

Farming Systems in Syria: its Constraints and Strategies for Improvement

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Abstract: Agriculture is one of the main industries in Syria. Agricultural products are very important not only for domestic consumption but also for export. The basic problems of Syrian agriculture are unstable production due to the farming systems practice. Hence, measures have to be put in place to improve farming systems in Syria for sustainable agriculture and overall development of the country, which can only be achieved in an atmosphere of peace among her citizenry. This paper provides a brief background of Agricultural sector and Agricultural zones in Syria, it describes agricultural crises and land utilization/types in Syria, farming systems in Syria, constraints of farming systems in Syria and strategies were given on how to improve farming systems in the country.

Keywords: Syria, Agriculture, farming systems

INTRODUCTION

The agricultural sector in Syria plays a key role in agricultural and in rural area development, its effects are clearly reflected on the overall economic development in the country, it is one of the most important sources for generating income and achieve food security and providing employment opportunities and providing the requirements of the manufacturing sector of the food industry. Also, it contributes to the stability of the rural population and provides a balance between the provinces [1].

Agriculture is a relative important part of Syria's economy, accounting for 22.9 percent of the Gross Domestic Product (GDP) in 2009. About three quarters of the total land area is agricultural land, most of which is used as pastures. About 25 percent of the total land area is arable land, but large areas lay waste because of lack of water. In most cases, irrigation is necessary, as most of the rain falls outside the growing season [2].

Agricultural land extends over an area of 13,864 hectares, of which 10 percent is irrigated land, 67 percent is rain-fed land and 11 percent is fallow land [3]. Irrigated lands mostly concentrate along the Euphrates River, in the coastal areas and in the central regions. The size of the irrigated holdings is substantially smaller than the size of the rain-fed holdings and varies distinctively across governorates. At the national level, the average holding size is 9.2 hectare, whereas for irrigated farms it is 3.6 hectare [2].

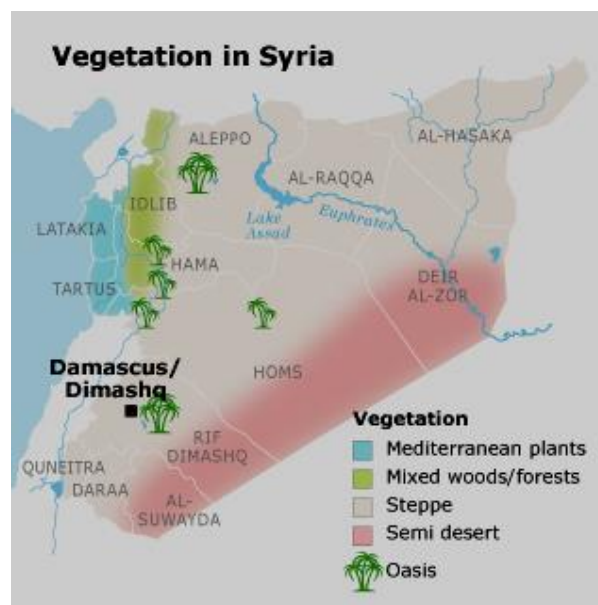


Fig-1: Vegetation in Syria. Source: Syria, fanack.com [2]

Agriculture in Syria is a very important economic sector, because a large proportion of population depends on agriculture and related economic activities. Rural population account for 51% of the total, the agricultural sector share in Gross Domestic Product (GDP) is around 30%, and labour force in agriculture is around 30% of the total employment. In the 21st century, Syrian agriculture will operate in a political and economic environment influenced by the outcomes of: the current peace process in the region, the new regional trade system, the reform programs, and World

Trade Organization (WTO). These changes not only will bring opportunities but also lot of constraint on Syrian agriculture[4].

Syria's exports of agricultural products equalled a total of USD 1.9 billion in 2010. Among its main export agricultural products are olive oil, tomatoes, anise and similar spices, wheat, and cotton products. Yet Syria is also an importer of wheat, flour and milk, among other agricultural products. Fisheries are little developed, and boats are small or medium-sized. Captured fish include sardines, tuna fish, groupers, and red and grey mullet, for a total of 18,000 tonnes in 2007 [5].

AGRICULTURAL ZONES OF SYRIA

Syria is located in the eastern coast of the Mediterranean basin and its total area amounts to 18.517.971 hectares. It can be divided into four geographical areas (coastal, mountainous, internal and Al-Badiya) but, from an agricultural point of view (Table 1), Syria is normally divided into five zones [6].

First zone:

It includes the coastal area, the Golan Heights, the northern part of Aleppo Governorate, the borderline with Turkey, in addition to the mountainous area in Suweida, where rainfall exceeds 350 mm annually. This zone can be divided into two sub-areas, according to the annual quantity of rain: more than 600-mm/ year and from 350 mm to 600 mm/ year. It constitutes nearly

15% of the total country area. The richest crops, which are planted in this area, are fruitful trees and early vegetables, accompanied by barley, wheat, corn, sugar beet, cotton, etc.

Second zone:

This zone stretches next to the first zone and has nearly the same size. Rain ranges between 250-350 mm/ year. The main crops are barley and the summer crops.

Third zone:

It constitutes 10% of the total country area. The annual rainfall is about 200-250mm/year and the main crop here is barley. It includes the southern area and passes through the northern and middle area to the Al-Jazira area. The fields in this third zone are also used as pasture for cattle and sheep.

Fourth zone:

It constitutes about 20% of the total country area and is suitable only for pastures. It can be cultivated with barley only in good years, because the average annual rainfall is below 200 mm/year.

Fifth zone:

It constitutes more than 40% of the total country area. The rainfall here is always less than 200 mm/year and it is not suitable for rain fed farming. It is used for free-range pastures, with low animal density and Bedouins who raise sheep and goats populate it.

Table-1: Annual rainfall and main crops, by agro-ecological zones. Source: MAAR, (2000) [6]

Zones	% of Total Area	Annual Rainfall	Main Crops
Zone 1	14,60	>600 mm	Fruitful trees/wide range of crops
		350-600 mm	Wheat/Legumes/Summer crops
Zone 2	13,30	250-350 mm	Wheat/Barley/Legumes/Summer crops
Zone 3	9,90	>=250	Mainly Barley/Grazing
Zone 4 Marginal	20,00	<=200	Just for Barley or Permanent grazing
Zone 5 the Badia	42,20	Almost no rainfall	Only for low density pastures

AGRICULTURAL CRISES AND LAND UTILIZATION/TYPES IN SYRIA

War and drought are now slowly erasing part of Syria, leaving scars behind that will probably never heal. Villages, towns, and entire farming regions are being depopulated by violence, social breakdown, and economic collapse; they may never again be able to sustain a population of the size they held before 2011. For every field abandoned, pump engine stolen, water pipe shot or rusted, and farming family forced to flee, Syria's future grows yet a little darker.

A new study from the World Food Program (WFP) paints a very bleak portrait of Syria's agricultural sector. The past few years of war have had catastrophic effects on the maintenance of irrigation

systems and infrastructure, and they have displaced farming populations, disrupted trade, and caused untold damage to the ecology. And now, again, Syria suffers a drought. Cumulative rainfall from September 2013 to mid-February 2014 was recorded at less than half of the long-term average. The WFP's satellite images and ground rainfall data confirm the downturn in Syria's agricultural capacity, showing a severe deterioration in vegetation conditions across Syria, particularly in the north and northeast. These areas include the war-torn Aleppo and Hasakah Provinces, which together account for more than half of Syria's wheat production [7]. Map of Syria showing land utilization is shown in figure 2.

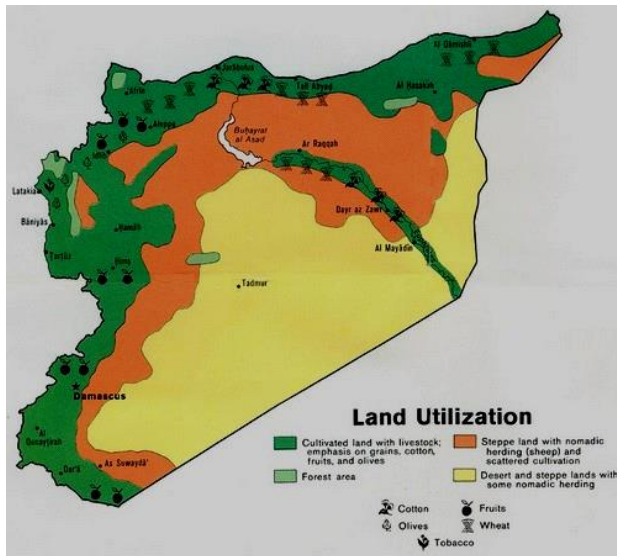


Fig-2: Land Utilization in Syria. Source: Juan Cole (2010) [8]

Pastures/Range land and meadow form 45 percent of the land. This percentage includes the Syrian Desert, providing there is sufficient rainfall. Extensive cattle breeding are mostly practiced. Syria's top agricultural products are (in decreasing order as to value and volume) olives wheat, indigenous sheep meat, cow's milk, tomatoes, almonds, sheep milk, anise and similar herbs, chicken meat, cotton lint, grapes, pistachios, cattle meat, cottonseed, hen's eggs, oranges, apples, potatoes, and citrus fruits A natural forest which covers 3% of the total area of Syrian, Fertile/cultivable lands is 32%, while arid/uncultivable lands have a share of 20%. [1, 8, 9].

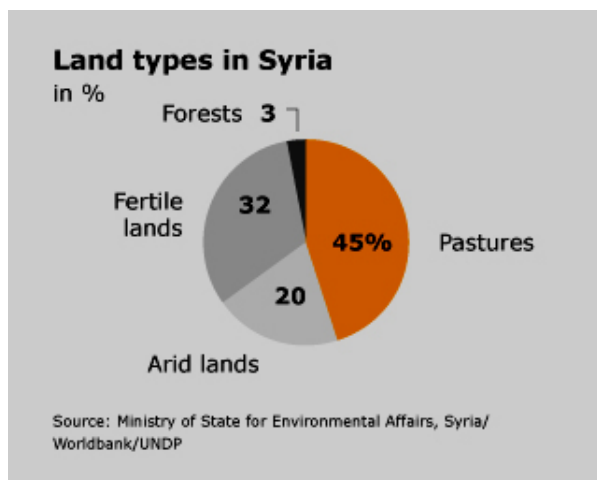


Fig-3: Land Types in Syria.[11]

FARMING SYSTEMS IN SYRIA

Rain-fed systems:

Rain-fed agriculture in northern Syria is largely comprised of rotations of cereals with food and feed legumes. These rotations help restore or sustain soil nutrients, reduce the risk of pests and diseases, and

minimize the use of mineral fertilizers. The decision to use fertilizer is contingent upon the expectation of rainfall as the crop-growing season unfolds. Weather and market-price variations within and among seasons determine the allocation of inputs, as well as the decision on how to combine alternative rotations to achieve the farmers' goals [10].

Farmers depend on the quantity of rainfall and are concentrated in areas of at least 350 mm/year. These areas are suitable for different kinds of products, as these areas are directed towards increasing productivity and intensive agricultural production according to the government agricultural plan is aggressively pursued. In case of zones of less than 300 mm rainfall, the farmers choose their crops[11]. Most people see rain-fed agriculture as risky, but it has the potential to produce large amounts of cereal in dry regions. For this potential to be realised, farmers, researchers and policymakers must work together to improve technology and reconsider economic policies[12].

Irrigated farming systems:

In Syria, the main system of irrigation is pumping from rivers and flood irrigation. In these areas, several irrigated crops are cultivated, such as the strategic crops of cotton, wheat and sugar beet. The fruit trees and early vegetables are also planted as in the Syrian coast. All these crops with fruit trees included are irrigated. The irrigated area is about 1.186.000 hectares, and the cultivated area with fruit trees in the different zones, except for Al-Badiya, is about 3,355,000 ha, according to 1999 statistics [11].

The Ministry of Irrigation is responsible for the planning, design and management of dams and public irrigation systems that cover about 400 000 ha. There are also numerous small- and medium-size irrigation networks which operate with waters coming from rivers or springs and which are managed by cooperatives. In these irrigation systems, land holdings tend to be very small and the cooperative is responsible for providing a large number of services to their associates, such as the maintenance of the irrigation system, the distribution of water, the provision of inputs and the sale of produce. Water distribution is normally organized by groups of farmers who receive water from the same canal. The water in the main canal and pumping station is managed by a hired person or sometimes by the leaders of the cooperative. Water in the lateral canals is generally distributed on an established rotation [13].

Total irrigated area by wells is 715 509 ha, of which 44 percent are in Al Hassakeh (Khabour basin). The total number of wells is 201 259, out of which about one-fourth were not licensed in 1999. This situation provoked the enacting of a special decree stating the obligation of licensing all wells by 2001 alongside the Government's decision to encourage the

adoption of modern irrigation technologies by the farmers. About three-quarters of the wells use fuel as primary energy and only the remaining quarter use electricity. Well depth and discharge rates are quite variable. In groundwater areas most of the wells are private and water is used on the farm of the owner of the well, and sometimes it includes those plots of farmers located nearby. According to field survey's data, farmers who have excess water capacity in their wells sell some of the extra water to neighbours [13, 3].

Animal production systems:

The livestock sector will have a significant impact on the future growth of Syria's economy. It provides more than 30 percent of the total value of agricultural production, 15 percent of the value of agricultural exports, and employs 11 percent of Syria's total labour force, including many low income families in the rural areas. Among the more than 8 million people who are rural dwellers, 2.5 million of which are low income earners, more than 35 percent (households) own livestock and derive from it 15 to 100 percent of total family income. Growth and improved productivity in the livestock sector is therefore also important for poverty reduction in Syria [14].

There are about 11.4 million sheep, 1.0 million goats, 780,000 cattle, 7000 camels and 2500 buffaloes in Syria. The local, unproductive Akshi is the main breed of cattle; Shami comprise 10% of the population and imported high-yielding dairy breeds 20%. All the sheep are of the Awassi breed, and goats are mainly mountain, with a small proportion (6%) of Shami, or Damascus.

In arable areas with between 200 and 350 mm of winter rainfall, where barley is the main crop, the grain, straw and residues are used for feeding livestock. Adjacent to the barley zone are vast areas of rangelands,

which are an important seasonal grazing resource for small ruminant flocks based in the barley zone, as well as for nomadic flocks. The movement of transhumant flocks was traditionally regulated by seasonal availability of grazing. Animals moved regularly between winter and spring grazing areas in the rangelands, and summer grazing on cereal and irrigated crop residues in the wetter zones. Nomadic flocks moved continuously within the rangelands in search of pasture and water.

Both systems have been transformed by recent developments. The rapid adoption of vehicles by flock owners in the rangelands has disrupted the traditional grazing cycle and intensified the exploitation of natural grazing. Animals can now be transported quickly over long distances to take advantage of fresh pasture, and water can be transported to the flocks so that they can stay longer in any given area. The quality and quantity of pasture is rapidly deteriorating as a result of early grazing and overgrazing. The possibility of transporting supplementary feed and the drilling of wells has encouraged some owners to keep their animals in the rangeland throughout the year and to increase the size of their flocks while obtaining as much free grazing as possible. The rangelands are now occupied for a long period each year by a larger number of animals than in the past [15].

Animal husbandry (Table 2) can be divided into two different sub-systems: goats and sheep are concentrated in the free pasturing system in the Al-Badiya. There are 13 million heads of goats according to 1999 statistics. As for cattle (800.0000 heads according to 1999 statistics), they are raised more intensively in villages and stables of farmers. In most cases, the number of cattle, cows included, kept by a peasant family, is less than three; only a handful of landowners have more than 100 animals [11].

Table-2: Lactiferous Animals and Milk Production in the cooperatives 1994-1995 Source: MAAR, (2000)[6]

Years	Sheep			Goats		
	Number	Milked	Milk	Number	Milked	Milk
1995	9.661	6.325	370	717	490	45
1996	10.828	7.048	413	748	511	51
1997	11.389	7.422	431	759	513	52
1998	13.362	8.516	483	760	531	55
1999	12.341	7.859	431	754	532	48
	Cattle			Cows		
	Number	Oxes	Calves	Number	Dairy	Milk
1995	599	17	146	436	273	656
1996	665	16	171	478	309	737
1997	683	17	175	491	323	820
1998	760	21	175	564	372	842
1999	829	26	214	589	381	932

CONSTRAINTS OF FARMING SYSTEMS IN SYRIA

The challenges of farming systems practices in Syria are as posited [16, 12] as follows:

1. The change in cropping patterns in the country has increased the use of groundwater for irrigation and water tables are now declining. And no adequate legal frame work to stop ground water depletion.
2. Poor farming practices in Syria bring about loss of organic matter and physical degradation of soil. Soil organic matter is integral to managing water cycles in ecosystems. Depleted levels of organic matter have significant negative impacts on infiltration and porosity, local and regional water cycles, water productivity, plant productivity, the resilience of agro-ecosystems and global carbon cycles.
3. Nutrient depletion and chemical degradation of soil in agricultural soils is a primary cause of decreasing yields, low on-site water productivity and off-site water pollution. Salinity, and sodicity threaten large areas Syrian most productive land and pollute ground waters..
4. Soil erosion and sedimentation leads to substantial yield losses and contributes to downstream sedimentation and degradation of water bodies, a major cause of investment failure in water and irrigation infrastructure.
5. Agriculture in Syria is the main consumer of water, and water scarcity is a significant problem for farmers in the country. Agricultural farming systems practice in the country is also the major contributor to non-point-source water pollution, Water availability issues have yet to receive as much attention in Syria.
6. Contamination of river and underground water due to agricultural chemicals. Impact of contaminated water from agriculture chemical is adverse in Syria and should be a matter of concern.
7. Farming systems in the country brings about soil erosion and degradation on the steep slopes of coastal areas. Wind erosion and shifting sand problems in the inland desert areas. And soil degradation due to continuous exploitative agriculture.
8. Intrusion of sea water into underground water supplies due to inappropriate water management techniques from irrigation channels and overuse of chemical fertilizers for agricultural activities.
9. Deterioration of land due to bad agricultural practices and deterioration of natural vegetation due to expansion of land off limits to grazing.
10. Poor research extension farmer linkages, which limit transfer and adoption of modern

agricultural technology. And inadequate information flow and lack of communication on current and modern development issues in Agriculture.

STRATEGIES TO IMPROVE FARMING SYSTEMS IN SYRIA

1. In Syria, policymakers must give more attention to the sustainability of groundwater. Policies must define groundwater rights clearly between different users. A legal framework is needed to stop groundwater depletion and enforce and encourage collective action to conserve water.
2. Syrian farmers receive 60 percent more than the international price for their wheat. This gives them a strong incentive to produce more by investing in fertiliser and supplementary irrigation. There should be more incentive for farmers in Syria in order to encourage good farming practices.
3. Need to strengthen capacities of institutions and farmers' organizations to support input and output of agricultural production systems. Such capacity building primary goal should be geared towards soil organic matter improvement, agro-ecosystems and global carbon cycles.
4. Need to focus research on soil fertility improvement, soil and water management, development of irrigation, promotion of integrated livestock-wildlife-crop systems and development of drought-mitigation strategies.
5. Policies should consider the resource costs (such as labour and fertiliser costs) of the major crops grown and the animal's rear by farmers in the country to let markets determine the output price and ensure farmers are earning a profit in order for them to have enough fund to engage in good farming practices.
6. Removing taxation on farmers and securing access to markets will allow them to benefit more from international market prices, this will afford Syrian farmers more money to improve on their farming method..
7. A Farmer Field Schools and the consortium approach to integrated management of community watersheds in Syria will aim to strengthen these research extension farmers linkages.
8. Need for policies and strategies on soil, water and biodiversity to offset the high rate of natural resource degradation in the area of Agriculture. Most especially in the area of integrated community water-shed management
9. There should be proper linkage between Agricultural research extension workers. And information flow and communication on current and modern development issues in

Agriculture should be reliably disseminated to farmers.

10. Transformation of crop rotation systems. And training and re-training of Agricultural extension workers on the recent technology and techniques of farming in order to attain Agricultural sustainability in the country.
11. There should be thorough implementation of appropriate water management systems by organizations such as water management co-operatives. Implementation of appropriate irrigation and water seepage measures in accordance with amounts of water consumption for different crops.
12. Experiments on improvement of water harvesting techniques and vegetation rehabilitation. Implementation of practical activities in ways that co-exist with the nomadic lifestyle.

CONCLUSION

Syrian farmers will always get good yield, depending on best farming system practice adopted, and this will also enable them get the best incentives from their produce on a short-term return. Good farming practices and the use of modern and proven systems of farming practice that is sustainable and at the same time increase agricultural yield in an atmosphere of peace will bring a balance between the farmers' financial welfare, the country's economic development and the state's ability to achieve sustainable food security. This will to a great extent help to curb the issue of arm confrontation in the country.

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