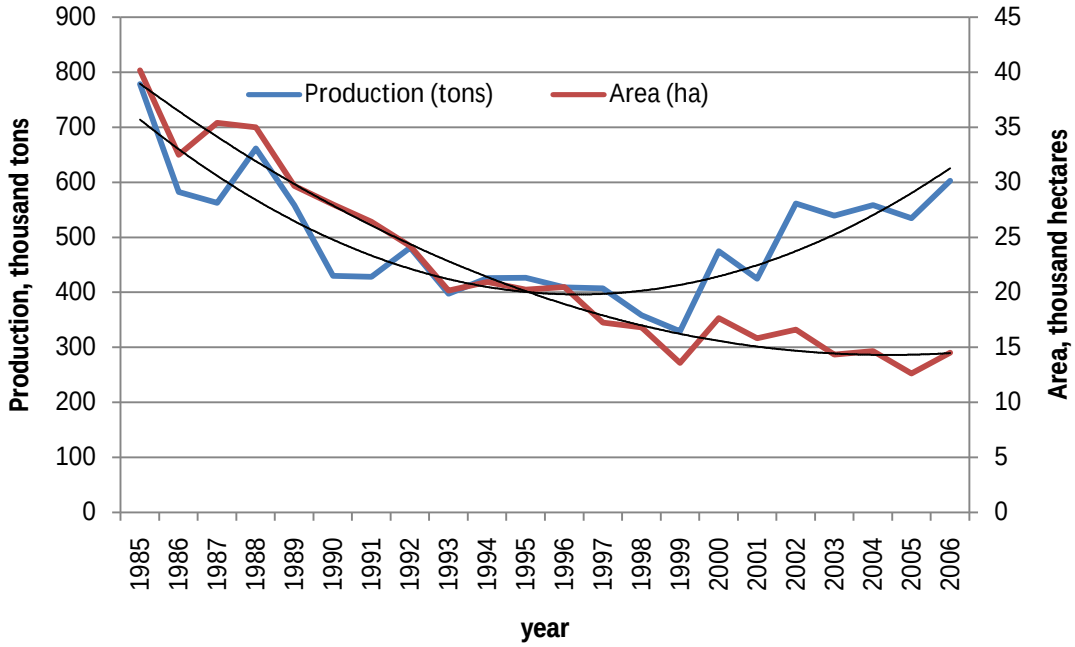
Both the expansion of alternative spice crops, especially on rainfed land, and the improvement on the type and quantity of tomato production should be seen as very promising features of the process of diversification of the Syrian agricultural production.

**Figure 26 Syrian "fast moving" vegetables and spices**



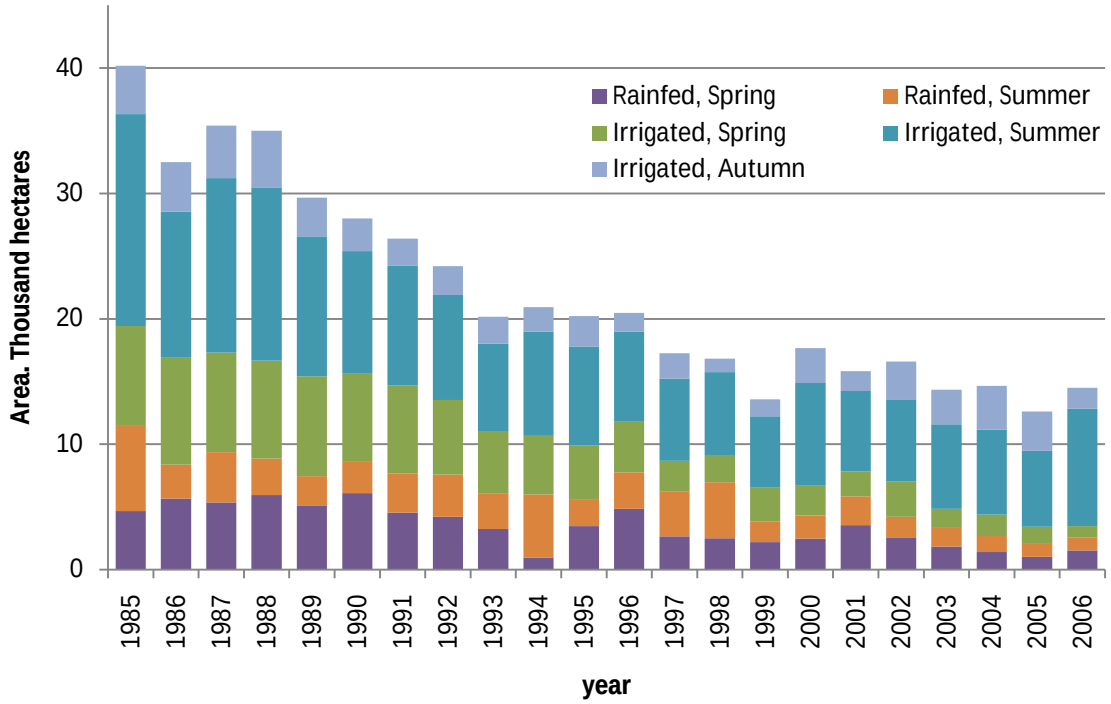

Note: the two panels show the tendency of acreage of two major vegetable and spice crops (panel 1) and three fast growing "minor" crops (panel 2)
Source: our elaboration on NAPC's SADB data.

## Figure 27 Tomatoes: Cropped area and production from 1985 to 2006




Source: Our elaboration on NAPC's SADB data

## Figure 28 Tomatoes. Cropped area by type of cultivation, 1985-2006




Source: our elaborations on NAPC's Syrian Agricultural Database data

## Table 26 Vegetable and spice cultivation in Syria. Comparison between 1990-1992 and 2004-2006. (Cropped area, hectares)

| | 2004-2006 | | | | | | 1990-1992 | | | | | | Change | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Zone1 | Zone2 | Zone3 | Zone4 | Zone5 | All | Zone1 | Zone2 | Zone3 | Zone4 | Zone5 | All | Absolute | Percent |
| **Cumin** | 10,666.0 | 41,117.7 | 2,540.3 | 136.3 | 1.3 | **54,461.7** | 1,461.0 | 4,467.7 | 565.0 | 115.0 | 22.0 | **6 630.7** | 47 831.0 | +721% |
| **Potato** | 19,509.0 | 6,166.7 | 1,136.0 | 150.7 | 1,180.7 | **28,143.0** | 17,657.3 | 3,523.3 | 2,036.3 | 292.0 | 242.0 | **23 751.0** | 4 392.0 | +18% |
| **Water melons** | 11,042.3 | 4,868.0 | 856.0 | 5,412.0 | 5,933.0 | **28,111.3** | 17,658.7 | 12,932.7 | 515.7 | 72.3 | 517.3 | **31 696.7** | -3 585.3 | -11% |
| **Tomato** | 6,799.3 | 3,298.3 | 825.0 | 1,031.0 | 1,971.3 | **13,925.0** | 18,933.3 | 4,385.3 | 717.7 | 339.3 | 1,819.3 | **26 195.0** | -12 270.0 | -47% |
| **Cucumber** | 6,977.8 | 2,280.0 | 483.3 | 70.7 | 1,021.7 | **10,833.5** | 10,004.7 | 2,275.0 | 454.7 | 122.0 | 599.7 | **13 456.0** | -2 622.5 | -19% |
| **Onion** | 5,003.7 | 1,568.3 | 621.3 | 290.0 | 1,601.7 | **9,085.0** | 6,875.3 | 937.3 | 302.0 | 236.7 | 630.3 | **8 981.7** | 103.3 | +1% |
| **Eggplant** | 4,430.7 | 912.3 | 366.7 | 316.3 | 1,390.0 | **7,416.0** | 4,454.7 | 894.0 | 209.0 | 190.0 | 365.0 | **6 112.7** | 1 303.3 | +21% |
| **Musk melons** | 3,539.0 | 1,888.3 | 482.7 | 173.7 | 1,123.3 | **7,207.0** | 4,897.7 | 2,685.3 | 219.7 | 17.7 | 217.0 | **8 037.3** | -830.3 | -10% |
| **Squash** | 3,831.7 | 902.3 | 436.0 | 75.7 | 914.3 | **6,160.0** | 5,064.3 | 806.0 | 214.3 | 148.3 | 430.7 | **6 663.7** | -503.7 | -8% |
| **Broad beans** | 2,547.7 | 681.3 | 357.2 | 232.0 | 1,456.7 | **5,274.8** | 4,536.3 | 951.7 | 259.2 | 261.0 | 932.0 | **6 940.2** | -1 665.3 | -24% |
| **Garlic** | 1,603.7 | 754.0 | 660.0 | 143.0 | 1,581.7 | **4,742.3** | 951.0 | 391.0 | 495.0 | 151.7 | 106.7 | **2 095.3** | 2 647.0 | +126% |
| **Haricot beans** | 2,868.5 | 539.0 | 178.7 | 50.3 | 319.7 | **3,956.2** | 3,791.0 | 294.7 | 86.0 | 96.3 | 180.0 | **4 448.0** | -491.8 | -11% |
| **Green peppers** | 2,069.3 | 769.0 | 238.3 | 154.7 | 392.7 | **3,624.0** | 2,065.3 | 469.7 | 92.3 | 50.3 | 154.0 | **2 831.7** | 792.3 | +28% |
| **Peas** | 1,890.0 | 712.7 | 245.5 | 57.5 | 134.0 | **3,039.7** | 557.7 | 617.0 | 225.7 | 24.3 | 48.0 | **1 472.7** | 1 567.0 | +106% |
| **Coriander** | 1,854.0 | 854.0 | 11.3 | 28.3 | 0.3 | **2,748.0** | 26.7 | 39.0 | 7.0 | 15.7 | 3.0 | **91.3** | 2 656.7 | +2 909% |
| **Cabbage** | 1,280.3 | 385.0 | 105.7 | 25.7 | 185.7 | **1,982.3** | 1,012.0 | 278.3 | 158.3 | 112.3 | 606.3 | **2 167.3** | -185.0 | -9% |

Note: Data in the table are ordered according to the total average areas in 2004-2006. In blue the most noticeable increases, in red the sharper decreases.
Source: Our elaboration on NAPC's Syrian Agricultural Database data.

## Table 27 Fruit production and area in Syria. Comparison between 1990-92 and 2004-06

| | 1990-92 | | | | | | 2004-06 | | | | | | Change | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | All zones | Zone 1 | Zone 2 | Zone 3 | Zone 4 | Zone 5 | All zones | Absolute | Percent |
| *Production (thousand tons)* | | | | | | | | | | | | | | |
| **Oranges** | 175.6 | 0.0 | 0.0 | 0.0 | 0.2 | 175.8 | 500.4 | 0.1 | 0.0 | 0.0 | 0.2 | 500.7 | 324.9 | 184.9% |
| **Apples** | 177.2 | 24.0 | 15.0 | 4.4 | 6.8 | 227.4 | 248.7 | 47.1 | 43.2 | 0.9 | 3.0 | 342.8 | 115.4 | 50.8% |
| **Grapes** | 232.2 | 156.4 | 25.8 | 15.0 | 28.1 | 457.5 | 131.1 | 122.4 | 21.6 | 8.1 | 12.1 | 295.3 | -162.2 | -35.5% |
| **Other citrus** | 156.1 | 0.6 | 0.1 | 0.0 | 0.1 | 156.8 | 227.6 | 0.3 | 0.0 | 0.0 | 0.3 | 228.2 | 71.4 | 45.5% |
| **Almonds** | 9.4 | 10.3 | 3.9 | 1.0 | 0.4 | 25.1 | 12.3 | 59.7 | 40.6 | 40.0 | 0.3 | 153.1 | 128.0 | 510.4% |
| **Lemons** | 44.6 | 0.0 | 0.0 | 0.0 | 0.4 | 44.9 | 112.5 | 0.6 | 0.0 | 0.0 | 0.2 | 113.4 | 68.5 | 152.4% |
| **Apricots** | 17.7 | 8.0 | 13.7 | 10.5 | 25.6 | 75.6 | 9.1 | 8.3 | 33.0 | 4.1 | 25.4 | 79.9 | 4.3 | 5.7% |
| **Peaches and Plums** | 59.4 | 19.5 | 4.2 | 6.7 | 16.3 | 106.1 | 39.7 | 15.3 | 1.2 | 1.1 | 10.7 | 68.0 | -38.1 | -35.9% |
| **Pomegranate** | 39.2 | 14.9 | 2.4 | 0.9 | 4.5 | 62.0 | 37.5 | 3.6 | 0.9 | 0.8 | 9.7 | 52.5 | -9.5 | -15.3% |
| **Cherries** | 20.0 | 4.0 | 2.3 | 0.5 | 0.4 | 27.2 | 35.2 | 6.2 | 4.4 | 4.7 | 0.1 | 50.6 | 23.4 | 86.3% |
| **Pistachios** | 4.8 | 10.9 | 0.1 | 0.0 | 0.1 | 15.9 | 12.6 | 33.3 | 0.5 | 0.0 | 0.0 | 46.3 | 30.5 | 192.1% |
| **Figs** | 33.7 | 2.7 | 1.6 | 0.7 | 1.9 | 40.7 | 40.3 | 3.5 | 0.6 | 0.5 | 1.0 | 45.9 | 5.2 | 12.7% |
| **Pears** | 14.3 | 2.7 | 1.3 | 1.2 | 2.4 | 22.0 | 12.5 | 4.4 | 0.8 | 0.2 | 2.9 | 20.8 | -1.2 | -5.2% |
| **Walnuts** | 3.1 | 0.8 | 0.6 | 2.5 | 3.2 | 10.2 | 6.1 | 2.1 | 0.4 | 0.8 | 2.7 | 12.1 | 2.0 | 19.7% |
| **All fruits** | 987.3 | 254.8 | 71.0 | 43.6 | 90.4 | 1447.0 | 1425.7 | 307.0 | 147.2 | 61.2 | 68.6 | 2009.7 | 562.8 | 38.9% |
| *Area (thousand hectares)* | | | | | | | | | | | | | | |
| **Almonds** | 3.2 | 13.3 | 5.8 | 2.5 | 1.7 | 26.5 | 3.0 | 26.4 | 19.0 | 12.5 | 0.9 | 61.8 | 35.2 | 132.7% |
| **Pistachios** | 9.5 | 51.1 | 3.0 | 0.4 | 3.1 | 67.2 | 8.3 | 43.2 | 1.6 | 0.3 | 3.4 | 56.8 | -10.3 | -15.4% |
| **Grapes** | 45.1 | 45.6 | 10.5 | 4.8 | 3.2 | 109.2 | 17.5 | 26.1 | 5.9 | 2.7 | 1.5 | 53.7 | -55.5 | -50.9% |
| **Apples** | 36.8 | 8.4 | 2.5 | 1.0 | 1.6 | 50.5 | 31.2 | 11.1 | 2.6 | 0.2 | 0.5 | 45.6 | -4.8 | -9.6% |
| **Cherries** | 10.4 | 3.3 | 1.5 | 0.6 | 0.2 | 16.0 | 11.3 | 4.5 | 5.1 | 3.9 | 0.0 | 24.8 | 8.8 | 55.0% |
| **Oranges** | 10.6 | 0.0 | 0.0 | 0.0 | 0.0 | 10.6 | 18.6 | 0.0 | 0.0 | 0.0 | 0.0 | 18.7 | 8.0 | 75.4% |
| **Apricots** | 3.7 | 2.1 | 2.1 | 1.4 | 5.4 | 14.7 | 1.4 | 2.3 | 4.5 | 1.2 | 4.0 | 13.4 | -1.3 | -8.6% |
| **Figs** | 10.4 | 1.5 | 1.4 | 0.8 | 0.4 | 14.5 | 7.7 | 1.2 | 0.6 | 0.2 | 0.1 | 9.8 | -4.6 | -32.1% |
| **Other citrus** | 9.9 | 0.2 | 0.0 | 0.0 | 0.0 | 10.1 | 8.1 | 0.0 | 0.0 | 0.0 | 0.0 | 8.1 | -2.0 | -19.6% |
| **PeachesPlums** | 9.0 | 3.1 | 0.7 | 0.9 | 2.7 | 16.4 | 5.1 | 2.6 | 0.2 | 0.2 | 1.3 | 9.4 | -7.0 | -42.8% |
| **Lemons** | 2.6 | 0.0 | 0.0 | 0.0 | 0.0 | 2.6 | 5.3 | 0.0 | 0.0 | 0.0 | 0.0 | 5.3 | 2.7 | 103.6% |
| **Pomegranate** | 7.2 | 1.4 | 0.3 | 0.1 | 0.7 | 9.7 | 3.1 | 0.5 | 0.1 | 0.1 | 0.5 | 4.3 | -5.4 | -55.4% |
| **Pears** | 4.7 | 1.8 | 0.4 | 0.3 | 0.8 | 8.0 | 2.4 | 0.8 | 0.1 | 0.1 | 0.6 | 4.1 | -3.9 | -49.1% |
| **Walnuts** | 1.6 | 0.4 | 0.3 | 0.9 | 1.5 | 4.6 | 1.5 | 0.6 | 0.2 | 0.3 | 0.8 | 3.3 | -1.3 | -28.4% |
| **All fruits** | 164.7 | 132.1 | 28.6 | 13.9 | 21.5 | 360.7 | 124.6 | 119.2 | 40.0 | 21.7 | 13.8 | 319.2 | -41.5 | -11.5% |

Note: Data in the table are ordered according to the total average areas in 2004-2006. In blue the most noticeable increases, in red the sharper decreases.
Source: Our elaboration on NAPC's Syrian Agricultural Database data.

As far as fruits are concerned, Oranges (and other citrus fruits) Apples, Grapes and Almonds are the species that leads the list in terms of average quantity produced in 2004-06, while Almonds, Pistachios, Grapes and Apples lead in terms of area invested. (Table 27).

Among the most dynamic fruit productions, we can notice the increase in Almond production, which have more than doubled the area in the period between 1990 and 2006 while, at the same time, obtaining a five-fold increase in production. Oranges also have seen an increase in production (+185%) that has outpaced the equally noticeable increase in the area planted (+75%), a sign of improved agronomic conditions (See Snouber, 2006). Even more impressive is the improvement in the production conditions of pistachios, which have experienced a tripling of production while the area cultivated has fallen by 15%.

As noted by Garcia-Alvarez Coque *et al.*, (2003) fruit and vegetable production is still planned mainly according to serve the domestic demand, given the existing set measures that restricted exports, which are used only when the domestic market no longer absorb production at prices that are considered socially acceptable. (In the past, when the price of vegetables on the urban markets has increased, concerns for the consequences on urban consumers have led to measures that restricted exports, in the attempt at reducing domestic price.)[17] However, without an understanding of the causes for price increases, such policies will have the effect of weakening the incentives towards a better organization of the exports of fruits and vegetables without sound benefits to the urban population.

[17] Al Ammouri (2008) reports a similar occurrence for potatoes in September 2006

# III. Demand

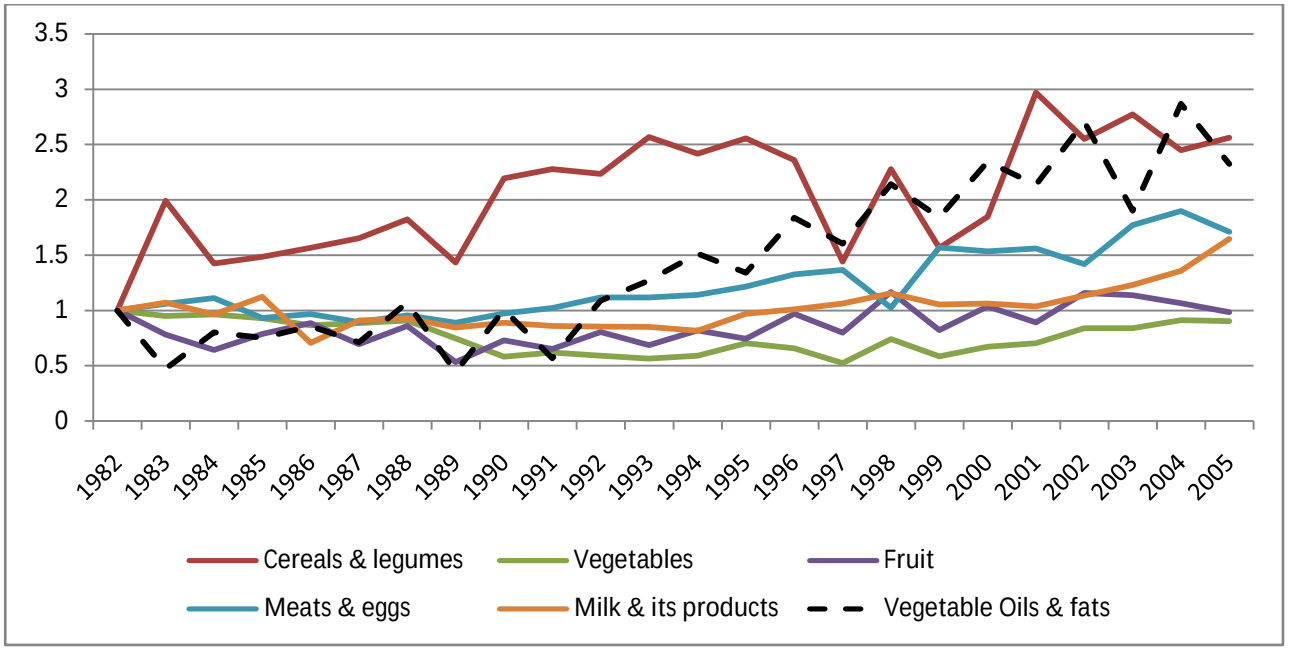
## III.1. The main factors conditioning food consumption in Syria

### III.1.1. Current consumption

In Grad (2008) a review of the status of agricultural and food product availability in Syria has been presented, based on the annual *food balances* prepared by the Syrian Ministry of Agriculture and Agrarian Reform. Such food balances define as "Available for Consumption" the quantity resulting from the accounting of Production plus Imports minus Exports. They include therefore not only quantities available for food but also for other uses such as seeds, losses, waste and changes in stocks. As pointed out by Grad, in the absence of comprehensive Supply/Utilizations Accounts for agricultural commodities, these remain nevertheless the best available indicator for the analysis of the evolution of food supply in Syria.

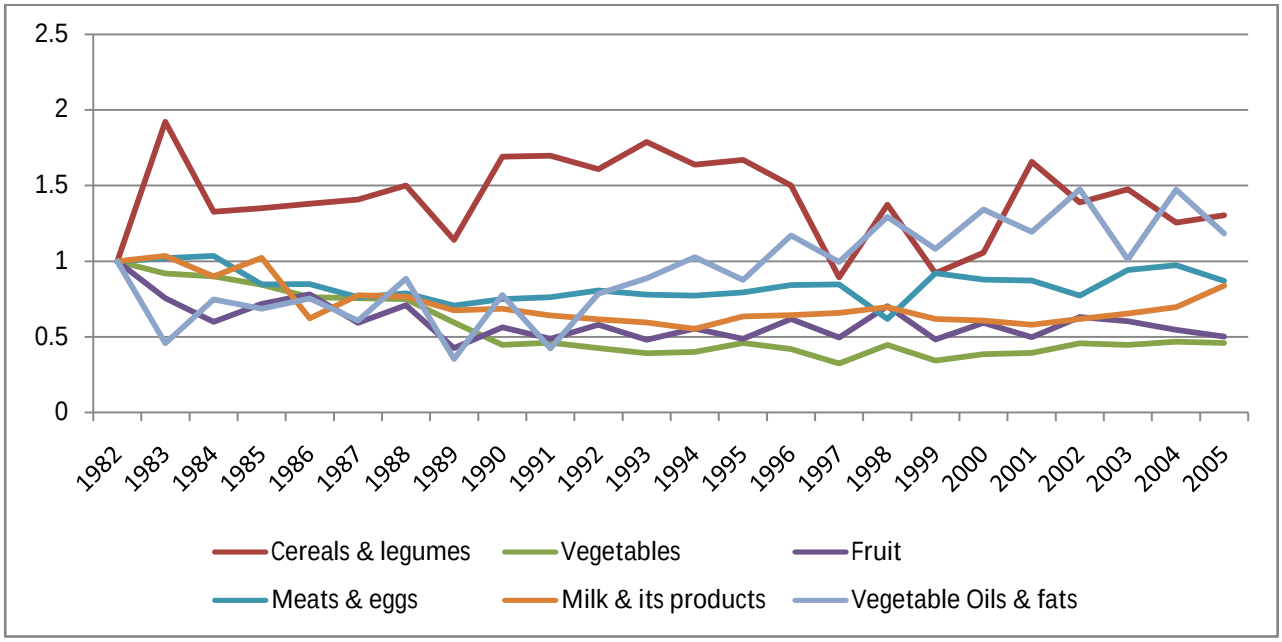
Figure 29 illustrates the evolution of indexes of **total** availability from 1982 to 2005, showing an increasing trend for all groups except for vegetables. By comparison with the population growth over the same period, however, only cereals and legumes and vegetable oils seem to have kept the pace, while all other groups show values of **per capita** availability (Figure 30) which are lower in 2005 than they were in 1982, and especially so for fruit and vegetables, thus highlighting a possible deterioration of nutrition standards, a phenomenon often associated with increase of per capita income from low to medium levels.

**Figure 29 Evolution of indexes of total food availability of various food groups, 1982-2005 (quantities indexes, 1982 = 1)**




Source: Elaborated from MAAR – The Agricultural Annual Statistical Abstract, Various issues and CBS, ASA, various issues.

**Figure 30 Evolution of the per capita availability for various food groups, 1982-2005 (indexes 1982=100)**




Source: Elaborated from MAAR – The Agricultural Annual Statistical Abstract, Various issues and CBS, ASA, various issues.

The evolution of per capita availability of various food groups seems to have been following two different patterns over time. Apart from cereals and legumes, all other categories of foods show a decreasing trend of the index of availability from the eighties trough the mid nineties, to then show a stabilization, with the only exception of vegetables oils and fats which has steadily being increasing from 1992 on.

In Grad (2008) a comparison of the per capita intake of calories, proteins and fats, distinct according to the origin, whether animal or vegetable, has been conducted on FAO data for Syria and other countries (Table 28).

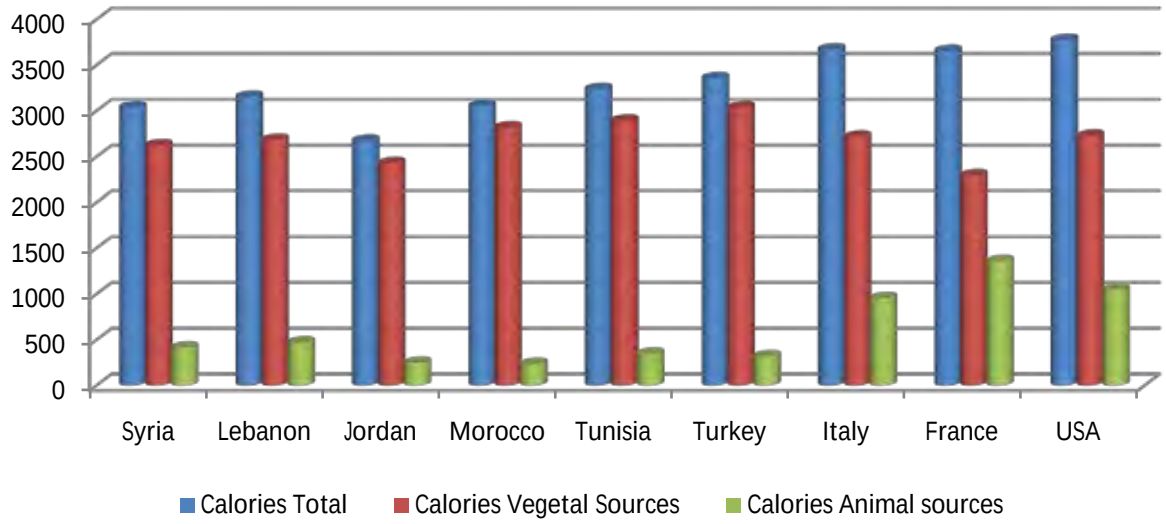
**Table 28 Per capita calories intake in different countries, 2002**

| Item | | Daily calories | Daily protein (grams) | Daily fat (grams) |
|---|---|---|---|---|
| **Syria** | Total, of which: | 3,038 | 77.0 | 105.0 |
| | Vegetal sources | 2,625 | 55.4 | 72.8 |
| | Animal sources | 413 | 21.6 | 32.2 |
| **Lebanon** | Total, of which: | 3,153 | 85.4 | 108.4 |
| | Vegetal sources | 2,684 | 54.0 | 74.8 |
| | Animal sources | 469 | 31.4 | 33.6 |
| **Jordan** | Total, of which: | 2,674 | 67.4 | 81.5 |
| | Vegetal sources | 2,428 | 49.1 | 64.4 |
| | Animal sources | 246 | 18.3 | 17.1 |
| **Morocco** | Total, of which: | 3,052 | 84.8 | 58.2 |
| | Vegetal sources | 2,818 | 67.9 | 42.3 |
| | Animal sources | 234 | 16.9 | 15.9 |
| **Tunisia** | Total, of which: | 3,238 | 86.9 | 94.9 |
| | Vegetal sources | 2,892 | 62.6 | 73.4 |
| | Animal sources | 346 | 24.3 | 21.5 |
| **Turkey** | Grand total | 3,357 | 95.5 | 91.6 |
| | Vegetal sources | 3,039 | 74.2 | 70.8 |
| | Animal sources | 318 | 21.3 | 20.8 |
| **Italy** | Grand total | 3,670 | 113.1 | 158.1 |
| | Vegetal sources | 2,718 | 51.1 | 86.4 |
| | Animal sources | 952 | 62.0 | 71.7 |
| **France** | Grand total | 3,653 | 119.2 | 170.9 |
| | Vegetal sources | 2,296 | 41.1 | 62.8 |
| | Animal sources | 1,357 | 78.1 | 108.1 |
| **USA** | Grand total | 3,774 | 114.0 | 156.5 |
| | Vegetal sources | 2,727 | 40.2 | 84.9 |
| | Animal sources | 1,047 | 73.8 | 71.6 |

Source: Grad (2008), with data from FAOSTAT, Food Balance Sheet

The results show that Syrian levels of calories intake, while in line with those of Lebanon, Jordan and Morocco, are still sensibly lower than those in western countries such as Italy, France and the US, and somewhat lower than those in richer eastern European and north African countries such as Turkey and Tunisia (Figure 31.) The difference in terms of total calorie intakes with the western countries seem to be fully accounted by the low level of calories from animal sources, a difference that might be partly due to religious and other sociological factors, and it is not clear whether in the future we should expect Syria to reach the levels of calories and composition of western diets. My opinion is that a sensible increase on the total average calories, while keeping the current balance between vegetable and animal sources, can be expected in the near future, as the economic conditions of the average household in Syria improve. By taking as a reference the current food balance in Turkey and Tunisia, we might expect an increase of about 10% of per capita calorie intake, distributed equally between animal and vegetable products.

**Figure 31 Calorie intakes by countries, 2002**

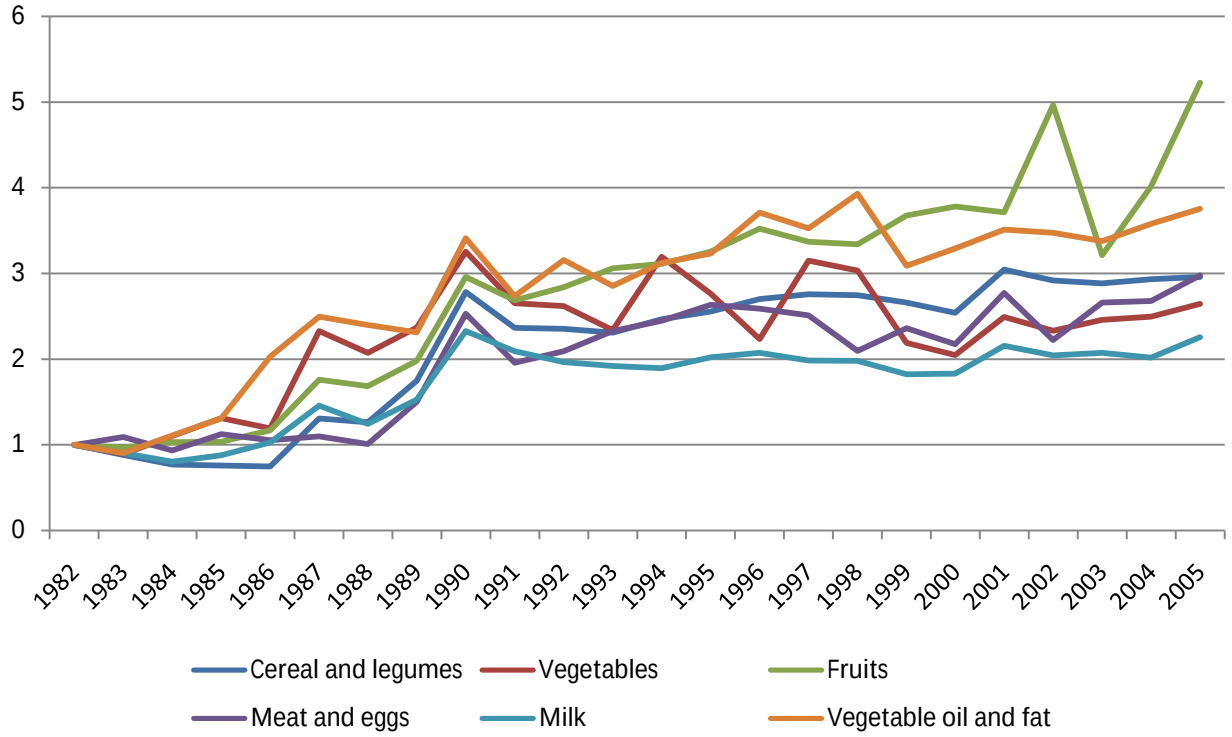



Source: Elaborated from FAOSTAT.

#### III.1.1.1. Prices, total expenditure and food expenditure

Figure 32 below, based on data presented in Grad (2008), traces the evolution of real retail prices for the food groups analyzed. It illustrates the evolution of indexes of retail prices from 1982 through 2005 and highlights, once again, two regimes in the evolution of real food prices in Syria: a strong increase in real terms from 1982 through 1990, when real prices of all foods doubled or tripled, followed by a relatively less steep increase. In the later period cereals and legumes, vegetable oils and fruits' prices have continued to increase, although at a much lower rate than before, while other products' prices have remained constant in real terms, with even a slight decreasing trends for vegetables. Particularly striking is the increase in real price volatility for fruits, meats and eggs occurred in the latest years, showing possibly some tensions in the markets while they adjust to changing conditions.

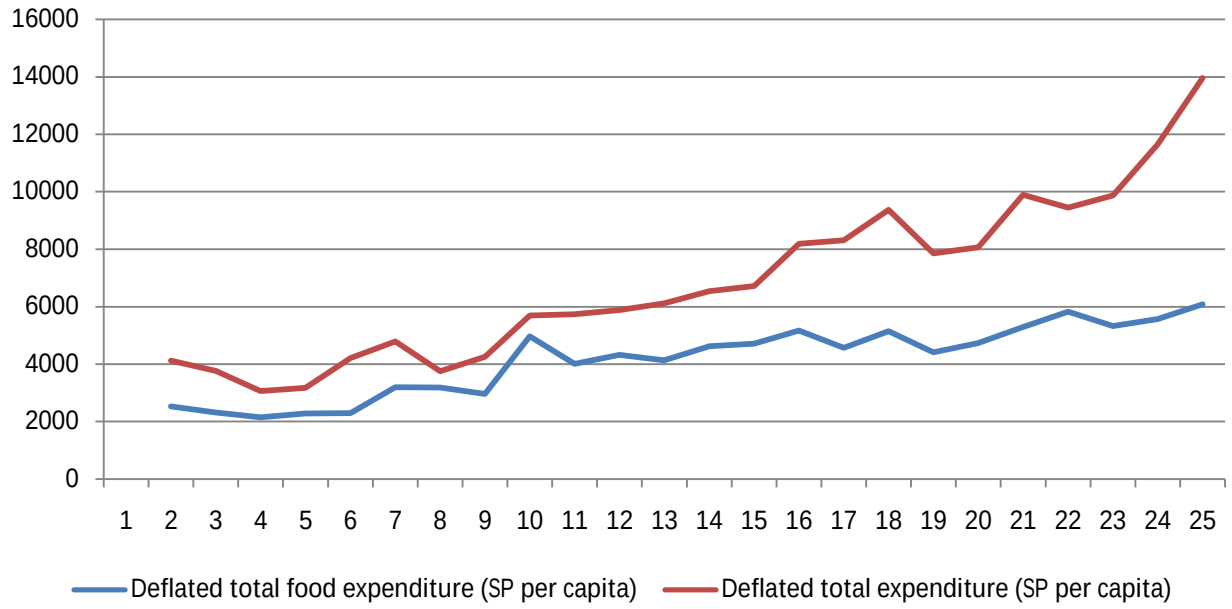
**Figure 32 Evolution of indexes of deflated retail prices of selected food groups, (1982=1)**




Source: Elaborated from MAAR – The Agricultural Annual Statistical Abstract, Various issues and CBS, ASA, Various issues.

As a result of the increased prices, per capita food expenditure in Syria has increased in real terms, although the share of income spent on food has been falling with the increase in total expenditure as predicted by Engel's Law. Figure 33 depicts the evolution of the per capita total expenditure and per capita food expenditure over the same period. Current food expenditure share is around 45% of total household expenditure.

**Figure 33 Evolution of the deflated total and per capita expenditure, 1982-2005 (SP/person)**




Source: Grad (2008) Elaborated by from MAAR – The Agricultural Annual Statistical Abstract, Various issues and CBS, ASA, Various issues.

The CBS undertakes periodic family budget surveys. These surveys are normally based on representative samples drawn from groups of different consumption expenditure levels and patterns, from all regions of the country. Table 31, adapted from Grad (2008) summarizes the data resulting from the analysis of food surveys conducted in the period from 1985 through 2004, distinguishing between urban and rural population.

The first noticeable result is that food expenditure has fallen from representing more than 51.2% and 51.9% of total expenditure in 1985/86, to shares of 39.2% and 44.4% for urban and rural population respectively, in 2003/04. The composition has also changed, with a sizeable raise in the share of income spent on cereal and derived products, which have risen from the 4.9% and 5.8% figures of 1985/86 to 12.4% and 18.7% in 2003/04 and in vegetables, which in 2003/04 accounted for more than 17%, as opposed to the 1985/86 figure of less than 13%, although the increase for vegetables expenditure is mostly due to increased prices rather than to an expansion of the quantities consumed.

Among the food categories considered, the major share of income is spent for meat, fish, and eggs, followed by cereals and vegetables.

## Table 29 Evolution of total availabilities by food groups, and population in Syria (1990-2005)

| Item | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cereals & legumes** | 3,857 | 4,004 | 3,928 | 4,512 | 4,250 | 4,495 | 4,146 | 2,537 | 4,005 | 2,756 | 3,249 | 5,221 | 4,482 | 4,877 | 4,307 | 4,506 |
| **Vegetables** | 1,598 | 1,703 | 1,627 | 1,549 | 1,625 | 1,934 | 1,808 | 1,439 | 2,038 | 1,611 | 1,850 | 1,938 | 2,307 | 2,310 | 2,508 | 2,485 |
| **Fruit** | 1,960 | 1,751 | 2,156 | 1,844 | 2,197 | 1,992 | 2,600 | 2,141 | 3,122 | 2,205 | 2,771 | 2,386 | 3,098 | 3,041 | 2,851 | 2,639 |
| **Meats &eggs** | 285 | 300 | 328 | 328 | 335 | 357 | 389 | 401 | 301 | 460 | 451 | 458 | 416 | 520 | 557 | 502 |
| **Milk & its products** | 1,410 | 1,364 | 1,355 | 1,351 | 1,293 | 1,538 | 1,600 | 1,682 | 1,828 | 1,668 | 1,685 | 1,643 | 1,798 | 1,949 | 2,150 | 2,608 |
| **Vegetable Oils & fats** | 124 | 70 | 134 | 156 | 186 | 165 | 226 | 197 | 263 | 226 | 288 | 263 | 332 | 234 | 352 | 286 |
| **Population** | 12,116 | 12,529 | 12,958 | 13,393 | 13,782 | 14,285 | 14,670 | 15,066 | 15,473 | 15,891 | 16,320 | 16,720 | 17,130 | 17,550 | 18,200 | 18,356 |

Note: Food quantity in thousand tons, population in thousands

## Table 30 Evolution of the per capita availability by food groups (1990-2005)

| Item | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cereals & legumes** | 318 | 320 | 303 | 337 | 308 | 315 | 283 | 168 | 259 | 173 | 199 | 312 | 262 | 278 | 237 | 245 |
| **Vegetables** | 132 | 136 | 126 | 116 | 118 | 135 | 123 | 96 | 132 | 101 | 113 | 116 | 135 | 132 | 138 | 135 |
| **Fruit** | 162 | 140 | 166 | 138 | 159 | 139 | 177 | 142 | 202 | 139 | 170 | 143 | 181 | 173 | 157 | 144 |
| **Meats & eggs** | 24 | 24 | 25 | 24 | 24 | 25 | 27 | 27 | 19 | 29 | 28 | 27 | 24 | 30 | 31 | 27 |
| **Milk & its products** | 116 | 109 | 105 | 101 | 94 | 108 | 109 | 112 | 118 | 105 | 103 | 98 | 105 | 111 | 118 | 142 |
| **Vegetable Oils & fats** | 10 | 6 | 10 | 12 | 13 | 12 | 15 | 13 | 17 | 14 | 18 | 16 | 19 | 13 | 19 | 16 |

Note: Food quantity, in kg/person

## Table 31 Composition of food expenditure, 1985 – 2004

| Item | 1985/86 | | | | 1996/97 | | | | 2003/04 | | | | Change 1985/86 - 2003/04 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % (1) | | % (2) | | % (1) | | % (2) | | % (1) | | % (2) | | D (1) | | D (2) | |
| | U | R | U | R | U | R | U | R | U | R | U | R | U | R | U | R |
| **Cereals and derived products** | 4.9 | 5.8 | 2.5 | 3.0 | 13.4 | 18.0 | 8.0 | 10.8 | 12.4 | 17.8 | 4.8 | 7.8 | 7.5 | 12.0 | 2.3 | 4.8 |
| **Dry legumes** | 2.6 | 3.7 | 1.4 | 1.9 | 1.4 | 1.8 | 0.8 | 1.1 | 1.1 | 1.4 | 0.4 | 0.6 | -1.5 | -2.3 | -1.0 | -1.3 |
| **Meat, fish and eggs** | 20.0 | 17.0 | 10.3 | 8.8 | 21.6 | 16.9 | 12.9 | 10.2 | 20.7 | 18.6 | 8.1 | 8.2 | 0.7 | 1.6 | -2.2 | -0.6 |
| **Dairy products** | 16.3 | 14.6 | 8.4 | 7.6 | 9.2 | 7.3 | 5.5 | 4.4 | 10.4 | 9.0 | 4.1 | 4.0 | -5.9 | -5.6 | -4.3 | -3.6 |
| **Oils and fats** | 14.5 | 18.6 | 7.5 | 9.7 | 9.6 | 13.1 | 5.7 | 7.9 | 10.4 | 12.1 | 4.1 | 5.3 | -4.1 | -6.5 | -3.4 | -4.4 |
| **Vegetables** | 12.8 | 12.6 | 6.6 | 6.6 | 16.0 | 16.6 | 9.5 | 10.0 | 17.3 | 17.5 | 6.8 | 7.7 | 4.5 | 4.9 | 0.2 | 1.1 |
| **Fruits and nuts** | 8.9 | 6.9 | 4.6 | 3.6 | 7.9 | 5.6 | 4.7 | 3.4 | 8.7 | 6.6 | 3.4 | 2.9 | -0.2 | -0.3 | -1.2 | -0.7 |
| **Other food products** | 20.0 | 20.8 | 10.2 | 10.7 | 20.9 | 20.7 | 12.3 | 12.4 | 19.1 | 17.0 | 7.5 | 7.5 | -0.9 | -3.8 | -2.7 | -3.2 |
| **Total food expenditure** | | | **51.5** | **51.9** | | | **59.4** | **60.2** | | | **39.2** | **44.0** | | | **-12.3** | **-7.9** |

% (1) = share on food expenditure
% (2) = share on total expenditure
D (1) = change in share on food expenditure
D (2) = change in share on total expenditure
U: Urban. R: Rural.
Source: Elaborated from NAPC database and CBS, Family budget survey, 2003-2004.

## III.2. Possible evolution of food consumption in Syria

As stated at the beginning of this section, the simple analysis of data on implied food availability and on actual food expenditure do not allow for identification of demand evolution separately from supply. Nevertheless, some projections can be formed based on the prospected evolution of the average per capita income of urban and rural population, and on the evolution in the share of urban population over total.

The major phenomena that we might consider are population growth, the share of urban population and the food consumption habits.

### Population growth.

Syria has shown a remarkably steady population growth over the last 25 years, leading the Country population from 9.3 million of 1982 to today's 19.7 million (2008), with a positive growth rate of between +2.5% and +2.1% in the latest ten years. Although part of the recent population growth rate is also due to the inflow of refugees from the neighboring countries of Iraq and Palestine, a phenomenon that is likely going to be much more limited in the near future, we can safely expect population growth rates of the order of to 2.0% for the next few years to come, as the death rate is falling faster than the birth rate, which, as for 2008, is still well above 25 birth per thousand inhabitants.

### Urban population share

According to the most recent population census data, in 2004 for the first time the share of urban population in Syria has significantly exceeded 50%, reaching 54% in 2004 and 2005, after having been steady at around 50% for several years before. The phenomenon is not likely going to revert, and we might expect a further increase of the share of urban population due to continued rural to urban migration, although at a slow pace that might greatly depend on the rural development policies that will be put in place. The percentage for urban population may reach the figure of 55 to 56 in the next five years.

### Consumption habits

Associated with the increase in per capita income and the share of urban population there is usually a significant change in the food consumption habits, as traditional markets and food shops are substituted by larger supermarkets, and as the number of meals consumed away from home increases, when more women are employed in the formal labor in urban areas. The organization of the working day is in Syria today is still compatible with home food consumption for the majority of the population, even in the urban areas, although in the future we cannot exclude that an extended work day with a lunch break will become more customary, at least among urban workers in the private sector, as it has historically happened in other countries following urbanization.[18]

If these projections are correct, we may expect a gradual change in consumption habits, with an increased share of processed and ready-to-eat products and a decrease of fresh meat and vegetables. In

[18] The working hours for public employees in Syria (still the majority of the work force) are from 8:15 to 15:00 in the urban areas and from 8:30 to 14:30 in the rural areas. People working in the education system work generally from 7:30 to 13:00 (or from 8:00 to 13:30 in the rural areas. These working hours are compatible with taking all major meals at home. The fast growing workforce in the private sector, however, have longer working hours: usually from 9:00 to 17:00, and often they would take one of the two main meals out of home.

terms of food categories, this would imply an increased share of cereals and derived products, milk and dairy products, and vegetable oils and fats. Also, although the expenditure in vegetables might increase, a larger share of value added will be appropriated by the food industry in preparing fast-foods, ready-to-eat vegetables and salad mixes.

The possible evolution of food consumption in Syria will thus depend on the combined effects of these factors and it is difficult to produce reliable quantitative estimates of how the domestic demand for agricultural products is going to evolve.

One possible prediction, based on the discussion so far, is that the domestic demand of agricultural products such as **wheat, vegetable oils and sugar** will **increase substantially**, at a rate of 3% to 4% a year, as will the demand for **products of the dairy and fruit and vegetable based industries**. Total domestic meat demand (which is already very high in Syria compared to that of comparable income level countries) on the other hand, is likely to remain stationary, at least for lamb and poultry, and will likely increase for beef, as western style food habits will spread.

If we add to this the pressures that are coming from the potential export markets, the conclusion that we can safely draw is that the domestic agricultural sector and food industry are required to undergo a significant change, if they want to respond to these challenges.

# IV. Elements for the creation of a structural model of Syrian Agriculture

## IV.1. Introduction

This chapter reports the current status of an ongoing research project being conducted by the staff of the AgroFood System division at NAPC.[19]

The research aims at developing a comprehensive model of Syrian agricultural production and is admittedly a very ambitious and challenging task. Nevertheless, the future that is likely to be ahead of Syrian agriculture is a peculiar one, and several *structural* changes are likely to occur in a short term, which makes the task of any researcher who is interested in modeling the sector to the aim of forecasting, particularly difficult.

A common modeling approach used in market economies stands on the assumption that *synthetic* information on prices and cropped area that have been formed in the past contain all the relevant information for developing *reduced form* descriptive models that can be used to predict the likely future evolution of the same variables. The approach is highly based on *time series analysis* techniques and, despite several criticisms, can be considered reliable *if no structural change occurs during the prediction horizon.*

This is certainly not the situation of Syria. Prices for the major agricultural commodities have been institutionally determined in the past, as have licensed areas. The determination of the levels of prices and of the area to be licensed to each specific crops have been based on *political* rather than bare economic efficiency criteria. This makes the time series based approach to analyze supply response in agriculture totally unfeasible. The most valuable result that even the more recent sophisticated econometric approach applied to the past data would obtain, would be to "uncover" what the political decision process has been in the past, an information that is going to be of very limited usefulness to those who have been taking those decisions. If an empirical analysis has to be useful to inform the policy making process in the future, it should be able to provide indications on what the agricultural sector can do and will do, under alternative policy frameworks, likely to be based on wider and more flexible decisions by the private sector (farmers, processors, and traders) than ever in the past.

For this reasons, the *only* modeling approach that is available to the researchers is a *structural* one, in which the fundamental physical and institutional constraints that determine agricultural output are explicitly modeled, so that they can be opportunely modified in *scenario analyses* to predict the likely impact of predicted evolution in both domestic and external conditions.

The remaining part of this chapter reports on the preliminary results that this approach has already produced and that have been included as part of his Masters' dissertation. We believe that the results are encouraging and that the time and resources spent in developing the model have already had (and will have even more in the future) an enormous return in terms of NAPC ability in assisting the agricultural policy making process in the future.

[19] The research is being conducted by Mr. Ahmad Sadiddin with the assistance of Ms. Basima Atiya.

The sections will describe, in sequence, the way in which representative farming systems have been modeled, the assumptions that have been made in terms of behavioral determinants of farmers and their families and in terms of the representation of the institutional settings that have led to the mathematical programming formulation, and a preliminary set of results which refer to one of the most sensitive and strategic part of the Syrian agriculture. [20]

## IV.2. Representative farming systems

The analytical tool to be used in this research is the modelling of representative farms through mathematical linear programming. In order to apply this method, the farms of Syria should be classified in a relatively small number of representative farm types. This classification should take the following criteria into consideration:

1. the cultivation mode of a farm whether irrigated or rainfed, which is very important since it significantly affects farm costs, structure, cropping patterns, etc.
2. the boundaries that separate different administative districts (mantikas). This is useful because data collection by governmental agencies is mainly based on these boundaries.
3. the boundaries that separate agro-ecological zones. This is necessary as many data collected by governmental agencies are also based on these boundaries. In addition, different agro-ecological zones have important effects on irrigation requirements (i.e. water use) of the cultivated crops in different areas since these zones are determined according to the average level of rainfalls. In general, the higher the rainfall the lower the irrigation requirements, holdiong all other things constant.
4. the sources of irrigation water, which are can be classified in three main types in Syria: private wells, public nets, and rivers. Water source usually affects water cost, which, in turn, affects water use.
5. the farm size (e.g. small, medium, or large), which has an impact on the economy of scale, affecting, in turn, the overall profitability of the farm as well as its capability to innovate and adopte new technologies.
6. the cropping patterns, as different farms might grow different crops reflecitng specialisation. This affects irrigation water use because different crops have different irrigation requirements.
7. the irrigation techniques, which can be generally categorised into flood, drip, or sprinkler schemes. They clearly have an impact on water use, since modern techniques tend to save water in comparison with the flood traditional technique. In addition, modern irrigation schemes affect the composition of production costs which influence the decision making of farmers.

Therefore, in order to estimate the supply of agricultural output and the derived demands for inputs, we need a model that represents the aggregate behaviour of the agricultural producing sector in Syria. The model used in this study is based on a bottom-top approach. We start modelling the behaviour of individual farming systems, which enables us to estimate the supply function and the derived demands' functions for each individual farming. By aggregating the supply and demands of individual farming

[20] For further reference, see Atiya and Sadiddin (2009) and Sadiddin (2009)

systems, we reach the aggregate supply of agricultural output and the derived aggregate demands for inputs such as water and labour at the governorate as well as the national levels. This can then be used in assessing the incidence of possible alternative policies at both levels.

To derive these functions, we need first to make an assumption about the overall objective at the farm level. In our research, we assumed that Syrian farmers have the objective of profits maximization, in which profits are expressed in terms of gross margins obtained from the overall activities carried out at the farm level. The choice of such an assumption is not without evidence.

A previous study has shown that food production for the sake of home consumption is rare and confined to some vegetables mainly grown in home gardens. The same study has also confirmed clearly the market-oriented behavior of the major part of Syrian farming systems, which justify very much the assumption of profit-maximization. Although many Syrian farming systems produce many crops that are sold to governmental agencies and whose productions are organized through the annual agricultural plan, the incentive systems that are offered to farmers motivate them to follow a profit-maximization behavior (Wattenbach, 2006).

By the incentive systems, we mean the set of policy instruments that the Government uses to motivate farmers to produce crops in line with the annual production plan. These are mainly prices that are set higher than what would prevail if markets were left to interact freely, and licensing systems to prevent farmers from producing more than needed under the threat of not receiving the supported price.

## IV.3. Mathematical programming models of agricultural production in Syria

The production function of a farm can be given by:

$$h(\underline{q}, \underline{x}, \underline{z}) = 0 \qquad (1)$$

where $\underline{q}$ is the vector of output quantities, $\underline{x}$ is the vector of variable input quantities, and $\underline{z}$ is the vector of fixed factor quantities. Variable inputs are usually hired labor, fertilizers and other chemicals, seeds, hired machinery, and all other inputs that can be purchased in desired quantities. Fixed factors are private factors that cannot be acquired in the time span analyzed such as land and equipment, and public factors such as roads and extension services and other exogenous features such as weather and distance from markets.

Assuming that $\underline{p}$ and $\underline{w}$ are the prices of outputs and inputs respectively, the producer's gross margin is given by $\underline{p}'\underline{q} - \underline{w}'\underline{x}$. Assuming that the producer is a profit-maximizer subject to technology constraint, we can formulate the producer's problem by:

$$\text{Max } (\underline{p}'\underline{q} - \underline{w}'\underline{x}), \text{ s.t. } h(\underline{q}, \underline{x}, \underline{z}) = 0 \qquad (2)$$

The solution to this problem provides a set of output's supply and input's demand functions at the individual farm level, which heavily depend on the technology described in the production function (1).

One widely used method of solving problem (2) is *linear programming* which requires some simplifying assumptions:

a) the technology is described by

$$A\underline{q} \text{ £ } \underline{z} \qquad (3)$$

where:

A is a matrix of technical coefficients expressing the unit requirements of fixed resources.

The typical elements of this matrix, $a_{ji}$, would indicate the amount of the $j$-th fixed factor required to produce one unit of $i$-th output. Typical relevant fixed resources include land (possibly distinct between rain-fed and irrigated), family labor, hired labor (possibly by season or month), liquidity, water, etc.

Additional rows to the matrix $A$ can be included to describe the relevant technological constraints, such as cropping rotation requirements, licensing systems, etc.

Another condition required to use linear programming is on the technology at the individual farming system level. The simplest one is to assume fixed coefficients, which implies constant marginal costs. This assumption requires that the production costs and total outputs of various crops are given per area unit (per hectare e.g.).

Given the above assumptions, the model formulae given by equations (2) and (3) are manipulated as follows:

$$\text{Max GM} = \Sigma_i (p_i y_i - c_i) h_i, \text{ for i =1, 2,....,m} \qquad (5)$$

Subject to:

$\Sigma_i h_i \le H$ that is, total cropped area must be less or equal to the farm size

$\Sigma_i a_{ji} h_i \le z_j$ for all j; total use of fixed resources cannot exceed its availability

$\mathbf{f}(h_1, h_2, \ldots, h_n) \le \mathbf{0}$ the set of other agronomic rotation requirements and policy constraints

where:

GM is the total gross margin of the farmer;

H is the total farm size;

$p_i$ is the price of the product of the i-th crop;

$y_i$ is the yield of the i-th crop;

$c_i$ is the per area unit variable costs of the i-th crop;

$h_i$ is the area cultivated with the i-th crop;

$z_j$ is the availability of the j-th resource (such as water);

$a_{ji}$ is the requirement of the j-th resource for one unit of land cultivated with the i-th crop;

the function **f**(.) defines a set of constraints on the relative dimension of the various crop areas to obey agronomic requirements (such as, for example, to define the rotations among crops), or to obey a policy constraint such as the licensing system.[21]

## IV.4. Preliminary results

This chapter is devoted to summarize some preliminary results of the analysis. The results shown in this chapter are partial in terms of geographical coverage since they are confined to Al-Hassakeh governorate. They are also not final as they may be modified based on further analysis and calibration,

[21] For further details, see Sadiddin (2007, 2008)

and we present them now to boost discussions that might well feedback into further analysis producing a better quality of the final results.

Simulations are performed on the basis of the existing directions of the Syrian agricultural policy, including the most recent policy reforms that affect the agricultural sector, namely the change in the prices of diesel fuel and of strategic crops as well as the subsidy devoted to cotton produced on land irrigated from wells. In particular, after calibrating the mathematical programming model according the prices prevailing in the reference year of the study (2005), we considered,

- the increase in diesel fuel from about 7 SP/liter to 25 SP/liter,

and the following increases in strategic crop prices:

- cotton from 30.75 SP/kg to 41 SP/kg
- wheat from 12 SP/kg to 16.5 SP/kg
- barley from 9 SP/kg to 15 SP/kg
- sugar beet from 2.25 SP/kg to 3.75 SP/kg.

while all other things are kept unchanged.

The simulations aimed at measuring:

1. the effect of wheat price change on wheat output and total water use.
2. the effect of cotton price change on cotton output and total water use
3. the impact of introducing cumin into the cropping patterns on water use.
4. the impact of modernizing the irrigation schemes on water use
5. the impact of changing water costs on the outputs of cotton and wheat as well as on water use.

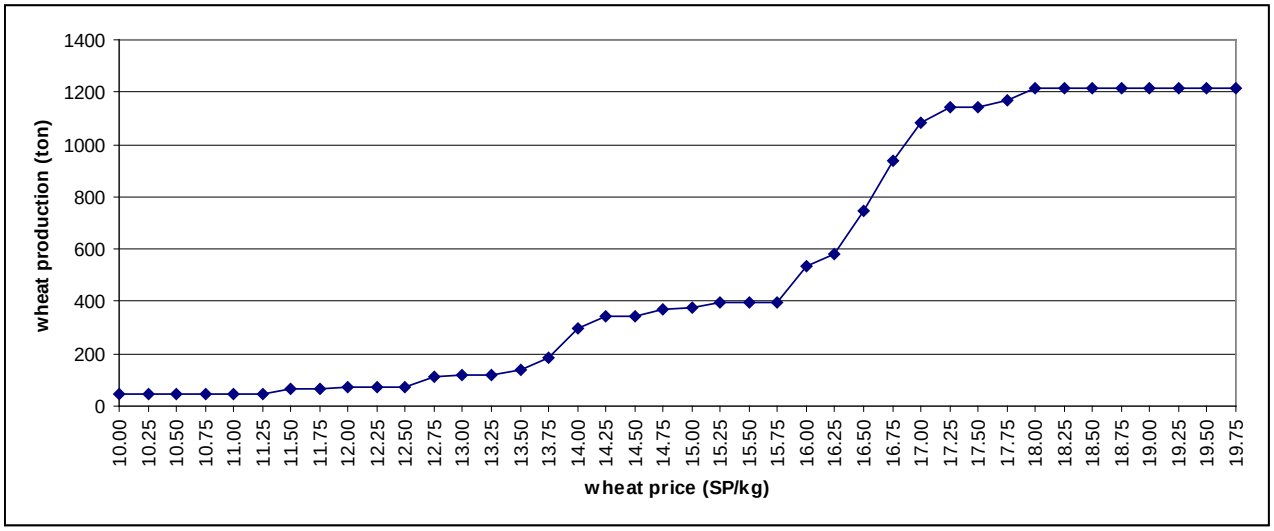
Barley is not considered at the level of Al-Hassakeh governorate due to its negligible share in its cropping patterns that are dominated by cotton and wheat in the irrigated farms, and wheat and lentil in the rainfed farms. Sugar beet, on the other hand, is not grown at all in Al-Hassakeh.

### IV.4.1. The impact of wheat price change on wheat output and total water use

This scenario aimes at assessing the impact of wheat pricing policy change on wheat output and water use. It is performed by a gradual reduction of wheat rpice while tracing its impact on wheat output and water use at each step. The result is summarised in a set of figures. Figure 34 shows that wheat production in Al-Hasakeh remains very low when the price of wheat is lower or equal to about 13 SP/kg. However, the increase in output becomes dramatic as price is raised to 16 SP/kg, which is more/less the floor price of wheat set by the GOS in the recent reform.

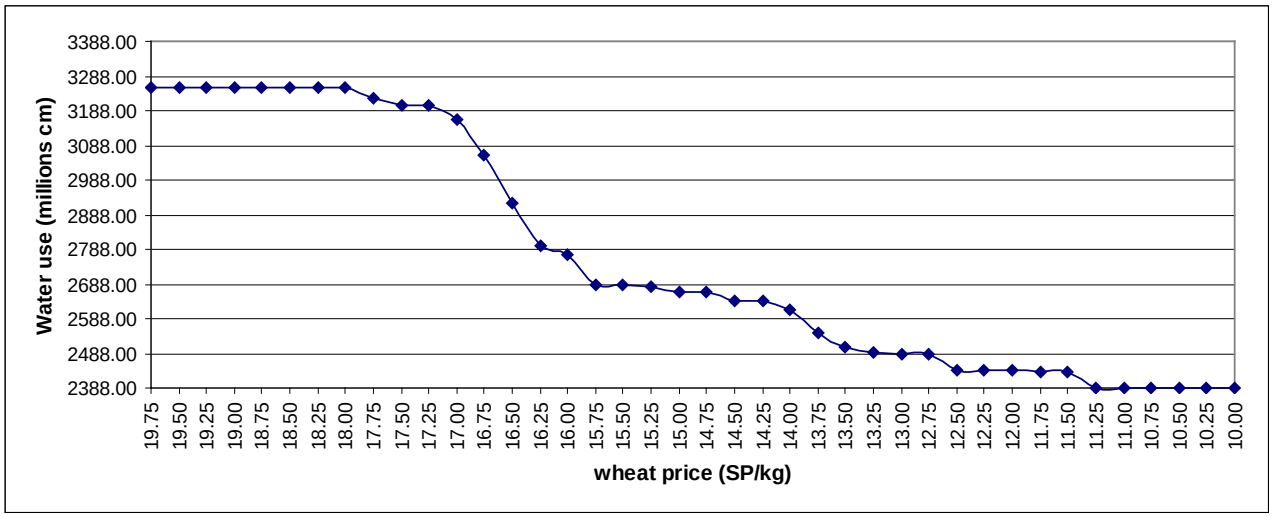
Figure 35, on the other hand, summarises the impact of wheat price change on water consumtion. It shows that as decreasing the wheat price up to 11 SP/kg would result in a reduction in water use from about 3,300 million $m^3$ to less than 2,388 million $cm^3$. Consequently, water deficit would be eliminated only when wheat price reaches 11 SP/kg, as shown in Figure 36.

## Figure 34 The impact of wheat price change on wheat output



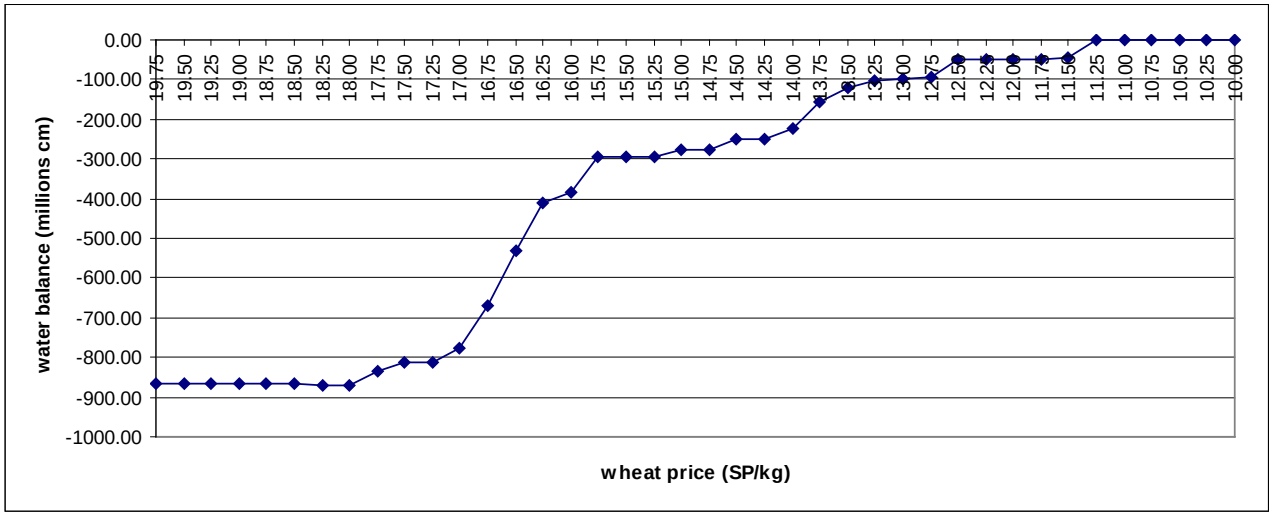

Source: Sadiddin (2009)

## Figure 35 Impact of wheat price change on water use




Source: Sadiddin (2009)

**Figure 36 Impact of wheat price change on water balance**

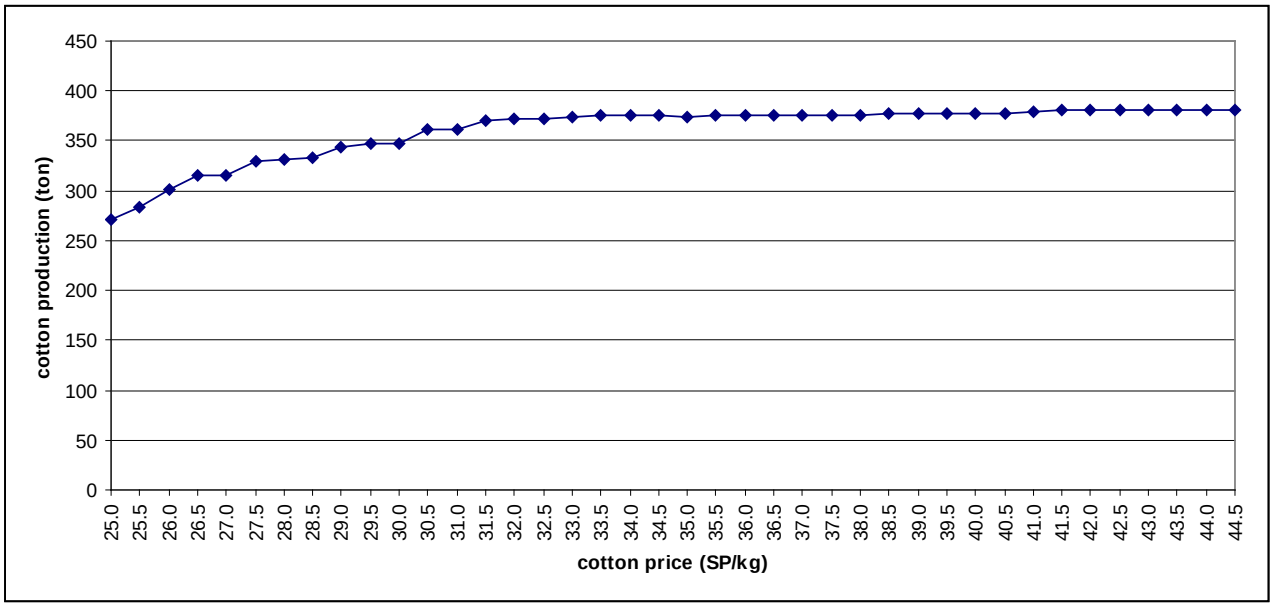



Source: Sadiddin (2009)

### IV.4.2. The impact of cotton price change on cotton output and total water use

The second scenario aimes to assess the impact of cotton pricing policy cotton output and water use. It was carried out by degreasing gradually the price of cotton while tracing the resulting changes in output and water use. Figure 37 below suggests a considerable increase in cotton output when price is increased from 25 to about 30 SP/kg. This suggests that the new official price of cotton that have a national average of about about 37 SP/kg is very advantageous for cotton producers in Al-Hassakeh. However, Figure 38 suggests that to reduce water consumption by significant amount (as a result of reducing cotton production, given that cotton is the most demanding crop in terms of water), cotton price should be decreased significantly.

**Figure 37 Impact of cotton price on cotton output**

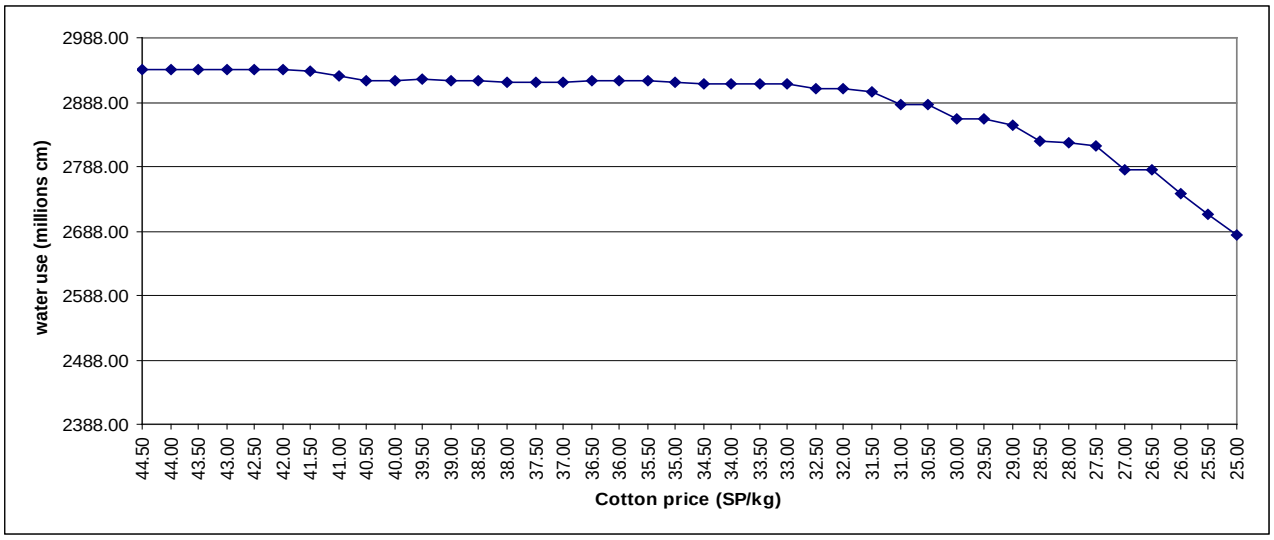



Source: Sadiddin (2009)

The results suggest that there would still be an important deficit (of about 300 million CMs) even when cotton price goes down to a very low value as 25 SP/kg (Figure 39).

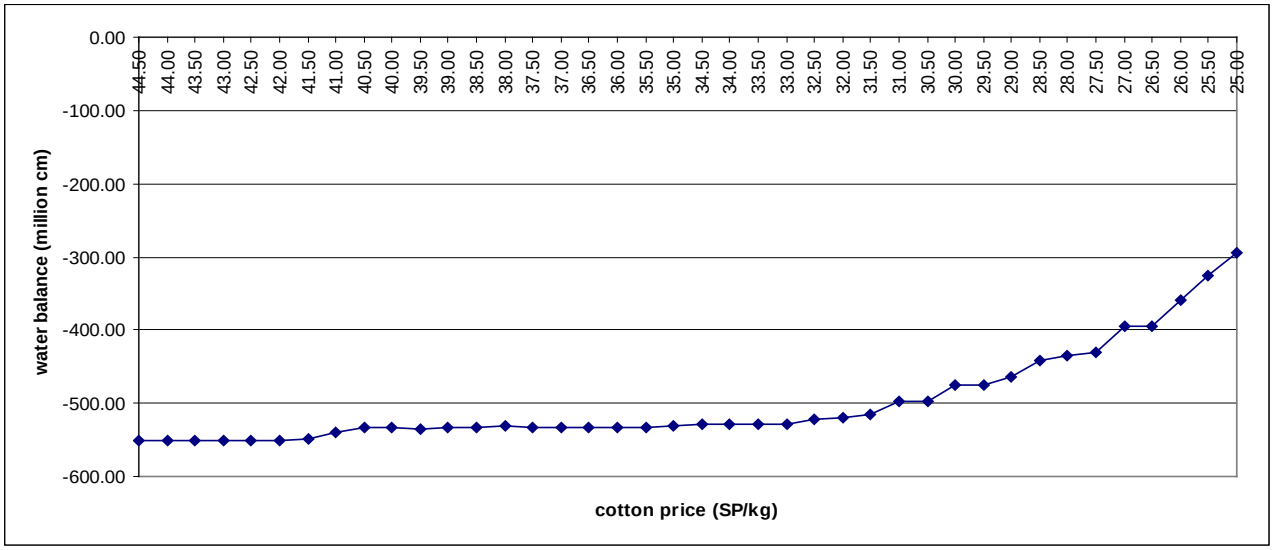
With reference to Figure 40, there appear to be no change in the cropping pattern occurs when the price goes down to 32.5 SP/kg, suggesting that the current price generates high gross margins for Al-Hassakeh farmers. The relative decrease in water use would only occur if some land cultivated with cotton is switched to wheat. If cotton price reached t price 30 SP/kg, barley may start to replace cotton, in addition to increasing the areas of wheat replacing cotton too.

**Figure 38 Impact of cotton price change on water use**



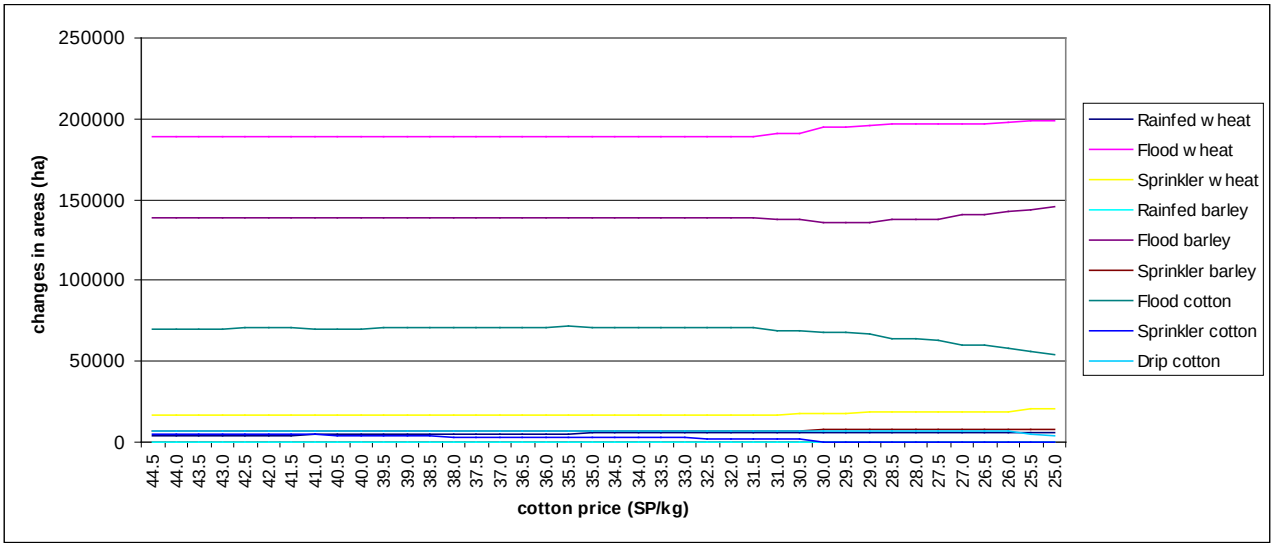

Source: Sadiddin (2009)

**Figure 39 Impact of cotton price change on water balance**




Source: Sadiddin (2009)

**Figure 40 Impact of cotton price change on cropping pattern**

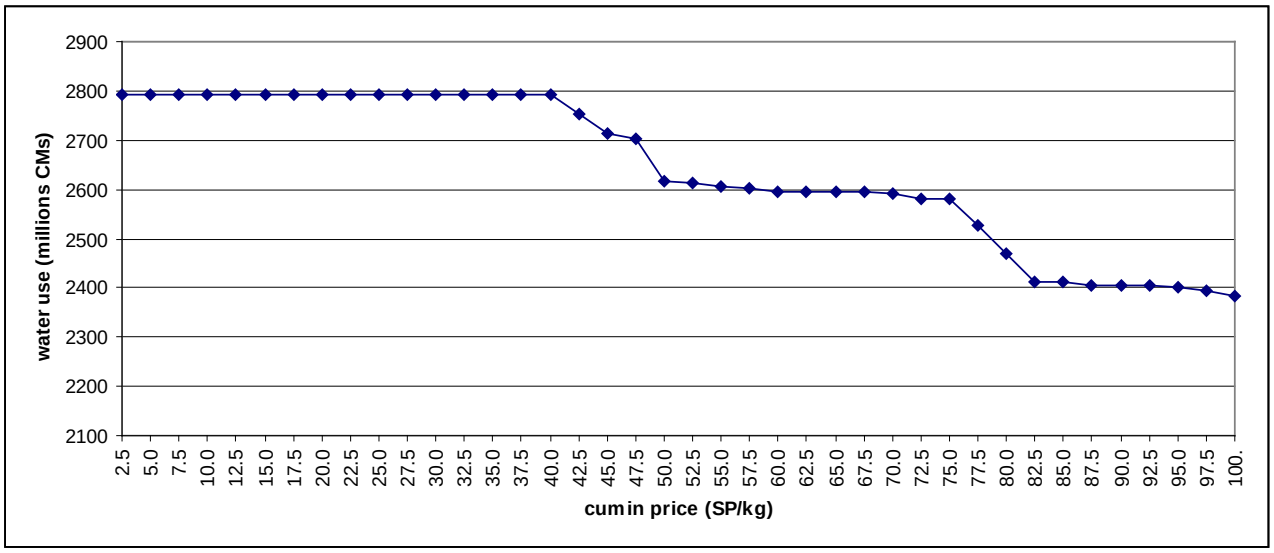



Source: Sadiddin (2009)

### IV.4.3. The impact of introducing cumin on water use

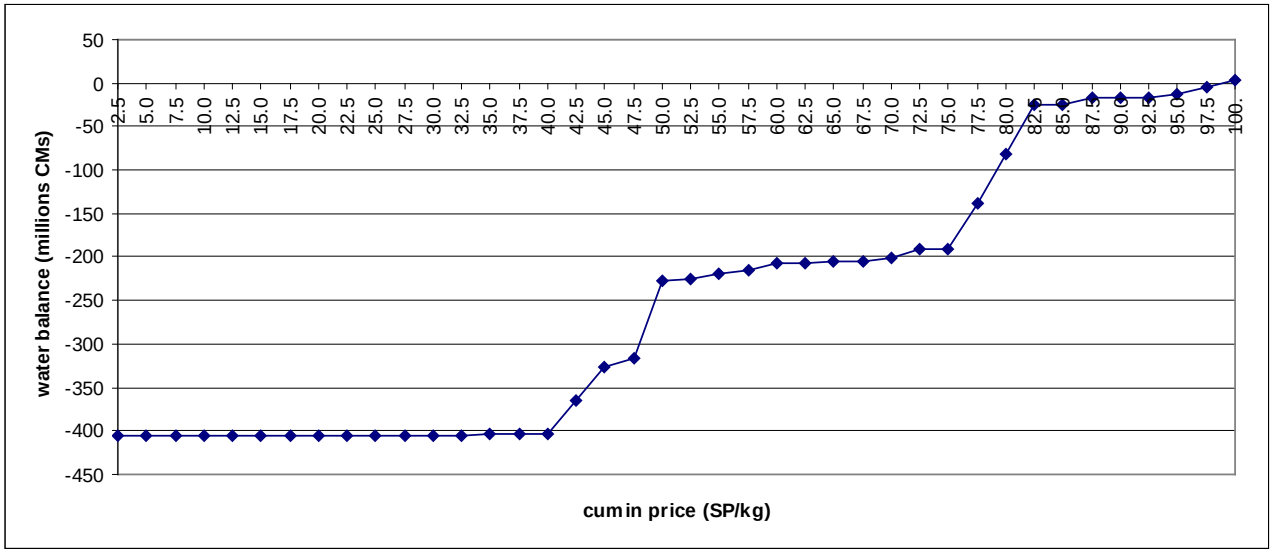
This scenario aims to evaluate the impact of introducing cumin into the cropping pattern. In the initial situation, cumin price is set equal to zero to simplify all the constraints that prevent cumin cultivation although its price has recently been very high. Therefore, the introduction of cumin into the cropping patterns is performed by raising its price, to simplify that all constraints (cfr. Sadiddin 2009, Chapter 3) are erased by a policy action. Figure 41 describes the impact of changing cumin price on water use, suggesting that water use starts to decrease when cumin price reaches about 30 SP/kg. After that, it continues to go down almost steadily.

**Figure 41 Impact of cumin price change on water use**




Source: Sadiddin (2009)

**Figure 42 Impact of cumin price change on water balance**




Source: Sadiddin (2009)

Figure 42, on the other hand, shows that water deficit disappears only when cumin price becomes more than 100 SP/kg.

### IV.4.4. The impact of modernizing the irrigation schemes on water use

This scenario intends to assess the impact of switching all irrigated farms of Al-Hassakeh to the modern irrigation techniques, whether sprinkler, drip, or both. The initial solution of the model results in a total water use of 3,303 millions $m^3$ before introducing the recent policy reforms, and of 2,793.3 million $m^3$.after adjusting the model to include the foreseeable effects of those reforms. Given that the current annual water availability in Al-Hassakeh is about 2,388 millions $m^3$, we have a deficit of about 915 millions $m^3$ and 405 million $m^3$, respectively.

This simulation is composed of three scenarios. The first is to allow all farms to adopt sprinkler schemes only. The second is to allow all farms to switch to drip technique only, and the third is to allow all farms to have both techniques. The rationale behind the last scenario is that modern irrigation schemes are crop-specific, whereas sprinkler is suited for wheat and barley and drip is suited for cotton only, although the latter might be irrigated by sprinkers too. Therefore, farms who already have a sprinkler scheme use it to irrigate all crops, but farms with only drip technique use it for cotton only. But there are some farms who have both techniques, so they use the sprinkler for wheat and barley and drip for cotton.

Table 32 summarizes the results of the three scenarios. It shows that the switch to drip method saves water more than the switch to sprinkler method does, although drip technique suits cotton only, as mentioned above, and therefore wheat and barley, in this scenario, would continue to be irrigated by the original method which is mostly flood. Water saving would be maximized when all farmers convert from flood to either sprinkler or, where feasible, flood. In this last case, although there would be a significant decrease, there would still be a considerable deficit amounting at about 35 million $m^3$. (Varela-Ortega *et al* 2001).

**Table 32 Impact of adopting modern irrigation on water use and balance**

| Scenario | Water use (millions CM) | Water availability (millions CM) | Water balance (millions CM) |
|---|---|---|---|
| Baseline situation | 3,303.24 | 2,388 | - 915.24 |
| After price policy reform | 2,793.30 | | - 405.30 |
| Sprinkler only | 2,587.20 | 2,388 | - 199.20 |
| Drip only | 2,562.38 | 2,388 | - 174.38 |
| All to both | 2,422.86 | 2,388 | - 34.86 |

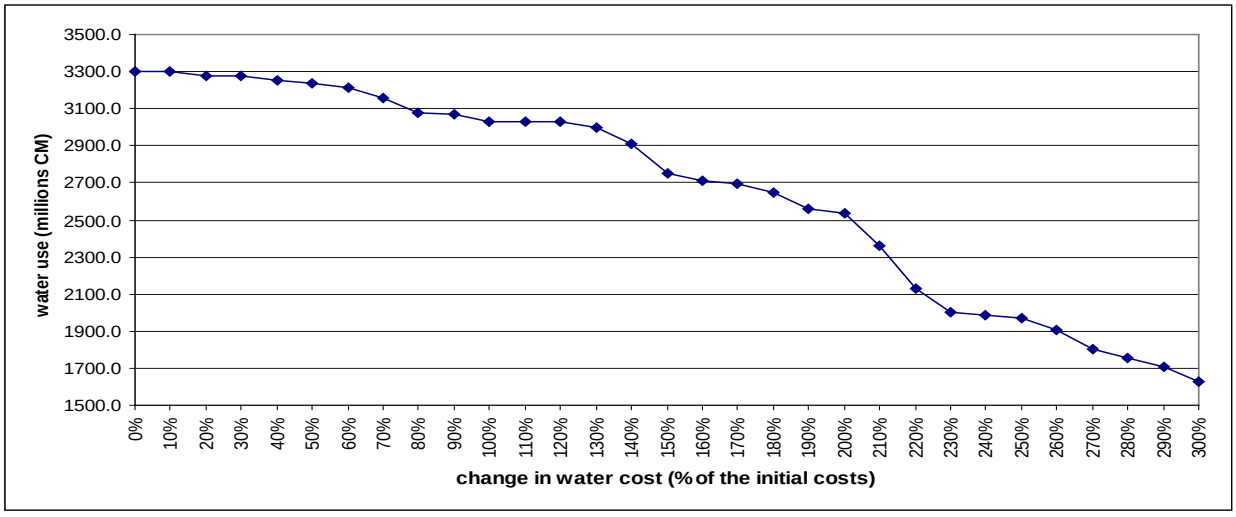
Source: Sadiddin (2009)

### IV.4.5. The impact of changing water costs on water use

This scenario aims at assessing the impact of increasing water costs on water use and balance. Diesel cost accounts for more than 95% of the total costs for flood irrigation schemes, while the rest is the cost of oil and repairs. For drip and sprinkler, a significant part of the costs is due to the costs of irrigation schemes. Due to the significant differences in water costs among farm types and different irrigation techniques in the same farm type, the increase in water cost is expressed in percentages with respect to the initial values. The increase in water costs proposed here would mainly result from an incease in diesel price. Figure 43shows the change in water use as water costs increase, suggesting a gradual but steady decrease in water use. However, water costs have to increase by more than 200% in order to restore the deficit (Figure 44).

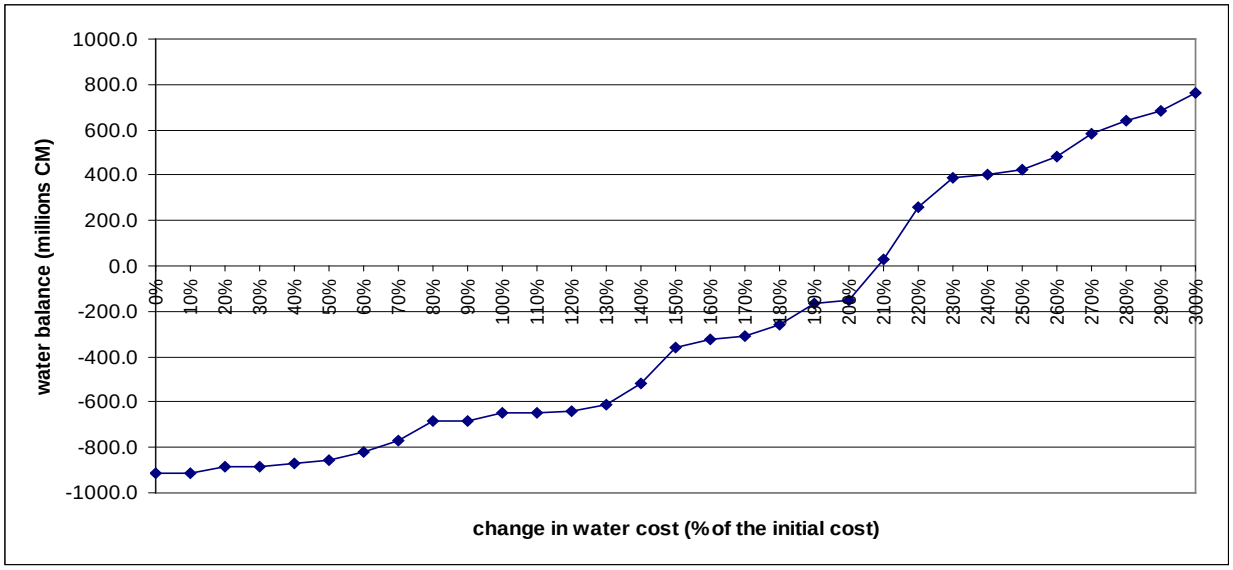
This decrease in water use is due, at the beginning, to the switch of land cultivated with irrigated wheat to rainfed wheat. When water costs increase by 70%, land cultivated with cotton in the farms of sprinkler irrigation starts to go down, switching to mainly to rainfed wheat, but after increasing water costs by 150% it also switches to flood-irrigated barley. The latter fluctuates very much after the increase of 200% (Figure 45).

**Figure 43 Impact of water costs change on water use**



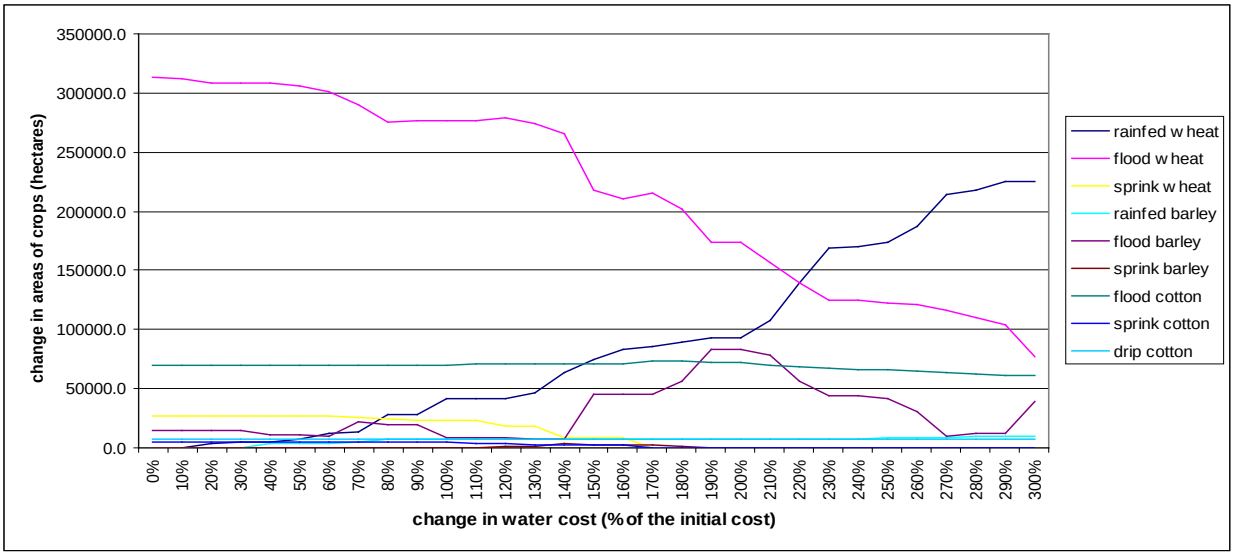

Source: Sadiddin (2009)

**Figure 44 Impact of water costs change on water balance**




Source: Sadiddin (2009)

**Figure 45 Impact of water costs change on cropping pattern**



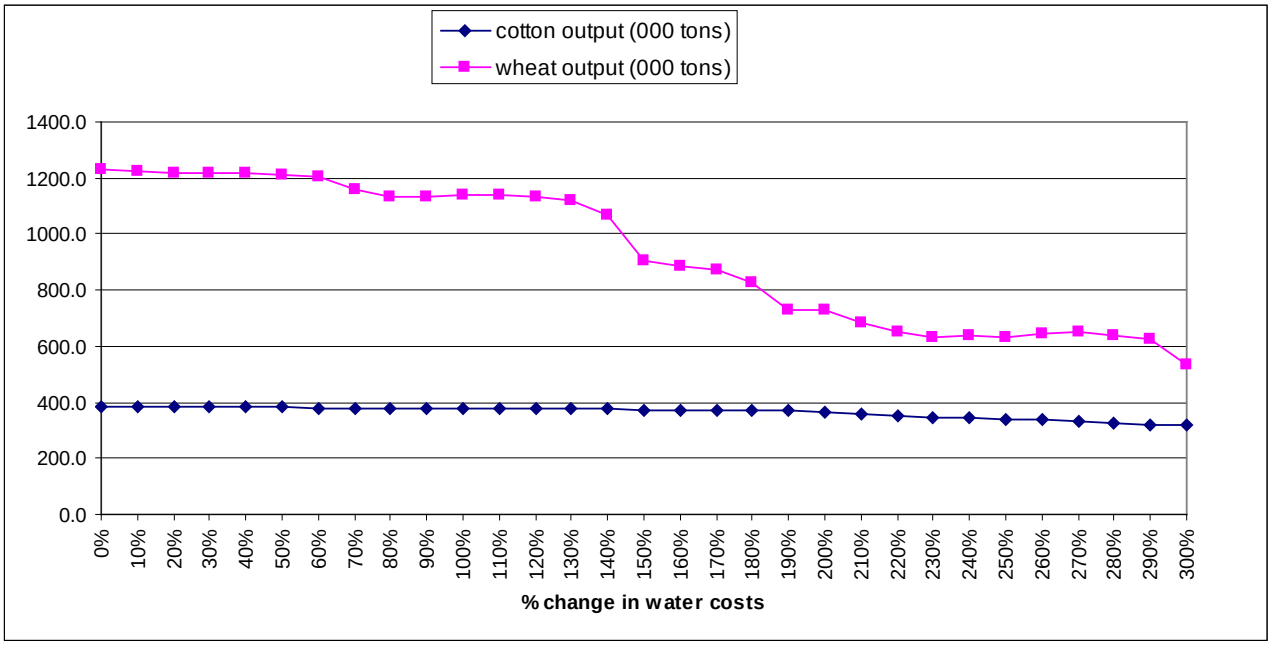

Source: Sadiddin (2009)

### IV.4.6. The impact of changing water costs on the outputs of cotton and wheat

It is suggested in the previous section that water balance in Al-Khabour basin cannot be restored until water costs increase by about 200% (all other things being equal). However, it must be noted now that this would be due to a dramatic decrease in the areas planted with wheat causing a significant reduction in wheat output. Figure 46 shows that while cotton output seems to maintain some stability (due to its advantageous price indicated above), wheat output tends to go down dramatically after an increase in water costs of 60%. This has important implication for policy makers, especially that the Government is now considering a reform to the subsidy policy of petroleum products. It must be noted

that wheat producers may be very much worse-off, and some may stop producing, if diesel price was raised without any other compensational measures.

**Figure 46 Impact of water costs change on wheat and cotton outputs**




Source: Sadiddin (2009)

# V. Mid term prospects

In light of all the results presented in the previous parts of this report, in this chapter I will elaborate on the current prospects for Syrian agricultural products, to the aim of defining the possible opportunities and constraints that are likely to be confronted by Syrian farmers in the near future.

As it should appear quite evident, such prospects will likely depend on three major sets of determinants:

(a) the natural and socio economic conditions faced by Syrian farmers and detailed in the first chapter of this report.
(b) the evolution in the policy regime that governs Syrian agricultural, and
(c) the prospects for the major current and potential agricultural production of Syria on the World markets.

While no dramatic change is to be expected in the natural conditions under which Syrian farmers operate, for all the other relevant determinants we face a period of high uncertainty.

In terms of policy environment, while the process of gradual liberalization and market orientation that the GoS has entertained, starting with the issue of the latest ten year plan is certainly going to proceed, the speed at which it will do so is highly uncertain.

Over last two seasons, 2007 and 2008, accompanying the tensions on the world food markets due to the rising prices, many Governments throughout the World have tightened agricultural export restrictions, to counteract high domestic inflation and in an attempt to help domestic producers. This phenomenon can be considered as part of a more general one of increased suspect towards free-market oriented policies and liberal international trade that is involving all countries throughout the World, also as a response to the deeply felt (but poorly understood) financial crisis that is hitting most economies. The point is that, in my opinion, it may well become a factor that will be taken into account by the GoS in deciding to "slow down" on the gradual opening of agriculture to the market forces, and therefore to indulge in a strong regulation of agricultural production planning. This may be particularly intense with reference to wheat, given its strategic importance as a food grain.

Also, because of the same turmoil that is affecting the World economy, there is wide uncertainty on which conditions might prevail in terms of World agricultural commodity prices in the future. We have been witnessing what has been termed by many a "food crisis" linked to the rapid rise of prices of corn and wheat, in the summer of 2007 and until late spring of 2008, followed by the even sharper increase in rice price, a process which has then reverted in the latest months (as of the date of closing this report, rice and cereal prices have fallen to levels that prevailed in 2006) .

Among the many causes that analysts have pointed at for the sharp increases in food prices, the high price of oil and the corresponding increased interests towards biofuels is the one that have received the most credit, although the arguments that have been advanced to support that claim do not seem to be very strong. In short, it is not at all clear that we are now in a different price regime for agricultural products and that the secular decline in real terms of trade has been broken. The spike that we have witnessed in the 2007/08 season might arguably be the result of low levels of effective stocks. As reported in the latest OECD-FAO Agricultural Outlook, the fundamental supply and demand factors leading to market unbalance have occurred "after there had already been a run-down in stocks, which, under more normal circumstances could have dampened price movements" (OECD-FAO, 2008, p. 37).

If this latter interpretation of the recent history of agricultural prices is correct, then there are no reasons to believe that worldwide terms of trade for agriculture have changed, and that therefore prices have moved to a higher level than in the past. The only thing that one can say for sure, is that if the conditions that have led to reduced stock accumulation in the past will continue to exist in the future, then global agricultural market might be riskier than they have been in the twenty years preceding the recent crisis. As it is clearly stated in the latest Food Outlook issue just released by FAO, "uncertainty is emerging as a dominant feature of world agricultural markets" (FAO, 2008, p.1) If this will be true or not, will mostly depend on the *political* decisions that are currently being made in many countries including Europe and the United States, of a shift towards stronger government intervention in control and regulation of financial and commodity markets.

With these caveats in mind, we will proceed now to the attempt at presenting what are the prospects for the major Syrian agricultural commodities.

## V.1. Global prospects of major agricultural commodities

There are two major sources currently available for agricultural forecasts, namely the OECD/FAO Agricultural Outlook, and the agricultural commodity section of the Prospects for the Global Economy at the World Bank, Prospects group.

In the following, repeated reference will be made to these two sources. In particular, reference will be made to the 2008-2017 OECD-FAO Agricultural Outlook, released on July 25, 2008 – arguably the most authoritative available source on mid-term forecasts on the agricultural markets, and to the section on agricultural commodities of the global prospect forecasts.

In evaluating the reliability of the estimates, it is worth to note that the editors of the OECD/FAO Agricultural Outlook themselves admit that their task, this year, has been more challenging than ever before (FAO/OECD, 2008, p.16), a consideration backed-up by authors of the latest "Global Economic Prospect-2009" report, according to which "forecasting future demand, supply, and prices in commodity markets is –at best – a hazardous undertaking" (World Bank, 2009, p.85)

Table 33 and Table 34 below report the forecasted prices for a selected number of commodities, as produced by the World Bank and the FAO/OECD respectively. The World Bank forecasts are more recent, and therefore reflect already the reversion of prices towards their long run average that we have been witnessing in the latest two months, and therefore they are significantly lower for wheat and maize than the corresponding forecast from the FAO/OECD.

**Table 33 World Bank's selected commodity price forecasts (real prices)**

| | 2007 | 2008 | 2009 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|
| **Wheat, US, HRW, $/mt** | 216 | 256 | 194 | 196 | 197 | 197 |
| **Maize, $/mt** | 139 | 175 | 126 | 127 | 127 | 125 |
| **Rice, Thailand, 5%, $/mt** | 277 | 513 | 339 | 343 | 343 | 344 |
| **Ginned cotton, $/mt** | 1180 | 1240 | 1140 | 1140 | 1170 | 1070 |

Note: World Bank Data for 2008 are preliminary estimates and data for 2009 - 2020 are forecasts.
$ = US dollar; c = US cents; bbl = barrel; mt = metric ton (1,000 kg);
Source: World Bank. Forecasts were prepared November 4, 2008 - Development Prospects Group, World Bank.

**Table 34 OECD/FAO selected world commodity prices forecasts** [a]

| | Average 02/03-06/07 | 07/08 | est.08/09 | 09/10 | 10/11 | 13/14 | 14/15 | 16/17 | 17/18 |
|---|---|---|---|---|---|---|---|---|---|
| **Wheat**[b] *$/mt* | 167.8 | 318.6 | 267.0 | 233.6 | 225.9 | 231.2 | 230.2 | 231.6 | 230.6 |
| **Maize**[c] *$/mt* | 113.2 | 181.3 | 185.3 | 185.0 | 189.0 | 173.0 | 173.2 | 166.6 | 164.6 |
| **Rice**[d] *$/mt* | 262.3 | 361.0 | 390.6 | 367.9 | 330.7 | 340.3 | 335.6 | 332.5 | 334.5 |

a) Prices for crops are on marketing year basis (e.g. 07/08 is calendar year 2007).
b) No. 2 hard red winter wheat, ordinary protein, USA f.o.b. Gulf Ports (June/May), less EEP payments where applicable.
c) No. 2 yellow corn, US f.o.b. Gulf Ports (September/August).
d) Milled, 100%, grade b, Nominal Price Quote, NPQ, f.o.b. Bangkok (August/July).
Source: OECD/FAO (2008, table A2.)

### V.1.1. Wheat

According to the most recent FAO/OECD estimates, wheat production worldwide is going to increase for the combined increase in area cropped and yields. Correspondingly, prices are forecasted to decline in real terms, although the 2007/08 surge is not going to be fully absorbed, and therefore the decline will occur starting from a level that is sensibly higher than the increase in production would in general favoring imports. FAO (2008) includes Syria as one of the countries whose import in 2009 will be higher than in the past. Production expansion may be occurring in part as a consequence of the diversion of other crops such as maize and oilseeds to the biofuel production, which in turn causes the diversion of wheat from human needs to animal feed. Also, the impressive increase in wheat yield that has occurred in the recent past (a result of investments made in the preceding twenty to thirty years) may continue, although at a slower rate.

According to the forecast formed by the Prospect Group at the World bank, wheat stocks are expected to fall to the lowest level, relative to consumption, since at least 1960. The low level of stocks has been recognized by many as one of the crucial factors that has contributed to a more than doubling of wheat prices in the past year with a first quarter 2008 average price of $412 per ton compared to $198 per ton in the first quarter of last year. Prices have peaked in March and have declined as the first of the new crop began to harvest in mid-May and **expectations are for a large increase in production in Europe, the ending of the two-year drought in Australia and large supply responses in other countries due to the high prices**. (World Bank, 2008)[22]

The decline in stocks was due largely to the strong competition for cropland to produce feedstock for biofuels for the U.S. and EU, especially maize and soybeans in the U.S. and rapeseed and sunflowers in wheat exporters such as Argentina, Canada, and the EU. This contributed to the decline in wheat area over the past three years of 4.2 percent in the EU, 8.5 percent in Canada, and 11.5 percent in Argentina while rapeseed and sunflower area rose 23 percent in these countries. Also, high corn prices in 2007 have been reported as one cause for diverting some of the wheat stocks to feed animals, which contributed to further drain wheat stocks. The US, however, have a large idle capacity for agricultural production. The high wheat prices however are expected to cause the U.S. to release some of the 15 million hectares of land from the Conservation Reserve Program for the 2009 crop year to be devoted

[22] Only few months ago, prices were projected by the World Bank to average $380 per ton in 2008 and then decline to $340 per ton in 2009 and $300 per ton in 2010. More recently the Bank has revised those forecasts (see Box 4), by projecting the price for 2009 at $194 per ton and at $197 per ton in 2020, and the need for such a revision should be taken as an indicator of how difficult it is to form price forecasts, given the recent instability of world markets.

to wheat production, so that total wheat producing area might not decline at all, despite the competition of biofuel crops.

### Box 3 Global Economic Prospects 2009: Commodity markets : Prices of agricultural commodities are falling sharply from peaks

Prices for food traded internationally increased almost 60 percent during the first half of 2008 in dollar terms, with basic staples such as grains and oilseeds showing the largest increases.
Wheat prices more than doubled, from $200 a ton to $440 between March 2007 and March 2008, while rice prices almost tripled in the four months ending April 2008.

Soybean and palm oil prices increased 44 percent from 2007 to 2008.
Prices have since declined sharply. Wheat prices, for example, fell to less than $240 a ton in November. Since their peak in April 2008, grain prices have declined by more than 30 percent.

The spike in rice prices in April and May 2008, on concerns regarding the adequacy of global food supplies and export bans, appears to have subsided, with prices falling from nearly $1,000 a ton to $550 a ton in November.
Export bans that had been in place were either eliminated by many countries or partly circumvented through bilateral agreements.

For example, Egypt, which had accumulated 7 million tons of rice during the period of its export ban, is expected to curb the intervention soon.
Similarly, India has allowed shipments of non-basmati rice to four African nations.

Oilseed prices also have fallen sharply.
Palm oil prices averaged less than $480 a ton in November, down from $1,250 a ton in March 2008. Similar declines took place in most edible oils (soybean oil dropped from $1,475 a ton to $835, and coconut oil from $1,470 a ton to $705 over the period).

The weakening of edible oil prices reflects not only slowing economic growth but also improved supplies, and perhaps mounting pressure in the European Union (EU) to scale back biofuel mandates—most of the EU's biofuel production is biodiesel, whose feedstock is rapeseed oil, a close substitute for palm and soybean oils.

Rubber prices began easing in July and August 2008, an unsurprising development because they track crude oil prices closely (synthetic rubber is made from petroleum).
Signs of weakening prices have also been evident in beverages, with cocoa averaging a little over $2 a kilogram in November, down from $3.00 in June 2008.

Other agricultural commodities, especially raw materials and some foods such as bananas and sugar, have experienced smaller declines, because their price increases were not as sharp and they are less closely linked to energy prices.

Fertilizer prices experienced the largest increase among all commodity groups in 2008, with the index up 116 percent between January and August 2008; prices were driven up by the combination of strong demand growth (in response to high crop prices), limited surplus production capacity, higher production costs related to high energy prices, and an export tax imposed by China to protect domestic supplies.
Phosphate prices (DAP), for example, increased by almost 110 percent between January and August 2008 while urea prices doubled in just four months (December 2007 to April 2008).

The decline in crude oil and grain prices, along with weak demand, however, is now being reflected in fertilizer prices.
Urea, for example, declined to $250/ton (a two-year low) while DAP averaged below $650/ton as of November 20.

Current crop prospects are favorable.
Grain production is projected to increase about 4 percent in the current crop year, and oilseed production is anticipated to rise by twice as much. Although this production increase will allow some rebuilding of stocks, continued growth of demand for biofuels should keep pressure on inventories.

Maize used for ethanol in the United States is expected to increase to 33 percent of the crop in 2008, accounting for nearly all of the increase in global maize consumption and causing global maize stocks to fall.
In contrast, large increases in wheat and oilseed production should allow some rebuilding of stocks. Stocks will remain low by historic standards, however, and prices will remain vulnerable to supply disruptions or demand surges.

Overall, grain prices are projected to decline about 28 percent in 2009 and to recoup 3 percent in 2010.
Fats and oil prices are anticipated to fall by 27 percent in 2009 and another 5 percent in 2010. And beverages are projected to decline 18 percent and 4 percent, respectively.

Despite these developments, food prices are expected to remain much higher than during the 1990s and more than 60 percent higher than their levels in 2003.

In the baseline, the very tight credit conditions observed in November are projected to dissipate during the first quarter of 2009—which together with a strong crop this season should ensure that prices do not rise sharply in the medium term.
However, if farmers in high- and middle-income countries are unable to get financing for seed and fertilizer purchases for plantings for next season, plantings may be lower than expected, which could cause agricultural prices to rebound during the 2009/10 crop year.

Farmers in key agricultural producing and exporting countries, including Australia, Argentina, Brazil, the United States, and the European Union, rely on short-term financing for inputs (e.g., fertilizer) and longer-term financing for the purchase of machinery.
The short-term financing is typically guaranteed by placing land as collateral and to a lesser extent by hedging in futures markets for a minimum price guarantee (the latter mostly in the United States).

The credit crunch combined with declining commodity prices has made banks reluctant to lend. The situation may worsen if land prices begin to decline—there are already signs that land prices are falling in some EU countries—or if credit conditions do not begin to thaw.
At the same time, farmers appear to have lost faith in hedging instruments.

### V.1.2. Cotton

The Cotlook A index, an index of cotton price commonly used in International forums,[23] averaged $1.68/kg during the first four months of 2008, 31% higher than the corresponding 2007 average of $1.28/kg. The price recovery, which was much weaker than for food commodities, was caused by a 15% reduction in plantings in the U.S. as **cotton area has being diverted to grain production to meet increasing biofuel demand**.

[23] The Cotlook A-Index is the average of the cheapest five quotations from a selection of the main upland cottons traded internationally from 19 origins (Memphis/East, California/Arizona, Orleans/Texas, Tanzania, Turkey, India, Uzbekistan, Paraguay, Pakistan, Côte d'Ivoire, Burkina Faso, Benin, Mali, Greece, Australia, Mexico, Syria, Brazil, China). The prices are CIF cash against documents on arrival of a vessel at a Far East port, Including Bangkok, Laemchabang, Jakarta, Hong Kong, Penang, Kelang, Singapore, Busan, principal Japanese and Chinese ports, Manila, Tainan, Keelung, Semarang, Surabaya..

At a global level, land diversion from cotton to grains and oilseeds is slow because markets for food commodities in developing countries are less integrated with world markets. Moreover, cotton production involves different types of investment than grains, diminishing the prospects for further land substitutability. Global cotton production is expected to reach 26.9 million tons in 2008/09, 3.2% higher than the 2007/08 season's output of 26 million tons. Consumption is expected to be 27.5 million tons, thus reducing global ending-stocks from 11.6 million tons in 2007/08 to 11 million tons in 2008/09. Apart from the U.S., all other major producers are expected to increase cotton production in 2008/09: China (5%), India (7%), Pakistan (6%), Turkey (5%), and West & Central Africa (33%). U.S. cotton production, however, is expected to decline by 15% in 2008/09, the third 2-digit consecutive decline. In response to the tight market, **the Cotlook A Index is expected to average 1.65/kg in 2008 and decline to $1.60/kg in 2009**.

**The most important change in the composition of global cotton production has been the emergence of China and India as the world's largest and second largest cotton suppliers. In just four years (from 2002 to 2006), India's cotton output doubled while China's output increased by 60%. In both cases the impressive increases are due to the adoption of genetically modified cotton**. If more countries embrace the technology, world prices are likely to come under pressure.

This phenomenon is of particular relevance for traditional cotton producing Countries, including Syria, because it may imply a further erosion of past existing comaprative advantages, and call for renewed investment in technological innovation, including possibly adoption of GM varieties.

### V.1.3. Fruits and Vegetables[24]

Of all agricultural products, fruits and vegetables are probably those with the most promising prospects in terms of demand evolution on the global market, especially on developed and emerging Countries, where a growing affluent urban population is likely to continue diversifying their diet, with a return to fresh produce.

While aggregate demand of developed countries for food and agricultural products in general is expected to grow little, fruits and vegetables, are among the products that enjoy above-average levels of income elasticities of demand. If we add that per capita consumption is still relatively low for several of these products in many new EU Member States and in many other emerging economies, such as Russia and China, the prospects are even clearer.

Although trade protection measures are still in place to safeguard the interests of local producers in the EU, exports of fresh fruit and vegetables towards those markets can be developed by extending the supply beyond the traditional season. The high season for these products is very short: for example, in the major EU countries it lasts a mere two months. In the remaining ten months of the year consumption is only about half the seasonal peak, and there is a vast potential for developing countries to try and fill supply gaps and to provide a variety of fresh products to consumers.

The United States market offers dynamic opportunities for a wider range of food products on more liberal terms of access, which are also extended to some temperate zone products, although transportation costs might be more of an issue for fresh produce exports from the Mediterranean basin.

[24] This section relies heavily on FAO 2003:. For more on the prospects for Syrian Fruits and Vegetables, see *Garcia-Alvarez-Coque et al.* (2003)

Consumer concerns and government policies in developed countries emphasize the importance of nutrition for health, which holds good prospects for future market growth of fruit and vegetables. Studies in EU on health and nutrition indicate that there is much scope for raising consumption of these products. France, for example, has adopted a National Nutrition and Health Program, with the prime objectives of increasing consumption, inter alia, by doubling the number of consumers eating fruit and vegetables at least twice a day. Such programs imply a substantial rise in supplies, especially off season, and a widening of the assortment available on French and other European markets.

A sustained trend of strong and steady growth of consumer demand for organic and "bio- products" in developed countries has provided exports of these products with a viable and sometimes high value added market niche. Changes in dietary habits among many segments of the population, increased health awareness and the increasing demand for a wider variety of products are contributing to this growth. Demand is expanding particularly rapidly for organic horticultural products in the United States, the EU and Japan. However, consumers of organic food are highly demanding regarding the safety, production, processing methods, and the ecological and social aspects of production. They demand full transparency, traceability and control of the products and zero default. A few developing countries have small market shares for organic fruit, but the cost for "organic" certifications are still high.

Food industries largely remain a domain of the developed countries and their TNCs. The major countries are themselves leading exporters of many processed food products. Their companies predominate in many food, fruit, cereal, beverage and tobacco industries, including those in which developing countries have a strong export and production base. The United States remains among the top exporters of fruit juices, whereas Brazil now leads in frozen orange juice. The continued predominance of these suppliers on world markets is due to the financial and marketing strength of their companies. Their major assets include their brand names, their capacity to ensure consistently high quality, product innovation and publicity campaigns, as well as closeness to consumers combined with low transport costs.

Governmental policy also plays a role. High regional preferences within integration groupings, high import protection through tariffs, tariff escalation and anti-dumping measures, regional, research and other subsidies for developing agricultural processing, export subsidies and special export credit schemes contribute to maintaining or expanding production in industrialized countries. This makes it difficult for new exporters of processed food from emerging countries to enter major markets.

## V.2. Prospects for Syrian agricultural production and exports

As there is no formal model as of yet that could be deemed reliable enough as to allow us for forming a precise estimate of future production of major agricultural production in Syria, we have formed our forecasts of Syrian agricultural production and exports based on what we have been illustrating in the previous parts of this report. Below is a synthesis of our major forecasts, which, to a certain extent, are also based on optimistic auspices of the report's author. The confirmation of these forecasts in the near future will mean also that the overall social and economic conditions of most part of Syrian agricultural community will have improved, and that Syria will be more strongly integrated in the World economy.

### V.2.1. Wheat and other winter crops

After a few seasons during which Syria will remain fundamentally self-sufficient in wheat production, it is reasonable to expect that wheat production will start falling and imports will increase, following the re-alignment of real world prices to historic trends and the gradual reduction of government intervention, which would also imply a realignment of Syrian wheat production to real comparative advantages.

The reduction in Syrian production will occur mostly because of withdrawal of land and, especially, precious water resources from wheat production in the most fertile irrigated areas in AC zones 1 and 2 of the Aleppo, Al-Hassakeh governorates and in Al-Ghab, where alternative winter crops might be introduced (barley and other animal feed, bio-fuel feedstock, winter vegetables for the food industry, etc.) Wheat will remain, on average, Syrian major crop, although its price and production will become more volatile. The success of this conversion will therefore crucially depend on the possibility for the agricultural sector to find mechanisms for yield and price risk management. Although yield risk management is going to be mostly a problem of technical nature, linked to the possibility and cost of water use to counter the negative impact of rainfall variation, price risk management could be thought of occurring, either at the public authority level, if the Government will continue relying on a policy of strong trade regulation and control, by setting official domestic prices and monopolizing international trade, thus shielding farmers from price risk, or at the private level, that is by farmers and private grain traders in the Country, if instead the often announced gradual liberalization takes off.

At the moment, the future prospect of public involvement in Syrian grain trade are difficult to predict. In the recent past there has been intense talks of liberalization, although admittedly very little has been done in practice in that direction. Recent concern on raising food prices have awakened the attention of many Governments worldwide on food security issues and pointed to the political value of strategic grain reserves, reversing a trend that had been going on for quite a while. Grain markets are going to be characterized by larger volatility than in the past, and, in such an environment, it is unlikely that Governments in transition Countries will increase the speed of their market liberalization process.

Nevertheless, Syria cannot afford to further postpone the needed structural adjustment in its agricultural production patterns, mostly for water concerns. As many studies conducted in the past have shown, there are several possibilities for improving the overall situation of Syrian agricultural trade in terms of comparative advantage. New trade agreements and the increased integration of Syria in both the Mediterranean and the Arab markets will mean that the entire agricultural sector will need to shift its attention from fundamental production risks, until now mostly managed through expensive water use, to marketing risk. The cost of running out water reserves at the current pace is already far exceeding the economic and social benefits of ensuring wheat self sufficiency. Production diversification, associated with expanded market access for Syrian agricultural and food products such as olive oil, specialty crops (pistachio, cumin and other spices), winter and early spring vegetables, lamb, will be one way to procure the resources to acquire the wheat needed to fulfill the domestic demand while, at the same time, save water and increase farm incomes.

### V.2.2. Cotton and other summer crops

Syrian cotton production is projected to be further reduced as the pressure on scarce water will continue mounting. Although there appear to be some margin for maintaining cotton production while reducing water consumption through technical innovation and improvement on agronomic practice (as

for example by converting more irrigated land to drip irrigation and by using other water saving features such as the use of mulch) in the near future the sustainability of current levels of cotton production is an issue to be seriously considered.

Alternative summer crops, characterized by more efficient use of water and better market prospects, might include sunflower and other vegetable oils, fodder crops (clover, alfalfa, etc) and corn. Although none of these will likely reach the relevance that cotton currently has in the Syrian agricultural economy, the evolution of the domestic and international demand for agricultural commodities might favor the expansions of these crops destined to export (as inputs in the production of biodiesel fuels) and to the expanding demand of the domestic food and livestock industries.

### V.2.3. Barley and other feed crops

Barley is the major Syrian crop in terms of cropped area, mostly because at the moment it is still the only crop suitable for rainfed cultivation in arid areas of the Country. Syria is likely to remain a net importer of Barley for a few years to come, given the current size of the sheep raising industry, and it is unlikely that through the nevertheless needed agronomic innovation that might be introduced, total barley production could be brought to the level of self sufficiency. On the other hand, it would be unlikely that self sufficiency in barley might be achieved while preserving comparative advantages, and therefore it would be unwise to promote such a policy.

On the contrary, attention should be given to the possibility of introducing other feed-crops, especially those particularly suited to the arid regions of the Country, including, but not limited to barley itself, other species such as broad-beans, vetch, oats, etc. might prove suitable to wider cultivation as feed crops. The work of the International Center for Agricultural Research in Dry Areas (ICARDA) and of other similar institutions is, in this respect, exceptionally valuable, and should be seen at with increasing attention by farmers, technicians and policy makers both in the Country and in the various International Organizations involved with Syrian agricultural development.

### V.2.4. Fruits, Vegetables and Olive Oil[25]

Here probably lies the most promising opportunity for successful expansion of Syrian agricultural economy. The geographic position of Syria at the crux between Europe, Russia and the Caucasia and the Middle East, the climate conditions that are less extreme than both the Winter in many European countries and the summer of Arab pen insula Countries, makes the potential prospects for Syria production of fresh fruits and vegetable especially promising.

The limited distance and the possibility of timely transport through both ground and sea transport, makes it suitable to supply European markets in late Winter and early Spring, and Arab countries in late Spring and Summer.

As we have discussed above, consumption of fresh fruit and vegetables in many of these emerging markets is still below the levels suggested by nutritionists, and the increased health awareness that

[25] For fruits and vegetables, a deep study on the existing opportunities for fresh Syrian fruits and vegetables on the EU market has been conducted in the recent past (Garcia-Alvarez-Coque et al, 2003). The study reports on a comprehensive endeavor aimed at establishing what are the existing constraints and opportunities for Syrian fresh fruits and vegetables, and we think that its major conclusions are still valid today. We refer the interest reader to the original report for more information. For Olive Oil, see Al Ashkar, 2006.

traditionally accompanies income improvements will likely push demand in many markets that are potentially within reach of Syrian exports.

Table grapes, peaches and nectarines, watermelons, cantaloupes, early potatoes, tomatoes, eggplants, squashes, artichokes, green beans, bell pepper s, and many more are all fruits and vegetables traditionally produced in Syria, and there is potential room for expansion of production in periods when the local production in Europe is absent or too expensive. While other Mediterranean countries (most notably Egypt and Morocco) have already strengthen their links with the European food retail industry, Syria is still lagging behind, although steps have been taken in the recent past.

The major obstacle to the expansion of fruit and vegetable production that has been active so far, is likely the higher level of marketing risk associated with such products. Today, only relatively wealthier farmers can afford to engage in productions such as potato or tomatoes given the unreliability of domestic markets. On the other hand, the possibility of reaching better markets in Europe or elsewhere depends on the ability of Syrian farmers to achieve a level of organization and supply coordination that is still largely missing. Producer Associations and marketing cooperatives are organizational forms that might prove very effective in coordinating production and supply and in responding to the quality standards demanded by consumers in rich Countries.

As for Olive oil, the possibility of conquering shares in traditional consumption markets greatly depends on the ability of Syrian producers to achieve quality standards that are comparable to those of the major producers such as Spain, Italy,

According to Al Ashkar (2006)

> "Syria joined the International Olive Oil Council in 1998 and adjusted its olive oil standards to comply with those adopted by the Council. In the framework of trade liberalization, the Syrian Government has been taking concrete measures for the expansion of agricultural trade and the enhancement of its role in agricultural development. In this context, all exports of agricultural products are exempted from income tax and agricultural production tax. The exchange rate applied to the part of export earnings to be converted in Syrian Pound at the Commercial Bank of Syria has been replaced with the exchange rate of the neighboring countries. In addition, instructions have been given to the Export Committee to ensure that quality standards are strictly respected and that the control of quality of exports is effective.
>
> Exporters of agricultural processed products are asked to label the export packages indicating the nature of the product, its components, name and address of the factory, and the mention "for export". Moreover, exporters have the obligation to comply with the standards and specifications required by the country of destination."

These are all important steps, and have gradually moved the olive oil producing sector closer to what could be considered an open trade, but still more distance needs to be covered.

# VI. Conclusions and recommendations

The data and analyses presented in these study allowed us to draw a number of conclusions on the current status and future prospects of Syrian agriculture.

The first major conclusion is that **agriculture is still, and will likely be more so in the near future, a strategic sector for the Syrian economy.** The climatic characteristics and the geographic position of Syria, at the junction between Europe and the Middle East, are the two crucial elements that makes us believe that it may soon return to be the fulcrum of an active trade of agricultural and food products, as it has once been in the now remote past.

This destiny, however, shall depend crucially on two sets of factors, one internal and the other external to the Syrian economic and political environment.

Concerning the internal factors, the process of gradual market liberalization that had started earlier in the 2000's is likely to take a slow down. There are many reasons to believe that the GoS will not renounce its role in controlling domestic and foreign trade of major crops, namely wheat and cotton. The trade off that it needs to face is to maintain sufficient price incentives for farmers to reduce the need for costly and to some extent ineffective monitoring activity (as it was done in the current season, when purchasing price for wheat at the Governmental establishments was raised to 20.0 SP/kg). This will likely slow down the needed process of readjustment of land use to the most efficient use.

One other element that contribute to reinforce our expectation of a relative stickiness in the total supply of wheat and cotton in the near future is the fact that farmers have very few alternative opportunities to obtain the needed access to credit.

Nevertheless, steps have been made and initiatives taken to try and improve on the efficiency of resource use, especially water, and this might have some effect on the aggregate supply of wheat and cotton in Syria, especially if farmers will need to bear at least part of the increasing social cost of water use.

Production of major crops will likely remain stable in the next few years, and only when the full incentives of market forces will be at work, we will witness an adjustment in the prevailing cropping patterns, with a reduction of the incidence of the current two major crops, i.e., wheat and cotton, and an increased share of alternative biofuels (especially biodiesel for the European market) and feedstock crops (including maize, various species of legumes, and - most likely - sorghum and other dry land species.)

The burning issue of water scarcity, on the other hand, has already urged the GoS to take urgent steps in terms of policy reform in the very recent past. These actions are in the right direction. The new policy of conversion to modern irrigation includes economic incentives for farmers who adopt new water saving irrigation systems.

While this is a very important step, it is likely not be sufficient. It is reasonable to imagine that other actions are needed to encourage farmers to modify the existing cropping patterns away from cotton and towards crops that use less water, and that have growing market potentials (for example, spice crops such as cumin, anis, and black seeds), at least where this problem is very crucial (e.g. in Al-Khabour basin).

Another major recommendation that comes out of this study is that, as the process of agricultural transformation proceeds under the pressure of market liberalization, more and more attention should be provided to the problem of farm income variability and, in general, income risk management strategies. In this context, the credit system can play a fundamental role. The current system based on operation of the Agricultural Cooperative Bank deserves to be fully assessed in its ability to provide credit to farmers when it is needed. Rather than just linking credit to farm operations or investment, viable credit should be made available to assist farmer to smooth their consumption patterns in periods of hardship. In formulating new credit policies, our advice would be to understand the current risk management strategies currently pursued by farmers to cope with income risk, and any policy should be based on strengthening the effective ones and allowing farmers to avoid costly coping activities.

In particular, the role of private and public stockpiling should be explored for such strategic crops as wheat, barley and cotton. Other than at the theoretical level (see Williams and Wright, 1991 for a comprehensive treatment) no clear understanding has been provided so far of the subtle implications that the bare *possibility* of storing these product have on prices and therefore on economic incentives for the various agents involved (producers, traders, processors and consumers) in the conditions of the past, present and future agricultural policy environment of a Country like Syria. If we want to progress in producing socially relevant policy analysis and advice, such a gap needs to be rapidly filled.

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