DESK REVIEW ON MEDSNAIL TOPICS IN TARGET REGIONS

Work Package 3 Agro-food alliance

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3.2.1 Desk review on studies and projects on MedSNAIL topics already carried out in target regions

Responsible Partner: All Partners with the support of Slow Food Foundation for Biodiversity

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INTRODUCTION

Once the methodology was established in the previous activity (311 Joint definition and internal dissemination of the WP activities' methodology), all MedSNAIL partners have prepared a desk review on studies and projects on MedSNAIL topics already carried out in target regions.

The first phase of the mapping have been carried out through desk activities aimed at analysing the target contexts, with particular reference to needs, demands, policies and programmes available in the fields of agri-business, sustainable agriculture and food security.

TARGET AREAS BY PARTNER

Each partner has chosen an intervention area to carry out case studies. These areas of study have been the following:

Partner	**Target area**
FAMP (Spain)	Andarax Valley (Almeria Province)
AUB (Lebanon)	The West Bekaa and the Shouf
RWDS (Palestine)	Jenin & Tubas Governorates
University of Sfax (Tunisia)	Sfax governorate and Tunisian Sahel
GRC (Malta)	The island of Gozo
NAMAA (Jordania)	Balqa Governorate

The desk reviews developed by the MedSNAIL partners have followed the indications made by the Slow Food Foundation, which has also reviewed the different studies and has given instructions to improve them. To this end, the Slow Food Foundation has organized on line bilateral meetings with each partner, which took place during the month of April 2020.

DESK REVIEW PROGRESSES IN TIME OF COVID-19

The health crisis provoked by the expansion of Covid-19 all over the world is undoubtely having an important impact on the normal development of european projects, as most of them deal with issues that need to be tested on the territory, for which mobility is of outmost importance. Transnational cooperation means working on a topic locally under a common approach agreed by a number of partners, and exchange experiences and know-how, trying to transfer good practices into other contexts.

European projects act as real ideas labs where to test and implement new ways of doing to improve governance, and management of resources with a wide approach involving innovative and experimental methodologies as a result from cooperation with european counterparts.

No contingency plan could foresee the development of a pandemic which would prevent people from going out and doing normal life, we are at a rare ocurrence and we must find ways to go on working with our projects, adapting working plans to the current situation.

That is what we're trying to do in MedSNAIL. Some weeks ago all partners had a virtual meeting and decided an alternative path for our project, to be tried along the following two or three months, this way leaving summer the possibility to mark a turning point in the development of Covid-19.

MedSNAIL wants to test a methodology, inspired by the Slow Food approach, with the aim of saving and valorising local agro-food products strongly linked to local communities and territories, in order to preserve agro-biodiversity and intangible cultural heritage, empower local farmers and trigger a more socially and environmentally sustainable rural development. At present, we are at the stage of mapping products (raw materials, animal breeds, processed products, traditional techniques, recipes) present in the area of intervention, and assess their potential in terms of conservation of the cultural and environmental heritage, as well as their potential to boost virtuous territorial dynamics from a socio-cultural, environmental and economic point of view.

The first phase of this mapping includes desk reviews by all partners aimed at analysing the target contexts and first approachment to stakeholders in the territories. Preliminary diagnosis have been made by every partner, which were to be pooled and confronted in the frame of a workshop addressed to project partners scheduled to be held in Beirut in June, with the aim to support partners to identify stakeholders and local leaders.

But the situation has made impossible to go on with this scenary, as June is so close and travels will still have to await a little more . That is why we have rethought the project's workplan for the next moths, in an attempt to reinforce partners' skills to face better prepared the engagement of their stakeholders and local leaders, once the confinement measures will be smoothed in their countries.

Indeed, a series of bilateral virtual meetings through which Slow Food Foundation, Italian partner in the project, has assisted and advised partners

on how to optimise their desk reviews.

MAIN FINDINGS

This section describes the main findings of the desk reviews of each partner:

American University of Beirut (AUB) – Lebanon

AUB has already identified the territories of intervention of the project: West Bekaa and Shouf, Their motivations for this choice are in line with the philosophy and values that the project wants to promote. It highlights the history and origins of food products and traditional dishes and focus on the cultural and emotional ties that people hold to the West Bekaa and Shouf areas.

“The areas of the West Bekaa and Shouf represent typical cases of diversified and authentic agriculture and food systems that are well embedded and preserved in their respective societies. Most of the inhabitants of these areas still rely on traditional agriculture and food processing practices and are tightly attached to their land and traditions. The areas are also known for having unique biodiversity, natural features and landscapes which also form important component of their heritage.

Small producers in these areas often struggle to maintain their productions due to the lack of resources and market access; hence valorising these products can help in creating opportunities to small producers and thus contribute in the conservation of local traditional practices while protecting native biodiversity and natural resources, preserving local agriculture varieties and traditional food recipes and of course contributing to the livelihoods of the rural communities in both areas” .

On the other hand, the rural tourism sector linked to the gastronomic heritage of the country presents good opportunities for development.

Gozo Regional Committee (GRC) - Malta

The agricultural area chosen for the study as part of the MedSNAIL project is the island of Gozo, which is both geologically and politically a part of the Maltese islands. Gozo is heavily dependent on the sea transport link with Malta. A consequence of this is the concept of double insularity, and a strong feeling of regional and cultural identity.

Also from the point of view of biodiversity is richer, especially compared to

wild biodiversity both animal and plant. On the other hand, from the point of view of domestic biodiversity, a large part of the island's heritage has been lost, both in terms of plant and animal species.

“Another important issue is that agriculture and fishing do have an important economic role ranging from food production, culinary tradition, land stewardship, and environmental conservation. They are also important for the tourism industry, and so their significance taken holistically may go farther than their nominal quantitative economic significance”.

This context provides the project with an opportunity to explore the consistency between gastronomical and rural traditions of the island with the new forms of slow tourism, which can be promoted from public policies, in contrast with the long tradition of massive tourism suffered by Malta.

The Rural Women’s Development Society Economic, social and political Empowerment for rural women’s (RWDS) - Palestine

In the case of Palestine, the Janin area has been identified as a possible area of intervention. It is an area with a strong rural vocation, many products of the internal market come from the area, is characterized by the presence of small-scale producers as well as many women who work in some cases individually but often also in cooperatives. RWDS has already activated interventions in the area, based on the community based organisation approach, which have resulted in the constitution of "clubs of women" and which represents a strong starting point for the planned interventions encompassed in the MedSNAIL project.

One of the main problems in the agricultural sector in Palestine is related to water scarcity. The problem is not only physical but also political, as producers do not have access to water resources. This circumstance brings an opportunity to the project to work putting the focus on productions that can be grown with scarce water resources, such as wheat, for example.

It is worth quoting here one of the messages included in the desk review by RWDS which adds a vualable dimension to the project, related to governance and sovereignty issues.

“Agriculture is not only essential component of the Palestinian national, cultural, economic and social fabric but it embodies their perseverance, confrontation and adherence to their land under the threat of confiscation and settlement activities. It also provides a refuge and a source of income and food supplies at times of crises"

Women for Cultural Development (NAMAA) – Jordania

In the case of Jordan, there's a clear relationship between agriculture and economic development and the desk review makes obvious that Jordan is a hotspot for biodiversity in the broadest sense of the word. The territory is characterized by different types of climate with arid, semi-arid, forest and wetlands, which obviously makes the biodiversity of the territory extremely rich.

Although there're many institutions are working on the preservation of biodiversity, all the action is focused on research, which is uncoordinated and fragmented. Small scale producers are not targeted by the national strategy on environment, but it seems that the main challenges at national level arise from the industrial approach to agriculture.

Citizens do not seem to be too aware of how important it is to have access to local and healthy food, although there is a very niche market for organic food. The origin of food is not a priority for citizens who base their choices primarily on price. Even markets of producers selling local products are scarce, mostly products of large scale producers are sold at markets and in shops.

The area of intervention of the project is not yet indicated in the desk, however the partner already has an idea that the Highlands could be a good pilot site. This is one of the areas of Jordan most in line with the philosophy of slow food, in fact there is no intensive agriculture but mostly small scale farmers. The producers need support because the quantities produced are not considered statistically significant and therefore the area is not considered by the government. It is characterized by products at risk of extinction.

University of Sfax - Tunisia

Tunisia has chosen two different areas for case study: Sfax Governorate and Tunisian Sahel.

The climate of Tunisia is divided into 7 bioclimatic areas favorable for a great diversity of husbandries. The great difference between the north and the rest of the country is due to the Tunisian dorsal which separates the areas influenced by the Mediterranean climate from those influenced by the arid climate engendered by the Sahara. Such a characteristic makes Tunisia a country particularly vulnerable to climate change.

Plant biodiversity and agriculture sector, extremely important, are evolving in a fragile natural environment, with highly sensitive dependence on weather conditions. An effective means for ensuring plant diversity should be based on improved skills related to conservation management of potential plants to combat desertification.

In both case study areas, there seems to be a problem of water shortage, provoking water deficit, which has as consequence salinization of the soil in the case of governorate of Sfax, and a clear diversity of soils in the case of the Tunisian Sahel, given by the fact that this study area is subject to two types of opposite climatic actions: the temperate Mediterranean climate on the East coasts and the dry arid climate in the West, with a problem of desertification, which make soil poor in organic matter.

Also in the case of Sahel, the study of agrosystems and the exploitation of agricultural land highlights all the problems relating to the extension of agriculture to the detriment of rangelands, notably cereal growing in the north and arboriculture. Analysis of the dry and irrigated operating systems in different sites, particularly in the coastal area(…), reveals that in this environment the climate forcing was well resolved in the past through traditional techniques

Andalusian Federation of Municipalities and Provinces (FAMP) - Spain

FAMP's choice for the implementation of MedSNAIL project is Valle de Andarax, located in the province of Almeria in Andalusia, and focusing the intervention area within the Valle de Andarax with a double criterion: municipalities that are effectively influenced by the Andarax River and also with a marked rural character.

The criteria for the selection of this case study area have been:

- Depopulation of the rural areas , as one of the most worrying realities of our national demographic. In Andalusia, the depopulation does not reach such dramatic figures as at the national level thanks to the network of medium and small cities distributed uniformly throughout the territory. Despite this, we cannot ignore the fact that there are depopulation situations in our territory that must be taken into account and that require new actions to fight against. In this sense, the report "On the subject of depopulation in Andalusia" elaborated by FAMP describes 11 rural areas to be revitalized in Andalusia, among which is the Valle de Andarax.

- Climate change and desertification, being the latter a process of soil degradation accelerated by aggressive and unsustainable human actions in the natural and productive environment. Nowadays is an endemic problem in Mediterranean environments.

- The aging of the population is another factor threatening the rural areas of the national and andalusian territory. Together with depopulation, the lack of generational replacement in rural areas leads in many to the disappearance of crops and traditional techniques.

- Lack of certified products. Andalusia currently has 58 products with a certified quality designation. Only one (the tomato from La Cañada) is found in the province of Almería. Almeria is the province with the fewest certified products in Andalusia.

DESK REVIEWS BY PARTNERS

The complete Desk Reviews prepared by each member can be analyzed below.

Activity 3.1.2

BEN – Andalusian Federation of Municipalities and Provinces (FAMP) DESK REVIEW

ENI CBCMED Cooperating across borders in the Mediterranean
Project funded by the EUROPEAN UNION
REGIONE AUTÒNOMA DE SARDIGNA
REGIONE AUTONOMA DELLA SARDEGNA
MedSNAIL

ENI CBCMED
Cooperating across borders in the Mediterranean

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FEDERACIÓN ANDALUZA DE MUNICIPIOS Y PROVINCIAS

MedSNAIL

SUSTAINABLE NETWORKS FOR AGRO-FOOD INNOVATION LEADING IN THE MEDITERRANEAN

D3.1.2. Desk review on studies and projects on MedSNAIL in Andalusía Valle de Andarax, Almería

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ENI CBCMED
Cooperating across borders in the Mediterranean

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REGIONE AUTÒNOMA DE SARDIGNA
REGIONE AUTONOMA DELLA SARDEGNA

FEDERACIÓN ANDALUZA DE MUNICIPIOS Y PROVINCIAS

MedSNAIL

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1. Summary

1.1. MedSNAIL Project

The European project MedSNAIL is led by the Andalusian Federation of Municipalities and Provinces (FAMP). MedSANIL aims to develop small-scale value chains of traditional agro-food products in the Mediterranean, in order to promote local sustainable development through the agro-food sector, to recover and promote the traditional products of the Mediterranean diet. Thus, MedSNAIL will work to preserve the identity and traditional heritage of rural communities, through the enhancement of agri-food products rooted in these local cultures.

This objective will be developed under the approach of the "Slow Food" movement and local food chains, taking into account the balance with local ecosystems, biodiversity' preservation and the ethical commitment to producers.

One of the main results of the project is to build a network of of local leaders and communities, who can establish an "Alliance of producers" and traditional Mediterranean products from a "Slow Food" approach, promoting a "new gastronomy" as an expression of their culture and identity.

In this document we review studies and projects related to MedSNAIL's objectives that have already been carried out in the study area, Valle de Andarax (Almería, Spain).

1.2. Intervention area

1.2.1. Criteria for selecting the intervention area

According to the objectives established by the MedSnail project:

1. Preserve the identity and traditional heritage of rural communities
2. Promote local sustainable development through the agri-food sector

The FAMP has decided to establish certain criteria that allow us to identify those areas of intervention most suitable for achieving the project's objectives, and at the same time, that allow us to increase the project's impact on the territory. In this sense, the established criteria have been:

- Depopulation

  The depopulation of the rural environment is one of the most worrying realities of our national demographic. In Andalusia, the depopulation does not reach such dramatic figures as at the national level thanks to the network of medium and small cities distributed uniformly throughout the territory. Despite this, we cannot ignore the fact that there are depopulation situations in our territory that must be taken into account and that require new actions to fight against this phenomenon. In this sense, the report "On the subject of depopulation in Andalusia" elaborated by FAMP describes 11 rural areas to be revitalized in Andalusia:

  1. Sierra de Aracena y Picos de Aroche (Mountains of Aracena and Picos de Aroche) (Huelva)
  2. Sierra de Segura y Sierra Cazorla (Mountains of Segura and Cazorla) (Jaén)
  3. Cuenca de Guadix y Baza (Basins of Guadix and Baza) (Granada)
  4. Valle de los Pedroches y Guadiato (Pedroches and Guadiato Valley) (Córdoba)
  5. Alpujarra y Valle del Andarax (Alpujarra and Andarax Valley) (Granada and Almería)
  6. Sierra Morena (Brown Mountains) (Seville)
  7. Sierra Occidental de Malaga (Western Mountains of Málaga) (Málaga)
  8. Zona del Andévalo (Andévalo Area) (Huelva)
  9. Sierra de los Filabres y Sierra Alhamilla (Mountains of Filabres – Alhamilla) (Almería)

10. Condado de Jaén (Jaén County) (Jaén)
11. Zona noroeste de Cadiz y Valle de los Alcornocales (Northwest area of Cádiz – Alcornocales Valley) (Cádiz)

Population variation rate between 2000-2016 in these areas, among which is the Valle de Andarax, stood at values higher than 12% per year. Specifically, the depopulation rate for municipalities with less than 1,500 inhabitants, which are all those belonging to the Andarax Valley, stood at 14.81%.

- Climate change and desertification

Desertification, as a process of soil degradation accelerated by aggressive and unsustainable human actions in the natural and productive environment. Nowadays is an endemic problem in Mediterranean environments.

The Andalusian Strategy for Adaptation to Climate Change develops indicators related to climatic change and environmental adaptation to be used in territorial planning. Their analysis can be essential to try to minimize the natural, social and economic impacts that climate change can produce.

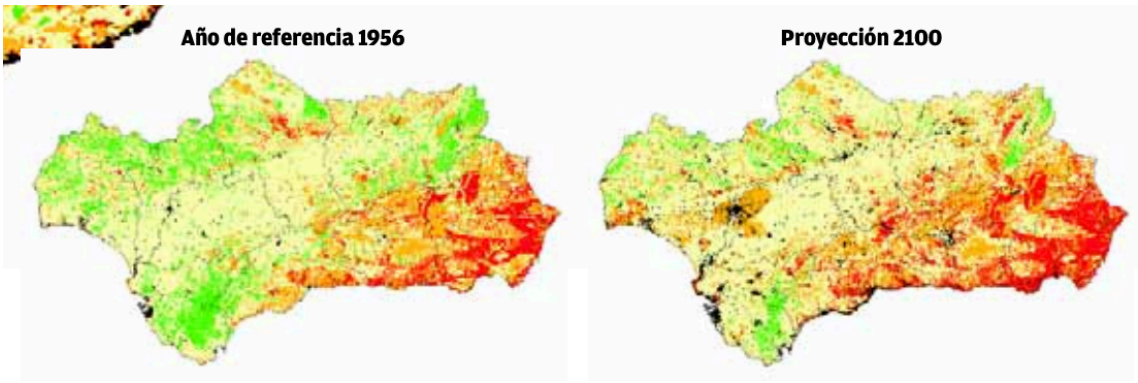

Image 1. Desertification in Andalusia
Source: GD Environmental Planning and Information (2008)

The diagnosis of desertification carried out by this study places practically all the areas affected by desertification processes in the province of Almeria, registering their presence, although to a lesser extent, in the province of Granada.

- Aging of population

The aging of the population is another factor that threatens the rural areas of the national and Andalusian territory. Associated with the phenomenon of depopulation, the lack of generational replacement in rural areas leads in many

cases to the loss of health care services provided by the municipalities, as well as the disappearance of crops and traditional techniques.

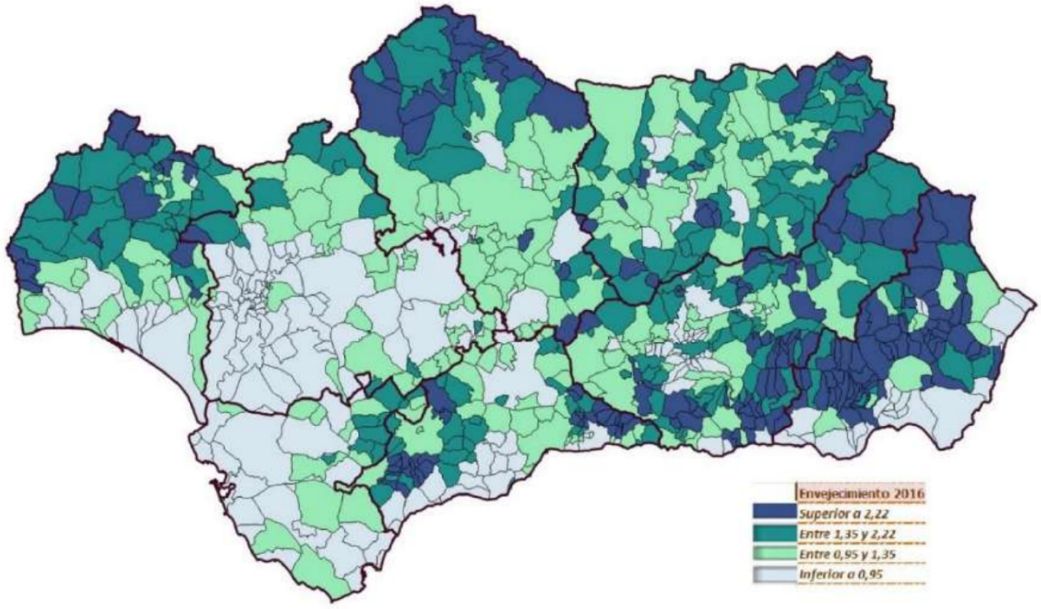

Image 2. Aging of population
Source: FAMP. About the depopulation in Andalusia. Report. (2018)

As you can see in the image above, the northern area of the Pedroches valley (Córdoba) but mainly the Alpujarras area of the Granada and Almería provinces are the areas with the highest aging index (2.2).

- Certified products

DOs aim to protect agri-food products that have additional qualities of quality, as a consequence of compliance with standards that go beyond mandatory quality requirements.

The different levels of DOs that currently exist are: Denominations that protect geographical indications (DO), which designate foods whose quality, characteristics or reputation is linked to a specific geographical origin; the Traditional Specialties Guaranteed (ETG), which cover foods with specific characteristics derived from the method of preparation, as well as Ecological Production and Integrated Production, mentions that refer to the use of a production system that is respectful with the environment.

Andalusia currently has 58 products with a certified quality designation. Only one (the tomato from La Cañada) is found in the province of Almería. Almería

also has two other products with Protected Geographical Indication in the wine category such as: local wine "Desierto de Almería" and local wine "Láujar - Alpujarra". Despite this, Almería is the province with the fewest certified products in Andalusia

1.2.2. Introduction and location of intervention area

El Valle de Andarax is located in the province of Almeria in Andalusia. El Valle de Andarax is bounded on the south by the Sierra de Gádor and on the north by Sierra Nevada. The Andarax Valley follows the course of the Andarax river which has a west-east orientation to turn at the end of its course towards the northwest-southeast orientation

Other authors demarcate the Valle de Andarax to the entire area crossed by the Andarax River from its spring in Laujar de Andarax to its mouth in the Mediterranean Sea close to city of Almeria

For the delimitation of the intervention area within the Medsnail project, we have used two information's sources that delimit the area influenced by Andarax river:

- "El Río Andarax" Agencia Andaluza del Agua, Consejería de Medio Ambiente, Junta de Andalucía, 2010.
- 'Unidades de paisaje del Valle del Andarax (provincia de Almería)' by Emilio Ferre Bueno published in "Baetica. Estudios de Arte, Geografía e Historia" 2006;

We have also completed this information with an analysis of municipalities that belong to the Rural Development Group "Alpujarra Sierra Nevada de Almería" which are linked to the Andarax River.

Based on this information, we have delimited our intervention area within the Valle de Andarax with a double criterion: municipalities that are effectively influenced by the Andarax River and also with a marked rural character.

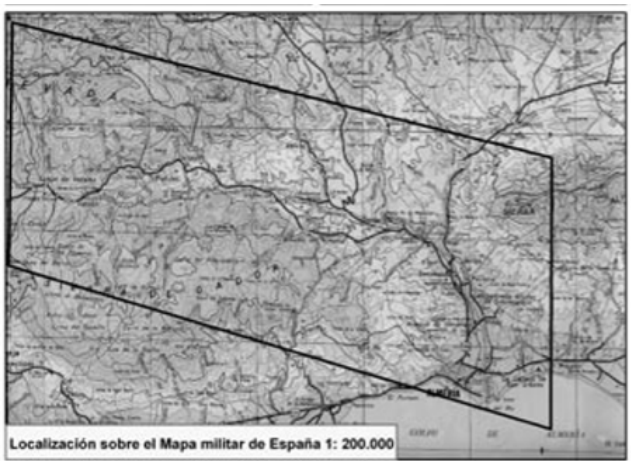

Image 3. Location of Andarax Valley
Source: Ferre, E. (2006)

Taking into account these two criteria, we have selected 20 rural municipalities located in this area that have great potential to participate in the MedSNAIL project: Laujar de Andarax, Fondón, Beires, Almócita, Padules, Ohanes, Canyájar, Rágol, Instinción, Alsodux, Aboloduy, Illar, Terque, Alhama de Almería, Santa Cruz de Marchena, Huécija, Santa Fe de Mondújar, Bentarique, Alhabia, y Alicún.

We have represented the intervention area on the following map:

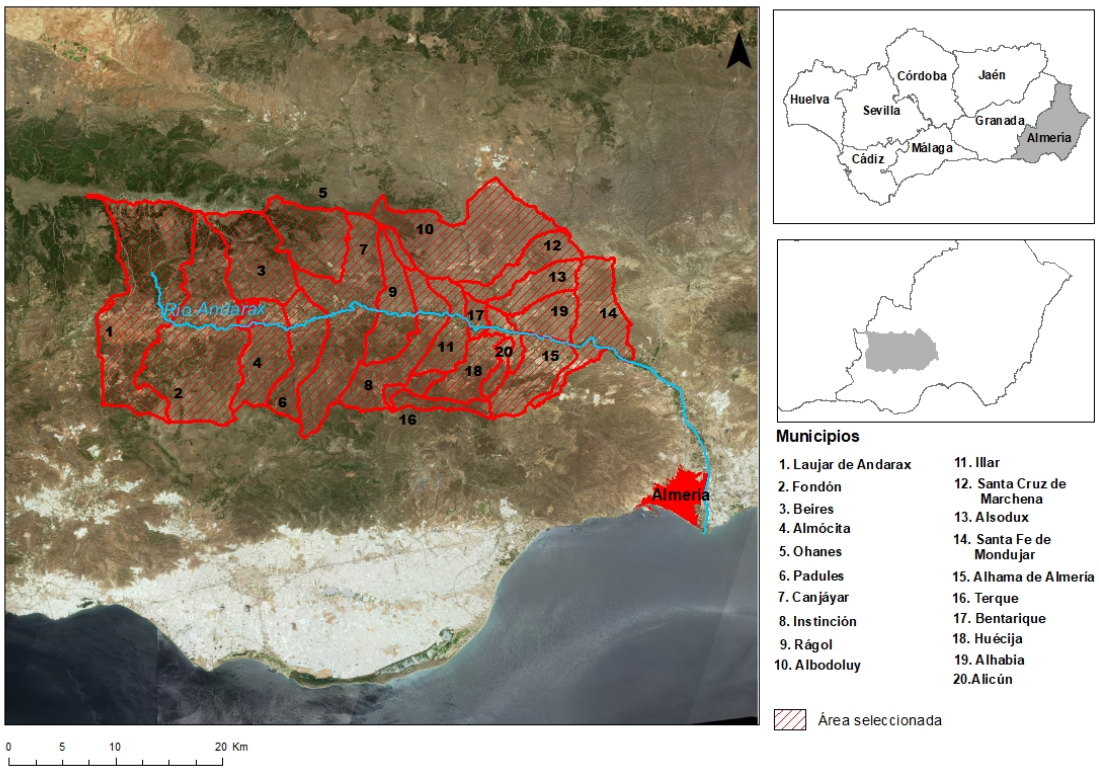

Image 4. Selected area
Source: Elaborated by FAMP

1.2.3. Geographic characteristics

El Valle de Andarax has an extension area of 2,187.6 km2. The hydrographic network of the Andarax river collects the waters of the Sierra de Gádor (north), Sierra Nevada (east) and Sierra de los Filabres in its central section.

The climatic characteristics change between the upper basin and the lower and middle valley. In the upper part of the valley next to the Sierra de Gádor, rainfall can reach 500-650 mm per year, even exceeding 1,250 mm in Sierra Nevada. However, when we descend through the valley the rainfall becomes scarcer (< 250 mm) reaching the extreme where the valley borders the Tabernas Desert.

Temperatures are moderate, although there is a thermal gradient from the eastern zone, warmer, to the western zone more temperate. The same is from the bottom of the valley to the highest peaks of the mountains. Thus the average annual temperature in the lower part of the valley is over 18º C, while in the higher parts of the valley it is 14.5º C. On the highest peaks of the mountains the average temperature barely reaches 10.2º C. The Valle de Andarax combines very cold winters especially in higher valley areas with the hottest summers in the whole province of Almeria in areas closest to the desert of Tabernas.

Following the bioclimatic characterization of Rivas Martínez (1995) the climate of this territory is Mediterranean with at least two dry months in summer.

Andarax River has the characteristics of the rivers in the southeast of the Iberian Peninsula, such as a fundamentally pluvial feeding and an irregular flow that combines scarce flows with sudden floods, especially in autumn, causing natural catastrophes.

2. Slow Food and intervention area

2.1. Introduction

The Slow Food movement was officially launched in 1987 in Bra (Florence) by Carlo Petrini, the founder of this culinary and ecological concept, which has now become a global movement.

The UN and the FAO have recognized the efforts of this foundation to reduce the loss of biodiversity and food waste. Some examples have been seen in cities like Amsterdam, where the Slow Food Youth Network (SFYN) organizes the annual Food Film Festival: three days of documentaries, talks and workshops dedicated not only to cooking, but also to the sustainability of the current food system.

In Spain there are about 1,000 Slow Food members distributed among 39 provinces. The provinces with the largest number of members are Vitoria, Bilbao and Zaragoza.

The increasingly widespread practice of collective catering "which standardizes food, sacrifices quality and is not suited to the nutritionally most vulnerable social groups" was one of the reasons for the establishment of Slow Food Spain. "Our orientation is based on support for local producers and sustainable rural development," points out from Slow Food Spain.

2.2. Slow Food in Spain

The Slow Food movement in Spain has had three different stages.

The first activities of the Slow Food movement took place mainly in Madrid and Barcelona where they were welcomed by a certain social elite of these cities who were interested in these principles. However, the Slow Food movement lacked the strength and confidence that the movement had in Italy where it received thousands of members from all over the country. In Spain, Slow Food was perceived as an interesting movement, but with an elitist component that did not reach wider sectors of the population.

The movement saw a recovery between 1995 and 1996. New organizational ideas coming from the international headquarters encouraged the emergence of associations (convivium) in different provinces that carried out interesting activities. However, some mistakes were repeated, such as the lack of coordination, the poor link with local gastronomy or the economic failure of the first Slow Food magazine in Spanish: a very important instrument for bringing together and offering initiatives to members.

In 2000, Slow Food had only a few members in Spain with little or no activity.

Things started to change in a very positive way between 2002 and 2003. Internationally Slow Food received more and more support since the first Salon del Gusto in 1998. New ideas and new projects were initiated such as: the Foundation for the Defense of Biodiversity, the Slow Food Award, the Ark of Taste, etc.

From these new initiatives, groups of members emerged again in Spain, and local events began to be organized. Examples of this new interest were the appointment of Carlo Petrini, International President of Slow Food, as Honorary Guild of the Basque Gastronomy Guild of San Sebastian in 2002, and a series of international activities he organized in April 2003 in Tarragona around wines of the Grenache variety.

Throughout 2003, there were also other important events for the future of Slow Food in Spain: first of all was the publication in Spanish of Slow magazine in January 2003. Slow magazine is a cultural publication that facilitated in this moment the association of new members and helped to build up an associative structure. On July of the same year in Barcelona, after a day of discussion, exchange and clarification of ideas, the first steps to make Slow Food a reality in Spain were taken with the designation of a Management Committee.

If in 2003 there was only a small organized group in San Sebastian, after Barcelona Slow food groups was created in Barcelona, Valencia, Zaragoza, Cordoba, Madrid, later in the Garraf region, Alava, Lleida, Tarragona, Bilbao, Huesca, Seville, in Asturias, Galicia and few areas of Andalusia.

The result of this new coordination and activities was an increased Spanish presence at events such as the Salone del Gusto and Terra Madre 2004: some Spanish products were recognized as Presidia (products favored by a special protection and dissemination project) and others became part of the Ark of Taste.

There were two Spanish Presidia achieved through the individual efforts of Slow Food International in July 2003: Gamonedo Asturian Cheese and Tolosa beans. Two more products were joined in Salone del Gusto 2004: Saffron from Alto Jiloca (Aragon) and EuskalTxerria / Basque Pig from Guipúzcoa. In 2005, there were already six: the Mongeta del Ganxet / Jewess of Ganxet (Catalonia) and the Malvasia Wine of Sitges (Catalonia). Each Presidia has a person in charge who ensures that the distinction and relationship with the Ark of Taste Commission are properly maintained.

2.3. Slow Food in Andalusia

In Andalusia only three provinces have had Slow Food associations in their cities: Seville, Granada and Jaén, being Seville the most active and numerous of them.

Within our area of intervention, Valle de Andarax in the province of Almeria, doesn't have any physical headquarters of the Slow Food association, but nevertheless products from the province of Almeria and the intervention area are identified.

SevillaySur began its activity in 2006 and is currently the most active association in Andalusia. In 2006 there were no convivium in the southern half of Spain. SevillaySur association was born to become a reference point for the different Andalusian provinces. SevillaySur is a non-profit association with the mission of organizing and collaborating in tasks of information, training and dissemination of Slow Food values in Andalusia.

Currently, SevillaySur has 80 members including producers, housewives, liberal professionals, cooks, teachers, etc. They are united by their concern for food issues: food production, protection of biodiversity, food security, the environment, sustainability of processes, taste education and the preservation of traditional and cultural values of the territories, local development, etc.

They are part of the Slow Food National Coordination, which includes more than 25 association in our country. And they are part of the great international Slow Food movement with nearly 100,000 members in more than 130 countries.

On the other hand, SevillaySur also develops strategies of collaboration with organizations and institutions related to these issues, as is the case of the Ministry of Agriculture and Fisheries of the Andalusian Government or the University of Seville.

Regularly, SevillaySur organises informative, awareness-raising and promotional activities; visits producers and participates in tastings and samplings of local foods; promotes the defence of traditional products at risk of disappearance and collaborates with producers and chefs. They believe that defending biodiversity and protecting the food heritage by asserting the right to pleasure and coexistence is an increasingly necessary and urgent task.

2.3.1. Slow Food SevillaySur initiatives

Slow Food SevillaySur has several initiatives focused on spreading this movement and promoting healthy and sustainable food that protects biodiversity and defends local values and cultures. Some of them are the following:

- Ark of Taste

The Ark of Taste was created in 1996 with the aim of having a catalogue of endangered food products closely linked to specific local communities and cultures.

The aim of the Ark of Taste is to describe the products and to draw the public's attention to the importance of preserving them. The products have to:

- Be of excepcional taste quality.
- Be linked to a specific geographical area.
- Be produced in a small-scale, artisanal manner.
- Be produced using sustainable and fair methods.
- Be in danger of extinction.

Following products are included in the Ark of Taste:

- Hinchonas beans
- Pías beans
- Andalusian chicken
- Ecologic pure Iberian pigs
- Chestnuts from Serranía de Ronda
- Sweet Orange Golden grain
- Olive Oil Royal variety
- Roteño tomato
- Cow from Cadiz
- Aloreña olive from Málaga
- Pink tomato from Sierra de Aracena y Picos de Aroche
- Ice Salt (Cádiz y Huelva)
- Extra virgin olive oil from Zuheros. Local varieties
- Ochio doughnuts
- Oil cake
- Purple carrots
- Dry liquor from Rute
- Pear from Ronda
- Black olives
- Canned tuna from Cádiz

- <u>Recommended foods</u>

Recommended foods include high quality local food that do not belong to Ark of Taste:

- Products with a Quality Certificated that doesn't need a specific support of Slow Food
- Derived products based on Ark of Taste products.
- Other high-quality products but aren't in danger of extinction or doesn't belong to local productions linked to the territory
- Products that are waiting to be approved by the Ark of Taste.

- Chef's network

The Andalusian Slow Food Chefs Network contributes to disseminate the role of Andalusian chefs as taste educators and vector of culinary culture. This network is part of the Spanish and International Terra Madre Chefs Network.

Restaurants can also be part of this movement if they comply with the agreements of the Km 0 Network, which aims to promote the consumption of local, regional or even territorial products produced by small farmers among consumers, restaurants and/or community kitchens. The aim is also to publicize Slow Food Ark of Taste's products to reduce the CO2 emissions produced by food transport.

Actually, there are 60 chefs and 59 restaurants throughout Spain that can wear the Slow Food km0 logo (seven in Andalusia).

- Informal group of experts

This group was created for the first time in Seville in 2009, with the following objectives

1. To improve coordination with institutions, groups and researchers that work in favour of biodiversity and food heritage in Andalusia, by supporting local foods.
2. To promote joint projects and activities that will make it possible to learn about, disseminate and support food heritage.
3. To create an Inventory of Local Foods of Andalusia.
4. To propose nominations for the Slow Food Ark of Taste and to advise on those submitted by other groups or individuals.

- University cafeterias

This initiative was created to introduce healthy and sustainable food into university cafeterias, as an educational and informative experience aimed at the entire university community (students, professors and service staff). It also aims to promote the link between science and arts with food culture (cinema, literature, sociology, etc.).

- Collaboration

SevillaySur association is committed to advancing in coordination with all those professionals, groups and institutions that share its interest in promoting taste education, defending biodiversity and supporting healthy and sustainable local food.

3. Selected area, biodiversity, agriculture, food and consumption

3.1. Introduction

Most of the municipalities of the Andarax Valley are within the area of influence of the Andarax River, one of the divisions established as a zoning area for the LEADER Programme. This LEADER approach, which has been an important component of the European local development policy, has the initiative to hand over planning to local communities, organising Local Action Groups, which elaborate and carry out development strategies for municipalities.

Within the municipalities, to be found in the area of the Andarax River, Alhama de Almería is the main focus of centrality, reinforcing its position over the years in relation to Canjáyar, a town that continues to be the focus of intermediate centralities or centred on private services. These are municipalities that are in-between enhancing their agricultural production, complementary in many cases, and their recreational function and that present demographic levels that pose a risk of depopulation for these municipalities.

Different subzones can be differentiated based on physical geography. We can talk about the middle course of the Andarax (Almócita, Beires, Bentarique, Íllar, Instinción, Huécija, Alicún, Rágol, Terque, Padules, Ohanes and Canjáyar), the encase Bajo Nacimiento-Andarax (Alboloduy, Alsodux, Santa Cruz de Marchena and Alhabia) and the medium-low section of the Andarax (Santa Fe de Mondújar and Alhama de Almería).

Moreover, we still need to add Laujar de Andarax, in the Alta Alpujarra Zone, which is also a gravitational focus. It has a quality agro-food production, being one of the main potentials of the area. Its geographical structure is essentially rural, and is characterised by an aging population.

3.2. Biodiversity

3.2.1. Landscape Units: flora and fauna.

Regarding the biodiversity of the selected area, we will begin by differentiating the different landscape units that make up the Andarax Valley basin, because this differentiation will lead us to analyse a different type of vegetation along with different land uses.

- Sierra Nevada

At the eastern end, we will find the part of Sierra Nevada belonging to the Almería province. It is a high mountain whose peaks exceed 2,000 m, lowering its altitude to the east. In this area, there is a gradation of the vegetation due to the climatic variations produced by the altitude.

Above 1,800-2,000 metres we find a vegetation formed by thorns and moorland whose dominant species are the Genista versicolor, in the most powerful soils, and the Ciytisus oromediterraneus in the least developed. Mixed with these thorny bushes, species of grassland or thyme appear, which become dominant in extensive areas managed by man, through fire and grazing, and in the summit area as serial vegetation of what may have been the ancient junipers. Wide areas have been repopulated with pine forests with different coverings, with clear areas where scrublands dominate, while in softer topographies the pine forest dominates with considerable density and degree of maturity.

Between 1,500 and 2,000 metres, the potential vegetation consists of holm oak groves of Quercus rotundifolia with thorns, currently represented only by thorns, with hawthorn and rose bushes, similar to those on the upper floor, dotted with broom.

From 800 m to 1,600 m, its potential vegetation is also a holm oak of Quercus rotundifolia. In the highest areas of the floor it appears in the form of open holm oak groves mixed with substitution stages in which the rockrose, ballast, cytisus striatus, and extensive thyme-grassland stains dominate. A little further down, holm oak groves develop in good condition, reaching over 60% coverage, mixed with broom plants.

At altitudes of 800 - 900 m, towards the eastern part of the mountain range, a kermes oak frequently appears, which supposes the passage to semi-arid conditions. In the degraded areas, only a serial vegetation remains made up of broom, cytisus striatus with gorse, rockrose, thyme and esparto areas.

Repopulations of pines have been carried out in large areas of this vegetation floor, which currently consolidate considerable forest formations. Similarly, this saw has been cultivated in the most favourable parts with dry land, almond and vineyards.

- La sierra de Gádor (Gador Mountains)

It limits by the south and at its eastern end with the Neogenous Andarax basin. It is a high mountain whose slopes often have slopes greater than 80% and the relative unevenness exceeds 1,000 metres. It has two subunits of landscapes, the summit area and the mountainside and its vegetation also differs depending on the climatic gradation that the altitude introduces, so it is possible to distinguish different plant communities from the summits to the basal areas:

Above 2,100 metres, its potential vegetation would be a light pine forest, under which a sabinal mixed with junipers is installed; but the anthropic action has degraded it and in its place, at present, what it can be found are bushy spinals with rose bushes and thorns.

Between 1,600 and 2,100 metres in height, its potential vegetation would have a sparse forest; at the moment, it is a serial vegetation formed by thorny bushes, plagues and padded bushes.

Between 750 and 1,700 metres, the vegetation should be a holm oak of Quercus rotundifolia, of which only isolated areas remain. In its place, there is a high mountain vegetation with kermes, scrub with lavenders, gorse, bowls, rosemary, rockrose, gorse and ballast.

In large areas of the "Sierra" there are pine stock. In addition, the mountainous territory has had a predominantly forest land use, although the relative weakness of the slopes has allowed crops to be planted to dry land and almond trees in some areas.

The northern slope of the "Sierra de Gádor" participates in the vegetation of the Mesomediterranean floor in the highest parts. The general aspect of this hillside is a high, well-developed mountain, in general, with kermes oak, blackthorn and juniper, together with a dense thicket of gorse, rosemary and rockrose. On the other hand, in the areas closest to the foothills it is represented by a thicket of mastic and broom. This landscape unit, not only has not been used for crops, but has been the subject of protection measures to prevent the action of the stream waters, so that in wide areas the slopes are repopulated with dense pine forests.

- La sierra de Alhamilla (Alhamilla Mountains)

It is a mountainous alignment with direction West-East that in the summit area reaches almost 1,400 m. It is constituted, fundamentally, by the stacking of mantles

of two of the tectonic complexes that form the Internal Units of the Betic Cordilleras (mountain range): the Nevado-Filábride complex and the Alpujárride complex mountain ranges.

Regarding the vegetation, it is currently represented by a well-preserved holm oak, although not very dense, between 850 and 1,000 metres, and by a thicket of gorse, gorse, canes, cytisus striatus and gorse. In the most degraded areas there are only broom, ballast, sticks to which palm hearts and asparagus are attached in the more heated areas.

Further down, between 400 and 800 metres, what exists is a thicket of the thermomediterranean floor formed by esparto areas and thyme where the esparto dominates, accompanied by boleas plant (santolina rosmarinifolia), tumbleweed salsolas and bojas plant.

In this part of the mountains there is little evidence of crops, as the territory has been dedicated to mining, forestry and livestock uses.

- Los piedemontes (The Piedmonts)

This is a unity of landscape easily perceptible by the abrupt change in the value of the slopes, by the different lithology and by the less abrupt morphologies, by the coloration of the rocks, by the vegetation cover and by the use of the soil. The slopes range between 12 and 20% and the relative unevenness is between 50 and 200 metres.

They are landscapes with moderately steep topographies with numerous hills made up of the remains of important staggered accumulations that have been carried by the river elements that come down from the mountains.

There are differences between the foothills of Sierra Nevada, the Sierra de Gádor and the Sierra de Alhamilla.

- The foothills of the southern Sierra Nevada are the least extensive. It is only recognised in the headwaters of the Andarax, where we find an intramountainous basin in the surroundings of Laujar and Fondón municipalities. However, between Beires and Ohanes, the ravines that descend from the Sierra de Beires have built wide alluvial fans currently destroyed by the erosion of the ravines themselves and reduced to elongated platforms.
    - The potential vegetation of this foothills would be represented by holm oak groves, of which there are deformed remains dominated by rosemary, mixed with boleas plant (santolina rosmarinifolia) and esparto grass. The areas with more powerful soils support broom.

- The Laujar-Fondón basin, traditionally, has had an agricultural use with mixed crops of rain-fed and irrigated crops, with olive, almond and fruit trees. The piedmont between Beires and Ohanes, apart from the olive grove, has been the cradle of the cultivation of table grape vines that have lasted until the last decades of the 20th century. The piedmont of "Sierra de Gádor" It is the most extensive, finding it from the western end of the basin to the city of Almería. It has two floors of vegetation.

- The foothills of the "Sierra de Gádor" is the most extensive, finding it from the western end of the basin to the city of Almería. It has two floors of vegetation.
  - In the western part, its potential vegetation is a holm oak forest of Quercus rotundifolia, from which isolated individuals remain and a high mount of scrub and hawthorns that, in the most degraded areas, is a thicket of gorse, bolina plant (santolina rosmarinifolia), rosemary and broom. The central-eastern part, from Canjáyar downwards, its current vegetation is a discontinuous scrub formed by mastic, gorse, asparagus, capers, tumbleweed salsoles, esparto grass and thyme.
  - This landscape unit is largely occupied by irrigated crops. For 100 years its main cultivation has been that of table grape vines with an export orientation. But this was changed by the economic situation, which is why in recent years this space has been occupied by olive groves, vineyards and even greenhouses.
- In the foothills of the "Sierra Alhamilla" it belongs to the thermomediterranean vegetation floor, whose current communities form a thicket of gorse, rosemary, boleas plant (santolina rosmarinifolia), asparagus, capers, esparto grass, boxwood and thyme. The territory has not been very cultivated, except in some recent alluvial fans with rain-fed crops, now abandoned. However, in recent years, greenhouses are beginning to gain space.

- <u>The gulies system of the neogenous basin</u>

It originated in a post-orogenic distension stage and separates the "Sierra de Gádor" to the south, the "Sierra Nevada" to the northwest and the "Sierra de los Filabres" to the north.

The landscape is dominated by a thyme aresa, with a low degree of coverage and very altered by livestock use, alternating with esparto grass and albardinal area (Lygeum spartum). In the most removed and nitrogenous soils, communities

consisting of Haloxylon tamariscifolium, Atriples glauca, Artemisia barrelieri, Salsola genistoides, Salsola vermiculata, etc. are frequent.

The use that man has given to this territory has been more livestock than agricultural, due to its structural nature. Being a region with the highest aridity index, agricultural use has been limited to those areas where water has been channelled for irrigation.

- The river terraces of the Andarax river

They are located in a strip near the main channel of the Andarax river and its main tributaries such as the Nacimiento river, the Gérgal dry river bed and the Tabernas dry river bed.

The channel of the Andarax river, as well as those of its tributaries, are accompanied by riverside vegetation, partly natural and, on the other, planted by man, consisting of poplar groves, willows, and reeds on the banks; while inside the channels (especially in those of the ravines and the dry river bed) oleanders, olive groves and reed beds appear.

All the levels of river terraces have been traditionally used for crops, which, during the 20th century, have followed one another from the vineyards, in the first half, to the citrus fruits in the second half. At the beginning of the 21st century, the greenhouses and, in the area of influence of the city of Almería, the housing developments are pressing hard in the lower part of the valley.

Regarding the fauna found in this area, it can be very diverse, since on the one hand we have the Sierra Nevada National and Natural Park area belonging to the province of Almería, which preserves protected animals and other varieties of fauna existing in the Park. Among them the mountain goat stands out.

On the other hand, the fauna is better represented in the upper part of the channel, far from the recreational area which is mainly made up of stone flies, dragonflies and numerous invertebrates, such as the butterflies that stand out in this area.

The vertebrate fauna includes birds such as the oriole and the common nightingale. The squirrel, very common in the area as there are pine forests in the vicinity of the birth. We will also find in rural areas other mammals such as wild boar, deer, wolves, etc.

3.2.2. Site of Community Interest (SCI)[1]

An outstanding aspect of the study area is its geographical location, since it is located in an emblematic area where many of its areas are established as a Site of Community Interest (SCI), being an environmental protection figure classified according to the framework of regional, state, European and international regulation.

- The SCI Tabernas Desert, with an official area of 11,459.37 hectares, was declared a Special Bird Protection Area (SPA) on October 1, 1989, prior to its declaration as a Place of Community Interest, on the 1st of December 1997. The percentage of municipal area occupied by this SCI in each of the municipalities in the study area are:

Table 1. % of municipal Surface SCI Tabernas Desert

Alboloduy	7,80
Alsodux	0,57
Santa Fe de Móndujar	0,29

- The SCI Ramblas de Gérgal, Tabernas and South Sierra Alhamilla with an official surface of 22,853.07 Has, was declared a Special Conservation Area on May 13, 2015. The percentage of municipal surface occupied by this SCI in each of the municipalities of the study area are:

Table 2. % of municipal Surface SCI of Ramblas (dry river basin) of Gergal, Tabernas and South of Sierra Alhamilla

Alhabia	75,98
Alhama de Almería	0,41
Alsodux	48,01
Santa Fe de Móndujar	71,90
Terque	0,02

- The SCI Sierra de Gádor and Enix with an official area of 50,343.76 Ha., was declared a Special Conservation Area on May 9, 2015. The percentage of

[1] All the Tables in this section have been taken from the Rural Devlopment Group of the Alpujarra-Sierra Nevada of Almería

municipal area occupied by this SCI in each of the municipalities in the study area are:

Table 3. % of municipal surface SCI Sierra de Gádor y Enix

Alhama de Almería	32,06
Alicún	47,64
Almócita	54,92
Bentarique	53,99
Canjáyar	46,24
Fondón	49,81
Huécija	76,80
Illar	46,96
Instincion	64,91
Laujar de Andarax	19,39
Padules	38,37
Rágol	42,25
Santa Fe de Mondujar	5,40
Terque	51,81

- The SIC Sierra Nevada with an official area of 172,238.05 Ha., was declared a Special Conservation Area on 12th of October, 2012 and a Special Protection Area for Birds (ZEPA) on 1st of October, 2002. The percentage of municipal area occupied for this SCI in each of the municipalities of the study area are:

Table 4. % de superficie municipal LIC Sierra Nevada

Alboloduy	45,60
Alhabia	2,57
Almócita	23,88
Alsodux	25,55
Bentarique	37,09
Canjáyar	48,56

Fondón	35,66
Illar	31,45
Instinción	24,22
Ohanes	100,00
Laujar de Andarax	60,93
Padules	25,09
Rágol	49,46
Terque	51,81

3.3. Agriculture

The first aspect to comment on agriculture in the Andarax Valley is the useful agricultural area found in each municipality, this surface is expressed in number of hectares used in agricultural activity. With this data, established as a percentage of the extension of the municipality (expressed in square kilometres), information is offered about the degree of agrarian specialization of a territory.

These data have been obtained considering the comparison with the total area of the municipality, converting the square kilometres into hectares.

The agrarian function of each municipality is mainly determined by its orography, and by the type of agriculture that takes place in an area, which constitutes a pattern of agrarian extension.

In the case of the Andarax Valley, farms belonging to mountain farming systems coexist with significant concentrations of intensive crops, with Alhama de Almería being the main example.

Another factor to consider influential in agriculture is the proportion of surface integrated in Protected Natural Spaces, relevant in the region, underlining the ecological function of this territory.

The regional area devoted to agriculture is less, in relative terms, than the agricultural area of Andalusia and the province of Almería. The municipalities of Alboloduy, Canjáyar, Laujar de Andarax, Ohanes, Padules, and Santa Cruz de Marchena exceed the regional average.

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Municipality	Surface area (ha)	Agriculture Surface area (ha)	Agriculture Surface area %
Alboloduy	6.970,0	1.978,62	28%
Alhabia	1.640,0	179,13	11%
Alhama de Almería	2.620,0	424,91	16%
Alicún	590,0	32,15	5%
Almócita	3.080,0	3.150,95	102%
Alsodux	2.010,0	172,46	9%
Beires	3.880,0	864,62	22%
Bentarique	1.130,0	77,9	7%
Canjáyar	6.690,0	2.560,88	38%
Fondón	9.120,0	480,79	5%
Huécija	1.900,0	271,27	14%
Illar	1.920,0	331,15	17%
Instinción	3.350,0	663,31	20%
Laujar de Andarax	9.280,0	2.720,77	29%
Ohanes	3.240,0	2.497,46	77%
Padules	2.650,0	1.429,41	54%
Rágol	2.690,0	42,11	2%
Santa Cruz de Marchena	2.000,0	1.362,86	68%
Santa Fe de Móndujar	3.490,0	184,77	5%
Terque	1.570,0	116,18	7%

Table 5. Useful Agricultural Area
Source: Local Development Strategy of LAG Alpujarra-Sierra Nevada of Almería (2016)

Agriculture in our field of study has been affected by a global agro-food system, which promotes a single strategy that is the same for everyone without taking into account its geographical area, weather or its own traditions, both cultural and culinary. This has led to the loss of a number of local production species, both plant and animal.

An example of the development of agriculture and which also had an impact on cultivation was the use in the 1960s of many pesticides, which were not suitable for food and which later had to be withdrawn from the market. This has led to the global struggle of the markets to produce GM crops, which, in search of an improvement in products, are often studied without prior evidence of the impact to be generated.

This unfavourable situation for agriculture has led to the abandonment, on many occasions of the new generations, of agrarian structures, generating rural depopulation.

Despite this situation, one can see a part of the population that still choose traditional agriculture and that has not been influence directly or indirectly by modern technology in the agricultural sector.

Before the war to the 1960s, the most developed crops were wheat, grapes and potatoes. Over the years this underwent a modification, and with the disappearance of the wheat tradition, its varieties became extinct, such as the "candela" wheat, which according to farmers was the most select variety of all, "raspinegro" wheat and durum wheat.

When people started to emigrate from this area, another food that disappeared was the potato of the "sierra", currently 100% of the potato that is planted is commercial.

On the contrary, in the case of the vineyard the situation has been reversed, diversity has increased due to the entry of commercial varieties, but traditional farmers have not replaced their local varieties with these varieties, but have implemented and integrated them into their systems. production, also because these varieties are more productive.

Therefore, the species and varieties that have been maintained over time have been those that productively have required less effort, and those that, due to their use or organoleptic quality, have been key in the culinary tradition. As an example, we can point out the colouring peppers (Marcone peppers), the Totana squash and the country's tomato.

Another change to point out over time in agriculture in the area is the use of multinational seeds in order to obtain plants with defined characteristics, higher yield and genetic uniformity.

Formerly, everything that was consumed in this area came from the surrounding environment. Being rural and mountainous areas, cultivation zones were differentiated according to the climate and altitude levels, and the seeds were recovered, conserved and replanted. With the opening of the market and industrialisation in agriculture in Almería, improved varieties began to be introduced.

Image 5. Vegetables from Andarax Valley
Source: Pexels

Image 6. Milk and wine products from the Andarax Valley.
Source: Pexels

3.4. Food and Consumption

This is an area where gastronomy has a special interest and is notable for the quality of its products. One of its most characteristic aspects in the kitchen is the use of local products, preserving the traditional and homemade recipes of the place. Among the variety of products we could highlight meat, vegetables, wine and desserts. And some of their typical recipes.

3.4.1. Foods

Here we will highlight the different local agricultural varieties with greater meaning and strategic value for different farmers.

- **Cheeses and wines**

The Alpujarra cheeses from Almería deserve a special mention as the region has been characterised for manufacturing this type of food in the most traditional and ecological possible way.

On the other hand, the wine of the area has obtained awards. In fact, oenology is one of the most practiced activities in the area and one of the main reasons for which this region has become known.

- **Pumpkin**

Pumpkin is a very common product in traditional dishes, it is an easy crop, handle and uses moisture more than other types of crops. Those that remain are also used for animal feed. The most used pumpkin is the Totana or Totanera, along with commercial varieties that are most in demand by the market.

- **Onion**

The onion comes from the amaryllidaceae family. It needs several years of cultivation, taking first the formation of the bulb during the first year, and the reproductive phase in the second year. There are different varieties of cultivation, the most typical are the "Easter, winter or white" onions which is smaller than usual and white in colour.

The summer onion "Valenciana or Matancera" that lasts longer due to the thickness of its skin and is the variety that resists the most the rest of the year. Lastly, it is worth noting the “Babosa” onion, which is less widespread, but can be planted at any time of the year.

- **Green bean**

In many of the cases, most farmers sow beans with corn together, a technique from Latin America, which was an agronomic revolution because corn is a nitrogen consumer that provides beans to the soil by be a legume.

- **Pepper**

Pepper is a very common crop along with tomato, cucumber and aubergine that we can find in many of the orchards. The most common is the Marcone pepper, with its characteristic red coloration and thick skin.

- **Tomato**

The local variety of this crop is the so-called "country tomato", it is a very fat fleshy tomato with thin skin. Later, different varieties have been added, such as the popularly called “bull's egg” or “pear tomato”. The tomato has been one of the main vegetables in the cultivation of the fertile plain.

Image 7.Vegetables products from the area
Source: Pexels

Table 6. Products from intervention area included in the Ark of Taste of Slow FoodSevillaySur

Food	Category	Historic/Traditional Area	Marketed
Garlic (Alliumsativum L.)	Vegetables	Very concentrated in the Eastern part of Andalusia. Specifically in the Alto Andarax Valley, Almería	Yes
Desert Olive Oil	Olive Oil	Tabernas Desert, Almería	Yes
Roman pumpkin	Vegetables	Alpujarras in the province of Almería and Granada	Yes
Water Pumpkin	Vegetables	Alpujarras in the province of Almería and Granada	Yes
Honeh of Filabres Alhamilla	Honey and beekeeping products	Filabres- Alhamilla region, Almería	Yes
Mead	Honey and beekeeping products		Yes

Image 8. Healthy producs from the area
Source: Pexell

Image 9. Honey products from the area
Source: Pexell

3.4.2. Recipes

- **Migas alpujarreñas (Alpujarra Crumbs)**

Migas Alpujarreñas stand out for being a dish that depends on the ingredients with which it is accompanied. Using native meats such as bacon, chorizo or loin, Alpujarra Crumbs, traditionally cooked with wheat semolina, make up one of the most characteristic dishes of this area and common during all times of the year.

- **Alpujarreño plate**

This is the most typical dish of the area. It consists of a preparation that includes "poor potatoes", fried eggs, blood sausage, loin of dagger board, sausage and serrano ham. It admits various variations such as using Iberian pork instead of loin, but the most typical is to make it with these Alpujarra ingredients. A simple mixture in which there is no lack of calories, protein, or flavour.

- **Patatas a lo pobre (Poor potatoes)**

One of the most deeply-rooted dishes of the Almerian culinary tradition: the "poor potatoes" is a dish of the townspeople of yesteryear that has been reinvented and survived the passing of time, being one of the most typical dishes of area today. It is an easy and cheap dish. The ingredients are onions, peppers, oil and salt.

- **Tabernero (Innkeeper)**

In this land of large greenhouses, a dish based on vegetables cannot be missing from the list of typical foods. It is the Tabernero, a tapa that is a kind of ratatouille with tomatoes, peppers, onions and a spicy touch due to the chillies.

- **Gurullos con conejo (Gurullos with rabbit)**

It is specially prepared in winter, during the hunting season. It is a stew-type dish with rabbit and an artisanal pasta made from wheat flour.

- **Olla de trigo**

Another wheat-based stew, one of the most used cereals in Almeria cuisine. It is said that this dish was created for the first time in the town of Las Tres Villas and, in fact, the tastiest wheat pots continue to be prepared in this town.

- **Acelgas esparragás (Swiss chard)**

A dish from the peasant tradition that survives today thanks, above all, to the great importance of agriculture in the economy of this area. It can be made from different types of ore, but the most popular ones of course include chard, chickpeas, broad beans, bell pepper and dry bread.

- **Conejo al ajillo (Rabbit with garlic)**

It is a rabbit-based dish, more typical in the hunting season, garlic, white wine and dressings.

- **Ajo colorao (Red Garlic)**

It is based on potatoes, red peppers, tomato, cumin, saffron as well as fish, usually cod or ray. All these ingredients are cooked to make a consistent pure or soup, very healthy and with a really exquisite flavour.

- **Pastries**

The variety of desserts offered by the area is wide and delicious. Like typical dishes, pastry recipes have passed from generation.

The puffs, for example, are traditional sweets from the area that have Arab origins and are made from cinnamon, lemon, egg whites and sugar.

Other varieties worth mentioning are: blueberry cheesecake, calatrava bread and, of course, cottage cheese with honey. There is also the almond nougat, the anise bagels, the pestiños and the fig bread.

Image 10. "Soplillos" Tradicional Dish
Source: Wikimedia Commons

3.5. SWOT Analysis. (Agriculture, livestock and agro-industry)

Table 7. SWOT Matrix

S.W.O.T Analysis	
Agriculture, livestock and agro-industry	
Weaknesses	- Aged population - Lack financial resources for an entrepreneur - Small Business Size (Company structure, machinery, invesments) - Lack of irrigation water - Isolation of companies and entrepreneurs - Location and distance to distribution and logistics centers - Lack of reusable products - Agricultural abandonment - Depopulation of Young people. Young people haven't their own farms - Agricultural unemployment - No presence of agricultural labor unions in the region - Unknown marketing channels - Low consumption of local products - Lack of psarkling wine culture in Andalusia - Low consumption and marketing of ecological local product - Low level of training and innovation in business management. Low investment capacity

Threats	- Drought, adverse weather conditions and lack of water - Competitive sector - Lowering and instability of prices, intermediaries, high commisions - Lack of qualify human resources - No sinergies between agricultural sector and tourism - Lack of awareness of organic and local products' consumption - Low economic resources and invesment due to public administration - Lack of awareness for the rural environment (agrochemicals and pesticides) - No harmony between agriculture and protected species - Low quality controls of handmade products - Inefficient supply transportation network - Low price for farmers. - Lack of incentives for young people

Strengths	- Location - Production and elaboration of quality products: handmade, ecological, innovative, etc. - Synergies among companies, public administration and producers - Quality raw materials - Product differentiation - Traditional family businesses with a strong ties between its members, ownership of the land, relying on theri own entrepreneurial capacity. - Nature and landscaping - Knowledge of the market and direct relations with customers - Positive visión of rural life and local consumption - Participatory population - Rural heritage - Diversification - Climatology - Increased of organic product demand - Production process' control - Diversity of resources

Opportunity	- Increased awareness of consuption of natural products without additives, ecological and healthy - Improvement of rural infraestructures, communications, etc.. - Improvement of the marketing and distribution channels. Mediterranean corridor of the coast - Improvement of the economic situation and financing of companies - Promotion campaigns in the media about organic production, agro-tourism, wine tourism, etc. - Organization of agricultural fairs by municipalities in the región or public administrations - Subsidies for agricultura, industry and tourism - New customers and markets interested in local products - New crops in the region - Environment capable of attracting new visitors and investors - Internationalisation of companies - Availability of qualified labour - Fomento de la artesanía, la tradición, la conservación - Promotion of local and traditional species - Sierra Nevada Natural Park - Increased natural awareness of citizens - Improved competitiveness - New technologies.

4. Main projects

4.1. Projects related to agriculture, livestock and agro-food industries

In order to improve the quality, production and trade of the food sector in this area, different projects have been carried out related to the creation and modernisation of agricultural or livestock farms, as well as the transformation of products derived from them, such as dairies, oil mills, wineries, factories of jams, liqueurs, etc.

Given the lack of information on the particular projects, for now only the list of projects identified is included:

1. Sierranevada Productions, S.L.U.
2. Improvement of livestock farming
3. Improvement of profitability of agricultural exploitation
4. Modernisation of production process in oil mill
5. Modernisation of agricultural farming
6. Modernisation of goat farming
7. Modernisation of sheep faming facilities
8. Agricultural warehouse to support honey production
9. Improvement of irrigation facilities of rural property
10. Acquisition of machinery to improve farm performance and high-quality wine
11. Modernisation of machinery and furniture set
12. Agro industrial warehouse for production of sausages
13. Facilities to cultivate and sell mushrooms
14. Improvement and modernization of the winery
15. The Canjáyar winery
16. Acquisition of agricultural machinery for livestock farming.

5. Slow Food communities in the selected area

Currently there are no Slow Food communities that operate in the municipality, however, we find a wide variety of gastronomic associations in the province of Almería included in the Andalusian Federation of Gastronomic Brotherhoods and Associations (FECOAN) in order to promote quality Andalusian agro-food products, as well as the preservation and dissemination of the gastronomic traditions of the community.

5.1. List of gastronomic associations collected in FECOAN in the province of Almería

Regarding the list of the different gastronomic associations found in the province of Almería, only information on some of them could be found:

- Andalusian academic association of gastronomy and enology.

The Andalusian gastronomy academy aims to value and promote Andalusian gastronomy linked to tourism in the community, this is done by carrying out several objectives, such as maintaining and publicizing culinary traditions by studying its history and defending its values, increase knowledge of Andalusian gastronomy, by improving products and services. They also promote healthy and balanced nutrition with responsible and sustainable agro-food and fisheries production. This association contributes to an improvement in the sector of the provision of catering and hospitality services. Without forgetting their training, research and development work.

- Peña gastronomic cultural association "the wooden spoon"

The association "The wooden spoon" has as its main objective the defence and dissemination of the Culture of the Olive Tree, making known the excellence of extra virgin olive oil.

- Brotherhood Association "and they come together"

This association owes its name to the fact that they meet one day a month, since the members of this association aim to meet to share different healthy recipes, especially stews.

Other associations:

- "El Rapo" gastronomic and wine brotherhood - Vera
- Cultural, gastronomic and oenological association "four or five in a rock"
- Gastronomic Association "the good paper"
- Association "Peña los Cabales"

- Peña gastronomic association "from ajoblanco to paprika"
- "Gaudeamus" gastronomic association, friends of good eating and better drinking
- Cultural, sports and gastronomic association "el enjuague"
- Association "el choto pelao y la buena mesa"
- Cultural gastronomic society association "garum"

6. Promotional activities

Related to the projects that we saw previously in section 4, we will highlight at this point those projects that have been implemented with the idea of improving the development of their products, with a component to promote their food.

- **Competitiveness Improvement of Valle Laujar Winery**

The Valle de Laujar Winery was founded in 1991 and opened in 1992. It is located in the valley of Laujar de Andarax. They produce high mountain wines and their name is Laujar-Alpujarra Protected Geographical Indication. Its wines have the Quality Certificate of the Junta de Andalucía.

- **Canned vegetable and liquor factory. Albentillas.**

Created in 1993 and based in Bentarique, it is mainly dedicated to the production and marketing of citrus and table grapes. Since 2001, it has been recognized as an Organization of Fruit and Vegetable Producers (OPFH). It has also bet in recent years on the transformation of its products, turning citrus, grapes and vegetables into artisan jams, canned vegetables and natural liqueurs, through an environmentally friendly crop without preservatives or dyes in artisan production of your products.

- **Improvement of waste management of the Ecological Winery "Cortijo el Cura".**

It is located between "Sierra Nevada" and "Sierra de Gádor", specifically in the municipality of Laujar de Andarax. In 1998 the Sánchez Vizcaíno family founded the winery with the aim of offering the first organic wines from Almería.

The Cortijo El Cura Eco-Bodega presents an organic wine made exclusively from home grown grapes from its farm. They also make high quality and strictly ecological products, respecting the environment and betting on sustainable development.

- **Creation of mini-dairy. Laujar Medal.**

The Rural Development Group (LAG) supported the construction of the structure that forms the mini-dairy within the livestock building itself, as well as the

acquisition of various machinery and facilities necessary for the implementation of this activity.

Medal Laujar, is the result of a dream of farmers, who in 2010 decided to give way to the low prices they obtained for the milk produced by their goats, building a society that managed both the farm and the cheese factory. The differentiation lies in the manufacture of dairy products made by hand with the own milk of their goats and in the research and rescue of the flavours of yesteryear.

- **Promotion of products from Almería County Council.**

On the other hand, in the province of Almería, activities are carried out by promoting the agro-food industries seeking the development of the municipalities of the province, since it is an essential factor in job creation and the sustainable development of the place.

For this reason, after 20 years supporting companies through agro-food promotion actions, "Sabores Almería" is created, a promotional brand that serves as a tool to recognize the efforts of these companies and their products from Almería.

The purpose of this brand is the collective promotion of agro-food and fishery products in the province of Almería, jointly supporting businesses and establishments of restaurants, hotels and tourism that use and / or market these products in a prominent way.

Finally, point out the variety of activities that we can find in the province of Almería and that are developed in order to promote its gastronomy and enhance its quality products

7. Preliminary Considerations

Both the province of Almería and specifically the Andarax Valley are areas that stand out for their agro-food production, due to the variety of their products and their quality.

The introduction of the Slow Food methodology in the selected area would not only entail reinforcing the protection of biodiversity, today clearly threatened and with clear symptoms of desertification, through ecological products for rural municipalities, but also local and economic development such as fundamental engine in the local economy of this area and the fight against depopulation.

MedSNAIL should represent, for this area, the promotion of organic products and artisan products associated with their production and the development of tourist activities related to gastronomy and consumer awareness.

- It seeks to preserve identity through these products that have a strong local roots, and thus create a link with the locality and social pride in valuing local quality products, promoting their gastronomy and being aware of this importance to the whole community.
- In order to improve the production chain, it is also sought that the development of this process leads to an organizational strengthening as well as a political and social positional improvement.

With this, the benefit will not only be for the producers in the area, but it will also allow the creation of a local network of consumers aware of the importance of good nutrition that leads to an improvement in the quality of lifetime.

Thus, betting on an effective network will be essential to carry out all these objectives and guarantee an ecological, local, clean and environmentally friendly production in the future.

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Activity 3.1.2

PP2 - American University of Beirut (AUB)

DESK REVIEW

ENI CBCMED Cooperating across borders in the Mediterranean
Project funded by the EUROPEAN UNION
REGIONE AUTÒNOMA DE SARDIGNA
REGIONE AUTONOMA DELLA SARDEGNA
MedSNAIL

2020

MedSNAIL

Overview on local agriculture and food heritage: Case of West Bekaa and Shouf in Lebanon

DESK REVIEW

Prepared and submitted by the Environmental and Sustainable Development Unit (ESDU) at the American University of Beirut under the project "Sustainable Networks for Agro-food Innovation Leading in the Mediterranean - MedSNAIL"

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1. Introduction

Lebanon's exceptional location at the crossroad of Africa, Europe and Asia, in addition to its singular morphology has contributed to making it a hub of botanic diversity. Locals gush over their country's cultural marvels, from its deep culinary traditions to the surprisingly varied topography. Lebanon has been host to many genetic species of wheat, barley, lentils, where their cultivation dates back more than 5000 years. Other local agricultural species include olives, figs, grapes, pomegranate and carob. Food made from these plants lie at the basis of culinary traditions transmitted between the generations (Zurayk, 2008). Aiming at fostering the valorisation and development of small-scale traditional agro-food value chains, combining enhancement of market potentialities and socio-economic sustainability, MedSnail is a 3 years project funded by the EU under the ENI CBC Med Program and jointly implemented by seven Mediterranean partners including the American University of Beirut represented by the Environment and Sustainable Development Unit (ESDU) and the Department of Landscape Design and Ecosystem Management (LDEM). For that, a desk review was conducted to have a better overview of the Lebanese agricultural and food systems, better promote these local food systems, raise awareness on responsible consumption and identify window opportunities for the small-scale producers in the Shouf and West Bekaa to create business services hubs, animated by local leaders trained on MedSNAIL principles and procedures. With the burden of the Syrian crisis and with many challenges facing the agro-food sector in Lebanon, the West Bekaa was traditionally the least frequented area for agro businesses. However, the area has significant potential, due to its rich culinary heritage and its vegetation and agricultural landscape, and has recently been the subject of increased interest from donors, investors and tourists alike. The agro-food sector in West Bekaa is largely seen as a spring or summer option. This is affecting employment in the sector, as operators still perceive it as an alternative source of revenue in addition to their full-time occupation, since they are not able to work in this sector throughout the year; therefore the need to emphasis promotion of sustainable rural development policies (LEADERS Report, 2017). On the other side, Shouf has always been home for the know-how linked to traditional food processing especially promoted by the geographical and topographical features that promoted the raising of sheep and goats, especially in areas

where rain fall is insufficient for productive farming (Zurayk, 2008). Thus, the Shouf area represents typical cases of diversified and authentic agriculture and food systems that need continuous conservation and promotion.

2. Lebanon Overview

2.1. Geographical location and climate

Lebanon is a Mediterranean country covering an area of 10,452 km^2. The country stretches from north to south along the eastern shores of the Mediterranean Sea having a coastline of 225 km. The country is bordered by Syria in the North and East, and Palestine in the south. Lebanon is divided into 8 administrative regions also called “Mohafaza”: Beirut, Mount Lebanon, North Lebanon, Akkar, South Lebanon, Nabatieh, Bekaa and Baalback-Hermel.

The geomorphology of Lebanon is characterized by complex topography the narrow coastal strips are surrounded by two mountain chains. Consequently, Lebanon can be divided into four topographic areas (shown in figure 1):

1. The narrow coastal plains that run parallel to the sea along the country with frequent urban sprawl.
2. The Mount Lebanon chain also stretching from north to south and having the highest peak in “Kornet El Sawda” reaching 3,088m above sea level.
3. The Anti-Lebanon chain is located on the eastern side of the country and forming birders with Syria. The chain includes the second highest crest of the country in Mount Hermon reaching 2,820m above sea level.
4. The Bekaa plain separated between the two mountain chains reaching up to 900m above sea level in west and central Bekaa and less than 600m above sea level in the northeast Bekaa. The plain is characterized by dominant agricultural activities.

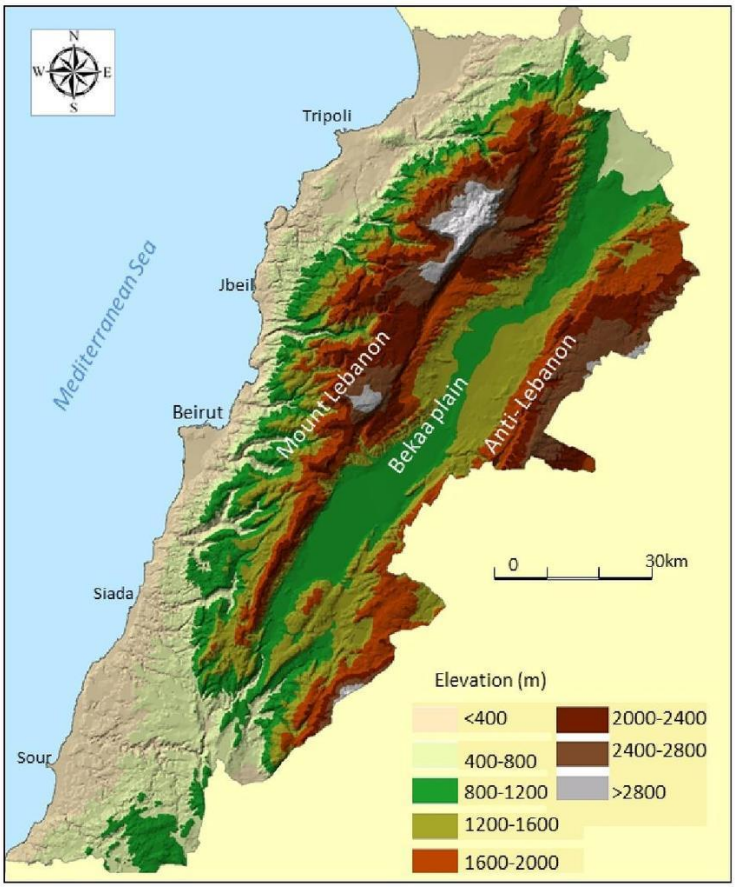

Figure 1. Topographic units of Lebanon (Source: 5, Council for Development and Reconstruction, 2005)

The climate in Lebanon varies from typical Mediterranean in the coastal areas and the mid ranges of Mount Lebanon, to mountain Mediterranean on the highest slopes. The climate becomes semi-arid to arid in-land and on the north-eastern plains of the Bekaa. Most of the precipitations occur from November until March with snow covering the highest peaks during this time. The mean annual rainfall vary from one area to the other, reaching 700 and 1 000 mm in coastal areas, up to 1 600 mm in mountainous areas. In the Bekaa, rainfall varies between 200 mm in the northeast part and 800 mm in the southern part while it can reach up to 1,000 mm in the Anti-Lebanon specifically in Mount Hermon.

Lebanon has a significant historical background mostly shaped by its land, mountainous terrain, proximity to the sea, and strategic location at a crossroads of the world. The Lebanese culture has substantially been imprinted by, political, economic, social and religious movements that originated or crossed through the region.

2.2. Economic Overview

Lebanon has one of the most diversified economies in the region based on growth from real estate, construction and tourism sectors (WBG, 2017). Although not among the largest contributors to the national production, the agriculture sector plays an important and steady role in the national economy (MoA, 2015); for instance, latest figures showed that in 2016, agriculture contributed approximately 3% of the GDP (Consultation & Research Institute, 2019).

2.3. Agriculture production systems

2.3.1. Overview of the Agricultural sector in Lebanon

The geographical location of Lebanon as a Mediterranean country and its topography allow for the cultivation of a wide variety of agriculture crops. The topographical features of the country divide it into five agro-climatic zones:

1. The coastal strip where citrus and horticulture crops are mostly grown.
2. On the low altitudes of Mount Lebanon, olive, grape and other Mediterranean crops are predominating.
3. The middle altitudes where temperate fruit orchards are planted.
4. West and central Bekaa predominantly including field crops, grapes and fruit orchards.
5. Northern Bekaa where rain-fed cereals or fruit trees and few irrigated crops can mostly be found (MoE/URC/GEF, 2012).

Lebanon has the highest proportion of agricultural lands in the region with agriculture forming 64.3% of its lands (IDAL, 2017). Almost, one third of the Lebanese territory is arable where most fertile areas can be found along the coastal strip and Bekaa valley. The majority of agricultural lands are found in the northern Bekaa specifically in Baalbek-Hermel (25% of the agricultural lands) followed by both central and west Bekaa (18% of agricultural lands) and the coastal plains of Akkar (16% of the agricultural lands). Figure 2 shows the distribution of the agricultural lands and exploitation per Mohafaza.

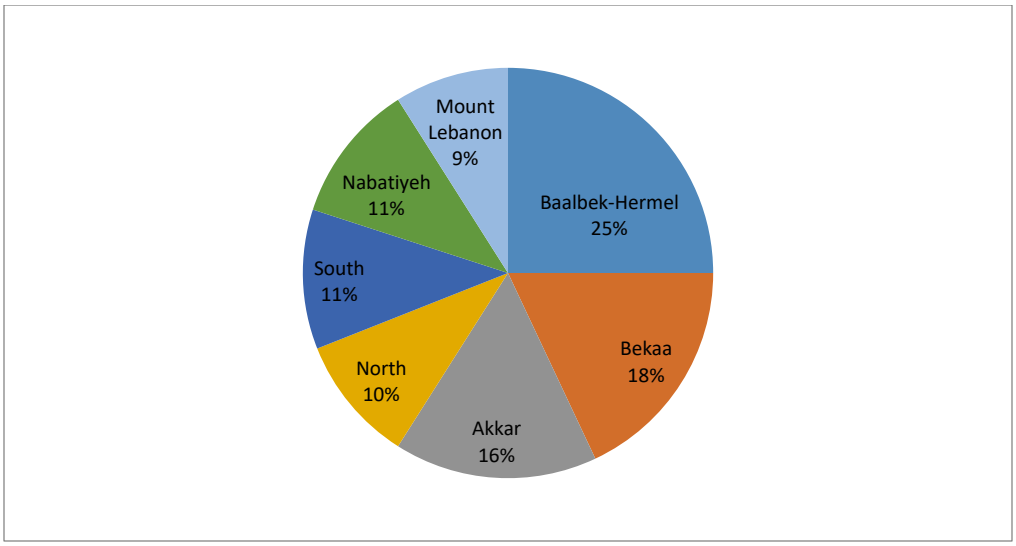

Figure 2. Distribution of the agricultural lands and exploitation per Mohafaza (%) (Source: MoA/FAO/Italian Cooperation, 2012)

2.3.2. Crop Production

According to the Agricultural Census 2010, the total agriculture land area is estimated at 332,000 ha, from which 230,983 ha are cultivated (MoA, 2015). Approximately half of the agriculture surface is irrigated; mainly composed of vegetables and fruit trees while other crops such as olive tree, tobacco, cereals and legumes are rain-fed. Only 2% of the agriculture is protected under greenhouses (MoA, 2017). Vegetables namely potatoes, tomatoes, cucumbers and lemon from the majority of crops produced. Fruits are the second largest category including mainly apples, oranges and grapes (IDAL, 2017).

Data series for crop production can be extracted from FAOSTAT; the chart in figure 3 was retrieved for the year 2017 and shows the production in tonnes for the main agricultural crops in Lebanon.

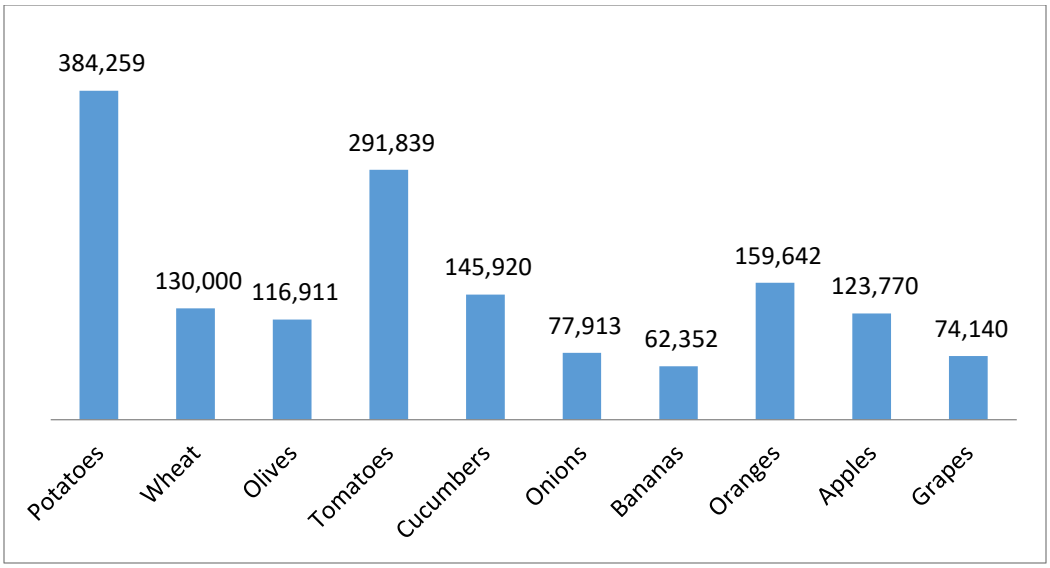

Figure 3. Production of the main agricultural crops in Lebanon (in tonnes) for the year 2017 (Sources: FAOSTAT)

The highest value for crop production is attributed to fruit and vegetables (44% and 29% respectively) followed by olives, legumes and cereals (8%, 2% and 6% respectively). In terms of area coverage, fruit trees occupy approximately 31% of the total cultivated area, followed by 20% for cereals, 23% for olive tree and 17% for vegetables. Industrial crops are mainly composed of tobacco, forage and other small crops and cover only 9% of the total cultivated area which constitutes a very low crop production value (MoA, 2012).

Lebanon farming system is characterized by the predominance of traditional cropping patterns with very fragmented agricultural holdings. This prevents the economic scaling up of agricultural production in the country and restricts marketing capacities. 85% of the land management is carried out through individual management and a very small proportion is carried by enterprises or cooperatives (12% and 3%, respectively). Another issue faced by agriculture, is the land tenure in remote rural areas where most the lands are communal or publicly owned by the municipalities, which prevents investments (MoA, 2012).

2.3.3. Animal production

Livestock activity is important and constitutes 10% of the agricultural activities practiced in Lebanon. Main livestock species in Lebanon include cattle and small ruminants (both sheep and goats). The local Sheep breed is the “Awasi” breed while goat breeds include the “Baladi” or

"Jabali" (local goat) and the Chami goat breeds (Jaber et al., 2004). The number of small ruminants has considerably fluctuated over the years. Sheep are mainly located in Baalback-Hermel district (38%), followed by Central and West Bekaa (34%). Goat herds are mainly located in Baalback-Hermel district as well (26%) followed by Central and West Bekaa (25%). Some herders raise both sheep and goat together and are mainly located in the Bekaa region. More than 70% of these herds are less than 50 heads. Small ruminant production in Lebanon relies on pasture and traditional pastoral systems. Goats are raised in extensive pastoral systems with semi- sedentary and vertical transhumant systems, while sheep herds are managed under nomadic and semi-nomadic systems with horizontal transhumance. Small ruminants mainly feed on native pastures, woodland species, and crop residues. Other types of herds such as cattle are raised in farms (MoA, 2010).

The Syrian crisis in 2010 had considerable impacts on the health of local small ruminants due to the influx of large numbers of unvaccinated animals which crossed the borders with the Syrian refugees (FAO, 2014).

When it comes to small ruminants, goat and sheep milk is subject to seasonality; it extends from April to July for sheep and May to November for goats. 60% of livestock farmers depend on dairy production for their livelihood (LACTIMED report, 2014). The majority of small ruminant's milk production is sold by the herders as fresh milk either to manufacturers for processing or directly to consumers. Only a small portion of the remaining part consumed by the herders is processed into dairy products (mainly as Labneh, Kishk or local cheeses such as Shanklish). Most dairy units in Lebanon are traditional and managed by families or cooperatives. There is also good number of small-scale dairy processing units scattered all over the Bekaa Valley; these are run by families or cooperatives and provide livelihoods for families in the region.

2.3.4. Vulnerability to climate change

According to the National Communication Report to the UNFCCC, the crops that are of economic importance include potato, tomato, apple, cherry, grapevine, banana and wheat. These are also considered highly vulnerable to climate change including extreme drought,

increase in temperatures, humidity and reduced water availability for irrigation and thus increasing the risk of food insecurity in the country. Curtail measure should be undertaken to increase production under unpredictable climate conditions while sustaining the viability of the agriculture sector and supporting the livelihood of rural populations (MoE/UNDP/GEF, 2016).

In 2012 the Ministry of Environment (MoE) led the development of the "Technology Needs Assessment Report for the Agricultural sector in Lebanon" which was developed in partnership with the United Nations Environment Programme (UNEP) and the UNEP-Risoe Centre (URC) in collaboration with the Regional Centre ENDA and the United Nations Development Program (UNDP). The report aimed at proposing technologies for adaptation to climate change for vulnerable crops (potato, tomato, apple, cherry, banana, olive, grape and wheat) and production systems (such as open field or protected crops, irrigated or rain-fed crops) (MoE/URC/GEF, 2012).

2.3.5. Agro-food Processing

The agro-food industry sector is the largest contributor to the Lebanese industry adding approximately 27% of value for the sector; it represents 8.2% of industrial enterprises in Lebanon, and constitutes more than 26% of the total industrial input. Thus, agro-food industry plays a fundamental role in the Lebanese economy and primary provides livelihoods to many Lebanese families (the sector employs 23% of the industrial labour force) (Darwish, 2008).

The agro-food industry in Lebanon is composed of large industrial companies with high investment opportunities and large production capacities on one hand, and family-based, small medium enterprises (SMEs) or cooperatives with limited resources and small production capacities on the other hand. Nevertheless, the majority of the food industry includes artisanal producers operating as family businesses or cooperatives and including less than 100 workers (MoI, 2010).

Main agro-food products include among others: jams, bakery products, olive oil, pickles, vinegar, processed fruits and vegetables, confectionery, alcoholic and non-alcoholic beverages, etc.

2.4. Food systems in Lebanon

2.4.1. The Lebanese diet

Situated between the east and the west, Lebanon is a culinary and cultural crossroads located at the crossways of Greece, Turkey, Syria, and Palestine. Hence, the Lebanese cuisine has been the centre of the Mediterranean diet (MD). “The Mediterranean diet (MD) has been widely used to describe the dietary pattern that dominated in olive tree growing areas of the Mediterranean coastline” (Naja et al., 2011). The MD is characterised by “high intake of extra virgin (cold pressed) olive oil, vegetables including leafy green vegetables, fruits, cereals, nuts and pulses/legumes, moderate intakes of fish and other meat, dairy products and red wine, and low intakes of eggs and sweets” (Davis et al., 2011). Meanwhile, the Lebanese diet has a unique dietary pattern, inspired by the MD that contributed into creating its positive culinary reputation.

Figure 4 :Traditional Lebanese breakfast

Figure 5: Seasoned wild edible plants Centaurea hyalolepis

Lebanon, a country historically ruled by different foreign powers, was influenced by European cuisines with the exotic ingredients of the orient. From 1516 to 1918, the Ottoman Turks controlled Lebanon and introduced a variety of foods that have become staples including olive oil, fresh bread, baklava (a sweet pastry dessert), laban (homemade yogurt), stuffed vegetables, and a variety of nuts. Then, after the Ottomans were defeated in World War I (1914–1918), France took control of Lebanon until 1946, when the country won its independence. During this time, the French introduced some of their most widely eaten foods especially pastries and jams (Sheehan, 1997).

The Lebanese themselves have also helped to bring foods of other cultures into their diet: the Lebanese were traders and they have journeyed in the Middle East, carrying with them food that would not spoil, such as rice and dates. These foods slowly became part of the Lebanese diet (Sheehan, 1997).

Figure 6: Freekeh with lamb

Consequently, the Lebanese diet became the essence of the Mediterranean diet. It includes an abundance of vegetarian and wheat-based dishes, such as cooked “Bourghul” (cracked wheat) and “Freekeh” (roasted green wheat). “Grains, seeds, and nuts are also important part of the staple Lebanese diet. Grains are made into savoury stews and are very much part of weekly meal menus. Seeds and nuts are common in Lebanese recipes” (Massaad, 2011). The tastiness of the Lebanese dishes comes from the use of a variety of spices and fresh herbs such as turmeric, cinnamon, cumin, mint, garlic, thyme, and coriander instead of heavy sauces. Moreover, the principle source of fat is the olive oil; Lebanese dishes include a generous amount of olive oil, garlic and pomegranate molasses. Dairy products are consumed on a daily basis: yoghurt is also consumed with various dishes, in sauces and salads, plain and in the form of “Labneh”. “Labneh” is the strained yoghurt with spreadable like texture and often considered as part of the breakfast. Cheeses are mostly fresh and white such as “Baladi Cheese” (white cheese) or dry and salty cheese such as “Shanklish”. Besides, vegetables are widely consumed in the cuisine including eggplant, beans, parsley, okra, zucchini, vine leaves. Additionally, poultry is consumed more than red meat, that it is usually lamb.

An important highlight of the Lebanese diet is the “Mezze”. “Mezze” comes from the Persian word “to taste”. Today it means an array of small, hot and cold, dishes served on a table (Perdew, 2015). In other words, it is the combination of different appetizers. Lebanese common mezze includes “Hummus” (chickpea dip), “Kebbeh” (mixture of ground meat, cracked wheat and spices), and “Tabbouleh” (parsley and cracked wheat salad) etc...

Lebanese diet is also distinguished by its variability among the seasons and the use of a mixture of ingredients coming from the different Lebanese regions each having special recipes reflecting its own history and culture. With the recent emphasis on the health benefits of Mediterranean cuisine, people across the world are discovering and embracing authentic Lebanese food. The awareness of this ancient cuisine has also inspired professional chefs and restaurateurs across the world to feature exciting Lebanese items on their menus.

2.4.2. Traditional FS

Traditional food system reflects culture, history and lifestyle. It is generally linked to people living in rural areas; however, in Lebanon, the current’s food system extends to domestically produced and imported food and involves many actors at different stages of the food supply chain. Since the early 1960’s, the literature describes the Lebanese diet as having a positive impact on the health by including many typical items of the Mediterranean Middle Eastern diet. The Lebanese traditional food system includes an “abundance of plant food (e.g., fruit, vegetables, breads, other forms of cereals, potatoes, legumes, nuts and seeds); minimally processed fresh fruit as the typical daily dessert with sweets containing concentrated sugars or honey consumed a few times per week; olive oil as the principle source of fat, replacing other oils, butter and margarines; dairy products (e.g., mainly cheese and yogurt) consumed daily in low to moderate amounts; wild edible plants used in many of the traditional dishes; fish, poultry and red meat consumed in low amounts; and wine consumed in low to moderate amounts” (Hwalla and Khoury, 2008).

People have found a way to value seasonal crops and preserve them for ulterior use when they are out of season. Similarly, the Lebanese preserve their highly perishable food and prepare what they call “*Mouneh”*.

According to Massaad (2011), “Mouneh is a Lebanese slang word coming from the Arabic word “Mana” which means to preserve food. Mouneh is a living Lebanese tradition refined through the generations by culture and creativity. And what makes the Lebanese Mouneh specifically so special is the rich mixture and inheritance of civilizations that affected Lebanon and its surroundings.”

Figure 7: Mouneh prepared by Khayrat Bekaina women cooperative in the West Bekaa: pickled green beans, stuffed eggplants “makdous”, hot sauce and mixed vegetables pickle

Traditional mouneh are the building blocks of the Lebanese culinary heritage; where typically villagers used to preserve their own local crops and foods. The practice of making preserves – drying, salting, pickling – is traditionally associated with the seasons (end of summer/ beginning of autumn) and regions due to produce’s availability.

The world of globalization has been threatening culinary heritage and exposing many of the traditional food to extinction (Trichopoulou et al., 2006). In Lebanon, not everything is in danger; however, the traditional food system requires understanding of the production process, the climate as well as crop and animal availability. Details of ingredients, seasoning and cooking procedures all constitute inseparable components of the Lebanese dietary traditions.

2.4.3. Food trends and initiatives

Lebanon is becoming a highly urbanized Mediterranean country. According to the Mediterranean diet index, “Lebanon has become host to four different dietary patterns:

- the Western: diet characterized by a high consumption of pizzas and pies, soda drinks, fast food sandwiches and sweets;

- the Prudent: diet consisting mostly of low fat milk and dairy products, whole bread, and breakfast cereals;
- the fish and alcohol characterized by a high consumption of fish and alcohol, popular among fishermen,
- Traditional Lebanese pattern including high intakes of fruits, vegetables, legumes and olives" (Naja et al., 2015).

Figure 8: Kishk making at Rashaya's women cooperative

Thus, shifting consumption patterns are having significant implications on the food system and public health nutrition. Lebanon is at an increased risk of adopting the westernized dietary pattern characterized by increased energy-dense diets that are low in fibre, fruit and vegetables, and high in fats and sugars and this is not restricted to urban areas. Rural regions in the country recorded consumption of wholegrain cereals, legumes, olive oil and fish reported as "less frequent" compared to the consumption of refined cereals, liquid sweets, fats and oils and dairy products.

Moreover, there's a constantly increasing access to a variety of fresh and processed foods that are now obtainable on a daily basis due to the progress in food production in the Mediterranean region. Currently, consumers have developed various food trends that as a reflection of their current economic situation:

1. Mass Grocery Retail (MGR) sector

Lebanon's MGR sector comprises mainly supermarkets and hypermarkets. According to a marketing research, the supermarket accounted for 88% of sector sales in 2017 and is likely to continue dominating the sector sales. Projections suggest that supermarkets will be influencing food consumption trends for the upcoming years (BLOMINVEST, 2017).

2. Dining-out trends

The high demand on Lebanese cuisine started after the end of the 90's where the returning expatriates and the tourists, especially from the Arab countries, dined out in Lebanon as part of a social event. The restaurants market developed quickly in Lebanon not because of the Lebanese consumer's purchasing power but because Lebanese people like to go out in places where they can meet people and enjoy good food.

Figure 9: Lebanese "mezze" is rich with vegetarian and dairy dishes

3. Restaurants Sector in Lebanon

For a relatively small country like Lebanon, the number of total restaurants in Lebanon is 1125, of which around 55% are international restaurants serving international meals. According to the AFC Consultants International, there's a trend for an increase demand in restaurants' choices, thus, the continuous opening of new concepts including a variety of ethnic foods, from Japanese cuisine to western restaurants.

4. Food tourism

According to the Daily Star, Beirut was the only Middle Eastern city to make the list of “The Best International Cities for Food” in 2017. And, in a survey conducted by Travel and Leisure, readers chose Beirut as the number one destination for the food-oriented traveller.

5. Food Trails

Food trails aim to create a touristic destination focused on food tourism and to increase and diversify the income of small farmers, food producers, local guides, and bed and breakfast operations integrated to the food trail through the development of touristic packages centred on agricultural, pastoral and food processing activities as well as traditional cuisine. Food trails and rural tourism have been gaining popularity in Lebanon; domestic tourism is increasing especially since the beginning of the Syrian crisis which resulted in significant decrease in international tourists.

Figure 10: Chef Gail Arnold visiting Darb el Karam food trail (summer 2018)

6. Farmers’ market

Farmers’ markets like for example: *Souk El Tayeb, Badaro’s Farmers Market, Souk Aal Souk*, etc. aim at promoting healthy traditional food from local farmers and small producers originating

from different Lebanese areas. They intend to build and strengthen linkages between urban residents and rural producers by offering urban dwellers access to healthy traditional food; and the small producers a channel to market their local produce.

Figure 11: Souk aal Souk – Farmers' Market promoting local food in AUB

7. Guest Houses and Tables d'hôtes

Guesthouses have become a trend linked to food trails and rural tourism. For example, L'Hôte Libanais is a family of carefully selected guesthouses and boutique hotels that enable travellers to experience the capital and Lebanese villages in an authentic way. Another successful example is *"Beit"* which means Home. *"Beit*" is the latest step in the *Souk El Tayeb* journey that began in 2004 with the founding of a weekly farmers' market in the heart of Beirut, bringing rural produce to the urban environment, as a way of uniting communities and supporting small-scale agriculture. In addition, "*Darb el Karam"* (the trail of generosity), Lebanese food heritage trail is a network of food producers who host visitors on their tables d'hôte and prepare local specialties using their own mouneh and harvests. There are six tables d'hôte and four B&Bs adhered to the trail which have developed seasonal menus highlighting typical dishes from their villages. A family restaurant and a traditional ice cream maker also form part of the trail.

8. Non-Governmental Organizations

In a country where social issues go unnoticed and unresolved, it is no strange fact that several NGO's have been founded to address some of the most important social concerns. Numerous NGOs with different aims started the work in the agro-food sector. Some highlighted the need for feeding programs, others like The Food Heritage Foundation established community kitchens in rural areas where Lebanese and Syrian women come together to produce healthy meals traditional to both cultures. In parallel, NGO's like Slow Food Lebanon and Taste Lebanon presented descriptive information on the local culinary heritage, and other NGO's like Food Blessed, Disco Soup and Lebanese Food Bank aimed at increasing knowledge on responsible consumption and decrease of food waste in different ways.

2.4.4. Food policies

Lebanon's Food Sector Policies

Food policy is mainly supported by a variety of programs related to economic and agricultural sectors. There are several regulatory programs to guide the production and distribution of food and consequently, food policy implementation. "Food policy is the collection of decisions made by governments – individually, bilaterally, multilaterally, and globally – that affect the production, distribution, and consumption of food" (IFPRI, 2015). The regulation of food policy relies on food security which entails a balance between supply and demand. "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (World Food Summit, 1996).

The approach to food policy has changed where it is no longer limited only to food crises and price shocks, but also to fluctuations in globalizations, trade liberalization and industrial food systems together with food security. It has also widened its focus to address various forms of malnutrition (Maxwell and Slater, 2003). More specifically, as part of the Sustainable Development Goals including sustainable diet concept, there is major attention given to the interaction between food systems and agriculture, health, sociocultural, environmental, and socioeconomic considerations (Johnston et al., 2014).

The several regulatory programs and food policies have been adapted to the changes that occurred locally and regionally. Food policies in Lebanon are mainly linked to the Ministry of agriculture. Agricultural policies were primarily divided between financial support and regulations. Concerning the financial support, the main beneficiaries are olive oil and apple producers who solely benefit from direct payments. Despite this support, apple farmers are affected by import competition and weak export and were insisting on a governmental intervention. On the other hand, fruit and vegetable producers are not offered any income support. Moreover, during pest outbreak, the Lebanese government offers some inputs subsidies including certified plant seeds for some strategic crops (wheat and olives).

As for regulations, several policy mechanisms were adopted to secure food accessibility for the Lebanese population. These regulations include price ceilings and control of commercial profits along with social protection programs for vulnerable households. Price ceilings imposed by the Lebanese government are mainly maintained by the Lebanese Government on two food items: Arabic bread and chicken. However, as it is the case with several regulations, the enforcement of this regulation seems to be weak where vendors manipulate the items' weights. As for the control of commercial profits, in 2010, the Ministry of Economy & Trade (MoET) has declared the reinforcement of a policy controlling the percentage of commercial profits. The MoET has been following up through regular inspection visits and reporting violations to the court system (Ministry of Economy and Trade, 2017).

Food policy mechanisms also focused on the financial situation of the Lebanese community especially after the Syrian crisis. Hence, several programs and funds were established to provide financial assistance including food purchases. The Emergency National Poverty Targeting Program supported vulnerable Lebanese and Syrian communities in Lebanon. The National Social Security Fund (NSSF) supports poorer Lebanese through allowance and medical insurance; however, it has been noted that this fund is not well managed as it is politically abused.

Furthermore, there are several food assistance programs for refugees in Lebanon such as the programs supported by UNRWA and WFP who deliver food aid and cash assistance to Palestinian and Syrian refugees respectively (Kukrety and Al Hamal, 2016).

In addition, the Lebanese government has attempted to enhance public health nutrition through several initiatives targeting the Lebanese consumers' food education and health. Lebanon has addressed some public health concerns related to nutritional deficiencies by adopting some measures. A specific law obliged the fortification of salt to minimize iron deficiency among the Lebanese population (Akik et al., 2016). For the aim of preventing micronutrient deficiency, a national flour fortification program was also proposed but it was not agreed to and had no legislation (FAO, 2007). As an attempt to improve public health nutrition, there were several governmental adjustments and orders to address food safety. Food safety was a responsibility divided across several ministries and institutions (Ghaida et al., 2014; Abebe et al., 2017). This required coordination between ministries (MoA, MoI, MoPH, and MoET) was again hindered by different authority objectives accompanied by weak implementation.

The MoA has put a National Plan of Action for Nutrition but failed to adopt it. The Ministry of Education and Higher Education (MEHE) in collaboration with American University of Beirut (AUB) has launched a Nutrition Education program for Overweight and Obesity and was able to intervene. Moreover, AUB has also developed 'The Food-Based Dietary Guideline (FBDG) Manual for Promoting Healthy Eating in the Lebanese Adult Population' in 2013 in collaboration with the Lebanese National Council for Scientific Research (CNRS), with reference to dietary recommendations from the United States Department of Agriculture. The Ministry of Public Health (MoPH) has adopted this FBDG but not through a formal law (FAO, 2018).

Lebanon's Agricultural Sector Policies

Given that the overall situation in Lebanon is governed by political parties, this has severely affected the nature of work and the ability to invest in any of the available resources. As previously presented, Lebanon's policy framework is disjointed. This disorganization is represented in the variety of public institutions and ministries that are in charge of agriculture and food policy. Despite it being a major sector in Lebanon, agriculture has been vastly

neglected by the Lebanese government. Exceptionally, the government still gives attention to some programs that target strategic products, such as wheat.

The agricultural sector has been vastly affected by Lebanon's policy environment where laws that were adopted fell short of effective implementation. Organic production is an example where it suffers from the absence of both, national legislation and legal infrastructure to support it. Due to this situation, some independent and non-governmental certifying bodies took the initiative to perform organic certification (Sebaaly, 2011; Naspetti et al., 2016). In 2012, and as an attempt to enhance the organization within the organic farming sector, the MoA announced the establishment of the National Register of Organic Agriculture (FAO, 2018). The MoA also adopted the Ministry of Agriculture Strategy 2015–9. The Lebanese ministry of agriculture, with some donor support, has put an effort to improve agricultural policy making it more strategic. Yet, these efforts were complicated by political considerations and interferences.

Lebanon's Trade Sector Policies

As for the trade policy, which has been traditionally liberal, it has shifted from the focus on imports costs to selecting higher-value agricultural exports as a source of profit. There are policies which promote food access accompanied with permanent measures to control prices and secure financial support for food purchase. As mentioned previously, isolated policies have been also adopted related to food safety and public health nutrition. However, the problem remains with lack of coordination between ministries and the weak ineffective implementation negatively affecting policy measures.

This table outlines the various public bodies in Lebanon which are directly involved in management and policy setting of food and nutrition security in the country (ESCWA, 2016).

Public Bodies
1. Ministries
A. Ministry of Agriculture-MoA

The General Directorate of Cooperatives
Directorate of Animal Resources
Directorate of Plant Resources.
Directorate of Natural Resources and Rural Development.
Directorate of Research and Coordination.
B. Ministry of Economy and Trade - MoET
Directorate General of Cereals and Beetroot (DGCB)
The Consumer Protection Directorate (CPD)
C. Ministry of Finance
Regie Libanaise des Tabaces et Tombaces
Credit Interest Rates
Directorate General of Customs
D. Ministry of Social Affairs - MoSA
Directorate General of Social Development
Directorate General of Social Services
The National Poverty Targeting Programme
E. Ministry of Public Works and Transport
Directorate General of Urban Planning (DGUP)
F. Ministry of Environment - MoEv
G. Ministry of Energy and Water - MoEW
General Directorate of Hydraulic and Electric Resources
General Directorate of Exploitation
H. Ministry of Public HealthMoPH
General Directorate of Preventative Health
General Directorate of Medical Care
2. Public Institutions
a. The Green Plan
b. Investment Development Authority of Lebanon-IDAL

c. Lebanese Standards Institute (LIBNOR)
d. Lebanese Agricultural Research Institute - LARI
e. National Authority of the Litani River - LRA
f. National Employment Office - NEO
g. National Social Security Fund - NSSF
h. Council for Development and Reconstruction - CDR
i. Public Authority for Consumer Markets- PACM

2.5. Challenges facing the Lebanese agro-food sector

"There are around 1,400 agro-food companies constituting the largest share of total industrial firms in Lebanon. More than 45% of the agro-food factories are engaged in the production of dairy, confectionary, dried fruits and nuts, baked goods, olive oil and wine" (IDAL, 2017). However, this sector is facing many challenges that alter its progress.

The effect of the Syrian Crisis

In the last registration update conducted by UNHCR, the total number of Syrian refugees in Lebanon reached 986,942 person of concern grouped under a total of 226,373 households (UNHCR, 2018). Hosting around 1 million refugees, spread in the areas where some of the most marginalised and vulnerable Lebanese communities reside, like in Akkar and Bekaa, have increased instability and accumulated an economic burden of 7.5 billion USD (FAO, 2015). The impact of the Syrian crisis on the agro-food sector in Lebanon can be summarized in few points:

- Reports found that competition between Lebanese workers and Syrian workers is high, as Syrians work for lower salaries, longer hours and without social security benefits;
- The loss of overland and export routes to the Gulf countries through Syria, severely impacted the agriculture sector (UNHCR, 2017);
- Farmers are struggling to compete with cheaper products from Syria (UNHCR, 2017);

- Food availability is in danger due to an increased demand for food, in addition to the increase in prices for basic commodities in Lebanon, affecting food access for host communities;
- Stability of supply: Increasing food prices and the unstable security situation of the country are factors negatively affecting the stability of food supply.

However, prior to the Syria Crisis, the agriculture sector in Lebanon was already facing major challenges. Many constraints resulted in the sector's low performance and struggle to expand:

High production cost: Around 70% of the total farm holders have an area of less than one hectare, and cultivate less than 20% of the total cropping area; thus, the majority of land holdings in Lebanon are small and fragmented, resulting in low productivity and low incomes for farmers.

Lack of access to agricultural inputs: Farmers are increasingly abandoning their livestock as they are unable to cope with the escalating feed prices and decreasing prices of their animals and animal products. All this escalated with the lack of irrigation networks, agricultural roads, marketing outlets for agricultural and agro-processed products.

Unfavourable international trade agreements: "It has been increasingly challenging for Lebanese exports to access foreign markets as most countries are applying progressively more stringent standards and specifications on imports" (CCIB,2017)[1]. Numerous types of violation were detected by the Food and Drug Administration (FDA) which caused exports to be denied access to USA, such as labelling, misbranding and administrative infringements.

Monopoly of traders: Since Lebanon bid by the open economy and trade policy, it has been leading to more competition and more control over the agro-food sector. Due to availability of substitutes and political instability in the country, food cartels are taking advantage of the situation by setting their prices in the market (MoE, 2003).

Food Safety Issues: The presence of unacceptable levels of pesticide residues, toxic levels of bacteria, or the use of unsafe colour additives, resulted in difficulty of access to export markets.

[1] https://www.ccib.org.lb/uploads/5b447b6d402a6.pdf

Therefore, enforcing compliance with internationally accepted health and safety standards is a must for the sector's sustainability.

3. Case-study areas: the West Bekaa and Shouf

3.1. The West Bekaa

3.1.1. Geography, climate and agricultural systems (food farming systems) including major crops and animal breeds

The Bekaa Mohafaza or governorate comprises three districts including, Central Bekaa, West Bekaa and Rashaya. The West Bekaa is situated between 33°44' – 33°37' latitude North and 35°41' – 35°49' longitude East. The district can be associated with two morphological units: the eastern slopes of Mount Lebanon and the eastern planes of the valley. The district is situated at an altitude ranging between 800 and 1,000 m above sea level. West Bekaa is one of the smallest districts accounting for 32 % of the Bekaa governorate. It is the second most populated district having a population of 129,540 (25% of the population in the Bekaa) (IDAL, 2017). The area like many regions in Lebanon has been impacted by the Syrian crisis; according to the UNHCR data of 2018, the number of refugees was 62,324 (UNHCR, 2018).

The Litany River encompasses the West Bekaa in its middle forming the Qaroun Lake, an artificial reservoir originally made for hydropower, domestic use and irrigation (Hassan et al., 2019). The West Bekaa is found on sub-humid bioclimatic zone (Safi et al., 1999) and characterized by a typical Mediterranean climate with seasonal precipitations (mainly occurring between November to April) followed by a dry period (May to September). Mean annual rainfall varies between 700 and 1000 mm per year. Main landscape dominating the area includes natural vegetation and agricultural fields (Hassan et al., 2019).

Like most Lebanese regions, the area has a very rich biodiversity comprising several types of ecosystems forming home for a diversity of animal and plant species. Forests and other wooded lands in this area include mostly mixtures of conifer and hardwood trees such as, *Quercus* sp. *Pinus* sp. These forests are known for their multi-functionality for providing goods and services including non-wood forest products such as aromatic and medicinal plants (used in the preparation of many traditional meals), honey production, pine nuts, etc. Thus, they play a key

role in the socio-economic development and the welfare of these rural communities. The West Bekaa is also known for having one of the most important wetlands of the country in “Ammiq” village which is declared as a Ramsar Conservation site by the UNESCO World heritage (MoE/GEF/UNEP/Elard, 2015).

The district is one of the most agriculture intensive regions where both land farming and animal farming are practiced. Agriculture activities in West Bekaa are diverse thanks to the abundance of water and its fertile soil. In addition, agro-food production is one of the most important sector providing major economic activities for locals.

The main activities in the region include crop production, animal farming and apiculture:

1. Crop production

- Fruit trees: Fruits constitute an important sub-sector in Lebanon in terms of production, socio-economic impact and rural development. Main fruit trees planted in the Bekaa in general and West Bekaa in particular:
    - Grapes with main varieties of grapes such as Vitamouni and Halawani (also known as Baytamouny and Tfeifihi respectively). Grapes are one the most important agricultural crops as they are considered to be high value products in both domestic and export markets. Moreover, the region is witnessing an increase in wine production; the area is considered to have all the optimal geographic, climatic, demographic and economic characteristics for the development of this sector (Antoun, 2014).
    - Other fruit trees planted in the region include apples, pears, peaches, cherries, plums, apricots, almonds (Choueiri, 2001).
- Legumes and vegetables:
    - Tomato is classified as the second vegetable crop planted in Lebanon. The majority of tomatoes are planted in open fields; in the West Bekaa most of tomatoes are grown by small-scale farmers (having less than 0.1ha). Most of the planted tomatoes are used for local consumption and to a lesser extend for agro-food processing (Aw-Hassan et al., 2018).

- Other vegetables include eggplants, cucumbers, zucchini, squash, watermelons, melons, bell peppers, beans, cabbages, cauliflowers, carrots and lettuce (Chalak and Sabra, 2007).

Dried fruits and vegetables are a nascent sector in Lebanon and their production is still limited to small women cooperatives which produce a diversity of dried fruits and vegetables. In the West Bekaa, mainly table grapes are dried (ESDU, 2019).

- Field crops include: cereals such as wheat, barley and freekeh. Freekeh is roasted green wheat, an ancient staple derived from Levantine and North African cuisines and still very popular in many countries of the eastern Mediterranean Basin. Freekeh is recognized internationally for having superior health benefits. It is produced locally by individual farmers or organizations such as agro-food cooperatives (mostly women coops).

Figure 12: Braided dry onions

Figure 13: Awassi sheep flock

2. <u>Animal farming</u>

- The Bekaa valley in general has the largest number of livestock. The Central and West Bekaa include the second largest number of small ruminants (34% of sheep and 25% of goats in Lebanon). Some herders raise both sheep and goat together in extensive systems feeding on native pastures, woodland species, and crop residues. The main species of sheep is “Awassi” and for goats both “Jabali” and Shami”. Cattle farms are also

spread across the valley and include mainly herds of the Holstein species (Asmar, 2011) ranging from micro herds of 2-3 heads up to commercial farms of hundreds of cows.

Dairy production is a key player in the agro-industrial sector. Goat and sheep milk is subject to seasonality; it extends from April to July for sheep and May to November for goats. Most dairy units are traditional and managed by families or cooperatives. There is also good number of small-scale dairy processing units scattered all over the Bekaa Valley in general; these are run by families or cooperatives and provide livelihoods for families in the region. The West Bekaa in particular is currently witnessing an increase in this sector and is home for the largest herds.

- Beekeeping is a common activity in Lebanon in general and the Bekaa in particular. Honey production plays an important role in rural development, decrease of poverty and the valorisation of natural resources. Small-scale beekeepers are the largest category and constitute more than 70% of beekeepers (Hamadeh, 2016).

3.1.2. Communities of the West Bekaa and their food culture

As it is the case with the beautiful nature of Lebanon's cultural diversity, the various Lebanese villages have special distinctive characteristics. When speaking about cultural diversity, the Bekaa governorate holds a special place. Besides all the interesting historical places and religious monuments, the inhabitants of this area are distinguished by their food production skills. The arable and fertile land of the Bekaa region has allowed villages to invest in agricultural practices suitable to their soil quality and altitude. Hence, the combination of food production skills and agricultural practices has created a special food culture. The West Bekaa has slightly been affected by the nutrition transition which occurred on the country level. Inhabitants were able to not only preserve authentic food, but also introduce their special dishes to several Lebanese villages. The West Bekaa traditional food dishes rely largely on vegetables and legumes. They have also managed to preserve the usage of edible wild plants and herbs (*Qors Anneh, Akkoub, Derdar, Meshheh*…) in their traditional dishes. Moreover, they introduce healthy versions of traditional desserts using regionally produced sweetening substitutes (Grape Molasses, Grape Syrup, Apple Molasses, honey...). Therefore, the West Bekaa has remarkably

been able to sustain the authenticity of its traditional food culture and even develop healthier recipes while maintaining the originality of the practices.

Figure 14: Wild edible plants collection during spring

3.1.3. Main food initiatives, projects and research implemented in the West Bekaa

Several development projects have been implemented in the West Bekaa district. The area provides great opportunities for the development of both the agriculture and the agro-food sectors. The area is also considered as an important summer vacation destination and provides diverse ecotourism options for both locals and foreigners.

When it comes to interventions, several local and international associations have implemented projects related to agriculture and ago-food processing. Many vocational training programs have been provided to farmers, women and youth focusing on important agricultural value chains, traditional products and eco-tourism. Moreover, following the Syrian crisis during the last years, projects have also been focusing on the integration of Syrian refugees in livelihood projects and vocational trainings. Some of the significant projects previously implemented in the West Bekaa include:

- USAID through the Lebanese Industry Value Chain Development (LIVCD) project; Darb El Karam or the Trail of Generosity is the first food Network connecting the villages of West

Bekaa and Higher Shouf promoting traditional food and agriculture heritage of the area. Darb el Karam was established in 2015 through the collaboration between the Environment and Sustainable Development Unit (ESDU) at the American University of Beirut (AUB), the Food Heritage Foundation (FHF) and the Shouf Biosphere Reserve (SBR) with support of USAID. The network aims to highlight the seasonality and locality of foods and crops, the traditional processing methods and most importantly, the generosity of the hosts[2].

- USAID through their program "Building Alliance for Local Advancement, Development, and Investment" (BALADI) aimed at encouraging municipalities with the support of NGOs to implement community projects. In the West Bekaa, a project implemented by Caritas Lebanon, supported the women cooperative of the Khiara village in the implementation of an agro processing centre, offering food processing equipment to the cooperative[3].
- WFP in collaboration with local organizations has been implementing livelihood projects including both Lebanese host communities and Syrian refugees. In 2019, ESDU in collaboration with the Cooperation without Borders (CWB), implemented the "Climate-Smart Livelihoods Initiatives and Market Access Tailoring" (CLIMAT) project, a one-year Food for Training (FFT) project funded by the German Cooperation through the World Food Program (WFP). CLIMAT aimed to sustainably improve the skills, capacities and livelihood opportunities of vulnerable Lebanese and Syrian refugees in West Bekaa. The project focused on three main value chains (VC) including, small ruminant production in which Comprehensive trainings were provided to herders and a pasture and grazing management demonstration plot was established aiming at promoting climate-smart practices. Moreover, ESDU provided a series of comprehensive trainings related to dairy production in its selected villages in the Bekaa valley and established a dairy unit within the premises of "Khayrat Bekaena COOP". In terms of alternative and climate-smart agricultural crop production, ESDU has established a demonstration plot in West Bekaa to encourage eco-friendly approaches including agroecology, organic production and

[2] https://food-heritage.org/establishing-a-food-trail-in-higher-shouf-and-west-bekaa/
[3] http://caritas.org.lb/project/development

sustainable agriculture and promote climate smart practices for local agricultural crops. Freekeh, an ancient wheat species and recognized internationally for having superior health benefits was included in the value chains targeted. Finally, for the agro-food processing, substantial work has been done on promoting sun drying techniques of local fruits and vegetables[4].

Figure 15: The climate-smart agricultural plot established by ESDU in the West Bekaa: a learning place for local farmers

- Mercy Corps through the implementation of the 'Fostering Resilience by Strengthening Abilities (FORSA) project consisted expanding economic opportunities for both Lebanese and Syrians. The project funded by the Dutch Ministry of Foreign Affairs was implemented in several Lebanese regions including in the West Bekaa from December 2016 until November 2019. The main objective was to provide trainings on agriculture and supporting small businesses[5]. Moreover, in 2014, Mercy Corps has conducted a study on small ruminant value chain in the Bekaa valley, under the project entitled Protect and Provide Livelihood in Lebanon (PPLL). The study funded by the European Union, aimed at helping small and medium producers protect their livelihoods in the face of the Syrian crisis. The report concluded that there is a crucial need for the protection of small producers who still have the knowhow on traditional technics for the making of local cheese and yogurt.

[4] https://www.aub.edu.lb/fafs/news/Pages/2018_CLIMAT-Workshop.aspx
[5] https://aidstream.org/who-is-using/GB-SC-SC030289/5526#

- The European Union through the Centre for the Promotion of Imports from developing countries (CBI) has conducted a value chain assessment for fresh fruits and vegetables in Lebanon. The assessment included among other a section on table grapes in Lebanon which are considered to be one the most important agricultural crops in Lebanon and the Bekaa in particular as they are considered to be high value products. The largest production of grapes is found in the Bekaa including several villages of the West Bekaa. Several traditional products are made from grapes including vinegar, grape molasses, dried grapes (raisins) etc.
- The Shouf Biosphere Reserve (SBR) extends until the West Bekaa region thus, the Reserve plays a major role in the protection of the cultural heritage of the area. Some of the most relevant projects include:
    - Through the M6 partnership, as part of the MAVA Foundation's 2016-2022 strategy, the SBR in collaboration with the society for the protection of Nature in Lebanon (SPNL) are implementing a project aiming at building ecologic and socio-economic resilience of the Shouf Mountain and West Bekaa Landscape through the conservation of Mediterranean Cultural Landscapes[6].
    - The Ammiq wetland extending over 100 ha, is one of the last significant wetland in Lebanon. The site includes the remnant of once extensive marshes and lakes that once covers the Bekaa valley. Ammiq wetland is an important spot for biodiversity forming a wintering area for migratory water birds. "Tawlit Ammiq" eco-restaurant was funded by the Swiss Agency for Development and Cooperation (SDC) implemented by the SBR. The building is a bed and breakfast receiving visitors of the SBR and aiming to promote local products. It also includes an eco-restaurant and offers meeting rooms for workshops and conferences[7].
- The Lebanon Mountain Trail (LMT) passes through the West Bekaa more specifically through Aitanit village in which a guesthouse was established in 2008; the Municipality

[6] https://www.spnl.org/building-the-ecologic-and-socio-economic-resilience-of-the-shouf-mountain-and-west-Bekaa-landscape/
[7] http://shoufcedar.org/wp/wp-content/uploads/2017/07/ammiq.

have thus included the LMT as part of their masterplan for the village. The LMT closely works with the local community for the maintenance of the trail and the protection of the cultural heritage of the village. The guesthouse offers a variety of traditional homemade dishes to the visitors.

- UNDP Sustainable Land Management of the Qaroun Catchment, which mainly aims to foster sustainable land management. The project worked on setting up a multi-sector planning platform to balance competing environmental, social and economic factors playing a major role in the development of the district. Thus, the project aimed at reducing conflicting land-uses and improving the sustainability of land management so as to maintain the flow of vital ecosystem services, sustain the livelihoods of the protect the value of the land (UNDP/GEF/MoE, 2014). Within the framework of this project, several local NGOs were subcontracted by the UNDP to implement specific initiatives related to the project. In 2019, the Lebanon Reforestation Initiative (LRI) worked on improving small ruminant value chain[8].
- In 2014, a study was conducted on wine grapes entitled "Wine industry in the Bekaa Valley, Lebanon food-processing industry as a basis for community dynamics and local socio-economic development". The first part of the study tackled socio-economic developmental situation in the Bekaa Valley focusing on the agriculture sector. Then the study focused on the growing sector of the wine industry and the community organization surrounding the vine tree and the wine industry in the Bekaa Valley.

3.2. The Shouf

3.2.1. Geography, climate and agricultural systems (food farming systems) including major crops and animal breeds

The Shouf district is one of the six districts located in Mount Lebanon Governorate. It extends from the Awali River in the south to Naameh/Haret Al-Naameh in the north of the Damour River, and from the Mediterranean Sea in the west to the Barouk mountains in the east (Al Masri and Abla, 2017). It is the largest district with an area of 495 km^2 which is for 25% of the

[8] https://lri-lb.org/project-details/6

governorate and includes more than 80 villages. Nevertheless, the Shouf district is one of the least populated districts having a population of not more than 204,743 which accounts for only 11% of Mount Lebanon population. Also, the district includes a high rate of deprived population (approximately 32%) compared to other districts (IDAL, 2017).

The Shouf area is found between sub-humid, humid and per-humid bioclimatic levels (Safi and Abi Said, 1999). The Shouf like most Lebanese regions is characterized by a typical Mediterranean climate having four distinct seasons; the warmest month is August and the coldest is January. Precipitations are seasonal (mainly occurring between November to April) followed by a dry period (May to September). Mean annual rainfall varies between more than 900 mm per year. Snow fall also occurs in the highest elevations (Abu-Izzeddine, 2012).

The landscape is composed of a mixture of rural and natural areas with some agricultural fields. The Shouf Nature Reserve has been established since 1996. In 2005 the UNESCO declared the Shouf Biosphere Reserve (SBR) which is currently the largest nature reserve of the country (accounting for 5% of Lebanon's' surface area). The Shouf area is known to have a very rich biodiversity; the area is home for one of the largest cedar (*C. libani*) forests of the country (30% of the Lebanese cedar forests in the country). Moreover, the Shouf area includes a wide variety of flora (more than 520 species) from which many are medicinal and aromatic. The reserve includes a big number of threatened species mostly endemic to Lebanon and the region. Moreover, the reserve forms one of the last remaining locations in Lebanon in which large mammals are found[9].

The Shouf area is an important touristic destination; both the coastal area and the mountains attract local and foreign tourists and provide a variety of touristic activities.

Agriculture in Shouf is practiced to some extend in the coastal parts and the mountainous upper Shouf area. Most of the people living within or near the SBR rely on agricultural activities for their livelihoods. The climatic diversity of the region allows for the production of a variety of crops. In addition, the agro-food industry is also important in the region.

Most common agricultural crops include:

1. Crop production

[9] www.iucn.org/news/protected-areas/201804/wonders-shouf-biosphere-reserve%C2%A0lebanon

- Fruit trees:
    - Olive trees in Mount Lebanon are mainly grown in the Shouf district forming 50% of the cultivated area in mountainous Shouf (MoA and UNEP, 1996). Most of the olive cultivations are highly fragmented and grown in small farmlands; more than 55% of olive growers are small-scale farmers having orchards of 0.5ha or less. The Olive oil value chain in Lebanon faces many challenges associated with its high cost of production, land fragmentation, and high competitiveness (ACTED, 2018).
    - Other fruit trees include apple trees, peach trees, cherry trees and grapes covering 38% of the area.
- Vegetables:
    - Vegetable crops are also important in the region accounting for 12% of crop production and mainly including Jabali tomatoes, broad beans, cauliflower and cabbage. Field crops are absent due to the topography of the region which is more of terraced mountains.

Figure 16: A lady from the Chouf preparing dry figs, the traditional way

2. Animal farming

- There are several small cattle farms scattered in the Shouf, most notably Holstein; Awassi Sheep are present in smaller numbers, and Jabali and Shami goats constitute the largest number of animals raised. Lastly, there is a big number of chicken farms in the area, and many households raise Baladi chicken in their gardens or backyards (Asmar, 2011).
- Honey production is also important in the Shouf area specifically in the SBR. There are more than 3,000 beehives registered in the villages surrounding the SBR. These produce considerable amount of honey (approximately 5kg more than similar beehives – in other regions).

3. Rural products

- Many traditional rural products can be found in the Shouf area. The presence of the SBR has had a very positive impact on the economic value of these products. Main products found in the SBR other than honey include, oregano with pine nuts, and rose and almond jams (El Jisr et al., 2015).

3.2.2. Communities of the Shouf and their food culture

Shouf is characterized by its cultural diversity, natural landscapes (cedar), water resources, fertile land, its heritage and the quality of life, which together constitute an essential factor in the tourist attractiveness of Lebanon. According to Massaad (2011), in her book "Mouneh", the Shouf region has the best food tradition of homemade preserves. Only in the Shouf you can find the best cedar honey "*Asal al 'Arz*". This type of honey is exclusively made in the Barouk cedar reserve in the heart of Shouf. Cedar honey is produced by the Lebanese bee strain and it is the only type of bee to withstand the variation in climate and temperature fluctuation found on high altitudes in Lebanese mountains (Rami Zurayk, 2008). Massaad attributed the Shouf's attachment to mouneh to its closely knit Druze community: "The Druze there, they are very much into nature and preserving their culture." In the villages around her house in the Shouf, food blogger Accad said there were still mills where someone could pay around 33 cents per

kilo to have thyme or sumac ground into spices, and community presses where in the fall, farmers unload crates of olives to be pressed into oil.

Figure 17: Spring menu served at a table d'hôte in the Chouf (Darb el Karam food trail)

Another star product that originated from the Shouf and Bekaa region is the *"Sirdeleh"* or *"Ambarees"* as known in the West Bekaa. The two names stands for the fermented raw goats' milk product that originate in dry, mountainous regions where local baladi or shami goats are the main gazing animals. Sirdeleh is made in special clay vessel with drainage hole where milk fermentation takes about 14-20 days at 20-25 ℃ (Zurayk, 2008). The Shouf region is also famous for its unique production of molasses: grape, carob and pomegranate. Lebanese villages mainly relied on molasses as a generic sweetener and it was a communal activity welcomed with festivities where everybody in the village get together and prepare the molasses under the direction of the eldest women (Zurayk, 2008). The combination of the culture and food specialties has put the Shouf on the map of eco and rural tourism due to its diverse activities and sightseeing.

Figure 18: Sirdeleh jar full with labneh

3.2.3. Main food initiatives, projects and research implemented in the Shouf

Several development projects have been implemented in the Shouf district. The area has a great potential for protection of the socio-cultural heritage and the development of communities. The area is as well considered as an important summer destination and provides diverse ecotourism options for both locals and foreigners.

The presence of the SBR in the region has supported the implementation of several projects related to agriculture and ago-food processing in addition to eco-tourism. Many vocational training programs have been provided to local farmers, women and youth focusing on sustainable agriculture, traditional products making, eco-tourism and others. Several local and international associations have also been involved in development of the region. With the Syrian crisis, projects have been integrating Syrian refugees in livelihood projects and vocational trainings. It is important to note that all development activities related to agriculture and food processing in Shouf, mainly occur under the patronage of the SBR. Some of the significant projects previously implemented in the Shouf area include:

- Since its implementation, the SBR has been involved in the development of the Shouf area especially within the Municipalities part of the reserve [10];
    - The M6 project is a three years project aiming at Building the ecologic and socio-economic resilience of the Shouf Mountain Landscape by restoring and strengthening the socio-cultural fabric which sustains its biodiversity and cultural values. The project is being implemented with several partners including the Society for the Protection of Nature in Lebanon (SPNL), MAVA Foundation, Italian Agency for Development Cooperation and ENPI CBCMed.
    - MEET Mediterranean Experience of Eco Tourism was a project funded by the EU was implemented in Lebanon among other Mediterranean countries to develop an eco-tourism model for Mediterranean Protected Areas (PAs).
    - The HELAND Promoting Mediterranean Heritage Tourism project aiming to promote socio-economic sustainable development through innovative technological actions for Mediterranean tourism-heritage and landscapes protection clusters.
    - The biosphere reserve has also supported their local communities, by providing training and marketing outlets for their food products. The SBR has created a rural products brand promoting traditional products such as Cedar Honey, Oregano with Pine nuts, and Rose and Almond Jam.
- The USAID LIVCD project (mentioned in the west Bekaa section) which established the Darb El Karam or the Trail of Generosity in 2015 as the first food network connecting the villages of West Bekaa and Higher Shouf and promoting traditional food and agriculture heritage of the area. Darb el Karam was established through the collaboration between ESDU at AUB, the FHF and the SBR with support of USAID[11].
- The LMT also passes through the Shouf region specifically through section 19 (El Barouk - Maaser El Shouf) which is part of the Shouf nature Reserve. Section 20 (Maaser El Shouf – Niha) also passes across the highest cultivated sites of the Shouf region at the foot of the mountain summits and includes historical and religious sites that can be

[10] http://shoufcedar.org/
[11] https://food-heritage.org/establishing-a-food-trail-in-higher-shouf-and-west-bekaa/

visited. The areas surrounding these sections include a number of guesthouses offering wide a variety of traditional homemade dishes to the visitors[12].

- In 2012, the Makhzoumi Foundation contributed to the establishment of an olive press in the town of Deir al-Qamar in Shouf in collaboration with the municipality. The project aimed to contribute to the economic development of villages and towns across Lebanon. The project was funded by the State of Italy[13].
- Eco Khalleh is an agroecology/organic agriculture training/educational centre Located in the town of Baaqlin. The centre displays best practices and appropriate technologies that are optimal for agriculture in Mediterranean mountain ecosystems[14].
- Farmville is a farmhouse located in the village of Barouk. The site offers an authentic farming lifestyle experience and agro tourism activities where visitors choose their fresh organic products, from fruits, vegetables, eggs etc.[15].
- The Economic and Social Fund for Development (ESFD) has also implemented projects funded by the EU in West Bekaa and Shouf region; (1) Conduct extension programs to farmers working in the Cherry and Apple value chains. (2) Provide equipment and supplies for beekeepers, through the agricultural cooperative in Mristi village in Shouf [16].

4. Conclusion

Through this MedSnail project we wish to highlight the history and origins of food products and traditional dishes and focus on the cultural and emotional ties that people hold to the West Bekaa and Shouf areas.

The areas of the West Bekaa and Shouf represent typical cases of diversified and authentic agriculture and food systems that are well embedded and preserved in their respective societies. Most of the inhabitants of these areas still rely on traditional agriculture and food processing practices and are tightly attached to their land and traditions. The areas are also

[12] https://www.lebanontrail.org/
[13] https://makhzoumi-foundation.org/
[14] https://www.facebook.com/ecokhalleh/
[15] https://www.lebtivity.com/event/snowshoeing-barouk-with-wild-explorers
[16] http://www.esfd.cdr.gov.lb/uploads/local/general/projects_list_local-development.pdf

known for having unique biodiversity, natural features and landscapes which also form important component of their heritage.

Small producers in these areas often struggle to maintain their productions due to the lack of resources and market access; hence valorising these products can help in creating opportunities to small producers and thus contribute in the conservation of local traditional practices while protecting native biodiversity and natural resources, preserving local agriculture varieties and traditional food recipes and of course contributing to the livelihoods of the rural communities in both areas.

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Activity 3.1.2

PP3 - RWDS

DESK REVIEW

Desk Review – Territory Mapping of Agro-Food Production in O.P.

Summary

Within the activities of the project, Sustainable Networks for Agro-food Innovation Leading in the Mediterranean – MedSNAIL. The overall objective of the desk review is to highlight Territorial Mapping, in agreement with the actors and those in charge of rural development at local level, the existence of an agricultural and food heritage, and to use it as an incentive for local development strategies. In order to initiate this virtuous process, it is necessary to develop common tools, easy to use. In a concise territorial characterization which emphasizes, together with the territorial actors, each distinct aspect of the local food farming system, from production to consumption, and the economic and social context of reference. In addition, it is to define the most specific area of intervention that, within the area in which, appears characterized by the presence of products, producers, and communities with traits that match the philosophy of the project, and to introduce data from a context at national level.

This desk review have been prepared on base on characterization tools as meeting with members and local communities in charge of Agro Food production and processing, as well National Agricultural Strategy, local governmental offices, published articles and information, internet surfing, and other projects surveys and analysis. Moreover, it has been allocated for more than two month of readings, information collecting, and discussions to come up with direct messages.

Key messages:

- Agriculture is not only essential component of the Palestinian national, cultural, economic and social fabric but it embodies their perseverance, confrontation and adherence to their land under the threat of confiscation and settlement activities. It also provides a refuge and a source of income and food supplies at times of crises.
- Palestinian also has the chance to compete in local and external markets mainly in the field of cash crop fulfilling good agricultural practices (Organic and Global Gap products) specially; herbs, strawberry, carnation…etc., which open new hope and horizon for the young generations.
- The strategic plan of the Cooperative Sector in Palestine (2011-2013) prepared by the Ministry of Labour focus on the following strategic goals: To provide an institutional environment that enables the development and growth of the cooperative movement as one of the main economic sectors. Increase the total value of current investment in the cooperative societies · Improve the general performance of the current cooperative societies in

accordance with the best practices in cooperative work. Encourage new social initiative for establishing cooperative societies that are able to develop in themselves or develop al-ready established societies. Therefore, Cooperative and community base organizations (CBOs) represent the only applicable solution to achieve rural areas development and have to play their developmental role within the Palestinian context.

When we conducted the desk review we found a deep linkage between a project with the Millennium Development Goals (MDGs), these are

- MDG 1: Eradicate extreme poverty and hunger.
- MDG 3: promote gender equality and empower women.
- MDG 7: Ensuring environmental sustainability.
- MDG 8: Develop a global partnership for development.

To be able to help and support the agricultural sector and the rural community effectively, RWDS moved towards the decentralization of its activities, as it believed that farmers', youth and women community based organization (CBOs) could implement some small agricultural and developmental projects, train the farmers, women and youth and promote all the previously mentioned activities. RWDS believes that by developing the capacities within these CBO's would have tremendous positive implications on the sustainability of the whole agricultural sector, as these CBO's are actually in the field and respond directly to the immediate priorities and needs of the sector. This urges the need to build the expertise of these CBOs to play its role in development.

This disk review have been recognised thanks to the joint collaboration of: RWDS Team represented by Mrs. Hannen Zeidan, Mrs. Rulla Sarras, and Mrs. Soheir Al-Jaloudi. Slow Food Palestine represented by Mr. Saad Al-Dagher and with support of Ms. Nazarena Lanza. Jenin and Tubas Governorate Agricultural Directorates represented by Mr. Hakam Salah and Mr. Basem Hamad, Mr. Sulaiman Abu Amer, Mr. Amer Labadeh Mrs. Zafaf Abu Shehadeh Mr. Maher Salahat, and Mr. Mahdi Bashar.

MedSNAIL

Table of content.

1. Background

a. Introduction.

i. The National Agricultural Sector Strategy: "Resilience and Sustainable Development" (2017-2022)

The Palestinian government is establishing an integrated and unified planning and budgeting management system based on well-deliberated policies that provide clear rules and steps for decision-making, as well as a national reference for civil society organizations, the private sector and international partners. The National Development Plan (2017-2022), in which consists of two key components. The first one is the national policy agenda, which represents a high-level policy document that sets out the national vision, priorities and policies. The second component is the 18 national sector strategies, along with three cross-sector strategies. Twenty ministers and directors of governmental institutions, in addition to the Minister of Agriculture, lead teams sector strategies of agriculture, culture, heritage, education, employment, energy, health, housing, communication and information technologies, international relations, justice, local government, national economy, public finance management, security, social protection, tourism and antiquities, transport and communications, water and wastewater. The cross-sectoral strategies include gender equality, environment and youth. The Manual for the Development of Sectoral Strategies (2017-2022), which was prepared by the Ministry of Finance and Planning has identified a set of expectations that are deemed as the objectives of the sectoral planning process.[1]

Based on the directives of the Minister of Agriculture and his deputy, as well as based on the preparation of the strategy manual and findings of the strategic review report, a series of consultations within the ministry and outside were launched to determine the sectoral priorities and the most important policy interventions. That the Ministry of Agriculture, other relevant government, non-governmental and private institutions and agencies will be implementing.[2]

ii. - RWDS Strategic Planning 2019 – 2022 in enhancing economic justice for women and girls in Rural Palestine.

RWDS has been characterized by its rural feminist identity, as well as by the presence of a women's feminist base in the form of women's clubs the northern and southern Palestinian governorates. In addition to representing the issues and rights of Palestinian women in general, and rural women's and girls in particular, voicing their human rights, developmental needs and liberation at various national, regional and international levels.

1 MoA, National Agriculture Sector Strategy "Resilience and Sustainable Development", Nov 2016.
2 MoA, National Agriculture Sector Strategy "Resilience and Sustainable Development", Nov 2016.

In this context, RWDS has worked on the preparation and development of its strategic plan for the years 2019-2023, stemming from the reality of women and girls in the Palestinian society, within the vision of; “Equality between women and men, boys and girls, in rural Palestine, in accordance with the Palestinian Declaration of Independence, as well as international conventions and standards,” and within the mission of; “To grow a movement led by Palestinian women that is capable of advocating for and advancing the enjoyment of women’s social, economic and political rights, especially in rural areas.” Including RWDS governing values consisting of "justice, alignment to the most marginalized and disadvantaged, equality, participation, transparency and accountability, volunteerism, credibility, consistency and non-bargaining when it comes to women and girls rights."

RWDS developed the following three goals[3] to achieve its vision:

Goal No. (1): Enhancing justice and equality between men and women and reduce violence against women and girls in the Palestinian Society.

Goal No. (2): Enhancing economic justice for women and girls in Rural Palestine.

Goal No. (3): Improving RWDS’s performance and efficiency and increasing its representation and influence at the national, regional and international levels.

Based on the enhancing economic justice for women and girls in Rural Palestine goal, the expected outcome is economic environment supportive of greater participation for women and girls which leads to effective participation of women in economic activity, together with men, which it is essential for building a cohesive society and effective participation of women in the labor force, promotes the level of justice and equality. Despite the progress made by the State of Palestine in providing the enabling environment for women's participation in various economic fields, there is still a large gap in the laws and legislations related to economic empowerment of women. There is a lack of encouraging measures for women's enrollment in the private sector and access to resources, the majority of Palestinian rural women still work in the informal sector (mainly small family businesses) and their contributions are not counted within the Gross National Product-GDP and they still lack legal protection, especially protection against violence in the workplaces.

In terms of technical and vocational training, these programs are designed on a stereotype basis within the traditional culture of the roles of men and women, which reduces the chances for women to enroll in TVET programs and have a fair chance for employment, especially for the newly graduates.

RWDS will work to facilitate women's access to economic resources and services, increase employment opportunities for women and girls in the labor market, by encouraging entrepreneurial initiatives and working with vocational and technical training institutions to provide an encouraging environment for women engagement, this will be accompanied by awareness campaigns to create

3 RWDS, Rural Women's Development Society Strategic planning 2019-2022, July 2019.

incentive measures for employers and industry to employ women graduating from TVET institutions.

b. Agricultural sector background.

i. Palestinian demographic situation

In 2015, the estimated Palestinian population was 4.7 million: 2.86 million Palestinians reside in the West Bank and 1.8 million in the Gaza Strip.[4] Despite the decline in the total fertility rate in 2014 to 4.06, Palestine still has a high population growth in comparison to the average fertility rate of 2.8 in Arab countries.

The percentage of individuals under the age of 14 constituted 40% of the total population, while people at least 65 years old account for just 2.9% of the population.[5] Despite the relative shift in the population age groups, Palestine is still experiencing a rise population growth. The above-average birth rate in Palestine has kept the annual growth rate very high for the past few decades. Despite consistent negative net migration, the population continues to swell while the average woman in Palestine gives birth to around four children. The growth rate has slowed somewhat in recent years, but not by much. As of 2019, the population in Palestine was growing 2.65% annually.

Population projections[6] reveals that the trend of declining growth rate is expected to continue in years to come. Current projections believe that the annual growth rate in Palestine will peak in 2020 at 2.68% before dropping over an entire percentage point by 2050. If these predictions prove true, the population of Palestine will be close to 5,322,629 in 2020, 6,739,073 in 2030, 8,208,074 in 2040 and 9.704,205 by 2050. These trends will lead to increased pressure on the labour market and the need to create new jobs for large numbers of working age population, in addition to the increasing pressure on natural resources, especially land, water and forests.

ii. General overview: The agricultural sector and its contribution in economic and social development.

The agricultural sector and its contribution in economic and social development since 1967, including all its various components and sub-sectors, has been constituting one of the most important pillars of Palestinian resilience in the face of Israeli occupation policies in the West Bank, including East Jerusalem, and the Gaza Strip. Constituting an employment, livelihood and food security source for a large proportion of Palestinians, the agricultural sector is

4 PCBS, Population of Palestine 2015.
5 worldpopulationreview.com, Palestine Population 2020, Palestine Demographics, http://worldpopulationreview.com/countries/palestine-population/
6 Prime Ministers Office/National Population Committee and UNFPA, Palestine 2030, Population Growth in Palestine and its Impact on socio-economic sectors, 2016.

also considered as one of the most important pillars of Palestinian national economy. It contributes in ensuring foreign currency through exports. Furthermore, being a supplier to requirements, user of services, and outputs of vital national sectors, the agricultural sector has a key contribution in industry, trade, transport, communications and services sectors.

The Palestinian agriculture sector is characterized by its diversity in terms of agricultural production. It benefits from the climatic variations in Palestine, and opportunities for expanding irrigated and export cash crops, as well as its ability to keep abreast of agricultural technological development, as a result of favourable agricultural patterns on the one hand, and the presence of many entrepreneurs on the other hand. These characteristics reflect the agricultural sector's ability to rapidly develop and effectively contribute in employment, as well as economic growth and development. This is of particular significant opportunity, especially in the case of declining occupation policies that impede the sector's sustainable development, and include the confiscation and access prevention to land, water resources and irrigation development, as well as hinder import and export of agricultural products and inputs.

In 2014, the value of agricultural production at constant prices was $ 540 million, registering a continuous annual decline since the year 2011, which recorded the highest value of agricultural production and rose to $ 721.5 million.[7] Within the same context, the value added of the agricultural sector in Palestine reached 339.1 million dollars in 2012 at constant prices, representing 4.6% of GDP at that time. This contribution fell to 3.8% in 2014,[8] as the value added of the agricultural sector reached $ 286.4 million despite its 8.2% contribution to GDP in 2000. Furthermore, the value of agricultural imports and exports was equal in the early seventies of the last century, ranging between 20-30 million dollars.[9] Over time, the annual agricultural imports increased to exceed exports significantly, as the total agricultural imports amounted to approximately $ 212 million in 2014, while agricultural exports amounted to $ 67 million, accounting for nearly 7% of total exports.[10]

Historically, the agricultural sector has played an important role in providing employment opportunities, especially in times of crisis, during which it was difficult to work in other sectors. This characteristic enhances the role of the agricultural sector in strengthening the resilience of Palestinians and increasing their capacities to adapt. Nevertheless, since 2006, the agricultural sector has witnessed significant decline in the number of agricultural workers, for both women and men, due to restrictions imposed on the sector's development and its low production. In 2015, labour force in the agricultural sector was estimated

7 PCBS 'National Accounts for the years 2000 – 2014.

8 PCBS 'National Accounts, 2014.

9 MoA 'Extension Service Strategy - 2014, 2014 – 2018.

10 Arab Agricultural Development Association.4102 ، ، 42 رقم العدد العربية، الزراعية للإحصاءات السنوي الكتاب

at 7.8% of the total male workers, while 13.1% of the total female workers were employed in agriculture, which indicates the relative importance of the agricultural sector to women.[11]

iii. Resources: Agricultural lands

Of approximately 6.023 million dunums, which make up the total land area of Palestine, with the largest percentage (94%) in the West Bank[12], 20% is used for agricultural purposes (1.2 million dunums). Ninety per cent of agricultural lands is located in the West Bank, while only 10% is located in the Gaza Strip.

The majority of the Palestinian territories in the West Bank, including agricultural land, are still under full Israeli control, as 62.9% of West Bank area is classified as Area (C) according to Oslo Agreement. On the other hand, only 18.8% of the West Bank area is located in Area (B) that falls under the Israeli-Palestinian administrative control and security, and 18.3% is classified as Area (A), which is the only area under full Palestinian control.

Despite the "Israeli withdrawal" from the Gaza Strip in 2005, during which lands occupied by Israeli settlement were returned to Palestinians, Israel is still preventing farmers' access to their land in what is known as the "buffer or border areas" that stretches along the eastern sector along the borders of Israel and extended over a depth ranging from 150 meters to one kilometres. The total agricultural land in the border areas is estimated to at least 62 square kilometres (40% of agricultural land in the Gaza Strip)[13]. This area is not exploited by farmers due to their inability to access their lands, or is cultivated by field crops that are of little use and cost-effective due to the danger facing farmers reaching their lands there.

In the state of Palestine, rain-fed agriculture is dominant, occupying nearly 81% of the total area of land used for agriculture, while irrigated areas cover approximately 19% of land used in agriculture, located mainly in the governorates of Gaza Strip and the Jordan Valley, as well as in semi-coastal areas in the West Bank only. In general, low soil fertility and weak trends in agricultural land investment, as a result of water scarcity, poor financial resources and high risk, are the key challenges associated with land development in Palestine.

The agricultural land currently used by Palestinians does not exceed half of the Palestinian agricultural land area available for cultivation. The remaining areas are distributed to lands that can be cultivated but are not used for such purposes, or lands that need rehabilitation, lands that cannot be rehabilitated (often used for grazing of ruminants), and lands used for industrial and urban expansion, as well as areas confiscated by the Israeli authorities for settlement expansion, building the separation wall and the construction of bypass roads. Pasture area cover 2.02 million dunums, but only 621 thousand dunums are allowed for grazing of ruminants, leading to increased load on pastoral practices

11 MoA, National Agriculture Sector Strategy "Resilience and Sustainable Development", Nov 2016.
12 FAO, National Strategy for Food Safety 2017-2022, State of Palestine, http://www.fao.org/3/i8861en/I8861EN.pdf
13 MoA, National Agriculture Sector Strategy "Resilience and Sustainable Development", Nov 2016.

and overgrazing in these areas that are open to at least 250 thousand livestock heads. These areas suffer from low rainfall that ranges between 100 and 250 millimetres per year only.[14]

On the other hand, closed forest areas amount to 94,000 dunums and 320 thousand dunums of open forest areas. Of the total 48 natural reserves in the West Bank, the Palestinian National Authority received 17 only that are located in the eastern slopes and the Jordan Valley[15].

iv. Agricultural holdings: Numbers and characteristics.[16]

Agricultural holdings in Palestine are usually small (average size 18.6 dunums) household holdings. The majority (88%) are owned outright by the household, but some are either fully rented, or owned land is supplemented by renting an extra area. There are 101,172 holdings in Palestine, nearly 70% of which are plant production holdings only, 7.6% are livestock holdings only, and the remainder practice mixed production.

The total number of agricultural holdings in Palestine reaches 111,310 holdings, of which 90,908 are in the West Bank, (81.7%), and the remaining 20.402 holdings are in the Gaza Strip (18.3%). The governorate of Hebron is one of the largest areas in terms of number of agricultural holdings, constituting approximately 18% of the total holdings in the Palestinian territories, and amounting to 19,768 holdings. On the other hand, the governorate of Jericho has the least number of agricultural holdings amounting to 1612, and constituting 1.4% of the total holdings in the Palestinian territories. The majority of agricultural holders are in the age group between 40-49 years (28.6%), of whom 28.9% are in the West Bank and 27.3% in the Gaza Strip.

Plant holdings are the most common in the Palestinian territories, reaching 79,176 holdings and averaging 71.1% (82.4% in the West Bank and 17.6% in the Gaza Strip). The Palestinian agricultural census reveals that most agricultural holdings are considered as smallholdings, as 83,785 holdings covered less than 10 dunums of area, amounting to 75.3% of total agricultural holdings and 20.7% of total agricultural land holdings. The percentage of large holdings, exceeding 80 dunums of area, constitutes 1.8% only of total agricultural holdings and 29.5% of total agricultural land holdings. In addition, the average area of agricultural holdings reached 10.8 dunums (12.2 dunums in the West Bank and 5 dunums in the Gaza Strip). The highest average area of holdings was in Tubas, Jericho and the Jordan Valley covering 25 dunums. Typically, agricultural holdings in Palestine are small due to the fragmented and divided agricultural holdings as a result of issues related to inheritance cases, lack of a law protecting agricultural lands from fragmentation, as well as the Israeli policies and attacks, including the confiscation, vandalisation and destruction of land.

14 MoA ،Agricultural Sector Strategy, 2014-2016
15 Idem.
16 PCBS, Key Characteristics of Agricultural Holdings in the Palestinian Territories/Agricultural Census/Livestock in Palestine/Agricultural Census 2010.

Agricultural holdings are divided between livestock and mixed holdings, as livestock holdings reached 14,241, representing 12.8% of total agricultural holdings in the Palestinian territories, of which 10.879 holdings (76.4%) were in the West Bank and 3362 holdings (23.6%) in the Gaza Strip. Mixed holdings reached 17,893, accounting for 16.1% of total agricultural holdings in the Palestinian territories, including 14,762 holdings (82.5%) in the West Bank and 3,131 holdings (17.5%) in the Gaza Strip. Livestock and mixed holdings are similar to plant holdings in terms of average area covered, and are considered as small. For example, 61% of livestock holdings that have cows (1263) do not exceed three heads, 65% of livestock holdings that have sheep (8844) do not exceed 19 heads, and 66% of holdings that have goats (5350) do not exceed 19 heads.

v. Water resources for agricultural purposes.

The water sector is one of the most vital sectors in sustainable agricultural development process at the national level. The Israeli occupation deliberate neglect and constraints imposed on water development over the decades and to our present day directly contributed to hindering real agricultural development opportunities. Israel's control over water resources has been for the benefit of Israeli development needs without taking into consideration Palestinian water needs, or Israel's obligations under the signed agreements. The critical situation and performance of the water sector is reflected by the limited irrigated agricultural areas in the Palestinian territories in general, constituting only 12% of agricultural land in the West Bank, in comparison to 77% in the Gaza Strip, 37% in Jordan and 59% in Israel.

In the absence of significant surface water sources, along with Palestinians' inability to often invest in infrastructure for water resources development (such as springs for example) because of its location in Area C, groundwater remains the primary source of water in the Palestinian territories. However, Palestinians extract only 20% of groundwater "expected quantities" in the West Bank, while Israel extracts large amount of water, exceeding 50% of the renewable quantities without the consent of the Joint Water Committee, which is supposed to operate according to the Oslo agreement to regulate and manage shared water issues. In fact, Israel extracts more than 1.8 times of its share under the Oslo agreement, consequently resulting in several risks to ground water wells and low quantities of water available to Palestinians from shallow wells pumping.

The estimated total water used for agriculture does not exceed 150 million cubic meters annually in the West Bank (60 million cubic meters) and 90 million cubic meters in the Gaza Strip. This amount represents 45% of the total water consumption, which is reflected directly on the limited prospects for the development of irrigated agriculture that can have an important economic, social and political role in rebuilding the Palestinian economy.

Despite the significant interest of farmers in increasing the irrigated agricultural area, especially in protected agricultures, which still provide a

relatively high level of profitability. The old agricultural wells and the inability to rehabilitate them due to Israeli restrictions, in addition to the limited number of licenses granted to new agricultural wells and drought of many springs hindered the desired transformation and growth of irrigated crops in the West Bank. It is worth mentioning here that the growing demand for water due to steady population growth leads to real crisis in the availability of water that consequently raise the price of water and the cost of delivery to farmers. This also plays a key role in the growing phenomenon of unlicensed wells and pumping practices.

The amount of water used in agriculture in the Gaza Strip is estimated by approximately 90 million cubic meters annually, which is equivalent to almost 54% of the total water consumption in the Gaza Strip. The excessive use of groundwater has led to poor water quality and saltwater intrusion from sea water into the groundwater. The proportion of water available for drinking and pumped from underground wells does not exceed 10%. As alternative solutions to water shortages, Palestinians in the Gaza Strip have been drilling private wells and desalinating sea water for domestic and agricultural use, which further exacerbated problems faced by the water sector in the Gaza Strip. The water sector is facing a dangerous situation that may not be reversed within the coming three years if reasons for its deterioration are not rapidly addressed.

2. Agricultural production

a. Plant production.

Plant production in the Palestinian territories fluctuated from year to year due to rainfall quantities fluctuation on the one hand, and the high-yield years followed by low-yield years in olive trees. Despite this, plant production has not experienced significant changes over the last decade. No significant change occurred in terms of the relative distribution of varieties of different crops, which is characterized in general-and especially in the West Bank- by relatively low values crops and the low percentage of irrigated agricultural areas. Olive tree cultivation covers the largest agricultural area in the West Bank, occupying approximately 57% of cultivated land, while field crops, vegetables and other fruit trees occupy the remaining area, by 24%, 10% and almost 9% each, respectively. In the Gaza Strip, vegetable crops constitute 32% of the total cultivated area, followed by olive trees and other field crops and fruit trees, occupying 24% and 23% and 21% respectively of the total cultivated area in the Gaza Strip[17].

In addition to the aforementioned mentioned concentration of low-value crop production, the Palestinian plant production sector, especially in the West Bank, is suffering from low productivity per acre as a result of the nature of plant production on the one hand, and the low percentage of irrigated crops, on the

17 MoA, National Agriculture Sector Strategy "Resilience and Sustainable Development", Nov 2016.

other hand. According to a report prepared by the Quartet[18], the productivity per dunum in the Palestinian territory was estimated by 0.6 tons, while it reached 1.2 tons in Jordan and 1.4 tons in Israel. Dunum productivity in the Palestinian territories differs by region and types of crops cultivated. Over the last ten years, the Palestinian territories have witnessed an expansion of plant production due to land reclamation and various agricultural development projects implemented by the Ministry of Agriculture and NGOs working in the agricultural sector. Many of these interventions focused and are still focusing on the horizontal expansion in agricultural production and increased agricultural cultivated areas. Despite the importance of the horizontal agricultural expansion for agricultural development and the protection of land from confiscation and settlements, the opportunities to continue this expansion are diminishing, if the competitiveness of other agricultural sub-sectors, as well as economic and social sectors is not taken into consideration. Hence, achieving transformation in plant production to keep pace with the continued growth in local demand, as well as with local and international market demands will also require a focus on improving agricultural technology and encouraging the vertical expansion of the plant production sector, by improving agricultural services and investing in intensive agriculture, that could achieve greater economic return and employment opportunities.

b. Livestock production.

Livestock production plays a major role in improving the lives of families in terms of providing a source of income and food (protein) to a large number of households in the Palestinian territories. The number of households depending primarily or secondarily on livestock is 32,200 households[19]. According to the results of the livestock survey conducted in 2013 and that falls within agricultural holdings, livestock population was estimated as follows: 33,980 cows, 730894 sheep, 215335 goats, 2058 camels, 32.5 million broilers (of which 994.6 thousand mothers), 1.8 million laying hens, 546.4 thousand turkeys, 19690 rabbits and 46,226 beehives. There is also a large number of domestic poultry, including 258.9 thousand domestic poultry, 285.6 thousand pigeons, and 5,000 turkeys, 29.1 thousand rabbits, 20 thousand quail birds, and 29.7 thousand of other types.[20]

Ruminant (cows, sheep and goats) depend on an intensive or semi-intensive breeding system for their livestock. Intensive production entails confining livestock in narrow spaces, where they are fed, watered and milked without being released to graze. This system is adopted mainly by cow breeders (87%) and to a lesser degree by sheep and goat breeders.[21] On the other hand, semi-

18 Established in 2002, the Quartet consists of the United Nations, the European Union, the United States and Russia. Its mandate is to help mediate Middle East peace negotiations and to support Palestinian economic development and institution building.
19 PCBS, Livestock Survey in Palestine, 2013.
20 Idem.
21 MoA, Livestock Strategy 2015-2019.

intensive production (traditional) allows livestock to graze, while providing supplementary nutritional feed at the same time. Intensive production requires a higher capital investment in infrastructure and administrative systems than the semi-intensive production system. In addition, intensive production requires high technical experience and knowledge in farm management, which is an aspect absent in many farmers, especially the younger ones.

There are two types of production systems in the dairy sector: the traditional and industrial systems. The traditional production system includes small and medium-sized cattle breeders, who sell their products to consumers mainly at the local level, and cattle breeders who produce cow's milk annually. In the West Bank and the Gaza Strip, there are 13 ruminant slaughterhouses, including eight in the West Bank and five in the Gaza Strip, in addition to nine poultry slaughterhouses in the West Bank and one in Gaza.

In the poultry sector, there are also 19 hatcheries in the West Bank and 4 in the Gaza Strip, producing 64,525 chicks in 2012 (0.4324 million layer and 64.0916 million broilers) and 91,861,700 eggs ready for hatching (1,158,700 layer eggs and 90,703,000 broiler eggs).[22] During the 2011/2012 agricultural year, the total production of poultry meat reached 72680 tons.[23]

Nutrition constitutes the main costs in livestock production, occupying 75-85% of total milk production costs, and 55-65% of the total costs associated with small ruminant animals. More than 95% of wheat feed and 85% of protein feed is imported from Israel to feed sheep and goats. Furthermore, most of feed and coarse fodder (high-cellulose feed, such as hay, straw and grass) to feed dairy cattle is imported from Israel. Feed supply, whether in terms of quality or quantity, is still unable to cover the existing need. The continuous rise in feed prices over recent years indeed, led to increasing production costs, forcing many farmers to sell their livestock or use low-quality forage (low quality protein mixture) to feed their cattle. The significant reliance on imported inputs consequently resulted in the reduction of livestock productivity and its poor quality.

c. Agro-Food Industry Production.

Throughout the Study conducted by ARIJ Society, between the years 2013 and 2015 and as main outputs of their project titled: Food Production-Consumption Assessment to Improve Sustainable Agriculture and Food Security in the West Bank- Palestine24, a remarkable study have been done in the agro – food production. Whereas, the food processing industry is considered one of the oldest industries in Palestine. In its early days, this industry was limited to the production of few processed foods and sweets. Currently, this industry is a major

22 MoA, National Agriculture Sector Strategy "Resilience and Sustainable Development", Nov 2016.
23 Ministry of Agriculture ،Livestock Strategy 2015-2019
24 secheresse.info, Food Production-Consumption Assessment to Improve Sustainable Agriculture and Food Security in the West Bank- Palestine, 2013, http://www.secheresse.info/spip.php?article51563

contributor to the Palestinian economy and its gross domestic product. In addition, this sector has created job opportunities in the local market, and has been employing over 11,400 employees as of the year 2012.25 This sector's importance also lies in its provision of needed processed foods essential for food security in Palestine, through producing 120 different food commodities.

Developing the food processing industry can have spill over effects on all associated sectors and industries, and in particular on the agricultural sector that acts as the main supplier of inputs. It also plays a key role in creating an added value to agro products.

According to the Palestinian Food Industries Union, following are the most important food processing industries in the West Bank, related to agro products targeted in the project26:

- **Canned vegetables and fruits**: In Palestine, there are 18 factories specialized in the production of canned vegetables and fruits, currently employing 545 workers. Investment in this industry is estimated at $30 million, and these products constitute 20% of total market share. In addition, it contributes to $21 million of the total value of exports. However, this industry still lacks the needed packaging techniques and storehouses, whose provision would drive higher investments.
- **Oils and vegetable fats:** There are 13 factories specialized in the production of oils and vegetable fats, currently employing more than 295 workers. Investment in this industry is estimated at $70 million, and these products constitute 20% of total market share. Within this industry, three factories have received the ISO 22000 certification, while 10 olive mills have received the Hazard Analysis & Critical Control Points (HACCP) certification. In addition, this industry contributes to more than $31 million of the value of exports. The olive oil industry still needs to achieve higher international market penetration.
- **Wheat flour and grains:** There are nine factories working within this industry, employing more than 236 workers. Investment in this industry is estimated at $45 million, while these products constitute to 30% of market share.
- **Pasta and vermicelli:** There are five factories working in the production of pasta and vermicelli, employing more than 89 workers. Investment in this industry is estimated at $34 million.5

Agricultural products are the main inputs for the food processing industry. Sources of agro products vary among factories depending on the size of production and the number of production lines. For example, survey results found that 70% of wheat used for the production of food commodities is imported from foreign markets (specifically Russia and the United States of

25 The Palestinian Central Bureau of Statistics (2013). Establishment Census, 2012.
26 Palestinian Food Industries Union (2014).

America). This also reflects low rates of self-sufficiency in regards to wheat production and consumption in the local Palestinian market, estimated at only 11%. On the other hand, olive and olive oil used in food processing come from local sources. This also applies to cucumbers, dates, tomatoes, eggplants, almonds and grapes. Furthermore, almost 50%-70% of the supply of potatoes and citrus fruits used in food processing is imported from the Israeli market.27

More than 30 food and industrial commodities in WB use targeted agro crops as their inputs. It also reflects that most food commodities in the West Bank use wheat and grapes specifically. Wheat is a main ingredient in the production are flour, maftoul, freekeh, bran, and semolina, while grapes are used for the production like grape molasses, grape Jam, malbann, raisins, and grape vinegar. Indeed the study shows indicators of Pricing, production quantities per months and seasonality, average price in the local market per kilo, for the most processed agro foods as the table below.

Agro Product	Processed Food Commodity
Wheat	Flour
	Semolina
	Bran
	Freekeh
	Maftoul
Eggplants	Spiced Eggplant
	Pickled Eggplant
	Makdous Eggplant
Grapes	Grape molasses
	Malbann
	Grape Jam
	Grape Vinegar
	Raisins
Olives	Olive oil
	Makdous Olive
	Olive Honey Spread
	Olive Oil Soap
Dates	Date
	Ajwa dates
	Dates stuffed
Almonds	Peeled almonds
	Almond oil
	Hlawoh almonds with Sesame

27 The Applied Research Institute – Jerusalem / Society. The Food Industry Sector In The West Bank, 2013-2015, http://www.arij.org/component/content/article/210-publications/food-market-assessments/baseline-surveys/672-the-food-industry-sector-in-the-west-bank.html

	Candied almonds
Cucumbers	Pickle
Citrus Fruits	Marmalade

Table 1, Processed Food Commodities in WB Palestine.

With highlighting the Challenges, facing the Food Production Industry and Information conducted by ARIJ Society with food processors and factory owners have shown the following:

- High cost of inputs of agro products, due to fluctuations in their available quantities and lack of coordination between farmers on cultivation and collection dates, in addition to their seasonality.
- Unfair competition between local and Israeli products, given that these products are allowed into the Palestinian local market, and the absence of protection policies for Palestinian infant industries.
- Barriers to entry into new markets due to the high costs of exporting, and the Israeli restrictions on crossings.
- The limited local market size and its inability to absorb all local production, especially during the ongoing financial and economic crisis. As a result, many factories have been terminated.
- High cost of transportation, delivery and storage.

Thus, the Study by ARIJ shows recommendations as follow:

- Adopt new technologies in production, and respond to local and international market needs.
- Provide producers and exporters with data from market research.
- Enhance infrastructure and regulations.
- Follow Palestinian and international quality standards in the production of processed food commodities.
- Coordinate activities and reinforce monitoring in central wholesale markets.
- Provide storage, cooling, delivery, packaging and grading services.
- Create an information system on marketing services, and market needs.
- Conduct feasibility studies on the exporting possibilities of processed food commodities.
- Encourage and support agriculture-related exports.

d. Agricultural services.

Governmental and non-governmental organizations, as well as private sector companies provide a wide range of services to Palestinian farmers. These

services include agricultural extension services (including its various components and elements of agricultural education and awareness raising), veterinary services, agricultural research and funding. In general, the agricultural sector suffers from weak agricultural services, hindering hence sound agricultural investment, as well as weakening the sector's competitiveness and profitability. The following sections present the status of the main agricultural services provided in Palestine:

i. Agricultural research and education.

The Palestine National Agricultural Research Center (NARC) is responsible for conducting agricultural research, through its' five research units and seven agricultural experiment stations, of which five are located in the West Bank and two in the Gaza Strip. In addition, five faculties of agriculture in AnNajah University, Hebron University, Al-Azhar University, Palestine Technical College (Khadoury) and Al-Quds Open universities, offer agricultural bachelors and masters' degrees in some disciplines. There are two agricultural secondary schools; one is Beit Hanoun Agricultural School in Gaza, and AlAroub Agricultural School in the West Bank. In addition, there are some NGOs, which conduct agricultural research, such as the Jerusalem Institute for Applied Research (ARIJ) and the Land Research Center.

NARC, agricultural colleges and non-governmental research centers have relatively large areas of land, experiment stations, as well as basic and some modern equipment that facilitate access to externally funded projects. However, there are weaknesses in the coordination mechanisms between these institutions and some duplication of research. Furthermore, institutions face challenges in renovating and maintaining their tools, equipment and facilities. Universities continue their exploratory and theoretical research in isolation from the reality of Palestinian farmer and the national extension service system, and without coordinating with national agricultural research centers. All these knowledge-generating institutions, are influenced by fluctuating and unsustainable financial resources allocated for research.

Many students graduate from universities and agricultural training programs annually, but their qualifications and abilities are not aligned with the requirements and needs of the labour market. Furthermore, academic research has low impact despite meeting global quality standards. The country's lack of a national reference library for agriculture weakens policy advice abilities. Unfortunately, consulting services in the field of agricultural policy are also weak.

ii. Agricultural extension services and training.

MoA provides extension services to farmers on a regular basis and indirectly, in which, are offered through companies supplying production inputs, which in turn provide agricultural extension services to farmers as part of their purchase process. In addition, a number of civil society organizations provide such services as part of their agricultural development projects, which are usually limited in

scope and lifecycle. As per farmers' perspective, MoA and companies supplying production inputs are the most important sources of extension services.

The Palestinian National Agricultural Extension Strategy (PNAES) of 2015-2018 refers to the limited scope of coverage of extension services that, in general, are still deemed insufficient to cover effectively all agricultural holdings, given that the individual visit to farms is the most common method used when providing extension services. In addition, agricultural testing stations are not playing an active role in providing advice or responding to the problems faced by farmers.

The lack of coverage of operational costs is one of the key factors adversely influencing the efficiency and effectiveness of governmental agricultural extension services in Palestine. Agricultural extension officers are not allocated sufficient financial resources to ensure their adequate coverage of all areas, in addition to the lack of financial allocation dedicated for agricultural experiments and observations, which are some of the agricultural extension methods.

iii. Veterinary services.

Veterinary services play a pivotal role in animal health, food hygiene and public health protection. Livestock productivity is highly dependent on the availability of animal health care services that are characterized by their quality and regular availability. Veterinary services in the Palestinian territories (which are provided for a great part by MoA) include free animal vaccination against foot and mouth disease and Maltese fever, while fees are charged for vaccination against other diseases, as well as the provision of clinical and laboratory diagnosis. In addition, fees are almost free of charge for most important animal diseases, and for undertaking pathological surveys, control programs, eradication of important diseases, such as bird pathogenicity influenza, follow-up of slaughterhouses and the general health of consumers through animal products safety monitoring, as well as animal tracking via the national identification program. The government provides veterinary services in the West Bank through its veterinary clinics affiliated to MoA, as well as via the private sector.

iv. Plant protection.

Plant protection services play a vital role in protecting agricultural plant production through the implementation of regulations, as well as phytosanitary measures that prevent the introduction and spread of agricultural pests at national level. These services provide all international trade requirements and agreements related to plant protection and quarantine. MoA is the competent authority responsible for recording, controlling and regulating all national trading operations and use of agricultural pesticides. It also has a key role in determining the safe use of pesticides and chemicals, as well as rationalizing their use and direct effects on agriculture, the environment and food safety. Moreover, the

private sector undertakes some extension activities in this area, focusing on marketing aspects.

v. Agricultural and rural funding.

The annual demand for agricultural loans is estimated at about $ 200 million, while only 30% is available, since a large proportion of agricultural funding comes through traders, brokers and borrowing from relatives and acquaintances. Palestinian financing and banking institutions perceive the agricultural sector as a high-risk sector. In 2015, the Palestinian government established the Palestinian Agricultural Credit Institution, under the Decree Law No. (8) for the year 2015[28], to be a governmental mechanism that helps Palestinian farmers and agricultural companies to obtain loans for the establishment and development of agricultural projects, as well as for agricultural production and inputs projects that are in line with the agricultural sector development strategy. The association is in process of developing its administrative and financial systems to ensure the implementation of its tasks.

vi. Agricultural insurance.

Due to the high risk factors and uncertainties in agricultural work, agricultural insurance activities face many problems and obstacles, namely high cost, resulting in an unfeasible service for farmers given its pure commercial base. The Palestinian government created the Risk Prevention and Insurance Fund based on the Decree Law No. (12) for the year 2013 to be the governmental institutions specialized in the management of risks that hinder agricultural development in Palestine.[29] It also aims at reducing the impact of these risks by implementing various interventions, tools and methods to mitigate damages caused to the agricultural sector, and to enable Palestinian farmers to cope with the negative effects of climatic and political changes. Despite the establishment of the Fund by a decision of the Palestinian government, it still needs to activate its work and funding mechanisms to be able to accomplish the tasks assigned to it by law.

vii. Agricultural marketing and post-harvesting services.

MoA, General Directorate of Marketing ensures access of agricultural products to local and international markets through focusing on the concept of producing what can be marketed instead of marketing what is produced. It also protects national products, provides economic and marketing information to investors and producers, as well as develops measures for export crop development. A group of Palestinian private companies contribute to the export of local agricultural products abroad, especially the Gulf, America and Europe. Local companies and some traders work on marketing agricultural products in Israel. Many of the official and civil society organizations, companies, as well as farmers' associations and cooperatives organize exhibitions, marketing days and

28 MoA, National Agriculture Sector Strategy "Resilience and Sustainable Development", Nov 2016
29 MoA, National Agriculture Sector Strategy "Resilience and Sustainable Development", Nov 2016

festivals for marketing of national products, such as grapes, apricots, oil and cooperative products, dates and snake cucumber.

3. Agricultural institutions in oPt.

a. Agricultural legislative framework.

The Agriculture Law No. (2) of 2003, as amended, for the year 2005, constitutes the basic legal framework that regulates the work in the agricultural sector, in addition to many agricultural by laws that have been adopted, after the issuance of the Agriculture Law. During the past period, various laws and by-laws have been issues to namely include the Agricultural Pesticides by law, Plant Product Smuggling by-law, Fodder by-law, Animal Recording and Identification by-law, Veterinary by-law, Animal health Control and Veterinary Quarantine by-law, Risk Prevention and Agricultural Insurance law, and the law of the Palestinian Agricultural Credit Institution. A by-law for the National Center for Research was also adopted.

Despite these achievements, there remains an urgent need to prepare many of the regulations and instructions to complete the legal framework, and needless to say that enforcement of legislation is as important as issue. Laws and regulations presented to the Council of Ministers and that are awaiting approval include a draft law on specialized agricultural councils, in addition to modifying some of the approved regulations, including (the agricultural quarantine by-law that has been replaced by the draft law on phytosanitary). There is a set of regulations that are currently being modified including namely, livestock and poultry markets, agricultural fertilizers, bio-safety, plant products smuggling, slaughterhouses, poultry farms and the agricultural law.

It is worth mentioning that the Palestinian legislative framework suffers from outdated laws, dating from the era of the Ottoman Empire, the British Mandate and even the Israeli occupation. Some of these laws are still in effect, consequently impeding agricultural development processes. In the case 17 of accession to international treaties and conventions, Palestinian laws should be updated to remove any incoherence between international conventions and the national legislative framework.

The recognition of United Nations General Assembly of the State of Palestine – represented by the Palestinian Liberation Organization - as a non-member observer in the United Nations system in November 2012, resulted in a turning point to the Arab-Israeli conflict, as well as to international community perspective on Palestine and Palestinians. This enabled the State of Palestine to join international frameworks, through international organizations and treaties. It should be noted that Palestine's accession to international organizations and treaties affects the work of the agricultural sector. The State of Palestine joined the United Nations Economic and Social Commission for Western Asia (ESCWA) that aims to stimulate economic and social development in member countries.

In addition to all mentioned, the State of Palestine also joined Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes and Their Disposal in 2015, nonetheless the Convention on Biological Diversity of 1992, the Cartagena Protocol on Biosafety of 2000. Also, the United Nations Framework Convention on Climate Change of 1992, the Paris Agreement within the United Nations Framework Convention on Climate Change, and the Convention on the Law of Non-Navigational Uses of International Watercourses of 1997. According to the negotiations, Affairs Department report on organizations and treaties related to the agricultural sector in 2015 there is more than 20 international organizations and treaties to join as a future priority for the Palestinian government[30].

b. Ministry of Agriculture & governmental organizations.

MoA is the main governmental body that leads agricultural development and is responsible for the formation of the umbrella under which civil society and international institutions work. The Ministry has 1710 employees with various technical and managerial disciplines divided between the southern (472 employees) and the northern governorates (1238 employees, including 440 employees working on regular contracts and day labourers), within an organizational structure led by the Minister of Agriculture.

There are many ministries and public institutions that play key role in the development, organization and service provision to the agricultural sector. Development objectives and agricultural progress are achieved, as the policies and investments that fall within the mandate of these ministries and institutions are crucial to the success of policies, programs and development initiatives in the agricultural sector.

Some institutions implement their interventions in Agricultural Sector include the following: the Water Authority, Environment Quality Authority, the Palestinian Investment Fund and its affiliated companies specialized in agricultural investment, the Ministry of National Economy, Ministry of Local Government and local government units, the Ministry of Finance and Planning, Ministry of Health, Ministry of Labour, the Ministry of Women's Affairs, Ministry of Interior, Governorates, Palestinian Central Bureau of Statistics, PECDAR, Land Authority, Palestine Standard Institution, and the Palestinian Investment Promotion Agency.

c. Risk prevention and agricultural insurance fund.

The Palestinian government established the Risk Prevention and Agricultural Insurance Fund based on the Decree Law No. (12) for the year 2013 to be the governmental institution specialized in the management of risks that hinder agricultural development in Palestine. It also aims at reducing the impact of these risks by implementing various interventions, tools and methods to mitigate damages caused to the agricultural sector, and to enable Palestinian farmers to cope with the negative effects of climatic and political changes. Despite the establishment of the Fund by a decision of the Palestinian government, it still

30 MoA, National Agriculture Sector Strategy "Resilience and Sustainable Development", Nov 2016

needs to activate its work and funding mechanisms to be able to accomplish the tasks assigned to it by law.

d. Palestinian Agriculture Credit Institution.

In 2015, the Palestinian government established the Palestinian Agricultural Credit Institution, under the Decree Law No. (8) for the year 2015, to be a governmental tool and mechanism that helps Palestinian farmers and agricultural companies to obtain loans for the establishment and 18 development of agricultural projects, as well agricultural production and inputs projects, in line with the agricultural sector development strategy. The association is in process of developing its administrative and financial systems to ensure the implementation of its tasks.

e. Agricultural Cooperatives in Palatine.

Historically mentioning cooperative is defined as a legal entity representing a group of individuals that come together to achieve a common objective. Their purpose is to serve themselves and their community and to work together as a team. In Mr. Qadous article posted in ARENA BLOG titled "The Importance of Cooperatives in Palestine", he express that the first cooperative in Palestine – and in the larger Arab community – was founded in 1920. Located in Akka, it was an agricultural cooperative specializing in tobacco.31

However, long before the first official cooperatives appeared, people would come together informally to help each other in the fields. Neighbours would pitch in with their labour and equipment to harvest crops. Sharing the labour made the work move quickly and efficiently. It also built a sense of social cohesion. Olive picking particularly benefited from this communal approach as the quality of olive oil hinged on moving the picked olives quickly from the tree to the press.

In 1948, with Israel's founding and a weakening Palestinian society, the importance of Palestinian cooperatives grew, as they provided some structure and ability to get things done. Twenty years later, after the 1967 war, development and aid organizations recognized that cooperatives were effective and legal entities with which to work in Palestine.

Palestinian cooperatives take many forms. Agricultural entities are the most common, with specialties like beekeeping, livestock and irrigation. There are also cooperatives to help people with housing, to provide services for savings and credit, to protect consumers, to share electricity and water resources, etc.

Nevertheless, as any other institution even the Cooperatives faces obstacles and challenges, and in light of shortcomings and deficiencies, there is a need to enhancing and spreading the idea of cooperative work by learning from the rich

[31] Qadous, Naser, July 5, 2019, The Importance of Cooperatives in Palestine, Arena Blog, https://www.anera.org/blog/the-importance-of-cooperatives-in-palestine/

experiences and developments seen by the global cooperative movement. The Ministry on 2017 updated law for cooperatives based on the principles of international cooperation and the resolutions and recommendations of the United Nations, the International Labour Organization (ILO), and the International Co-operative alliance (ICA).[32]

f. The private sector, non-governmental and farmers' organizations

Non-governmental and civil society organizations, amounting to 35 organizations, have historically played key roles in agricultural development before and after the establishment of the Palestinian National Authority. They are characterized by their long expertise enabling them to cope with changes. Working in the agricultural sector by Privet sector played a complimentary integral role with the MoA, also it played a key role in the agricultural production value chain, as well as in investing in the agricultural sector and providing various business services needed by farmers, especially, in the production and post-harvest processes.

The private sector is the only player in the food-processing sector, as well as in the local and external marketing. Thus, coordination with and involvement of the private sector and farmers' organizations, as well as their encouragement to invest in the agricultural sector are key pillars in the Palestinian agricultural development efforts.

Private sector organizations that are directly involved in the agricultural sector include the following: Chambers of Commerce, Industry and Agriculture scattered in all provinces as well as their public union, based in the city of Ramallah, the Palestinian Food Industry Union, the Palestinian Trade Center (PalTrade), the Private Sector Coordinating Council, Union of Agricultural Cooperative Associations, agricultural marketing and export companies, the Palestinian Shippers Council, and companies of agricultural inputs, including nurseries. The private sector organizations also include farmers' organizations and unions, and the ten agricultural commodity councils that have been formed based on the first article of the amended Agriculture Law No. (11) for the year (2005) and under special regulations they are classified as semi-government institutions. In which, these councils provide a framework for all stakeholders involved in the aforementioned commodities. The preparation of the draft law of the General Union of Agricultural Councils is under progress, with the aim of regulating the work of these councils to ensure sustainability and organization of work.

[32] Srouji, Fathi. 2015. *Reforming the Cooperative Sector in Palestine.* Ramllah: MAS, https://www.mas.ps/files/server/20151012092147-1.pdf

g. International development partners

A large proportion of the agricultural sector projects is funded and overseen by donors and international institutions, through project-based arrangements. These projects are often implemented, either by state institutions, such as the MoA, Water Authority and PECDAR, or by Palestinian civil society organizations or foreign NGOs that are registered in Palestine. Despite the sectoral and cross-sectoral coordination, the agricultural sector-working group is an important mechanism to coordinate stakeholders' efforts in the agricultural sector. The group includes Palestinian and international organizations, as well as donors.

4. Spot light on Agriculture Sector Jenin & Tubas Governorates.

As preparation of the MedSNAIL project, on January 13, 2020 MedSNAIL-RWDS Team composed of Mrs. Haneen Zeidan, Mrs. Rulla Sarras, Mr. Amin Juaidi and Mrs. Soher Al-Jaloudi made a filed visit to each of Jenin and Tubas governorate agricultural directorate. It was in purpose of collecting data and information, and in aim of better understanding for the agriculture production of both plants and livestock.

a. Findings based on Jenin Governorate Agricultural Directorate.

The meeting was held with Mr. Hakam Salah the Director of the Support Services Department, and on behave of Mr. Basem Hamad General Director of Jenin Governorate Agricultural Directorate. That, Mr. Hakam have provided us with the following information:

Jenin Governorate is consist of 82 communities, they almost inhabit at the foot of the rugged northernmost hills between 4 large plains as known of Arraba plain or the Plain of Sanur to Wadi Bal'ama, and across the plain of Marj Ibn Amer and Lajjun to Haifa, Maysaloon plain, and Qabatia plain. In which it have brought to Jenin communities the biological diversity into the agro food production as Horticulture Trees, Vegetables, Field Crops, herbs and Livestock. Whereas, the vegetables are divided into irrigated and dry farming, including the irrigated exposed vegetables as onion.

Presenting each plains as mentioned, Mr. Hakam came across the data and information as the list below:

Arraba plain is consist of:	
Arrabah cultivated land	About 32k dunums[33].
Irrigated farming	About 7-9k dunums.
Dry Farming	About 23-25k dunums.

33 عرابة (سهل), الموسوعة الفلسطينية, https://www.palestinapedia.net/%D8%B9%D8%B1%D8%A7%D8%A8%D8%A9-%D8%B3%D9%87%D9%84/

Main Crops	Exposed and Irrigated Vegetables
Maysaloon plain is consist of:	
Maysaloon cultivated land	About 16k dunums[34].
Irrigated farming	About 16k dunums Contains about 5 Artesian aquifer wells & 22 pond.
Dry Farming	Not determined
Main Crops	Exposed and Irrigated Vegetables, including herbs as parsley, spearmint, Common sage, Sesame and Wheat.
Qabatia plain is consist of:	
Qabatia cultivated land	About 14k dunums[35].
Irrigated farming	Not determined
Dry Farming	Not determined
Main Crops	Not Exposed and Dry farming Vegetables as Potato.
Marj Ibn Amer plain is consist of:	
Marj Ibn Amer cultivated land	About 350k dunums[36].
Irrigated farming	About 20% of the land is irrigated farming.
Dry Farming	Almost over 80%.
Main Crops	Exposed and Dry farming Vegetables, including 21k dunums of irrigated vegetables, 55-60k dunums of Wheat, 80k pastoral crops, 18-25k dunums of Dry vegetables, and about 150k dunums of Olive trees, and Grapes trees about 3.5 k.

Indeed it was been mentioned that there are about 3 companies of production the Thyme in Jenin Governorate as Alnasr company, Sanabel company, and Al-Quds Co.

34 مرج ميثلون، ويكيبيديا،
https://ar.wikipedia.org/wiki/%D9%85%D8%B1%D8%AC_%D9%85%D9%8A%D8%AB%D9%84%D9%88%D9%86

35 مركز الإحصاء الفلسطيني وزارة الزراعة، التعداد الزراعي، النتائج النهائية – محافظة جنين,2010
http://www.pcbs.gov.ps/Downloads/book1843.pdf

36 أين يقع مرج بن عامر,موضوع , Nov 2015
https://mawdoo3.com/%D8%A3%D9%8A%D9%86_%D9%8A%D9%82%D8%B9_%D9%85%D8%B1%D8%AC_%D8%A8%D9%86_%D8%B9%D8%A7%D9%85%D8%B1

In discussing the livestock and polarity, Mr. Hakam declared the estimated farming products in Jenin Governorate as following:

Item	**Production per year**
Dairy Cattles	About 4.5 k
Sheep	About 90 k
Bees	About 4 k
Hatcheries farms	7 Farms
Laying Hens Farms	3 Farms
Broiler chicken	12 m
Turkey (Bird)	15 k

Asking about the Holdings per person in Jenin governorate for the Land, the answer was not clearly determined, but the estimation leads to that each holding person has about 36% of the a total of One Dunums Plant production and Livestock holding. The agricultural holdings in Jenin are small due to the fragmented and divided agricultural holdings. Indeed, that effects on the Labour force in which depends of Family business and workforce.

In addition, asking about the cost of the irrigated or drinking water, Mr Hakam expressed that the price per each cube is about 3.5 New Israeli Shekel equivalent to 1.0 USD.

Where almost the agricultural production in Jenin governorate is automated or semi-automated, in some areas of east of Jenin Governorate there is the traditional and manual production still in practice.

At the end of the interview with Mr. Hakam, his recommendation were toward the productive and economically business agriculture is to go with consultation and advisory activities to the farmers is many fields as:

- Irrigation methods and cultivation mechanisms.
- Capacity and Farm management.
- Consultancy in Making Decisions.
- Safety Period of consumption agro food.
- Pest control and Pesticide safety.
- Harvesting methods and procedures.

b. Findings based on Tubas Governorate Agricultural Directorate.

RWDS team was supposed to meet with Mr. Sulaiman Abu Amer the director of the Department of Vegetables of Tubas Governorate Agricultural Directorate. Being lucky, RWDS team got the chance to meet also with, Mr. Amer Labadeh the director of the Department of the Support Services, Mrs. Zafaf Abu Shehadeh the director of Horticulture Trees Department, Mr. Maher Salahat the director of Field Crops

Department, and Mr. Mahdi Bashar the director of Livestock Department, who have kindly provide the RWDS team with the relative information of each department and sector as following:

Mr. Abu Amer has introduced the geographic and climate diversity of Tubas Governorate, in which it provides growth of a wide range of agricultural products, although agricultural area is relatively small, the climate makes it suitable for the production of vegetables year-round. Tubas is known as the Northers Aghwar or "AlAghwar Alshamaleyah", in which it lays on two of ecological zones according to the classification of MoA, the steppe zone that extends from Eastern Jenin to the Dead Sea in the south and is considered a range-land, and the Ghor (Western Jordan Valley) zone. Tubas is famous with its plains as; Tubas Plain on the lands of Tubas city and town, Al-Kfeer Plain on the land that expands between Jenin and Tubas Governorates, Al-Beqe'ah Plain of Tamoun Town, and Al-Smaeet Plain of the Al-Far'ah Valley. In addition, there is the mountain land, which is known as Ahrash Tubas, with its dry climate.

Tubas Governorate have about 95k dunums of Agricultural land, 35k dunums are considered as of vegetables crops and production, about 50k dunums are for field crops, the exposed cultivation expands on 30k, whereas about 50k are depending on Green Houses. Herbs are planted on about 0.8k dunums mainly by 4 Palestinian companies, in which their production of herbs are for export to North America and Europe, estimated by Mr. abu Amer that up to 99% of the production are for export. The main vegetables irrigated crops produced in tubas governorate lands are; Potato is estimated to be planted on 15k dunums annually, Cucumber, Onion and Zucchini.

Tubas Governorate has about 40 artesian aquifer wells, mainly the irrigation are depending on Israeli Water Supply companies, the price per each cube of water is estimated to 2.5 – 2.7 NIS is which is equivalent to 0.75 cent of USD. However, at Tubas Plain, the price may reach to 3.8 NIS, 1.10 USD for each cube of water, and since it has dry climate it requires more irrigation than other plains.

Farming on Horticulture Trees is estimated to be around 25k dunums, mainly the Grape is about 800 dunums of seedless and 250 dunums of local Grape. The Citrus trees have been planted on almost 600 dunums, and recently there is the Guava Trees, which is planted on about 450 dunums, nonetheless the Palm trees with 100 dunums. The olive trees are estimated to be 22k dunums, including about 1k Dunums of the Almonds Trees, which are not irrigated mainly planted on mountainsides of Tubas. Tubas is known also with it is a vast area of Bushes in which extends over 65000 dunums, and almost there are about 50k dunums more were recently planted.

Questioning about the Fields Crops plants and grains, Tubas have annually planted about 40k dunums. Wheat is the main production, it is estimated to be planted over 25k dunums, also 4k Fodder is produced such as Clover and Bekka, and 5k dunums of Barley. Chickpeas is also produced of planting about 3k dunums; mainly 90% of chickpeas are consumed as green grain. About 10k dunums are

planted with the other grains as Okra and Peas. It is mainly planted between November and February, and the harvesting take place between March and July.

Livestock in Tubas has enormous effect on Palestinians production. It has 50k of Local Sheep known as "Awase Sheep", about 8k Crossbreed known as Mahala, the milk is used mainly in Chees production, individuals as traditional processing produce it, which its price for selling is 12-18 NIS per one kilo, the milk costs 4.5 – 5 Nis. Cows on another hand, is ranching in almost 20 farms with estimated number of 1.5k, the breeding is local and there is lack in production new cows as weak breed, the feeding of livestock depends on both green pastures and produced fodder, about 70% depends on the produced fodder. Whereas, AREEJ Center have installed in tubas Milk collection Unit to help the farmers in selling and marketing their production. In addition, there are 1 - 1.2m Poultry production, recently about 5 to 6 farms were terminated, and only one farm is working as laying chicken farm, whereas, no hatchery farms are there. For Turkey birds, there are two farms with production of 75k annually.

East of Tubas has Salty Soil, the potentiality of using it in agro food production is denial, Israeli Settlers and Military have done many offences toward the farmers and population, destruction of Artesian wells, pot fire on planted lands and crops, sabotage of agro crops, and Confiscation of machineries and tractors and, doing military trainings on planted lands.

The holdings in tubas is mainly limited to few reasons, as Estimated about 95% of farmers have about 30% of total Holdings. Al-Ghor part of tubas are known as family business where the family do not have holdings, and they work as partner to big agro food producers, as agreed for a proportion of the Crops produced.

Tubas has no Bank of seeds, the Tubas Governorate Agricultural Directorate is working with the National Agricultural Research Center in founding a bank of seeds, nowadays, they mainly works with the farmers as source of seeds. Tubas Governorate Agricultural Directorate with repetitive field visits and consultancy to farmers in their farms, they try to assure the good seeds source of the local agricultural products. In which the Beit Qad Agricultural Station works of experimental and examination of agricultural products with the National Agricultural Research Center. Nonetheless, the role that is recently played by the Genebank and National Herbarium of registering and collecting the medicinal and nutritional herbs.

The agricultural cultivation in Tubas is looking for Economical agriculture, in which basically it leads to income generating, and the farmers are mainly seeking for Safe cultivation, to be introduced and advocated toward how to reach agricultural production density, Best practice in using pesticides and general safety, and safety period of consumption.

5. The role of women in the Palestinian agricultural sector.

a. Palestinian Female Net Holdings.

As indicated previously, the results of the agricultural census carried out by the Palestinian Central Bureau of Statistics in cooperation with the Palestinian Ministry of Agriculture in 2010, indicated that the number of agricultural holdings in the Palestinian territories amounted to 111,310 holdings, of which 90,908 holdings in the West Bank accounted for about 82%, while in the Gaza strip the number of holdings is 20,402 holdings, which constituted about 18% of the total holdings.

At the governorate level, the largest number of holdings in the Hebron Governorate was 19,768 holdings, which constituted 18% of the total holdings in the Palestinian territories, while the lowest number of holdings in Jericho and Al Aghwar Governorate was 1,612 holdings, constituting less than 2% of the total holdings.

For the types of holdings in the Palestinian territories, the results indicated that the number of plant agricultural holdings amounted to 79,176 holdings, it constituted 71% of the total agricultural holdings, while, the number of mixed agricultural holdings 17,893 holdings, in which formed 16% of the total holdings. Nonetheless, the number of animal holdings amounted to 14,241 holdings, in which formed about 13% of the total holdings.

As for gender, the results indicated that the number of holdings held by a male amounted to 97,592 holdings and accounted for 87.7% of agricultural holdings in the Palestinian territories, while the number of holdings held by a female amounted to 7,561 holdings and constituted 6.8%. While the rest of the holdings were distributed among joint holdings, where the number reached to 6,034 holdings and accounted for 5.4% distributed, and according to the gender of the holder, including male and female partnership, or male, or female partnership. While there are 123 holdings by 0.1%, in which the gender of the holder is not shown or does not apply to the sex of the holder. Perhaps these percentages indicate that women have less access to agricultural resources, especially agricultural land, which is the main resource for agricultural production.

When focusing on the net female holdings in the Palestinian territories, which are held by women or women's partnerships only, the census results indicated that the number of these holdings amounted to 7,666 possessions, in the West Bank it reached 6,388 holdings, 83% of the total net female holdings, While the number of these holdings in the Gaza Strip reached 1,278 holdings, which constituted 17% of total female holdings.

It is noteworthy that these percentages do not go far from the total distribution of holdings percentages between the West Bank and the Gaza Strip, as the rates as indicated above were 82% and 12%, respectively.

According to the distribution of net female holdings in the Palestinian territories and according to the type of possession, plant, animal and mixed, it is indicated that plant holdings accounted for 78% of net female holdings, and animal holdings

accounted for 14% of them, while mixed holdings accounted for only 8% of mixed holdings37.

These percentages indicate the concentration of holdings held by agricultural women on plant production, are more than the concentration of total holdings at the level of the Palestinian territories, where plant holdings accounted for 71% of total holdings, representing 78% of net female holdings.

It shows that the distribution of net female holdings in the Gaza Strip by type of occupancy. It is noteworthy that plant holdings accounted for 64% of net female holdings in the Gaza Strip, and animal holdings accounted for 26% of them, while mixed holdings accounted for only 10% of mixed holdings.

In contrast to the reality in the West Bank, these percentages indicate the concentration of holdings held by agricultural women in the Gaza Strip on plant production less than the concentration of total holdings at the level of the Palestinian territories, where plant holdings accounted for 71% of total holdings and 64% of net female holdings.

b. Palestinian Women as Agricultural Worker.

Many Palestinian women work as agricultural workers, with data on labour and the Palestinian workforce available in labour force surveys implemented by the Palestinian Central Bureau of Statistics. Agriculture occupies about 10.4% of the workforce during the year 2014. However, agriculture employment, work permanence, and terms of wages differs between males and females.38

Whereas, the relative distribution of agricultural workers in agricultural holdings in the Palestinian territories, according to the type of employment, gender, and region of the family members without pay (permanent workers).

It is indicated that 24.5% of the total number of family members working permanently in the holdings of these families are male, while 10.6% of them are female. These percentages differ, of course, between the West Bank and the Gaza Strip, where the percentage of female working family members without pay and permanently in the West Bank is 11.2%, while this percentage is lower in the Gaza Strip, where it is 7.9%. As these percentages differ among the governorates of the West Bank, the highest percentage of women working as such reaches 16% in the governorates of the southern West Bank, while the lowest percentage is in the governorates of the northern West Bank, which is 7.9%.

As for the relative distribution of agricultural workers in agricultural holdings in the Palestinian territories according to the type of employment, gender, and region of the family members who work without pay (temporary employment), and that

37 Srouji, Fathi, Enhancing the role of women in the Palestinian agricultural sector, MAS ,Ramallah, 2016, http://mas.noursoft.com/records/1/22525.aspx

38 Economic and Social Monitor, Annual Volume 2015, Vol. 44, 2016, http://www.pcbs.gov.ps/Downloads/book2203.pdf

21.6% of the total number of family members working temporarily in the holdings of those families are male, while 16.6% of them are females. These percentages differ, of course, between the West Bank and the Gaza Strip, where the percentage of female workers who are unpaid family members and temporarily in the West Bank is 18.5%, while this percentage is lower in the Gaza Strip, where it reaches 7.5%. Similarly, these percentages differ between the governorates of the West Bank, where the highest percentage of women working in this way is 22.2% in the governorates of the northern West Bank, while the lowest percentage is in the governorates of the southern West Bank, which is 9.3%.

With regard to the relative distribution of agricultural workers in agricultural holdings in the Palestinian territories, according to the type of employment, gender, and region of the family members who work for wages. It should be noted that these ratios are very modest if compared to the employment of unpaid family members, whether permanent or temporary. Statistics indicate that 2.1% of the total workforce of family members working permanently and with wages in the holdings of those families are male, while 0.3% of them are female. These percentages differ, of course, between the West Bank and the Gaza Strip, where the percentage of female working family members with permanent wages in the West Bank is 1.3%, while this percentage is lower in the Gaza Strip, where it is 0.4%. These percentages do not differ between the West Bank governorates, as they range between 0.3% in the northern governorates and 0.5% in the southern governorates.

It was not possible to obtain detailed information about the paid workers temporarily in terms of their gender distribution, but it is clear that they constitute just over a fifth.39

In addition to the difference in workers' wages by region and economic activity, the data reviewed confirm that the average wage of male workers exceeds the rate of female workers in all regions and in all economic activities. In agricultural activity in particular, the wage differential between males and females can be explained by the nature of the work that each can do, as the males perform muscular tasks that many females cannot do; such as ploughing, loading and unloading, and the use of chemicals of all kinds, which explains Males receive higher wages. However, what is unacceptable is that males receive higher wages than females when doing the same work: irrigation, weeding, picking, sorting and grading.40

c. Palestinian Female Affiliation with Cooperative Societies and RWDS Women's Clubs.

Nowadays, cooperative societies are formed in Palestinian Territories to achieve the common interests of their members, women farmers of plant and animal

39 PCBS, Palestinian Labour Force Survey, Annual report of 2014, April 2015, http://www.pcbs.gov.ps/Downloads/book2120.pdf
40 Srouji, Fathi, Enhancing the role of women in the Palestinian agricultural sector, MAS ,Ramallah, 2016, http://mas.noursoft.com/records/1/22525.aspx

production can benefit from the presence of cooperative societies spread over the Palestinian territories, or through the establishment of new cooperative societies that achieve specific objectives for these farmers. Based on the results of the analysis of the survey conducted by Mr. Fathi Masrouji, on ways to advance the role of Palestinian women in the agricultural sector, indicates that 41% of the women farmers who were interviewed knew of the existence of cooperative societies in the region where they live, but only 19% participated to these associations. 43% of the affiliates affirm that their associations are feminist (especially for women), that 37% of them belong to agricultural service-oriented cooperative societies, 22% of credit and savings societies, 20% of craft associations, and a small percentage not exceeding 2% affiliated with each of the housing, service, and consumer associations.

The analysis of the survey also shows that 15% of the members of cooperative societies are members of their boards of directors. In addition to that, 2% of the women affiliated to the premiership of the cooperative, while others reached the Secretariats or the Treasurer positions.

In addition, it indicates that 35% of the female livestock farmers interviewed are aware of the existence of cooperative societies in the area in which they live, and that 34% attribute these associations.

Whereas 39% of women who affiliates to cooperative or societies confirm that their associations are feminist, that 52% of them belong to agricultural service-oriented cooperative societies, 9% are credit and savings societies, 19% are service societies, and 14% are practiced societies. The results of the analysis also indicate that 12% of the members of cooperative societies are members of their boards of directors. Just as 2% of female members came to the management of the cooperative.

As women farmers benefits of affiliation in the cooperatives and societies, the results of the analysis that 48% of the women respondents indicated that they benefited from affiliation with the cooperatives. Regarding the forms of benefit, the results indicate that 21% of the women farmers surveyed reported that the benefit was in the field of product marketing, and 26% in the field of purchasing production requirements collectively. The results also indicate that 32% of them benefited from cooperatives in various forms, such as: constructing a water collection well, having coupons for buying fodder, participating in agricultural and handicraft courses and workshops, as well as building a social and economic knowledge network.

It should be noted that most of the supporting institutions with those in charge of enhancing women roles in their Palestinian communities socially and/or economically are motivating women to engage in agricultural cooperative societies, throughout providing services to women and men farmers mainly through their cooperatives. These services are provided to Palestinian farmers and cooperatives through many international and local institutions, in particular mentioning the International Food and Agriculture Organization (FAO), Agricultural Development

Association (PARC), The Applied Research Institute Jerusalem (ARIJ), WE EFFECT - Palestine, Economic and Social Development Center of Palestine (ESDC), and Oxfam International, including the Rural Women's Development Society (RWDS).

In addition, RWDS has 10 women's clubs in Jenin Governorate, and has good relations with several other women's societies in the governorate. These clubs were established to empower rural women economically and socially for more than 30 years, with 30-50 members of each club. More women who are not members of the village's councils nowadays benefit from women's clubs service. There are production units in all of these clubs and other women societies, where women produce agricultural products from their localities, such as jams, pickles, maftool, thyme, tomato juice, in addition to dairy products, pastries, sweets, and soap.

RWDS has been working for years to rehabilitate these units and build their capabilities in order to register them to become formal, organized and sustainable cooperatives. RWDS also works to network between these cooperatives to exchange experiences between them and help in marketing their products. There is 24 cooperatives in Jenin Governorate , 3 of them only registered as women cooperatives , One of them is the Jalboun Cooperative Society of the Jalboun Women's Club , which we will target in this project.

Through this project, the following women's clubs will be targeted: Anza, Jalboun, Maythalon, Faqoua, in addition to the Al-Jalama Women Club society and Burqeen charitable society.

6. Slow Food in Palatine

A meeting was held between a team from RWDS and Mr. Saad Dagher a Consultant Lead of Slow Food International in Middle East, it was held in the main office located in the city of Ramallah - Al-Masyoun - Sabat Building 2nd floor on Sunday, January 12, 2020.

At the beginning of the meeting, Mrs. Haneen and Mrs. Rulla has presented the Project titled "Sustainable Networks of Agro-food Innovation Leading in the Mediterranean (Med SNAIL)", including RWDS recent future activities and aims. She mentioned the Funder as EU, and the Partners including the Lead as Andalusian Federation of Municipalities and Provinces (FAMP) as Lead Beneficiary, Slow Food Foundation for Biodiversity, American University of Beirut (UAB), Rural Women's Development Society, University of Sfax, Gozo Development Agency, and Women for Cultural Development (Namaa).

Later on Mr. Saad Dagher introduced to RWDS his role and Consultant Representative of Slow Food foundation in Arab World as his specifications in Agriculture and Ecological Agriculture. He also has expressed the goal of implementing Slow Food politics on agriculture and biodiversity into practice. In addition, he explained the race by the Israeli to register the plants and gastronomic sciences of origin of Palestine as Israeli Products, so his referred to the latest 10 year

of efforts on creating the project called “Akli Baladi- I Eat Local” in which calls all for good, fair and clean food production for all.

Moreover, Mr. Saad expanded the definition of Slow food with bringing and holding Events for the local and ecological Agro–food produces, and the goal of marketing their products as traditional and cultural gastronomy. He also revealed about the intended efforts about registering certain foods and recipes under Slow Food Palestine, such as Al- Charadeesh, Al-Badoudi Oil and Al-Rashtaya.

Despite the Good Food concept, Mr. Saad has declared it as the Agro –food products, which are planted and raised with no use of chemical Pesticides. Also it refers to, the biodiversity in the planted products in aim of protection of environment, eliminating pests with nature’s balance, and gaining access to more balanced food diet by agricultural biodiversity, in which it leads to better nutritional value. Moreover, he has added that ecological farming does not need to till the ground/soil, and the ground/soil in covered with the remains of the cultivated plants.

Then, Mr. Saad presented to RWDS team the Slows food Project focus, in which are reflected on maintaining foods and diets that people almost are up to forget, registering traditional and original foods and agro products, and reviving of vegetarian foods in Palestinian Society.

The Slow Food project may touch other aspects as:

- National, to register all historical and cultural foods and cultivated plants.
- Biological, maintain the diversity within plants and animals.
- Ecological, to keep and preserve the local resources, including soil and water, in which the ecological farming preserves about 50% of irrigation required for same crops.
- Social, to gather the people about their heritage, culture and traditions.

In addition, Mr. Saad expressed that there are efforts toward reviving the Local Tomato. But, that some of the inappropriate activities of cultivating lands, turn some of lands poor as the one of flatland of Derbalout located in Salfit Governorate. Whereas, there is other flatlands as between Senjel and Almughayar in Ramallah and Albereh Governorates are up to lose their lands value in regards to poor practice of cultivating the land. It is the same with Al-Jeeb in west of Jerusalem which main reason or the inappropriate use of cultivation is the use of chemical pesticides.

In reference to the Badoudi Oil, as Mr. Saad mentioned that it has a high value return and its acidity pH is less than 0.02 free fatty acids. Moreover, the Badoudi Oil depends on the period of harvesting the olive fruit, which mainly the purple colour covers between 50-70% of the fruit (Mshalhebeh).

About the products of animals, Slow Food registering focus on Milk Products as Chees. Also mentioning, the period of safety after using the pesticides is very important to prevent any harms to the human beings who will use these products.

As Mentioning Al-Nassareyeh and flatland of Smeet in Nablus Governorate are turning into the ecological farming by several projects there, including the global Ecovillage Network activities in Palestine.

Mr. Saad reassures the harmony between the food production and farming and the Role of the Women, thus the meaning of Terra Madre, which come out of the concept “Pachamama”, the Earth Mother, reveals all over the world intend to show the relation between the women and the earth. In addition, his consumptions are that women are going with better practice of ecological farming, since they are more related and close to the cultivation, and the way they produce the delicious foods and diets, as Rashtaya food.

The known institution, which has providing training and was working with farmers in the ecological practice of farming and cultivation is Youth Men Christian Association (YMCA), they are providing training for more than 3 years in Palestine.

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Activity 3.1.2

PP4 - University of Sfax

DESK REVIEW

ENI CBCMED Cooperating across borders in the Mediterranean
Project funded by the EUROPEAN UNION
REGIONE AUTÒNOMA DE SARDIGNA
REGIONE AUTONOMA DELLA SARDEGNA
MedSNAIL

Overview on local agriculture and food heritage: Case of Sfax and Sahel in Tunisia

DESK REVIEW

Prepared and submitted by the University of Sfax (US)

under the project "Sustainable Networks for Agro-food Innovation Leading in the Mediterranean - MedSNAIL"

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Tunisia Overview

I. Generality

I.1. Geographical presentation and climate characteristics

Tunisia is located in North Africa, between longitudes 7° and 12° E and latitudes 32° and 38°N. Belonging to the Maghreb, It is bordered on the North and the East by the Mediterranean. Its western border opens on Algeria (965 km) and its South-eastern border on Libya (459 km, Figure 1). Tunisia covers 163 610 km², which makes it the smallest country of the Maghreb. It has a relief relatively contrasting according to the areas and a significant maritime front of almost 1300 km mainly directed towards the east. Tunisia, as an integral part of the Maghreb and the northernmost country of Africa, has a strategic location dominating the Strait of Sicily, between Cap Bon Peninsula and Italy. The Strait of 200 km wide, is one of the most frequented pathways in the world.

Figure 1. *Tunisia geographical position*

Due to this geographical position and general orientation of the main relief, Tunisia is influenced in the North by the Mediterranean, the South being under the influence of the desert. About 40 % of the surface area of Tunisia is occupied by the Sahara desert. The Center is under the joint effect of these two elements. The principal mountain chain crosses the country from the south-western direction to the North-East on the way to Cap Bon. It is the Tunisian dorsal, which constitutes the Eastern end of the Atlas chain. Its highest peak is Djebel Chambi (1544

m) and the average altitude is 700 m. Between the mountains, there are fertile valleys and plains. Only one river is continuously feeding: Medjerda which flows into the Gulf of Tunis.

The climate of Tunisia is divided into 7 bioclimatic areas favorable for a great diversity of husbandries. Subjected to a Mediterranean climate, the north part of the country is characterized by a hot and dry summer and mild and relatively rainy winter. This region is agriculturally rich. The Center and the Gulf of Gabes have a semi-arid climate, characterized by relatively high temperatures and modest rainfall (between 200 and 400 mm/year). The mountains are separated by fertile valleys and large olive plains (the Sahel and Sfax region) appears in the east. The rest of the country marked by the large depression of Chott El Djerid and its riparian palm groves, witnesses a desert arid climate characterized by high temperatures as well as important amplitudes were rainfall rarely exceeding 100 mm. The great difference between the north and the rest of the country is due to the Tunisian dorsal which separates the areas influenced by the Mediterranean climate from those influenced by the arid climate engendered by the Sahara. Such a characteristic makes Tunisia a country particularly vulnerable to climate change.

The summer season in Tunisia is marked by significant aridity, which is characterized by heat and dryness due in part, to the sirocco. The temperatures vary because of the latitude, and the nearness to or farness from the Mediterranean Sea. The average temperatures for the entire country are 12 °C in December and 30 °C in July. The country also profits from a rate of significant sunshine which exceeds 3000 hours a year. The temperature may be a few degrees below 0°C in winter in the mountains of Kroumirie, and sometimes it can be, in summer, around 50°C in the shade in the desert areas.

Thinks of Tunisia's geographical location, many different peoples have entered and dominated the country.

I.2. Tunisia History and Culture

In the heart of the Mediterranean, Tunisia has been a crossroads of civilizations. The first known inhabitants of the country were the Berbers. There is also African, Asian (brought by the Phoenicians and by Judaism and Christianity from the East), Arabo-Iranian, Islamo-European (through Andalusia) and European, comprising Greek, Roman, and French influences.

In 814 B.C, the first invaders were the Phoenicians, who settled Carthage, used it as a trading base, and eventually entered into a losing conflict with Rome. Then Romans dominated Tunisia for several centuries. After the decline of the Romans, the Vandals invaded from the west, followed by a Byzantine reconquer from the east. In the seventh century, the Byzantines were

replaced by Muslim Arabs from the east. Though dynasties have come and gone, Tunisia has been predominantly Arabic-speaking and Muslim since then. In 1574, Tunisia was incorporated into the Ottoman Empire. The Spanish held parts of Tunisia briefly before the Ottomans, and the French ruled Tunisia during the colonial period for 75 years.

After the Jasmin revolution in January 2011, Tunisia has become a model of peaceful democratic transition benefiting from a developed local governance system. Since that time, culture has become increasingly politicized and polarized in Tunisia, becoming a political stake in itself. It is seen as a tool for development and dialogue with a view to promoting Tunisian culture. The 2014 Constitution and state structure deal with culture made decentralization an unavoidable choice by instituting the principle of local power and by considering citizen participation as a guarantee of democratic governance.

I.3. Tunisian Demography and social environment

History, as well as natural environment, generate inequality population density between north and south and between east and west since Independence (Figure 2).

Figure 2. *Population density according to Governorates*

Tunisia has no cities with more than a million people, 6 cities with between 100,000 and 1 million people, and 81 cities with between 10,000 and 100,000 people. The largest city in Tunisia is Tunis, with a population of people. The population includes Arabs (98 %), Europeans (1 %), Jews and others (1 %). In 2018, Tunisians under the age of 14 were estimated at 25.25 % (male 1.502.655 / female 1.405.310) of the total population, those between 15 and 64 years were 66.53 % of the population, and 8.22 % were 65 years old and above (male 448.784 /female 498.400). Two-third of the total Tunisian population live in urban centers, particularly in coastal governorates. Thus, the geographical distribution of urban areas is mainly concentrated along the coastal strip. It includes 71 % of the urban population, whereas only a third of the Tunisian population lives in the country, which has several sizable cities of rural areas based precisely on promoting agricultural activities. This structural imbalance between coastal regions and regions of the interior is mainly due to the presence of a modern public infrastructure and a social and cultural infrastructure, high regional population density, regions size and urbanization (Karray and Driss, 2006). Looking for a better balance, some development policies have been adopted to reduce these regional development inequalities. It consists of creating in each governorate a general commission for regional development, a regional commissioner for agricultural development, offices of irrigated perimeters as well as municipalities. Other several measures have been adopted by Tunisian authorities such as the classification of the less developed regions as regional development areas and priority development areas. Such actions provide several advantages and may improve the attractiveness of industrial enterprises and therefore the development of the region. On the other hand, the Tunisian social environment is “modern” which promoted women's rights and ratified a modern personal status code. Furthermore, Tunisia’s population is more so educated than any other Arab country. It has an efficient educational system making the middle class considerable. All these reasons made Tunisia one of the most modern and socially advanced countries in the Muslim world (“Islamists set sights,” 2011).

I.4. Tunisian Economic environment

The geographical location of Tunisia, adjacent to many European cities, is considered an asset necessary to enhance the tourism industry and improve the country’s infrastructure. Historically Tunisian economy was linked to agriculture (wheat, dates, olives, citrus fruits, and sea products), to mines and energy (a large producer of phosphates), to tourism (6.5 million tourists in 2006) and to manufacturing industries (textile, food processing, and electromechanical engineering). After a half-century of rapid growth, the structure of the Tunisian economy has

changed. It has a diversified economy. Industry and services share in output have increased, that of agriculture has gradually decreased. Tunisia engaged in economic liberalization, global economy opening, and integration. Thus, as early as 1991, Tunisia became a member of the GATT. It was the first Mediterranean country which had agreed to free trade with the European Union (17 July 1995). According to the terms of this agreement, Tunisia and the European Union are committed to gradually create by the year 2008 a free trade area. A stronger Euro-Mediterranean partnership grew out. It states a progressive lifting of customs barriers on the imports of goods and services from the countries of the Union, until their total removal at the end of 2007.

Over the past five decades, agriculture had a large but volatile influence on overall growth performance. The contribution of this sector to real GDP growth rates fluctuated in the past decade. It has an average of 13.4 percent during 2000-07 but declined to 10 percent between 2005 and 2009 (Chemingui and Sánchez 2011). Manufacturing was the fastest growing sector. Three important manufacturing subsectors: textiles/clothing-leather/footwear, agro-food, and mechanical, electrical and electronic industries are the main industry involved in GDP growth. Excluding the agro-food industry, manufacturing value-added grew at 11 percent annually over nearly four decades, until 2000. During the years 2000-07, the contribution of the industry to GDP stood at 29.2 percent and its growth rate averaged at 4.2 percent (Chemingui and Sánchez 2011). Tourism value-added grew at an average annual rate of 12 percent over the period 1962-2000. The employment share of the sector grew from an insignificant proportion to almost 3 percent of the total labor force (Ayadi et al. 2005). During the period 1990-2007, the contribution of services to GDP stood at 57.4 percent and its average growth rate was equal to 5.6 percent (Chemingui and Sánchez 2011).

I.5. Agriculture production system and biodiversity

The agricultural sector in Tunisia remains economically and socially important for its contribution to the achievement of national objectives as regards to food security, employment, regional equilibrium and social cohesion despite the change and diversification observed in the Tunisian economy (industrialization, growth of service sector and the expansion of tourism). Ensuring the bulk of food supplies of the country, this sector not only provides resources to the non-agricultural sectors but is also an important market for industrial products and benefits in turn as industry helps modernize traditional production techniques by providing technology, modern inputs, and improved managerial skills. The agricultural sector which occupies a quarter of the active population in Tunisia is conducted over 10 million hectares throughout

more than 500000 farmlands. The income for a large part of the population depends on agriculture and the use of natural resources.

Characterized by a large diversity of habitats, ecosystems and biodiversity, the current area of forest land in Tunisia is 1.141.628 ha (13 % of total superficies), comprising 679.099 ha (59 %) of forests, 336.788 ha (29 %) of other forest formations (fire trenches, rocky terrain, etc.) and 131.850 ha (12 %) of wasteland. The national afforestation rate exceeds 13 %. This rate covers very significant regional differences (governorates) ranging from less than 1 % in the southern governorates to 39.06 % in Jendouba in the North of Tunisia. The Country includes wetlands (5 %), cultivated land (32 %), urban land (0.5 %), as well as unexploited land (50 %). About 40 % of this latter is made up by the desert. This means that only about half the country contributes to agricultural production.

I.5.1. Crop production and plant biodiversity

Bioclimatic diversity, morphological and geological diversity, as well as soils diversified, are at the origin for the existence of a mosaic of genetically different cultures. Crop production in Tunisia depends mainly on major crops; grains (wheat and barley) that cover 43 % of total agriculture land which is about 1.7 million hectares. More than half (53 %) of agriculture land cultivated under grains are located in the central and southern part of the country. The rest is distributed in the north of Tunisia were grains cultivation is relatively stable compared to the central and southern parts. Also, tree crops (mainly olives) that cover on average 1.9 million hectares occupy an average of 44 % of total land. As per grains, most tree crop cultivated areas (87 %) are located in the center and south and are cultivated under essentially rain-fed conditions. 1.4 million hectares are under olive cultivation followed by almond, pistachio, date, apple and pear trees, and grapevines. The remaining 17 % of total agriculture land is allocated between forage crops (7 %), vegetable crops (3 %), legumes (2.5 %), and others (0.5 %). Tunisian flora comprises 2,162 species, of which 2103 species are distributed among 115 families and 742 genera.

- **Native plants**: showed mainly in the northern Tunisia forest area including *Quercus ilex* (the evergreen oak/holm oak) and *Pinus halepensis* as well as *Myrtus communis* (myrtle), *Arbutus unedo* (strawberry tree), *Erica arborea* (tree heath), and *Crataegus monogyna* (hawthorn), which have been commonly used as folk remedies. Trees such as *Cupressus sempervirens* (italian cypress) and *O. europaea* (olive tree) also grow in the Mediterranean region.

- **Medicinal plants**: Up to 80 % of the population in Africa use traditional medicine to meet their health care needs. Tunisia occupies the 32nd place in the world of the exporting countries of Aromatic and Medicinal Plants. With more than 2.160 vascular species, Tunisia constitutes a veritable phylogenetic reservoir in the Mediterranean. They grow spontaneously and in wild form, especially in large forest areas. The list is very long and flexible and includes a large number of spontaneous species. Their number varies from a few tens to more than two hundred species. However, despite this potential, Tunisia is only 38th globally among exporting countries. The contribution of the medicinal and aromatic plants sector to agricultural production does not exceed 0.8 %, although Tunisia is among the main countries producing these forest plants in the Arab world. Products extracted from plants with multiple virtues, including thyme and rosemary, are in increasing demand on the national and international markets. It should be noted that the average annual sales of rosemary over the 2016-2017 period amounted to around 865 thousand dinars and 134 thousand dinars for thyme. In Tunisia, the cultivation of these plants covers around 340.000 hectares, spread over the different governorates including around 60.000 hectares of organic crops.
- Some medicinal plants are commonly used in various health systems and are of economic importance. *E. maritimum* (sea holly, Figure 3A) is one of the major medicinal plants found in the area used in preventing diseases including atherosclerosis, diabetes, and cancer. A. campestris (field wormwood; Figure 3B) is used for diabetes, bronchitis, diarrhea, high blood pressure, and nerve pain treatment. According to Sefi et al (2012), the essential oil is also effective in treating diabetes by protecting the kidneys. *A. armatus* (milkvetch; Figure 3C) is widely distributed in the pre-Saharan zones. It is used to treat cough, asthma, arthritis, anemia, and paralysis. *J. phoenicea* (*Phoenician juniper*; Figure 3D) grows across the northern and central regions of Tunisia. It is usually used for the production of essential oil which has the potential to treat obesity and diabetes.
- Desert plants: Steppe and desert climate regions are important habitats for plants that have adapted to dry conditions such *Acacia tortilis subsp. Raddiana, A. tortilis, Vachellia, Stipagrostis pungens subsp., Argania spinose, P. harmala*… .

Plant biodiversity and agriculture sector, extremely important, are evolving in a fragile natural environment, with highly sensitive dependence on weather conditions.

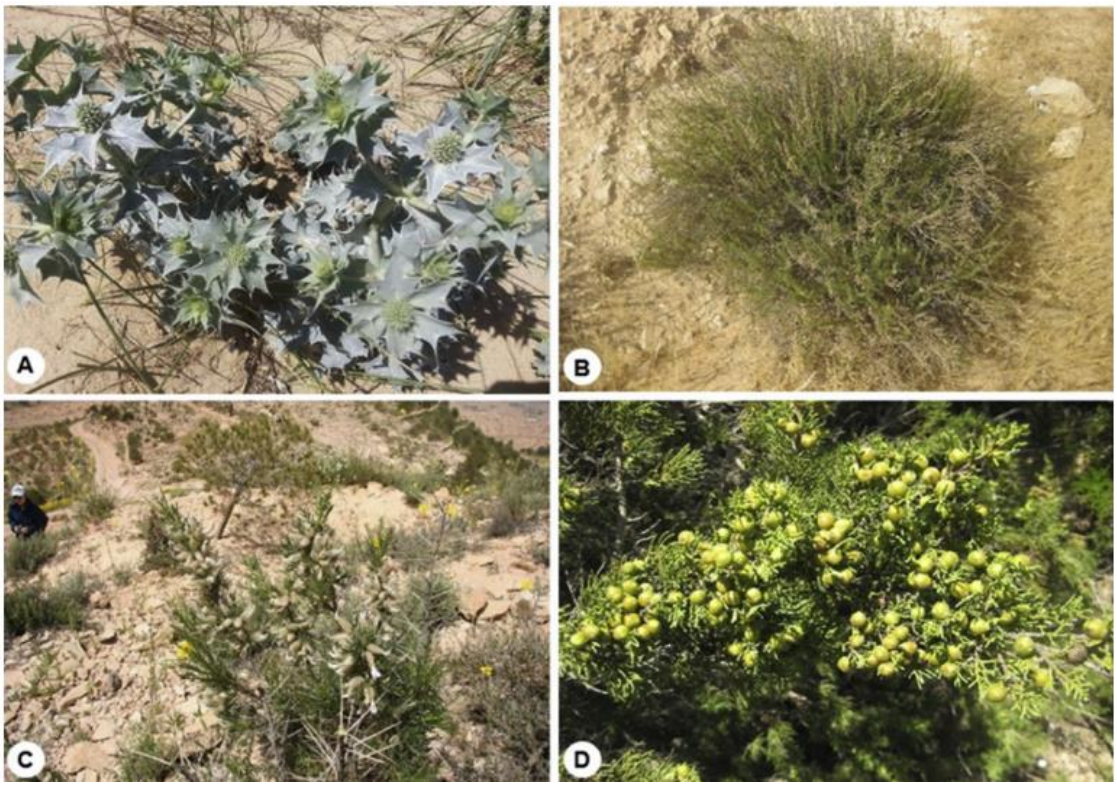

Figure 3. *Medicinal and aromatic species in Tunisia. A, Eryngium maritimum; B, Artemisia campestris; C, Astragalus armatus; D, Juniperus phoenicea*

One third of Tunisia territory was in danger of desertification. In particular, the loss of biodiversity (Figure 4) caused by overgrazing is a serious issue in southern Tunisia. This environmental problem enhancing soil dryness produce only 1 to 10 % of vegetation that covers the ground and a dry biomass of perennial plants of about 100 kg/y/ha (Gamoun et al 2012). An effective means for ensuring plant diversity should be based on improved skills related to conservation management of potential plants to combat desertification.

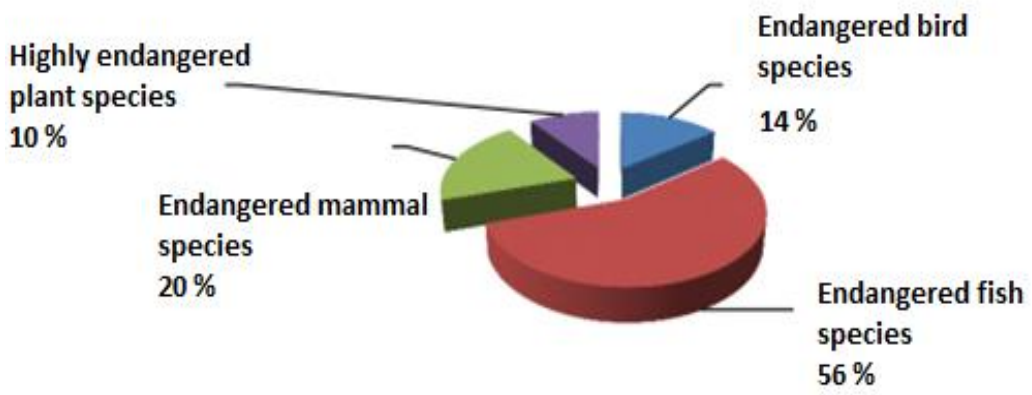

Figure 4. *Plant and animal species in danger*

The main protected species in Tunisia that are important parts of arid and semiarid landscapes preventing soil erosion and desertification include *Salvia aegyptiaca*, *Cenchrus ciliaris*, *Echiochilon fruticosum*, *Helianthemum kahiricum*, *Helianthemum sessiliflorum*, *Helianthemum scoparium*, *Marrubium deserti*, *Haloxylon schmittianum*, and *Deverra tortuosa*. However, they are negatively influenced by various human activities.

The study on biological diversity in Tunisia highlighted the interest of conserving it because it fulfills vital functions for all ecosystems and natural systems. Despite the fact that the economic potential of all-natural resources is not expressed by current forms of development, these resources are over-exploited without significant investment, times to ensure their protection, and to improve their productivity. Investing in the protection and development of these natural resources will help increase their economic and environmental returns. As part of this economic development of natural resources and Biodiversity for development sustainable, Tunisia is oriented towards supporting activities, projects, and programs, in relation to this development. As part of the promotion of sustainable agriculture is the launch of a strategy to develop biological farming. A strategy for the development of the organic farming sector has been put in place for the five-year plan (2016/2020). The objective of this strategy is to strengthen the contribution of professionals in the biological farming sector and working on major areas such as, for example, the sector's best value, the preservation of the environment and health and the promotion of organic products, as well as the increase in the area devoted to biological agriculture. Thus, this national strategy has led to the development of the organic farming sector. Organic farming areas have reached 370.000 hectares in 2017 compared to 18.600 hectares in 2002 and 300 ha in 1997. As for the number of operators, it increased from 481 in 2002 to 4.700 in 2017.

I.5.2. Animal production biodiversity

Tunisia, like other North African countries, is characterized by vast pastoral territories. The main vocation of these areas was livestock production. Pastoral lands provide not only forage to feed livestock but also play a critical role in alleviating many of the most challenging environmental and ecological problems. Since phenomena of drought, these lands are subject to increasing pressure leading to their degradation. Adding grain price escalation some breeders stop their activity in search of more lucrative chances. On the other hand, Tunisia disposes of 7 lagoons, covering a total surface of more than 100 000 ha and an exceptional continental shelf of a few 88 000 Km2 and it claimed an Exclusive Economic Zone (EEZ), of 102.300 km^2. The coast is characterized by the presence of several shallow water zones, notably in the vicinity of

Kerkennah Islands and in the Gabes Gulf. Both provide an exceptional biotope to the maritime fauna and facilitating its capture. The current assessment of marine biodiversity shows 3480 species, distributed among 15 groups. This number represents around 45 % of Mediterranean biodiversity. The number of exotic species continues to increase, reaching 191 species in 2018, while the number of threatened species is around 55 species. This biodiversity offers 190 species, as targets for fishing. Fishing is an important economic sector, employing 51.565 people (1.35 % of the active national population), by means of 13702 fishing units. The fact that Tunisia has 1300 km of coastline, fishing represents a very important activity, insofar as it occupies 54.000 fishermen, corresponding to an equivalent number of households. Fish production has grown steadily since 2010, ranging from a total production of 102.066 to 130.289 tons in 2017. During the period 2007-2016, fisheries and aquaculture provided 7.5 % of the value of agricultural production and 15.2 % of the value of agricultural exports. Average consumption, per capita and per year, is around 11 Kg. The large extension of soft bottoms has contributed to the development of artisanal and industrial fisheries in the Gulf of Gabès, where over 40 % of total landings are generated (Najar et al. 2010). The artisanal sector, consisting of a fishing fleet of around 10,300 boats (in 2008), is well developed along the Tunisian coast, and it is mainly performed by about 4,500 small boats, of which 66 % were motorized (in 2008); they use a wide variety of fishing techniques and target high-value species. Traditional fishing techniques, the so-called cherfiya plays a key role in the economy of the country. The Tunisian department of fisheries has applied correction factors to the landings data since the end of the 1970s to take into account subsistence and unreported commercial catches, which amount to considerable quantities of fishing products sold directly to hotels and restaurants or in local markets without being accounted by the statistical agents. These correction factors account for 42 % of total commercial catches in the artisanal fishery, 17 % in the trawl fishery and 15 % in the small pelagic fishery. Fish and sea product exports reached about 20 555 tons evaluated at 202 millions dinars in 2005 (Annuaire Statistiques de la Direction Générale de la Pêche et de aquaculture, 2009). The biodiversity of marine and coastal ecosystems is rich and extremely diverse due to the wide assortment of environments along the coast. Mammalian diversity comprises 11 large mammals, including the wild boar, Barbary sheep, Barbary deer, 4 distributed species of gazelles, oryx and addax antelope and water buffalo… The number of bird species reported in Tunisia is about 400 species while carnivores are represented by 15 species (civet, zorille, mongoose, weasel, red fox, otter, striped hyena, golden jackal, Rüppell's fox, fennec fox, serval, lynx, caracal...). At this time, 7 species of amphibians are known in Tunisia. As for reptiles, 6 species of turtles have been reported. Lizards are represented by 36

species, of which the Trogonophide de Wiegmann is considered rare and requires special protection measures. Snakes are represented by 24 species, including 14 species of garter snakes and 7 species of vipers. The country has at least 671 species of insects, distributed among 14 orders and 82 families.

The greatest negative impacts to wildlife are due to land use exploitation and population growth. The last lion disappeared long time ago in 1891 in Babouche, between Tabarka et Ain Draham (northwest); the leopard (*Panthera pardus*) previously occupied the mountains along the Algerian border, near El Feidja to Nefza. The hartebeest (*Alcelaphus buselaphus*) has also been eradicated, with its last sighting in 1902, 150 km southwest of Tataouine (Lavauden, 1924a). Other species that have disappeared are the addax (1932, in Litt.) and the oryx.

I.6. Food System in Tunisia

Food in the Mediterranean region has been forged through the many and varied contacts of distant cultures over the different colonial eras. Each having introduced and disseminated their plants, animals and beliefs. The current Mediterranean food model is, therefore, the fruit of borrowing, spreading and adopting in space and over the last centuries, cultural innovations in the form of various food products and practices coming from Asia, India, the Middle East, and America, as well as the development of the international agricultural market and the increasing population's mobility.

In Tunisia, like most developing countries, food expenditure represents a high percentage of total family expenditure.

1.6.1. Sustainable production and consumption

Value chain and value chain development projects aim to ensure better sustainable production and promote the marketing of agricultural products, are part of a development vision of sustainable agriculture and concern several sectors financed by different financing tools, the TASDIR project (2018), the North West value chain development project (2018) World Bank, the GIZ collaborative platforms project in 8 governorates, etc. All of these projects are aimed at promoting sustainable production and support for the marketing of agricultural products for consumption sustainable. Measures are also taken to ensure sustainable production and consumption and to maintain the impact of the use of natural resources within safe ecological limits. Within the framework of the National Strategy for the Development and Sustainable Management of Forests and Rangelands (2015-2024), the Project integrated co-management of forest and pastoral ecosystems is made. This project supports the co-management of forests and

routes in the state domain by local communities based on integrated landscape management plans within targeted areas, by involving the populations through the Agricultural Development Group (ADG) and service companies. For example, the project aims to diversify livelihoods and create direct employment for 636 people in the oasis. The job openings offer non-permanent support jobs to promote sustainable production by using production techniques and tools that enable sustainability. Also, the project provided support for the electrification of boreholes, including two boreholes with photovoltaic pumps. Support projects for the use of renewable energies have been initiated by ANME to ensure sustainability from the production of energies. However, these projects have an impact on the costs of production and their durability.

I.6.2. Tunisian diet

Tunisia is characterized by a diet entirely based on cereals. Although the quantities consumed in these products are in continuous decline, cereals still the main product of the Tunisian diet (Figure 5). Conversely, the ration recorded an increasingly important contribution in meat, fish, milk, and eggs but also vegetables and fruits, which are almost present during the year (Figure 5).

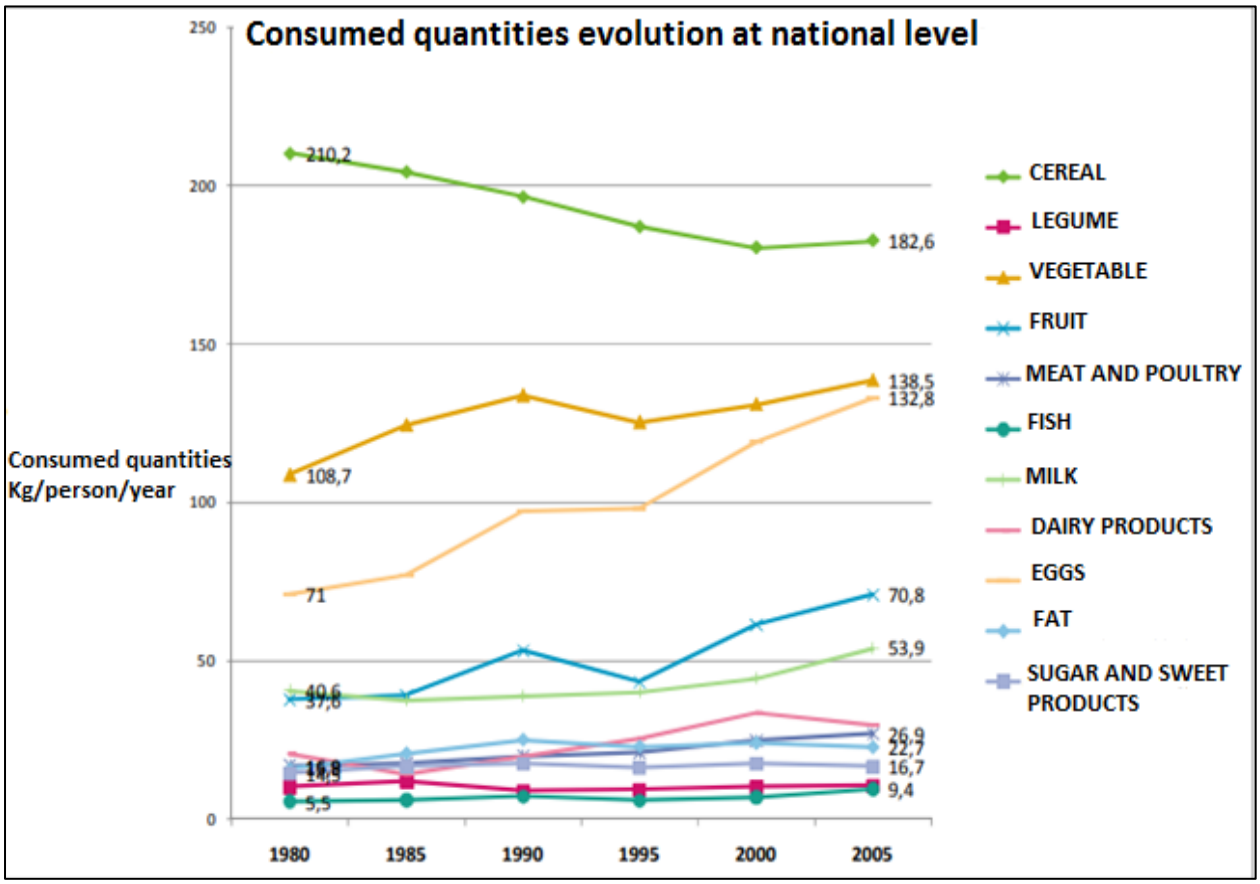

Figure 5. *Evolution of the quantities consumed / person / year at the national level from 1980 to 2005*

They are produced locally and therefore consumed according to the seasons. Indeed, there is greater diversification of the Tunisian diet with higher consumption of legumes and eggs. Due to the performances achieved by the dairy sector, we note a strong decrease in the share of milk against dairy products (yogurt, cheese, and others; Figure 5). Mixture oils (rich in saturated acids) are also consumed. Because of the urbanization, the increasing trend in the consumption of animal proteins (meat, poultry, fish, eggs, and yogurt) is observed. The evolution of Tunisian food consumption during the last two decades is characterized by:

- An average energy level almost stable and within the tolerated range;
- A change in the structure of the daily ration: the proportion of carbohydrates has significantly decreased in favor of lipids;
- A decrease in absolute protein intake with an increased protein of animal origin against vegetable protein;
- Nowadays, fast food in Tunisia increases and dominates Tunisian diet.

Tunisia has developed its own version of fast food with Tunisian sandwiches over the years. When you visit Tunisia, you will notice the fast food industry is not dominated by major fast food franchises, but rather there are little street-side restaurants scattered throughout the country. At the center of the Tunisian fast food culture is the enjoyment of bread, which comes in all forms of shapes and sizes. Bread has existed in Tunisia since over thousands of years ago and has a rich history and local bread culture. Tunisians have since developed it into many varieties of bread since ancient times. Although bread is a staple food item in Tunisia, there are also plate options for those who are gluten-free or do not enjoy bread.

I.6.3. Traditional food system in Tunisia

The evolution of eating habits towards the urban model with an increasing migration towards industrialized products, therefore, more fatty, sweeter, saltier which gradually replace the traditional products made at home. This transition is mainly due to socio-economic changes including: urbanization, mainly young population, feminization of economic life (statistics in Tunisia), household members moving out, organization of working time, collective environment replaces the family group favoring the development of taste, appearance and development of mass distribution and food "Modern", the appearance of fast food culture and coke culture, overall decrease in traditional products, industrial production focused on energy-dense products (multiplication of production of margarine, biscuits, confectionery, sugary

drinks…) and increased income. Also, it should be noted that agricultural production levels also condition the quantities consumed at home, particularly in non-municipal areas.

I.6.4. Culinary heritage in Tunisia

Culinary heritage is one expression among others of intangible heritage that the United Nations for Education, Science, and Culture (UNESCO) grants a growing interest through its actions and legislation to safeguard and enhance this heritage. The several States, like Tunisia, have also accepted its conventions and recommendations to develop the culinary heritage present in their territories. In Tunisia, measures have been taken at the national level to ensure the preservation of the culinary heritage which finds its place within North African society and civilization. This consideration is mainly expressed through the celebration and staging of these culinary "traditions" as part of Tunisian heritage month, in which all regions of the country participate. Thus, several events are organized displaying a "return" to food "traditions", in reality to practices rich in whole grains, legumes, vegetables, and promoting olive oil. "Tradition" that we represent as having ensured food security and the fight against deficiencies in various members of the community. The Tunisian Sahel (Monastir, Sousse, Mahdia, and Nabeul) stood out in the celebration of this month, by the national festival of culinary heritage. The 11th edition of the culinary heritage flavors festival: "Olive Oil & Traditional Bread" was held from in Boumerdès (Mahdia Governorate) 2018. It was marked, by the programming of several contests and competitions of painting, cooking, photos having for theme the traditional cooking, and the historical couple" olive oil and traditional bread. The 19th edition of the festival: "Culinary Heritage of Lamta" was held from in Lamta (Monastir Governorate) 2018 (Figure 6).

I.6.5. Example of Tunisian "Mediterranean" dishes

- Vegetables make salads, soups, mixes of cooked vegetables, and they are used in the composition of many preparations (associated with fish, cereals, legumes ...).
- Fruits eaten most often plain, at the end of meals or as a snack,
- Cereals present at all meals and snacks,
- Legumes Simmered incomplete dishes, or mashed, they are also used in the form of flour (making cakes, pancakes),
- Fermented milk: Raeib, lben,
- Salad Mechwia (vegetable-based: tomato, chilli, onion, eggplant, garlic, tuna or sardine, olive oil), Tunisian salad (vegetable-based: tomato, cucumber, onion, radish, parsley, pepper, fruit: apple, tuna or sardine, olive oil, egg),

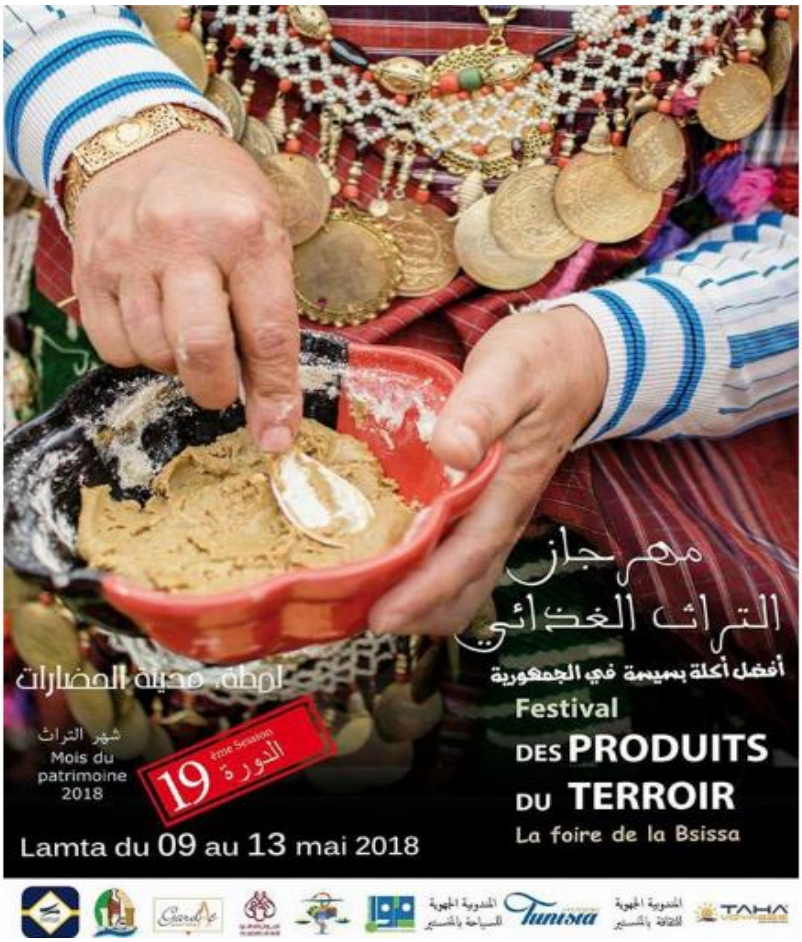

Figure 6. *Culinary Heritage of Lamta brochure*

- Omek houria (carrots, garlic, harissa, olive oil),
- Vegetable stew (vegetable based: spinach, parsley, carrots, onion, tomato, ... legumes: lentils, chickpeas, olive oil, meat ...),
- Stew in general (based on sauce with all kinds of vegetables and legumes, meat or fish, olive oil),
- Kobiza (vegetable-based: kobiza, salk, harissa (chili),
- Couscous example djerbien, barkoukech, malthouth, farfouch… (cereal-based: wheat, barley, vegetables: tomato, onion, carrots, chilli, zucchini, pumpkin, fennel, legumes: chickpeas, peas, potatoes, meat: red, white or fish),
- Barkoukech sahel (cereal-based: mhamssa made in the state, vegetables: tomato, onion, carrots, chilli, zucchini, pumpkin, legumes: beans),
- chebtia (in the form of kefta): vegetable-based: parsley, salk, chilli, cereals: smid, egg),
- Felfel with onions (vegetable based: onion, garlic, egg, olive oil),
- Hlelem (based on cereals, vegetables: spinach, parsley, korchef, starchy foods: beans, lentils, chickpeas) accompanied by fish (especially chawri from May-June),

- Tlaitlou, kad khmira, nwassar, rechta njara, homemade macaroni (all made from cereals, vegetables: carrots…, legumes: chickpeas, broad beans,…),
- Lablabi (cereal-based: bread crouton, vegetables: garlic, legumes: chickpeas, Harissa, fish: tuna or sardines, olive oil),
- Chorba frik (based on cereals, vegetables: onion, garlic, tomato, celery, legumes: lentils, chickpeas, meat or fish),
- Bsissa (based on cereal flour: wheat or barley, sorghum, legumes: chickpeas, lentils, fenugreek, anise seeds, olive oil, spice, sometimes vegetables: onion or fruit: pomegranate, grapes, fig, dates, carob),
- Couscous (Figure 7), kefta, mergues and the list is still long…

Figure 7. *Couscous: Traditional Food in Tunisia*

Case-study area 1: Sfax governorate

II. Sfax Overview

II.1. Location

The governorate of Sfax (Tunisia) extends over a surface of 7,545 km^2 (5 % of the total surface area in Tunisia). With more than 950 000 inhabitants in 2017 and with 16 delegations and 16 communes, Sfax constitutes the Tunisian second peopled region and the second-largest city in Tunisia. It is located 270 km south-east of the Tunisian capital. It is a coastal city oriented towards the Mediterranean Sea with a seafront of over 30 km. Its latitude and longitude are 34°43' in North and 10°46'E respectively. It is limited by Mahdia to the North, Kairouan, Sidi Bouzid, and Gafsa to the west, Gabes to the South, and finally the Mediterranean to the East. Accounting more than 500.000 inhabitants the urban area of Greater Sfax are Sfax City, Thyna, Sfax West, Sfax South, Sakiet Ezzit, and Sakiet Eddaier (Figure 8). Except for Sakiet Ezzit, the other five delegations have a seafront. It represents the second demographic and economic pole as well as an important production and consumption center. Kerkennah is an archipelago, 32.7 km away from the mainland city of Sfax (34°42N 11°10E). Along 35 km, this archipelago grouped two main islands are Chergui and Gharbi (Eastern and Western in Arabic) and ten small islands and islets (< 4 ha, Figure 8). The coastline is 174 km, 98,5% of which is stable (DGEQV, 2012). There are 12 uninhabited islets concentrated in the north of Kerkennah, among them Gremdi (207 ha), Roumadiya (160 ha), Sefnou (50 ha), Rakadia (5 ha) and Charmandia (3.3 ha). According to the classification of APAL (2001), they are sensitive littoral areas.

Figure 8. *Location, topography, toponymical and localities of Sfax and Kerkennah archipelago*

Metropolis in full expansion, the city occupies a strategic location in the Mediterranean and plays an important role in economic exchanges. The urban system of the city is characterized by macrocephaly between a central town which has the largest part of the activities and more than half of the total population of the agglomeration (64 %) and peripheral towns that are almost residential (Ben Nasr, 2006). The main economic activities of Sfax are industries (phosphate processing), agriculture (olive and olive oil, nuts), fishing (largest fishing port in Tunisia), and trade (import-export).

II.2. History

Founded in 849 AD, Sfax is an ancient city with a wealth of cultural and historical heritage. It includes a succession of several civilizations: From the Punic to the Byzantine to the Roman and Islamic. During the Roman area, the town was known as Taparura, a place that has transformed into a modern suburb. "In the books of history, you always find Sfax referred to as the guarded town or 'al-Mahroussa.' This is because the walls of the fences surrounding the medina of Sfax remained intact through the centuries (Figure 9 A)," historian Wahid Lotfi Mokni said. "From afar, the medina of Sfax always looks guarded and shielded."

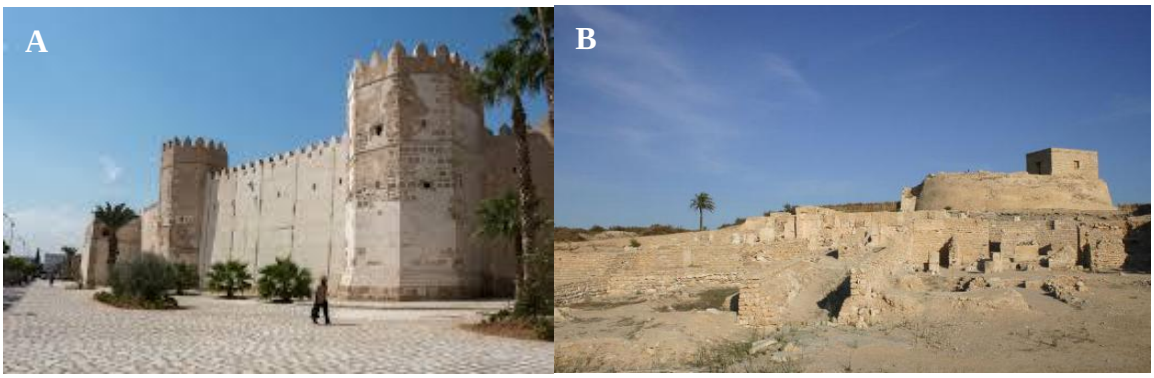

Figure 9. *(A) Sfax Walls (B) Borj El H'sar*

The walls are among the city's most majestic and captivating hallmarks. Built-in 850 during the rule of Aghlabid Prince Abu Abbas Muhammad, they make up what is believed to be one of the oldest forts in the Maghreb. Made of clay and stones, the medina has two main doors: Bab Jebli, facing the northern lands, and Bab Bhar, facing the sea. Other doors were built throughout the years some during the Ottoman rule, others during the French colonial era. Besides, Kerkennah, this forgotten paradise, is almost untouched by history, save a brief point. Since the 12th century BC, the Phoenicians, a sea people, have lived in Kerkennah islands, developed an economy based on trade and agriculture, and saw the archipelago as a strategic viewpoint and a trading post and stopover for ships coming from the east. Later, in 814 BC,

they settled on the western coast of Kerkennah where they built the town and port of Cercina where Borj El H'sar. Presenting a compelling sight, Borj El H'sar is an ancient ruin of a fort built almost 1000 years ago (Figure 9 B). In the 5th century, the Greek historian Herodotus spoke of Kyrannis (Kerkennah) as prosperous islands famous for its major trading port. Another reminder of the Phoenician Empire in Kerkennah is the Punic underground tombs in Karraba, near Borj El H'sar, and in Mellita (Fehri A., 2003). After the Phoenicians came the Romans. Since the 9th century comes the Islamic period. The strategic importance of Kerkennah gradually dwindled. In the Aghlabite and Hafsid age, it had not completely lost its prosperity place, but in the 11th century, with the Hilalian tribes' invasion that gave it over for their cattle, Kerkennah suffered economically. During 400 years, many attacks; Italian, Spanish and Ottoman, made the people flee the west coast to settle on the east part of Kerkennah, where shallows prevented big ships from sailing and landing, or in the interior; this is how the present village network was set up (Kebaïli Tarchouna M., 2014).

II.3. Topology and climate conditions

The studied area is characterized by a very flat relief. It has a semi-arid Mediterranean climate, largely influenced by its gentle topography and its maritime exposure. The average annual temperature is about 18.8 °C. The average winter and summer temperatures are 12.3 °C and 24.9°C, respectively. The hot season extends over a period of five months from May (average temperature = 24.2 °C) to September (average temperature = 29.4 °C). The region receives little rainfall (an average of 217 mm per year). Annual precipitation greatly varies from one year to another and generally varies between 100 and 400mm (Dahech, 2007). It is characterized by its seasonal irregularity. October, the wettest month, has an average of 44 mm. while, July is the driest month, with an average of less than 1 mm. The winds come mostly from the north and the north-east and east in summer and spring and from the west in autumn and winter.

Kerkennah archipelago topography is made up of a succession of flatlands, occupied by shorrs, sebkhas, and irregular hillocks. The archipelago is the tip part of a vast underwater plateau that extends from 9-50 km around the islands. Its average varies between 0 and 5m, the plateau is interspersed with channels that can reach 20 m and pits up to 30 m. The highest point is no more than 13 m located in Ouled Ezzedine. Kerkennah's very extensive coastal sebkhas lie at the edge of the sea. It allows rainwater to run off into the sea. They are always very low, less than 2 m high. It makes their outside margins frequently affected by seawater. The bioclimatic conditions of the archipelago are one of the main reasons for the vulnerability of the natural environment in the Kerkennah Islands. Although the presence of moisture in the sea around the

archipelago increases humidity and decreases the temperature difference between the land and the sea (Etienne, 2014), the low rainfall, the relatively high temperatures, and the winds cause active evaporation resulting in soil salinization and a big water deficit of over 1,036 mm./year (Fehri, 2011).

II.4. Water resources

The shortage of water resources in the governorate of Sfax limited its socio-economic development. The quantities of water brought from the North and from the centre-west (Sbeïtla, Jelma) are not enough to cover the water deficit in the studied area. The severity of the water problem in Sfax (Tunisia) was realized since the beginning of the 1950s. Because of the extension of draught, water scarcity increases. The Sfax urban area is crossed by several small wadis, most of their beds are now completely obscured by urbanization. These watercourses are temporary flows, converge towards the center of the city and lead into the Mediterranean Sea. From north to south, there are Oued Ezzit, Oued El Haffara, Oued Agareb, and Oued El Maou.

Facing rising serious water shortage problems, reuse of urban wastewater for non-potable purposes, such as agriculture was adopted as water management policy in the governorate. While the archipelago of Kerkennah is located on two aquifers. The first is shallow flush in low natural or artificial areas. It is salt and only used for irrigation contributing to soil salinization when excess water is not drained by a drainage system. The second is deep (350 m) and it is used for the freshwater supply of the population. The features of these resources mainly depend on climatic, geological, and hydrogeological conditions. Groundwaters (oueds) are almost inexistent because of the flat topography and numerous sebkhas communicating with the sea. Underground water has a low potential in Kerkennah which is constituted by superficial phreatic sheets. These laters are exploited by surface wells (over 400 wells with average-to-mediocre water quality) of little depth, frequently sunk in the centre of little basins where surface water accumulates. The brackish water desalination plant in Kerkennah (the first in Tunisia) is in operation since 1983; its capacity is 3,300 m3 /day. It uses the inverse osmosis technique (DGAT, 2011). Yet, during the tourist season, water demand enhances significantly thus, saline water is added to the freshwater to produce up to 6000 m3 / day. Due to the low quality and quantity of water in the distribution network and connection rates, the vast majority of the archipelago's buildings have a recovery tank of rainwater. Discards of water loaded with high salt content (14 g/l) are now carried out directly on the shore.

II.5. Soil resources

Sfax is characterized by a light-colored soil witch are generally sandy to sandy clay, or sandy loam, sometimes gypsum or salty. Their pH is generally basic to neutral. Their depth is very variable; we often have aeolian sandy veneers on the surface giving rise to fouling. While, soil quality has been strongly conditioned by the geological substratum, climate, and topography and the insular nature of Sfax (negative water balance, subsidence, sea-level rise, dissolution of Gypsum). In some places, erosion (wind or water) can seriously degrade the soil. Depending on the case, the roots can be removed (sometimes on more than 50 cm), or the trunks will be silted up, to at least similar depths. Agriculture land in the governorate of Sfax covers 575 000 Ha. However, urban expansion (residential and industrial) has taken place at the expense of rural areas (almond and olive fields), whose thermal and radiative properties are different from those of urbanized environments. Several practices promoted soil salinization. In fact, the use of treated wastewater for irrigated perimeters poses a soil salinization problem when dispersed outside the drained areas. Natural factors have encouraged the forming of salty to alkaline land with the degraded structure in the archipelago of Kerkennah. Saline soil with a crumbly surface structure occupied 7,315 hectares (about 47 % of the total surface area of the archipelago). These soils are characteristic of the sebkhas and their edges (Fehri, 2011, Figure 10). Kerkennah soil salinization by raising the roof of the water table or dissolution of gypsum naturally contained in the subsoil of islands is also an important factor to take into account.

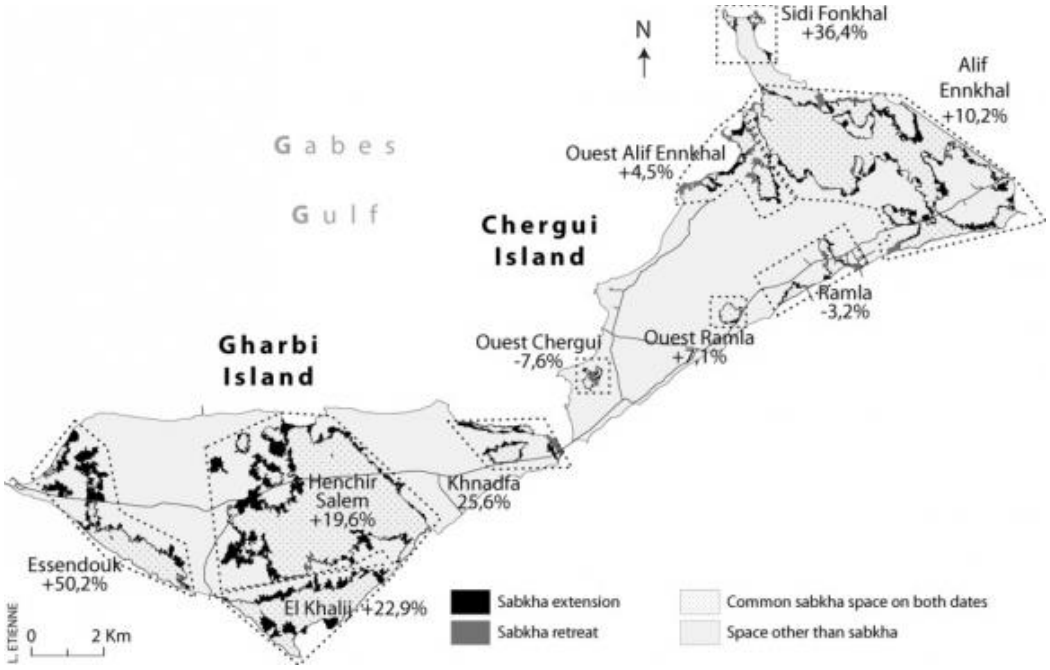

Figure 10. *Salty surfaces extension in the Kerkennah archipelago*

Soil salinization is favorable to the expansion of artificial sebkhas resulting a beautiful orchard of Sidi Ezzorai, Sidi Frej and Ouled Yaneg were soil is thick are constructed in the lower parts of the breaks in the slopes that loose formations with running water. Other loose outcrops are the dunes that appear at the edges of some sebkhas in Remla and between Mellita and Sidi Yousef (Oueslati, 1995). Although the formation of such beautiful structures, soil salinization phenomena has affected freshwater resources in the Kerkennah archipelago and degrade soil quality that influence land vegetation occupation by decimating non-halophytic vegetation.

II.6. Economic activity evolution

Sfax is a large industrial center, (the second after the capital) which is constantly developing. Sfax economy is essentially based on olive oil, peach, and phosphates. Since the 1960s, the industrialization of the economy has been adopted with the appearance of small and medium-sized manufacturing companies and the development of the tertiary sector. In Kerkennah, the economic activity is essentially based on the primary sector, marked by a very old form of agriculture and, particularly, a fishing activity that constitutes the base of the economy around which life in the archipelago is structured.

II.6.1. Vegetable production and breeding

The different physical characteristics (topography, hydrography, geology), Bioclimatic (climate, soil), and anthropic have largely influenced the natural plant cover of Sfax governorate. The plant cover is roughly degraded and not very dense. It is visible only in Skhira and Menzel Chaker and on the reliefs of the central-west governorate (Figure 11). Land distribution in Sfax shows a very limited forest cover of around 5,680 ha (0.8 % of Sfax total area). Agriculture land is mainly extensive in Skhira, Menzel Chaker, and Bir Ali Ben Khalifa delegation covering respectively 38 %, 24 %, and 15 % of the total area (Figure 11). Yet, agricultural land use is relatively high in the governorate of Sfax. In 2011, 469,893 ha were exploited (i.e. 73.8 % of the total agricultural land). We noted the presence of arboriculture (92.2 %), cereal crops (4.9 %), market gardening (2.1 %) and fodder (0.8 %). If we go further, by comparing the different delegations, Menzel Chaker includes 131,135 ha of cultivated agricultural land, of which 130,320 ha cultivated in arboriculture (i.e. 99.4 %). Forages, mostly irrigated, exist mostly in Djebeniana (32.6 %), Tina (29.5 %), and Mahres (14.2 %). They are very limited in Western delegations, ensuring costly feeding for livestock.

Agriculture, in particular the cultivation of the olive and almonds (326.000 ha and 87 000 ha respectively), has an important place in the regional economy. More than 50 thousand farmers

work in the agricultural fields. The governorate produces on average 40 % of olive oil and 30 % of almonds from Tunisia, making it the leading national producer. The Sfax region is the leading exporter of olive oil with 60 % of national exports.

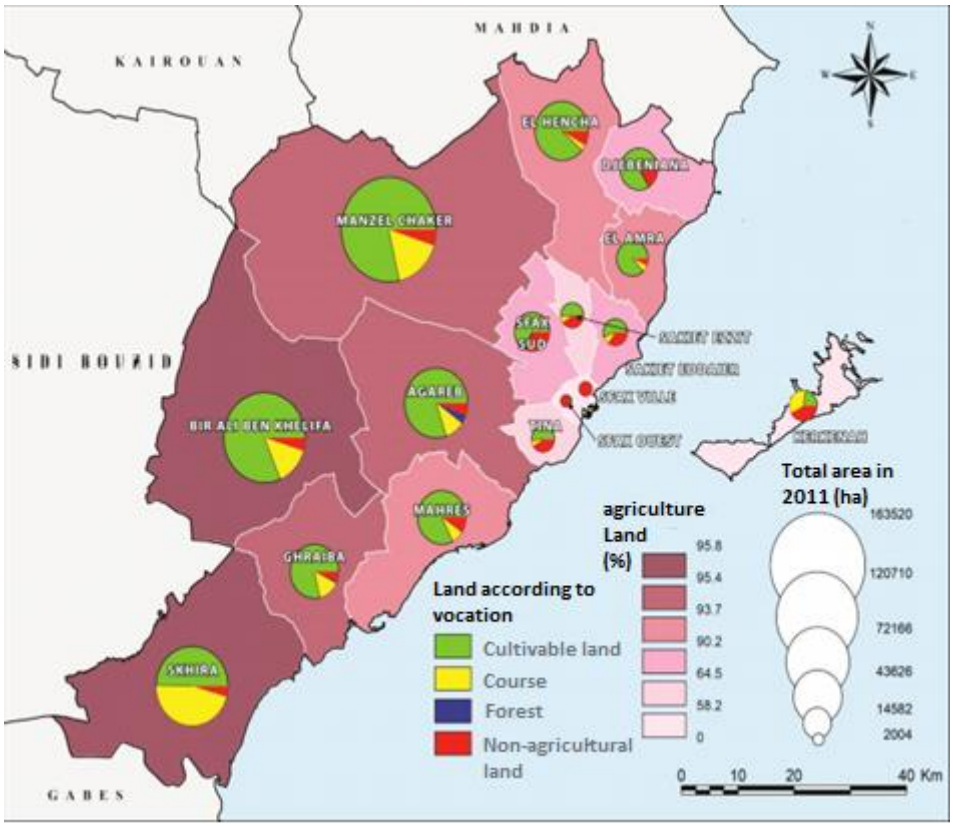

Figure 11. *Sfax land distribution by delegation and by vocation in 2011 (in ha)*

Furthermore, the surface area of the archipelago is about 15.000 hectares, 55 % of which are farmland. However, 5.500 hectares (i.e. 66 % of the usable farmable surface area) are not cultivated and occupied by palm trees and natural herbaceous vegetation. Only three irrigated areas in Remla, Melliti, and newly in Ouled Ezzedine exist Kerkennah archipelago. Natural and anthropic archipelago conditions marked by water resources scarcity, soil salinization, and the frequency of violent winds enhance the dry farming, extensive arboriculture, and cereal growing (1,200 hectares), particularly of barley collected generally by women (Figure 12). Figs (300 hectares), vines (500 hectares), olive trees (600 hectares), and 200 hectares of various fruit trees are widespread throughout the archipelago. We note the existence of 8 varieties of fig such as “El Bithri”, 7 varieties of vine-like “El Assli” and 2 varieties of olives, ‘Chemlali’ and ‘Chetwi’ (Kebaïli Tarchouna M., 2014). Date palms in Kerkennah constitute the archipelago’s most numerous natural plants. The Kerkennah date palm’s genetic diversity is very rich were each individual is a clone head (DGEQV, 2012).

Figure 12. *Barley collection in Kerkennah*

4 decades ago, agriculture and orchards were more occupied by food crops. However, in 2000 More than 85% of fruit trees have been lost (Rhouma et al., 2005) because of the growing phenomenon of drought, the exodus of the workforce, and the high cost of plowing. Nowadays, several short-term olive producers' projects are made in the islands to reverse that trend.

Likewise, stock breeding is an activity that involves a few small herds integrated into the farm, has remained traditional and supplementary. Containing mainly sheep (about 10,000 head), the livestock is dominated by small ruminants. Moreover, increasing the irrigated areas has enabled the growing of fodder to feed cattle, the breeding of which did not form part of the archipelago's traditions. Currently, milk production is about 350,000 l/year (CRDA Sfax, 2014). The development of breeding in the Kerkennah archipelago corresponds to a need to supplement income and savings. It did not constitute a stable source of income. Indeed, civil servants, shopkeepers, and wage laborers often invest in this activity.

II.6.2. Fishing

Fishing is a strategic activity for the local economy: modern port infrastructure: 8 fishing ports providing 20,000 tons, or 20 % of national production, of which 10,000 tons are exported (i.e. 45 % of national seafood exports). The amount produced from sea salt constitutes 60 % of national production. Likewise, the fishing activity is very old and is an important part of Kerkennah's culture as well as the economy. It is that they revolve around social and institutional relations. Appropriate traditional fishing techniques (transmitted from generation to generation), scheduled in time and space, are managed by accepted social rules and strictly

respected by the community. The studied archipelago possesses three fishing ports, the coastal ports of Sidi Youssef, El Ataya and El Kraten, and about 17 unloading sites throughout the islands. Ports contain infrastructure that is relatively sufficient to provide the services necessary for the fishing fleet they shelter. The fishing units that exist in the archipelago made up of 1,663 units are coastal craft, usually of wood, falling into two categories; 1,449 Non-motorized Coastal Craft (BCNM) and Motorized Coastal Boats (BCM). The archipelago's fleet is relatively big compared with the Sfax governorate. It represents 52% of that of the entire governorate. The traditional artisanal fishing system of a vast range of fishing gear characterizes this sector in Kerkennah. As well as fixed fisheries of the 'Charfia' (Figure 13) type, 22 kinds of fishing gear used by coastal boats were found in the archipelago mostly used trammel for cuttlefish, bottom mesh for various benthic fishes, trammel for shrimps, trammel for fishes, hollow stones for octopus, surface mesh for fishing various pelagic fishes, and keepnets.

Figure 13. *Charfia a traditional fishing technique*

Traditionally chrafis installed and operated in the autumn (September-October) in early summer (June-July) and then dismantled for a period of biological recovery, were built mainly with products of the date palm. Nowadays fishing nets, PVC pipes and ferrous materials have replaced the products from the date palm and are left in place for several years; they no longer respect the biological rest. The production from the coastal fishery in the Kerkennah Islands is about 33.4 % and 7.4 % of the production of coastal fishing in the Sfax governorate and nationally. The value of the production was assessed at 9,150 thousand Tunisian dinars, corresponding to 11 % and 2.1 % respectively for the same product in the Sfax governorate and

nationally. With 42,7 % of the total archipelago's halieutic production, the Mellita zone has the biggest share followed by the Kraten zone (34.3 %), and lastly the El Ataya zone (23 %). Fisherman production is made up of species of high commercial value (octopus, sea bass, cuttlefish, king prawn, breams, etc.).

II.7. Biodiversity and biological heritage

The archipelago of Kerkennah exhibit remarkable biological richness, with many rare or endangered endemic animal and plant species (APAL, 2001). Since November 2010, part of the island of Chergui is listed as a Ramsar site. Kerkennah benthos seems relatively original compared to that of all the other parts of the Mediterranean. This specificity is true for both qualities with the presence of rare and endemic species and species threatened with extinction and quantity. As to algae, 30 species to be identified, 8 chlorobionta (green algae), 12 rhodobionta (red algae), and 10 xenobionta (brown algae). The seagrass Posidonia and Cymodocea are very widespread in the archipelago of Kerkennah (Romdhane and Missaoui, 2002). These seagrasses have great heritage value constituting the major ecosystems of the Mediterranean. It is a biodiversity center that provides refuge to a quarter of species, Mediterranean (fauna and flora), and playing a significant role in coastal protection against erosion. Other species that have high heritage value are the noble pen shell *Pinna nobilis* (although it is rare in the Mediterranean its quantity in the Kerkennah beds with meadows is relatively great) and *Gibbula umbilicaris latior* with its albino form, which, despite environmental constraints, remains abundant. Kerkennah Islands are also an important wintering grounds (Romdhane Missaoui and 2002) for shoreline seabirds and other water birds; it is also an important crossing site for passerine birds during migration. The Kerkennah Islands are recognized as a Zone Important for the Conservation of Birds (ZICO) because they are an important wintering area for the cormorant *Phalacrocorax carbo*, a protected species that feed almost exclusively on fishes.

In the land environment, the floristic inventory of the Kerkennah Islands shows four main plant associations; the *Artemisia herba-alba* and *Asparagus albus* association, the *Lygeum spartum*, and *Thymaelea hirsuta* association, the *Frankenia thymifolia* and *Suaeda mollis* association and the *Arthrocnemum indicum* and *Halocnemum strobilaceum* association. In some places where the plant cover is well-preserved, islands have a varied floristic gathering where certain rare high heritage value species are present, such as *Cenchrus ciliaris*. This species is present mostly in the islet of Gremdi. The Kerkennah date palm is widespread throughout the archipelago naturally as clumps. It is seen as spontaneously growing, not cultivated. Local resources of alfa

and palms are used to make nets and braid ropes, but also hats and baskets often made at home, even if a weaving center exists in Chergui. Because of the aridity of the climate, the land fauna is less important than the marine fauna. There are insects and some mammals like the hare. The herpetofauna is made up of ten species of reptile, between lizards and snakes (not venomous).

II.8. Food tradition

The Sfaxian kitchen is characterized by its diversity where there are daily dishes and dishes devoted to celebrations and special occasions. The Sfaxian pastry ranked the first in Tunisia, it consists of two types: Daily pastry or hlou arbi such as makroudh asmar, ghraiba homs , doria, maachach ... and the high range pastry used for weddings and other ceremonies such as baklawa, le kaak ouarka, mlabbes ... (Figure 14).

Figure 14. *Sfaxien and Kerkennian cuisine*

The Bezine is a culinary specialty of the region of Sfax. It is consumed on the day of Eid el Adha or during the month of Ramadhan. It is a kind of cream is eaten early in the morning, as a breakfast, accompanied by the famous "Kleya of Sfax " and the honey. The Kleya also prepared in advance, it is small pieces of mutton, liver, heart, and kidneys, all associated with salt and pepper and cooked into olive oil and a little fat tail sheep. The Charmoula, famous in

Sfax, consists of mashed raisins and onions cooked in olive oil along with spices. The charmoula accompanied by salted fish is a specific dish in the Sfax region, which is eaten on the first day of Eid al-Fitr in breakfast. The Marka, also known as "Market sbarès" (Type of fish known in Sfax) is mainly eaten with couscous, but it can also be used to make soups baked inside the ‘Tchich’ (Tchich bil marka) mini "mhammas" (m’hammas bil marka), or just vermicelli (chorbat Hout) or It can be eaten with barley bread or "bechmat" (small pieces of bread cut in cubes and put into the oven to become crunchy). The Saffoud, lafif bread, couscous, melthouth….

The Kerkennian specialties offer delicious food value local fish, such as pataclet, mullet or sea bream, crushed barley, dates, and raisins, with a special place for octopus caught and dried on-site. These are local products easily stored in jars which were the subject of a barter exchange with the merchants of Djerba. The arrival of electricity in the archipelago allowed refrigeration and the proliferation of convenience stores, present in all the villages, which widen the range of food products. Paradoxically, fish are becoming rarer because it is a product with high added value and not all Kerkennians can afford to eat them as often as before. Palm wine is produced in Kerkennah, from the legmi (sweet sap) and called qêchem, which must be drunk fresh. However, this production remains very limited.

Case-study area 2: Tunisian Sahel

III. Sahel Overview

III.1. Location

The Sahel is the coastal region of central Tunisia. Geographically, this area is between 36° 14’ and 35° 7’ North latitude and between 11° 10’ and 9° 45’ East longitude. The Sahel extends from the north of Sousse to the south of Mahdia. It includes the regions of Enfidha, Sousse, Mahdia, Monastir, and the Gulf of Hammamet. It is made up of Cap Bon and Hammamet Gulf in the North and Kairouan in the South. To the east, it extends into the sea through the pelagic block (Figure 15). The Sahel maximum length is 140 km from north to south and its width varies between 20 and 60 km from east to west. It covers 4.02 % (i.e. 163.610 km^2) of the total area of Tunisia.

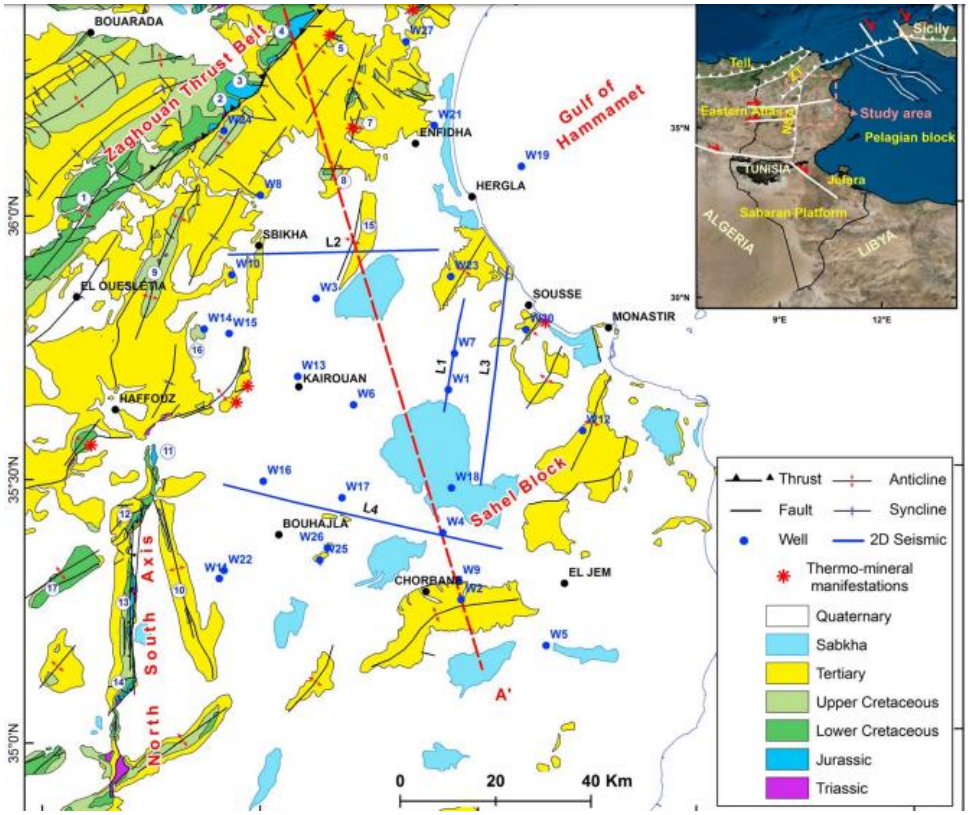

Figure 15. *Location and topography of the Sahel*

Its name comes from the Arabic word Sahel for the coastline. The region attracts tourists to its fine beaches, historic sites, good hotels, and its countryside, a patchwork of olive groves, grain, and flocks of sheep. The capital of the Sahel, Sousse is Tunisia’s third-largest city. Although it is a major port and a busy commercial and industrial center, the workings of the city do not impinge on the relaxed atmosphere of the medina or waterfront. The golden sands stretch for miles north of town, lined with resorts, to the marina of Port el Kantaoui (Figure 15). Located in the heart of the vast Sahel region of Tunisia, Mahdia Governorate opens on the eastern basin

of the Mediterranean Sea with a coastline of more than 75 km. As a tourist town with a rich historical and cultural heritage, Mahdia has an economy mainly focused on agriculture and fishing and emerging industry.

III.2. History

Since antiquity, the Tunisian Sahel seems to have been a distinct region dominated by urban settlements on the sea. The Phoenicians founded most of its cities. Thus, Hadrumetum (Sousse now) was founded at the beginning of the 9th century BC. It gained importance in the following centuries, becoming one of the main Phoenician ports in the Western Mediterranean. The area was a key part of the Carthaginian empire (Figure 16A), but after the Second Punic War, it came under increasing Numidian influence. In 146 BC, after the Third Punic War, it became part of the new Roman province of Africa. The Sahel was the location of one of the key battles of the War between Pompey and Caesar. The Battle of Thapsus took place on 6 April 46 BC and was a massive victory for Caesar and the city surrendered to him shortly after. Then he proceeded to take control of northern Tunisia. Around 293 AD the Romans divided the province of Africa and the Sahel became its province.

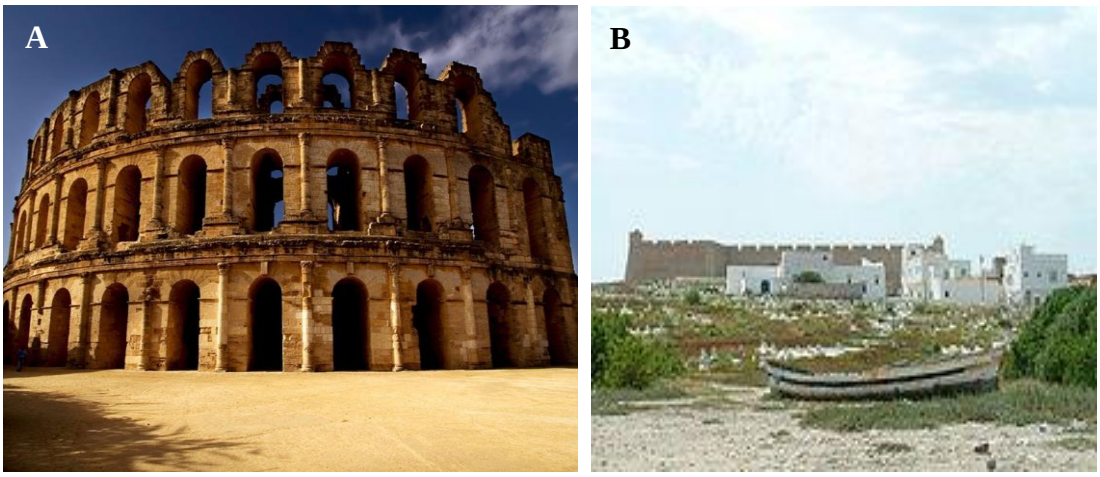

Figure 18. *(A) The Roman amphitheater at El Jem (B) Fort of Mahdia*

With the arrival of Islam and the establishment of the capital of Ifriqiya, the Sahel's maritime ports became the key to its security. This explains the construction of several ribats in the region, which particularly served defensive. The most important ribats are those of Monastir and Sousse.

The foundation of Mahdia by the Fatamids in 916 gave the Sahel a key political role, which continued under the Zirids. Kairouan lost some of its religious roles to Monastir, where the Zirid princes and other luminaries were buried. Mahdia with its magnific fort (Figure 16B),

became the seat of a splendid court that drew poets from across the Maghreb, Al-Andalus, and Sicily. However, the invasion of Banu Hilal plunged the region into chaos, and Tunisia fractured into numerous taifas; only the Sahel remained under Zirid control. The invasion led to the further urbanization of the region, with the establishment of many villages that still exist today. Later the region suffered from Norman attacks. Mahdia was taken in 1148 by troops of Roger II of Sicily, until 1160 when Almohads arrived. After this period, the Sahel experienced a decline in importance following the transfer of the capital to Tunis. In the 19th century, the Sahel was divided into two qaidates, one based at Sousse and the other at Monastir. After the establishment of a French protectorate, the new power established the qaidate of Jemmal (which took part in modern Monastir and Mahdia governorates) and centralized the region at Sousse which became the seat of civil government, contributing to the weakening of the other regional centers. After independence, the government of Neo Destour ended the Sahel's administrative union during the abolition of the qaidates and establishment of the modern system of governorates. The whole region was under the control of the governor of Sousse from 1956 to 1974, when the governorates of Monastir and Mahdia were created.

III.3. Topology and climate conditions

The topography of the region, made up of plains and hills, is disturbed by different morphological levels. Its reliefs generally do not exceed 200 meters above sea level. These morphological levels determine the actual distribution of soils and particularly the hydrological functioning of the landscape. These later are traversed by small temporary rivers (Oueds Mlal, Gharraf Chrita and Oued Chrichira existing in the three delegations of Chorben, Souassi, and Eljem). Below the high steppes near the study area extend vast coastal plains steep with small hills enclosing the wadis. These plains end in the East by a low coastline barely hilly by small "Rass" (caps) such as Chebba and Mahdia. They are stretched at sea by a vast continental platform.

The Sahel is subject to a Mediterranean coastal climate characterized by hot and dry summers and mild and wet winters. Marked by transitional between the arid stages in the southwest and semi-arid stages in the East, the average annual rainfall is about 300 millimeters. The study area is subject to two types of opposite climatic actions: the temperate Mediterranean climate on the East coasts and the dry arid climate in the West. There are no significant changes in rainfall, but rather a higher frequency of extreme events (floods and drought, etc.), which occur more often in recent decades, particularly in autumn and winter in the arid southwest part. Several floods have been observed, particularly in the past three decades. The study of temperatures

shows a warming of the order of 1 ° C during the period 1976-2004, leading drought and aridity enhancement.

The Sahel coastal region's temperature (Bouficha, Enfidha, Hergla, Sousse, Monastir, Ksour Essef, Mahdia ...) is generally marked by an alternation of two seasons. The winter, from December to April, is characterized by mild temperatures. The average temperature is around 12 °C. During the coldest months of the year (January and February), the average temperature fluctuates between 11 °C and 13 °C. The summer is characterized by hot weather. The moderating effect of the sea only intervenes to ensure a relative cooling limited to the coastal fringe. The average summer temperature is 25 °C. During the day, the temperature rises to reach an average of 29 °C. Saharan winds from the southwest (Shehili), hot and dry, are responsible for strong heat waves which raise the temperature to levels exceeding 40 °C. The region is largely subject to Saharan and steppe influences. As for the temperature of the southwest zone (Hbira, Chorben, Ouled Chamekh, Eljem, Souassi with the recent appearance of a small arid zone to the East; Chebba and Meloulch) it is marked by the alternation of two seasons arid and steppe. The average winter temperature is around 10 °C. The hot summer is characterized by hot weather. The average summer temperature is 33 °C. During the day, the temperature rises to an average of 39 °C. Saharan winds "Shehili" which come from the southwest and the desert, very hot and dry are responsible for strong heat waves, which raise the temperature at levels above 45 °C. The region is largely subject to Saharan and steppe influences. It is confronted annually on average with more than 40 days of sirocco.

Rainfall is one of the most important elements of the Sahel's climate constituting the essential factor of its hydrological regime. An annual rainfall ranging from 200 to 350 mm characterizes it. However, rains are irregular from season to season and poorly distributed from year to year throughout the region. The relative weakness of the rains and their irregularity is aggravated by intense potential evaporation associated, in summer, with high temperatures, and in all seasons, with dry and sometimes violent winds.

III.4. Water resources

The region of the study constitutes a space made up of plains and hills interrupted by numerous "Sebkhas" depressions. These later collect runoff water including the endorheic flow by dry wadis (Oueds Mlal, Gharraf, Chrita, Bou Sayela, El Maleh, Soussi, Louza, Guendoul, Grida, Sidi Ahmed and Oued Chrichira) due to evaporation and infiltration. All the water coming from neighboring areas to the West is partially stored in these depressions and the rest is infiltrated

to supply the numerous underground aquifers that are at the origin of the development of irrigated agriculture.

In 1993, the water resources of the entire Sahel region were assessed with a total contribution of 23 Mm^3 and a mobilizable contribution of 4 Mm^3. Losses in the form of runoff are estimated at 3 Mm^3 towards the sea and the "Sebkhats" of Sidi Abdel Hamid, Skaness, Mahdia, Halk El Menjel, Sidi el Hani, El Kelbia, Shérita, El Ggherra. The hydrogeological balance of the region has highlighted a deficit of around 2 Mm^3/year, which increases every year. The hydrogeological reserves are not very renewable and the piezometric level saw a significant lowering. It is a reservoir in the process of depletion by overexploitation resulting in a continuous drop in the piezometric level.

In the Tunisian Sahel, the peaks of the hills are kept overgrazed to produce runoff which will be redistributed in the plains (Majdoub et al, 2011). The hills thus form the impluvium known as the "meskat" and serve as a collector for precipitation waters. The plains, areas cultivated, are arranged in lockers known as mankâas and are used to recover runoff from the meskat. The traps are often established in two or four olive trees. The meskat and the lockers form a hydraulic system that has been developed since Roman times. It is about the Meskat-mankâas system which represents the model of anti-erosion management typical of the Tunisian Sahel region. This system, which covers 200.000 ha in the Sousse region, effectively contributes to increasing the amount of water received by olive growing. The Meskat system seems to fit well into the geological, geomorphological, topographic, soil, and climatic contexts of the Sahel region. It is an example of sustainable agriculture by participating effectively in ensuring the production of olive growing while playing a leading role in the fight against water erosion.

III.5. Soil resources

Limestones, more or fewer gypsum marls, and coarse and fine sands dominate Tunisian Sahel pedogenesis. According to their degree of development, soils differ recording to the climate, the rock source, and the relief. A clear diversity takes place between soils of the eastern semi-arid zones and soils of the southwest part characterized by its arid climate. Due to drought enhancement, southern regions suffered from significant water deficiencies that promote soils salinization and desertification. These soils are poor in organic matter, rocky, and often eroded. They are suitable for grazing and olive plantations. In the alluvial plains, they are suitable for many crops, especially irrigated ones. Furthermore, the urban extension of the Sahel, outside the limits of the city center, has created an intermediate space between the urban agglomeration and spaces qualified as "deep" rural. In this transitional fringe, changes in the use of certain

agricultural land for urban purposes are significant. Peri-urbanization is often a conflicting process that produces territorial changes.

The municipal population of Mahdia increased from 25 711 inhabitants in 1975 (INS, 1975) to 54 902 in 2004. Due to the economic development and especially that of tourism migratory relationship enhance in the region providing significant employment opportunities. In parallel with population growth, accommodation increased from 4 997 in 1975 (INS, 1975) to 14 548 in 2004 (INS , 2004). Therefore, rural areas have experienced territorial changes in connection with the spread of a new form of life marked by the city, the way of life, and city activities. Even the "ghaba" has recorded the establishment of industrial units on both sides of the road axes and the construction of second homes on the impluviums of olive groves (Houimli, 2008). Urban sprawl at the expense of agricultural land has led to a decrease in the cultivable land area, farms number, and agricultural assets. Indeed, agricultural land has decreased by 44 % from 1962 to 2008. The total irrigated area declined about 30 % (CRDA de Mahdia, 2009). Furthermore, farms number failed from 5 100 units in 1980 to 2 584 units in 2008 (CRDA de Mahdia, 2009), a decrease of 50 %. Farmers have developed different logics according to their investment capacities related to higher production factors and to the distance to the city center. The traditional spatial organization with regard to agricultural production systems appeared in Mahdia (Figure 17).

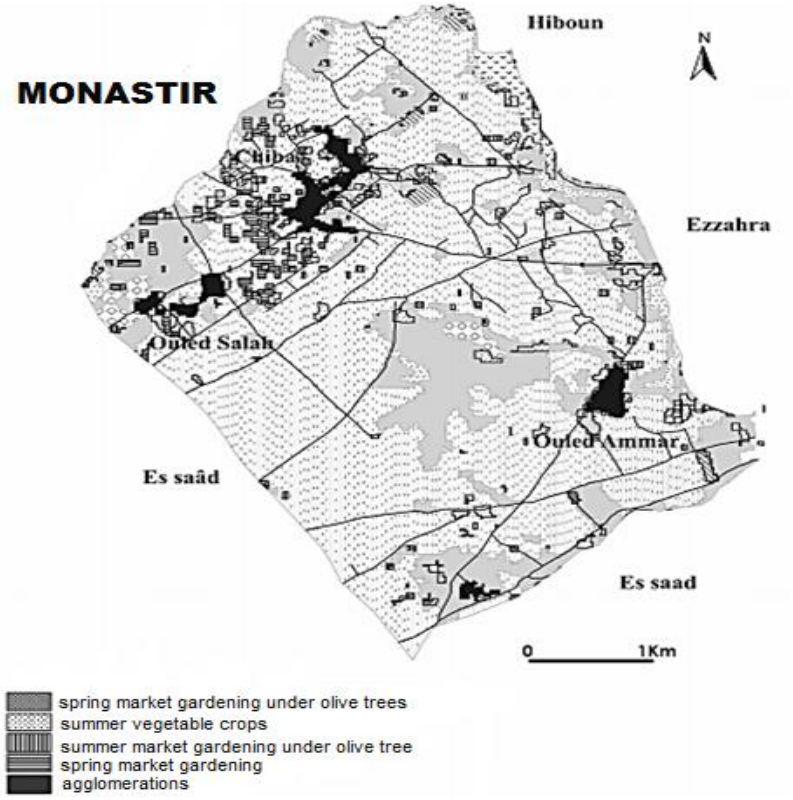

Figure 17. *Traditional soils occupation in Mahdia*

In nearby areas (Hiboun, Chiba, and Bir ben Kamla) where farmers have triggered a development dynamic, we find productivist agriculture. However, in remote areas (Dkhila and Saâfet) which are located 8 km from the center, farmers, lacking the means, have remained on the defensive (Prost, 1991) and practice extensive production systems (Figure 17). Farmers belonging to liberal socio-professional categories practice an intensive agricultural production system, based on the integration of high value-added crops, especially back-season market gardening and crops in tunnels and greenhouses on olive farms (Figure 17).

III.6. Economic activity evolution

Tunisian Sahel occupies a central position on the Mediterranean Sea and is one of the country's most important areas for agriculture, industries, bathing, and tourism. The cities of Monastir and Sousse are key tourist centers. As well as Mahdia region has been attempting to develop its tourist industry since the 1990s. In the Sahel and especially in Monastir, Habib Bourguiba International Airport is the busiest airport in Tunisia in terms of passenger numbers. In addition, it has the most charter flights of any airport in Africa. There is a commercial port at Sousse, numerous fishing ports, and two marinas (Port El Kantaoui and Cap Monastir).

Benefiting from a rich historical and cultural heritage, Mahdia, like Sahel has an economy mainly focused on agriculture and fishing and emerging industry. With a varied economic potential, adequate infrastructure, and legislation favorable to investment in regional development areas, the governorate of Mahdia offers wide possibilities for setting up and hosting tourism and agricultural projects, industrial and services. It is a safe destination and an undeniable opportunity for development and success.

III.6.1. Vegetable production and breeding

The available data relating to the plant resources of the Sahel region illustrate forest areas with different strata (forests, scrub...), and rangelands (steppes, alfa, meadows, lawns). The comparison between different forest and pastoral inventories highlights the presence of low and discontinuous vegetation, composed herbaceous plants, especially in the southwest area. This vegetation is diversified by its composition and its density and remains the fundamental stake of the pastor's life. Generally, the vegetation varies according to the zones. Coastal zone includes meadows, scrubland, scrub while, steppe type with a dominance of the alfa in the southwest part of the studied area.

The study of agrosystems and the exploitation of agricultural land of Sahel highlights all the problems relating to the extension of agriculture to the detriment of rangelands, notably cereal

growing in the north and arboriculture. Analysis of the dry and irrigated operating systems in different sites, particularly in the coastal area (Chot Meriem, Enfidha, Hergla, Kssour Essef, Moknine, Mahdia ...), reveals that in this environment the climate forcing was well resolved in the past through traditional techniques. Olive trees and cereals (wheat / barley) predominates throughout the region and occupies almost all of the agricultural areas each year, followed by the cultivation of legumes. The olive tree adapts well in Sahel soils particularly in the arid southwest (Figure 18).

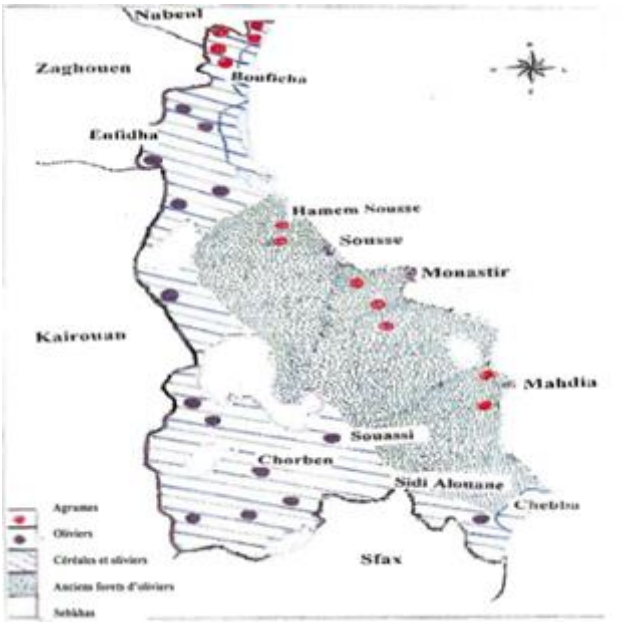

Figure 18. *The agricultural map of the Tunisian Sahel*

It is the main fruit tree followed by the almond then the fig and some attempts to introduce other species such as pear and apple. Olive trees cultivation depend on rainfall, cultural practices, which are often unsuitable, and fertilization, which is also lacking, especially in the sites of the internal zone of the Sahel (Figure 18). The technical level of farmers is weak despite attempts to initiate awareness, observed in the region and particularly the internal area, concerning modern techniques of planting arboriculture and the introduction of fertilizers and manure. Land preparation is not done with great care, chemical weeding is lacking and it is by hand that weeds are uprooted during the spring and given to the animals.

Farmers do not use high yielding varieties of wheat and barley, but mostly use local variety. These varieties are less demanding and provide maximum security for the food of local and regional populations. The yields observed in the region are around 15 Q/ha during good years for wheat and 7 Q/ha for barley. The irrigated sector in Sahel contributes 34 % of total production and more than 20 % of agricultural export. It provides 95 % of vegetable production

and 45 % of fruit production. Socially, it is also a crucial sector since it employs 27 % of the workforce.

Aboveground dairy cattle farming has developed over the past twenty years in the coastal regions of the Sahel (Sousse and Mahdia). The emergence of milk production, in these areas marked by strong pressure on water and agricultural land, has certainly enabled the diversification and intensification of activities and sources of income (Darej et al 2010).

III.6.2. Fishing

Tunisia has 41 fishing ports. These ports can be classified, according to their importance, in two categories. Ten large ports, allowing to shelter trawlers, tuna vessels, sardine boats, and coastal fishing units. These ports are in Tazarka, Bizerte, la Goulette, Kélibia, Sousse, Monastir, Mahdia, Sfax, Gabès, and Zarzis and are equipped with all the services necessary for fishing. The small coastal fishing ports, thirty house coastal fishing units and provide adequate services for this type of boat. It existed mainly in the Sahel and Kerkennah regions.

In addition to the port infrastructure, there are several landing sites, particularly at the lagoons. From Roman times to the present day, the different civilizations that have settled in the Tunisian Sahel have identified the existence of fishing potential and have focused on their economic development and the exploitation of marine resources. Over the ages and civilizations, the processes of accumulation through contact with foreign fishermen (Italian and Maltese) have enabled marine populations to assert technical know-how and naturalistic knowledge which represents the two elements composing a local fishery heritage.

A rise in the sea level, coastal erosion, and an increase in the temperature of fishing waters caused by climate change are threatening habitats vital for both human activity and marine biodiversity. Thus, the main area of marine aquaculture production is in the governorates of Sousse, Monastir, Mahdia, and Nabeul of the Tunisian Sahel. In Monastir, the aquaculture sector experienced a turning point from 2008, with the establishment of seven offshore farms covering an overall marine area of around 70 000 ha, with around 400 ha of concession area (APAL, 2015). From that date, Monastir became the most important offshore aquaculture production area, where all the farms cultivate the wolf (*Dicentrarchus labrax*) and the sea bream (*Sparus aurata*). For these two species, exponential growth in production has produced, reaching 6579 tons in 2015, which represented 24.37 % of regional production in the same year.

Chebba is a coastal city in the Tunisian Sahel located 65 kilometers north of Sfax and 36 kilometers south of Mahdia. The city is located at the level of Cape Ras Kapoudia that is the

easternmost point of the Tunisian Sahel. Attached to the governorate of Mahdia, it constitutes a municipality with an area of 12 156 hectares and populated by 19 883 inhabitants. It has an important fishing port benefiting from an exceptional maritime situation because it is a fishing zone. This later is located at the intersection of the bluefish fishing zone (north towards Mahdia) and that of white fish (south towards Sfax).

III.7. Biodiversity and biological heritage

The northern Mediterranean coast of the Sahel, is formed of cork oak (Q. suber) forest. Trees such as *Cupressus sempervirens* and *O. europaea* also grow in the study region. Some medicinal plants that originated in North Africa are widely used in traditional folk medicine. Tunisia has more than 500 species of medicinal and aromatic plants, and 2 163 varieties; the majority of these plants are found in harsh environments such as semiarid conditions of the Sahel. *E. maritimum* is a perennial plant that belongs to the Apiaceae family and is one of the major medicinal plants found in the area. It is effective in preventing diseases including atherosclerosis, diabetes, and cancer due to its content on polyphenol and flavonoid. *A. campestris* grows in the arid and semiarid areas. It is widely used as a traditional medicinal plant for diabetes, bronchitis, diarrhea, high blood pressure, and nerve pain treatment. In Tunisia, especially in the Sahel, halophytes such as *Cakile maritima*, *Limoniastrum monopetalum*, *Mesembryanthemum crystallinum*, *Mesembryanthemum edule*, *Salsola kali*, and *Tamarix gallica* are widely used as traditional medicinal plants.

The plant cover of the first few centimeters of water is formed mainly by photophilic nitrophilic algae such as ulvae and enteromorphs, which proliferate throughout the year on the coast of the Tunisian Sahel. Is floristic landscape is mainly dominated by the phanerogam *Posidonia oceanica.*

The macrofaunistic community is mainly dominated by 3 Phylums: Molluscs, Crsutaceae, and Annelids. These Phylums contribute with almost 94 % to the composition of the global fauna with a predominance of Crustaceans. The other groups are poorly represented. In the Sahel, at depths of 40 meters, large fish biodiversity detections have been observed. In the Gulf of Hammamet, these were horse mackerel (*Trachurus trachurus* and *Trachurus mediterraneus*). The biomass calculated in these two regions is 138 000 tons, 65 000 of which adults or 56.17%.

III.8. Food tradition

The Tunisian Sahel region (Monastir, Sousse, Mahdia) stood out in the celebration of Tunisian heritage month, by the national festival of culinary heritage specially dedicated to bsîssa. This

traditional dish is emblematic of the current heritage process, which should also be questioned very seriously. Several preparations of bsîssa are presented during this festival showing that there is not a tradition, but "traditions" (Figure 19). Bsîssa has nutritious and medicinal properties validated by nutritionists and confirming the "knowledge of ancestors". It is prepared according to different regional recipes. Snails or babouches present molluscs that are generally collected on rainy days in gardens and forests to cook them in traditional dishes, especially from the Tunisian Sahel region.

Figure 19. *Bsîssa Sahlia*

The bondleka also known as blibcha of Mahdia: It is a stew made from purslane: an annual plant whose leaf is very rich in omega 3 and trace elements: potassium, magnesium, and calcium are abundant. The “couseïla” is a nice word, invented by contraction of the words couscous and paella just for this Tunisian recipe. Indeed, it consists of semolina, lamb, chicken, fish, and seafood. This recipe uses only the ingredients of Cap Bon: like dried rosebuds, typical of Nabeul, and those of the Tunisian coast, very full of fish, which also offers a varied palette of seafood. In this oriental paella, semolina replaces traditional rice. Before being poured in rain, it must be moistened and then steamed in the couscoussier for 15 min. The “couseïla” of Nabeul remains an original dish between tradition and creativity, which brings together in the plates, flavors, and scents of the Mediterranean basin.

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Activity 3.1.2

PP5 - Gozo Regional Committee

DESK REVIEW

ENI CBCMED Cooperating across borders in the Mediterranean
Project funded by the EUROPEAN UNION
REGIONE AUTÒNOMA DE SARDIGNA
REGIONE AUTONOMA DELLA SARDEGNA
MedSNAIL

ENI CBCMED
Cooperating across borders in the Mediterranean

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REGIONE AUTONOMA DELLA SARDEGNA

MedSNAIL

SUSTAINABLE NETWORK FOR AGRO_FOOD INNOVATION LEADING IN THE MEDITERRANEAN

Activity 3.1.2.

Desk review on studies and projects on MedSNAIL topics already carried out in target regions

ENI CBC MED PROGRAMME 2014-2020
This project is co-financed by the European Union
under the ENI CBC Mediterranean Sea Basin Programme
Co-financing rate: 90% EU Funds; 10% National Funds

Table of Contents

1 Introduction

The present document presents the results of the first phase of the mapping will be carried out through desk activities aimed at analysing the target contexts within the territory, with particular reference to needs, demands, policies and programmes available in the fields of agribusiness, sustainable agriculture and food security.

The activity is being carried out in the context of Work Package 3, which aims at building the common cross-border framework needed for coordinating and harmonizing a shared knowledge base on agro-biodiversity, built according to an harmonized procedure combining field surveys and desk analysis.

The desk review follows the methodology prepared and detailed primarily by the activity leader, namely the Slow Food Foundation for Biodiversity. The activity will collate contributions from all the project partners, each working on their respective territories, and will be instrumental in the development and alignment of the project objectives and approach across the entire MedSNAIL partnership, and in the fostering of meaningful cross border exchanges.

1.1 Gozo Regional Committee

The Gozo Regional Committee (GRC) groups together the fourteen municipalities of the island of Gozo. In recent years, regional authorities have been set up in the Maltese Islands to occupy a second tier of government between Local Councils and the central, national institutions. The GRC comprises of a Gozo Development Agency (GDA), whose aim is to support the municipalities to further the development of their territories in ways that enhance the well-being of their constituents, and that are in keeping with the wider vision of Malta as a European Union member state in support of the priorities of the EU and its programmes.

In order to learn from the experiences of other countries, the Gozo Region actively participates in transnational projects, particularly those that can help it overcome the difficulties faced by Gozo that arise from its "double insularity", as well as those that promote the economic development of its territory, with an emphasis on long-term sustainability and an eye for the island's contribution to the well-being of the planet. Among these, actions which enhance the island's rurality and character, as well as environmental sensitivity, are particularly relevant.

In pursuit of its aims and objectives, the Gozo Region works very closely with all the fourteen municipalities. In recent years, the thrust of this cooperation has increasingly focused on topical energy and climate change issues, as well as sustainable development and innovation. This has included support actions in the context of European Union programming. Conscious of the limitations of the Local Councils in terms of resources and expertise, GDA-GRC continues to support the actions of the Councils in the development of effective and appropriately targeted policies and initiatives.

2 The Agricultural Area

The Agricultural Area chosen for the study as part of the MedSNAIL project is the island of Gozo, which is both geologically and politically a part of the Maltese islands.

The very small islands that comprise the Maltese archipelago are situated right in the centre of the Mediterranean Sea. From ancient to relatively modern times, their location have made of the islands a sort of cross-roads for some of the world's greatest civilisations. They have been at once a theatre of endless strife and belligerence between east and west, and between the northern and southern shores of the historic sea; as well as a cultural and linguistic melting pot.

2.1 Geography and Geology

There are two main inhabited islands, Malta and Gozo, having areas of about 246 and 67 square kilometres respectively. Another island, Comino, has an area of just around 3.5 square kilometres. These three islands, together with other small islands and rocks, make up a total area of merely 316 square kilometres. The climate is typically Mediterranean, with cool, wet winters and hot, dry summers. The average annual rainfall stands at about 530 mm, of which some 85% falls during the period October to March. The mean monthly temperature range is 12–26 °C, and the islands are very windy and sunny. Although small, the Maltese Islands have a considerable diversity of landscapes and ecosystems which are representative of the range and variety of those of the Mediterranean region[1].

Geologically, the islands are relatively young. They are composed of layers of sedimentary rocks that were formed in a marine environment. Their soils are also young, and therefore quite similar to the parent rock. The climatic conditions render the soil cover relatively thin and sparse, and the more important natural vegetation and habitats are determined more by the annual distribution of precipitation than the actual quantity of water[2]. Surface fresh water is scarce, and there are no permanent rivers or lakes. Some very minor springs occur in places, and the winter rains form temporary rivulets and water courses along the valleys, with small seasonal lakes being formed where valleys are dammed, which catchments are used for irrigation during drier periods.

The main geomorphological features are limestone plateaux with a karst type landscape, hillsides covered with clay taluses, gently rolling limestone plains, valleys which drain runoff during the wet season, steep sea-cliffs on the south-western coasts, and gently sloping rocky shores to the Northeast.

[1] P. J. Schembri, 'The Maltese Islands: climate, vegetation and Landscape', *GeoJournal*, vol.41 no. 2, 1997 (February), pp. 115–125.

[2] Nature Trust (Malta), *Terrestrial Habitats* [Website], https://www.naturetrustmalta.org/environmental-education/biodiversity/habitats/terrestrian/, (accessed 15 February 2020).

2.2 Vegetation and Land Cover

The main vegetation communities are maquis, garigue and steppe. The dominant native species are xerophytes that can survive the hot and dry conditions of the long summer. There are also minor communities, including patches of woodland, coastal wetlands, sand dunes, freshwater, and rock surface communities. The latter are in actual fact of the utmost most ecological importance given that they support a remarkably large number of endemic species[3].

Population pressures on the islands are very considerable, with the country having a staggeringly large population of about 494,000 inhabitants[4]. Moreover, the islands have experienced millennia of continued habitation, and they have not been self-sufficient for centuries[5]. The impact of human activity is very significant. According to Eurostat's Land Use/Cover data, 21.3% of the island's area is classified as 'Services and Residential'. Approximately 7% is used by commercial and industrial activities, while just 44.8% is taken up by 'Agriculture'. The rest is countryside[6].

2.3 Human Impact

The present landscape results from the interplay of geology, climate, and the intense reshaping by humans. The latter has occurred principally through the diversion of vast tracts of land to cultivation, the construction of terraced fields, dam building across seasonal watercourses, and the construction of irrigation channels and drainage ditches. Of particular importance has been the grazing of animals on uncultivated land, and the ongoing and often inconsiderate exploitation of land for buildings and industry. The thin soil, when exposed to persistent human disturbance and the frequent seasonal deluges alternating with extreme droughts, has eroded very considerably. It is now increasingly difficult for the original vegetation to be re-established, with the consequence that much of the native flora has been lost or marginalised. Ruderal species, i.e. those growing on waste ground or among rubbish, as well as introduced species, now abound, although growing awareness has recently given rise to some important initiatives being taken to manage the environment and halt the deterioration of the landscape[7].

2.4 History

The Mediterranean Sea has been the cradle of the western world's major civilisations, and the Maltese Islands lie right at its centre. The sea has enabled movement of people and encouraged trade and cultural exchanges between its shores for millennia. The islands was first colonised around 5200 BC,

[3] P. J. Schembri, 'The Maltese Islands: climate, vegetation and Landscape', pp. 115–125.

[4] National Statistics Office, 'World Population Day: 2019', *NSO Website*, Malta, National Statistics Office, 2019, p. 1, https://nso.gov.mt, (accessed 10 February 2020).

[5] J. Rix , *Malta and Gozo*, Bucks, England, Bradt Travel Guides Ltd, 2013, p. 310.

[6] Eurostat, *Land use overview by NUTS 2 regions* [Website], https://ec.europa.eu/eurostat/data/database, (accessed 31 January 2020).

[7] P. J. Schembri, 'The Maltese Islands: climate, vegetation and Landscape', pp. 115–125.

probably by Neolithic people from neighbouring Sicily, and they have since never been far removed from the events that have shaped the civilisations of the region. Archaeological studies have uncovered the establishment of the islands as an important centre for earth-mother worship in the 4th millennium BCE, possibly long before those of Sumer and Egypt. The Phoenicians, and later the Carthaginians, set up ports and trading posts. In 218 BCE, during the second Punic War between Rome and Carthage, Malta became part of the Roman Empire[8].

With the final division of the Roman Empire into its East and West branches in 395 CE, the islands fell under Byzantine domination. There is some argument over whether Malta was occupied by the Vandals in 454 CE, and by the Goths in 464 CE.. In any case, between 400 and 600 CE a Western Roman church was built over the remains of megalithic temples. According to some historians, the Islands were restored to the Byzantine Empire in 533 CE. In 870 CE Malta was conquered by Aghlabid (Tunisian) Arabs. The new rulers fortified an ancient Roman settlement called Melita, strategically situated on high ground in the centre of Malta, and renamed Medina, which later became the Medieval city of Mdina. The Arabs improved agriculture and introduced irrigation systems, including the 'noria' or waterwheel. For the first time, cotton and citrus fruits were grown in Malta[9].

The Arab occupation had a profound influence on Maltese way of life, which influence would endure to the present day, particularly on the language. There has been considerable debate among scholars regarding the linguistic basis that existed on the islands at the time of the Arabs conquest in 870 CE. The debate revolves around a simple hypothesis which explains the ease with which the inhabitants of Malta and Gozo learned Arabic because they already talked a Semitic language, namely Punic. The issue was used as an attempt to give the Maltese language a kind of added prestige by ascribe non-existent Phoenicio-punic rather than Arabic origins, as this was considered more appropriate to the teaching of English. This idea has thankfully been abandoned, and the Arabo-Maghribite origin of Maltese as the ultimate source of the language is not subject to debate[10].

In 1091, the islands were invaded by the Normans, and in 1127 Norman control was consolidated under Roger II of Sicily. A Norman governor was installed, and Norman soldiers were garrisoned in Malta's three main castles; namely Mdina, Castrum Maris, Cittadella Gozo[11]. Christianity was thus re-established as the Islands' dominant religion, and Malta became an appendage of Sicily for 440 years, during which

[8] International Business Publications USA, *Malta Country Study Guide Volume 1: Strategic Information and Developments*, Washington, International Business Publications USA, 2013, p. 22.

[9] Maltese History & Heritage, *Maltese History Dates* [Website], https://vassallohistory.wordpress.com/a-maltese-history-2, (accessed 31 January 2020).

[10] Maltese History & Heritage, *Origins of the Maltese Language* [Website], https://vassallohistory.wordpress.com/2013/10/29/origins-of-the-maltese-language, (accessed 5 February 2020).

[11] [11] Maltese History & Heritage, *Maltese History Dates* [Website], https://vassallohistory.wordpress.com/a-maltese-history-2, (accessed 31 January 2020).

period Malta was sold and resold to various feudal lords and barons and was dominated successively by the rulers of Swabia, Aquitaine, Aragon, Castile, and Spain[12].

In 1530, Malta was under the Crown of Aragon (Kingdom of Sicily), having been incorporated into the kingdom a century earlier by King Alfonso of Spain, who had also promised never to grant Malta as a fief to any third party. Nevertheless, in October 1530, in an effort to protect Rome from Islamic invasion, Emperor Charles V granted the Maltese Islands to the Knights of St. John of Jerusalem in perpetual fief. The population around that time was some 15,000 people in Malta and 4,659 in Gozo[13]. The knights had been driven out of Rhodes in 1522 by Suleiman II. The Order made Malta its home for the next 268 years, transforming the islands by building towns, palaces, churches, gardens, and fortifications; and they also embellished the island with numerous works of art and priceless cultural heritage. In 1565, a great army was sent by Suleiman the Magnificent to conquer the islands, in what became known as the great siege of Malta. The expedition was unsuccessful, and after months of bloody fighting the Turkish army and navy left Malta never to return. The power of the Knights reached its zenith in the 17th century, with the completion of their new city Valletta and its magnificent fortifications. The Order gradually declined until its rule of Malta ended with its peaceful surrender to Napoleon in 1798. French rule was destined to be short-lived, with the people of Malta rising against the new rulers, and with the help of the British evicted them in 1800.[14]

In 1814, Malta voluntarily became part of the British Empire, once again reverting to its traditional role of military and naval fortress. The population of the island of Malta in 1807 was only 93,054, a drop of 18.4% over the previous decade, while in Gozo it was 12,829, a drop of 19.8%. This population drop was due to famine and disease, and exacerbated by a proportion of the population emigrating abroad with the departure of the Knights[15]. Throughout the 19th and 20th centuries, the British built numerous examples of military architecture in the British Colonial style, as well as military hospitals and other buildings in the British Neoclassical style. During World War II, Malta survived air-raids from German and Italian air forces, often several raids per day. Malta obtained independence on September 21, 1964, became a Republic on December 13, 1974, and a member of the European Union on May 1, 2004.

2.5 Economy

In the post-war years, the British military presence in Malta started to wind down. Consequently, the country had to move away from an economy largely based on the military, and in particular the naval

[12] International Business Publications USA, *Malta Country Study Guide Volume 1: Strategic Information and Developments*, p. 22.

[13] Maltese History & Heritage, *Maltese History Dates* [Website], https://vassallohistory.wordpress.com/a-maltese-history-2, (accessed 31 January 2020).

[14] International Business Publications USA, *Malta Country Study Guide Volume 1: Strategic Information and Developments*, p. 22.

[15] Maltese History & Heritage, *Maltese History Dates* [Website], https://vassallohistory.wordpress.com/a-maltese-history-2, (accessed 31 January 2020).

dockyard and associated industries, so a more diverse economy. The islands initially embarked on low-added-value, labour intensive manufacturing, as well as mass tourism starting from the early 1960s.

Malta's small internal market and lack of natural resources preclude local enterprise from producing all the products and services that the Maltese would like to consume. This means that Malta is highly dependent on imports to acquire raw materials and many primary commodities, while local enterprise cannot rely solely on the domestic market, making it inevitable for Malta to export goods and services. This has resulted in a very open economy, with imports and exports both hovering around 100% of GDP[16].

The major source of advantage is perceived as being the island's flexible and bilingual workforce. Over the past three decades, the price competitiveness has been swiftly disappearing because of brisk collective wage bargaining, and local enterprises are also finding it increasingly difficult to compete on costs because of the emergence of lower cost economies in the region. These countries are no longer being seen as high risk by foreign direct investors, and they boast of mobile capital and can offer a significant pool of labour at much cheaper rates. Moreover, changes in process technology have led to the fragmentation and standardisation of specific tasks which can use semi-skilled labour, making it possible to produce highly technological products in economically less advanced societies.

As a small Island EU Member State in the Mediterranean, Malta is faced with specific disadvantages when compared to other Member States within the Union, varying from a lack of accessibility and isolation from mainland European infrastructure to the lack of natural resources and high population density, amongst others. In this regard, these factors continue to impinge on the socio-economic growth of the Maltese Islands. The Maltese economy has of late been relatively resilient to the global economic crisis and the sovereign debt crisis in the euro area. Between 2009 and 2012, Malta's real Gross Domestic Product (GDP) grew by an annual average of 0.9%. The performance of the Maltese economy is also reflected by gains in the export market share in services. On the other hand, Malta's export market share in goods was on the decline, particularly in machinery and electrical equipment as well as textiles.[17].

2.6 Gozo

The geology, climate and ecology of Gozo are similar to those for the entire Maltese islands. The same can be said of their history and customs. The most significant difference is that the island is more rural than Malta, and therefore the population pressure is much less, albeit still very significant. Being an island of just 67 square kilometres and having a population of approximately 31,000, Gozo is heavily dependent on the sea transport link with Malta. A consequence of this is the concept of double insularity, and a strong feeling of disadvantage coupled with a keen sense of regional and cultural

[16] Farrugia, N. (2002) 'Constructing an index of international competitiveness for Malta', *Bank of Valletta Review*, Malta, Bank of Valletta, 2002, No. 26, p. 3

[17] Ministry for European Affairs (Malta), *Operational Programme I: Fostering a competitive and sustainable economy to meet our challenges*, Malta, Office of the Deputy Prime Minister, 2015, p. 2.

identity. Gozo has also developed less rapidly than Malta, and owing to more limited infrastructure, it has focused its marketing strategy by promoting itself as an eco-island that depends more on tourism, agriculture and fishing sectors when compared to Malta. In fact, Gozo accounts for 23% of the total organic land in the Maltese Islands[18].

3 Agriculture

Agriculture in Malta can be traced back to Neolithic times, as evidenced by tools and agricultural equipment discovered in archaeological sites. Even in documented history we have evidence of the agricultural skills of the inhabitants, such as references by Roman historians to their abilities in producing cotton and honey. Indeed, sails manufactured in Malta were very highly considered in the ancient world, as was honey. Nevertheless, following a reconnaissance mission sent out by the Knights of Malta to assess the offer of the island offered to them by Charles V, the assessors reported on the bareness of the land, the sparsity of vegetation, lack of water and climatic and topographic features being particularly averse to crop production[19].

3.1 Overview of Farming Practices

Land farming in Malta and Gozo generally falls within two main types, namely

1) dry (arable) farming that depends exclusively on rainfall, with crops being mostly fodder, onions, garlic, broad beans, potatoes, vines, olive trees and fruit trees; and

2) irrigated farmland in greenhouses and open fields, growing a wider range of vegetables.

Except for the spring potato crop for export, most farmers engage in mixed farming practices rather than single cash crops. Livestock breeders do not own pastures and largely keep their livestock indoors, feeding with imported feed concentrate and fodder, as well as local fodder[20].

In 2018, agriculture, forestry and fishing sector represented 1.03% of the total Gross Value Added generated by the Maltese economy[21], and accounted for 0.8% of all persons in full-time employment[22]. In 2013, 19,066 persons were actively engaged in agricultural activity, an increase of 2.8 per cent when compared to the 2010 census. Of these, only 1,372 persons were in full-time employment, while 17,693 persons were part-timers. Full-time and part-time employment during 2013 increased by 5.5 and 2.6

[18] Ministry for European Affairs (Malta), *Operational Programme I: Fostering a competitive and sustainable economy to meet our challenges*, Malta, Office of the Deputy Prime Minister, 2015, p. 2.

[19] Maltese History & Heritage, A*griculture in Malta* [Website], https://vassallohistory.wordpress.com/agriculture-in-malta, (accessed 15 February 2020)

[20] Parliamentary Secretariat for Agriculture, Fisheries and Animal Rights (Malta), *National Agricultural Policy for the Maltese Islands 2018 – 2028*, Malta, Parliamentary Secretariat for Agriculture, Fisheries and Animal Rights, 2017, p. 24.

[21] National Statistics Office, *Gross Domestic Product: 2018*, Malta, National Statistics Office, 2018, p. 3.

[22] National Statistics Office, *Labour Force Survey: Q4/2018*, Malta, National Statistics Office, 2018, p. 5.

per cent respectively over 2010[23]. Table 1 shows the total employment in agriculture for Gozo and Comino only.

These figures show that the sector's contribution to the Maltese economy is relatively very low, but agriculture and fishing do have an important economic role ranging from food production, culinary tradition, land stewardship, and environmental conservation. They are also important for the tourism industry, and so their significance taken holistically may go farther than their nominal quantitative economic significance.

Table 1 Total employment (number of persons) in agriculture by type of employment in Gozo and Comino

	Year			
Type	**2005**	**2007**	**2010**	**2013**
Full-time	276	316	185	272
Part-time	3,291	3,209	3,792	3,799
Total	3,567	3,525	3,977	4,071

Source: National Statistics Office

Holdings and farms are, almost in their entirety, exceedingly small. The National Agricultural Policy for the Maltese Islands 2018 – 2028 lists the following main challenges for the Maltese and Gozitan farming undertaking.

1) scarcity of land related to the small size of the islands and dense population;
2) lack of natural resources, in particular, water scarcity;
3) urbanization, land use pressures and opportunity cost of land;
4) dependence on imported fodder and other inputs that are costly in view of a limited bargaining power;
5) fragmentation of human and physical resources, and
6) individualism and general inability to exploit economies of scale[24].

Agriculture holdings in both Malta and Gozo are predominantly small, with 75.6% having a utilised agricultural area (UAA) of less than one hectare each; 22% that are between one and five hectares; and 2.4% that have an area exceeding five hectares[25]. Table 2 shows the total number of land holdings in Gozo and Comino for the years 2005 to 2013 in terms of UAA (ha).

[23] National Statistics Office, *Agriculture and Fisheries 2014,* Malta, National Statistics Office, 2016, Malta, p. 13.

[24] Parliamentary Secretariat for Agriculture, Fisheries and Animal Rights (Malta), *National Agricultural Policy for the Maltese Islands 2018 – 2028*, p. 24.

[25] National Statistics Office, *Agriculture and Fisheries 2014,* Malta, National Statistics Office, 2016, Malta, p. 3.

Table 2 Agricultural holdings by size class in Gozo and Comino

	Size class: Utilised Agricultural Area (ha)							
Year	**Total**	**0**	**>0 - <0.5**	**0.5 - <1**	**1 - <2**	**2 - <5**	**5 - <10**	**≥10**
2005	2,411	24	1,206	632	362	133	37	17
2007	2,399	59	1,229	462	447	107	79	16
2010	2,792	45	1,506	527	412	224	60	18
2013	2,782	14	1,484	590	286	322	64	20

Source: National Statistics Office

Table 3 gives the utilised area per crop type in Gozo and Comino. The proportion of the types on any one holding will depend on the agricultural landscape of the holding, as this may vary considerably even on such a small island as Gozo.

Table 3 Utilised agricultural area (hectares) by type in Gozo and Comino

	Type of crop								
Year	**Total**	**Forage**	**Potatoes**	**Permanent cropping excluding vineyards**	**Vineyards**	**Market gardening**	**Kitchen gardens**	**Other areas**	**Fallow land**
2005	2,135	1,336	41	76	61	305	191	26	99
2007	2,292	1,368	24	73	60	290	279	23	176
2010	2,613	1,671	51	124	74	298	236	24	134
2013	2,888	1,950	30	109	62	256	316	24	142

Note: Other areas include area under greenhouses and flowers and ornamental plants grown in the open.
Source: National Statistics Office

3.2 Agricultural Landscape

The Maltese Islands, and Gozo especially, exhibit characteristic heterogeneity of the topography that make for a relatively large variety of landscapes, each of which is associated with a specific agricultural region.

3.2.1 Rdum and Ġnien Areas

The *rdum* and *ġnien* (garden-type) areas are those who render the highest incomes in the farming community, and this is because here fruit is grown intensively and yields high profits. There are various examples of scarpland on both Malta and Gozo, including fault scarps, that are ideal for vine and fruit cultivation, often among a number of other agricultural produce. In Gozo, *ġnien* farming occurs in the Zebbuġ area of the Northern Region, and specialized fruit growing is centred to the east of Għajnsielem[26].

[26] Maltese History & Heritage, A*griculture in Malta* [Website]

3.2.2 Xagħra Areas

The xagħra (barren meadows) lands can only be used in parts and for the hardiest fodders and legumes. The crops are relatively humble and do not afford very important incomes. The soil on xagħra comes in very small patches, in which vetches and poor barley are cultivated. In Gozo, this landscape includes the coast-fringing wastelands in the Western uplands.

3.2.3 Dry-Farming Areas

Dry-farming areas constitute the greater part of the arable land of the Islands. The majority of the examples of these areas rely on rainfall only, with no provision for other irrigation, and will vary in crop-quality according to various exposures, slope and water supply. Medium-quality crops are grown in the more favourable conditions, with potatoes being preferred. Vegetables are grown quite profusely, and where irrigation is available, the higher-value vegetable crops (including melons, tomatoes and artichokes) are widespread[27].

3.3 Production

Table 4 shows the total production of fruit and vegetables in Gozo and Comino between 2010 and 2014. Fresh vegetables that passed through organised markets in 2014 in Gozo amounted to 3,254 tonnes, yielding a wholesale value of €1.664 million. This resulted in a substantial decrease when compared to 2013. The volume of fresh fruit increased by 26.9 per cent, from 420 tonnes in 2013 to 533 tonnes in 2014. The wholesale value of fresh fruit went up by 7.9 per cent when compared to 2013.

Table 4 Annual volume (tonnes) and wholesale value (€000) of fruit and vegetables sold through official markets (Gozo and Comino)

	Vegetables		Fruit	
	Weight	**Value**	**Weight**	**Value**
2010	3,438	1,984	593	458
2011	3,607	1,755	696	390
2012	3,521	1,789	490	352
2013	3,828	1,919	420	329
2014	3,254	1,664	533	355
	Percentage change in comparison to previous year:			
2012	-2.4	1.9	-29.6	-9.7
2013	8.7	7.3	-14.3	-6.7
2014	-15.0	-13.3	26.9	7.9

Source: National Statistics Office

[27] Maltese History & Heritage, A*griculture in Malta* [Website]

3.4 Main Species

The volume of individual species produced are not readily available for Gozo and Comino alone. National statistics, however, give an indication of the relative importance of the various species. Table 5 shows the annual total estimated volume of vegetables by species for Malta, Gozo and Comino combined.

Table 5 Annual total estimated volume (tonnes) of vegetables by species

	Year				
	2010	**2011**	**2012**	**2013**	**2014**
Bellpepper	1,007	901	781	866	857
Broad beans	2,529	2,568	2,533	3,008	3,008
Cabbages	3,334	3,760	3,833	4,429	4,374
Carrots	1,365	1,327	981	1,307	1,233
Cauliflowers	6,253	6,180	5,000	5,782	5,867
Celery	416	441	432	444	418
Cucumber	807	725	743	743	838
Dry onions	8,478	7,981	6,483	7,369	7,666
Eggplant	755	753	701	754	785
Globe artichokes	1,566	1,485	1,596	1,309	1,540
Green onions	759	643	614	804	540
Kohlrabi	1,127	1,038	953	942	895
Lettuce	4,008	4,199	4,111	4,611	4,230
Potatoes	15,541	18,920	12,691	12,644	10,808
Pumpkins	1,455	1,328	1,348	1,304	1,331
Sugar melons	2,513	3,473	3,095	2,808	2,901
Tomatoes	14,572	13,953	11,142	12,287	12,925
Vegetable marrows	3,419	3,393	3,079	3,177	3,451
Watermelons	3,248	3,572	3,837	3,426	3,668
Other vegetables	6,096	5,907	6,218	6,697	7,074
Total	**79,248**	**82,548**	**70,170**	**73,933**	**74,410**

Source: National Statistics Office

The estimated total fruit and vegetable production figures take into consideration direct sales, own consumption and sales to processors. Similar statistics are compiled for the annual total estimated volume of fruit by species on a national level (Table 6).

Table 6 Annual total estimated volume (tonnes) of fruit by species

	Year				
	2010	**2011**	**2012**	**2013**	**2014**
Bambinella	186	145	215	172	110
Cherry plums	26	74	132	15	31
Dry figs	9	16	11	15	5
Early figs	143	122	152	120	75
Grapes	4,082	3,919	5,516	5,256	5,363
Lemons	586	551	420	513	552
Nectarines	88	167	67	59	62
Oranges	544	567	393	334	444
Peaches	814	1,441	663	547	602
Pomegranates	138	166	151	148	141
Strawberries	690	762	932	720	855
Sweet oranges	737	900	639	482	671
Other fruit	586	602	512	511	447
Total	**8,631**	**9,432**	**9,804**	**8,891**	**9,359**

Activity 3.1.2

PP6 – NAMAA

DESK REVIEW

ENI CBCMED Cooperating across borders in the Mediterranean
Project funded by the EUROPEAN UNION
REGIONE AUTÒNOMA DE SARDIGNA
REGIONE AUTONOMA DELLA SARDEGNA
MedSNAIL

Sustainable Networks For Agro-Food Innovation Leading In The Mediterranean (MedSNAIL)

WP3 – AGRO-FOOD ALLIANCE
Output 3.1.- Agro Biodiversity Study
3.1.2. DESK REVIEW

Country: Jordan
Partner 6: Women for Cultural Development (Namaa)

OUTLINE

1. INTRODUCTION AND BACKGROUND

Jordan is an Eastern Mediterranean country in Western Asia, on the East Bank of the Jordan River, bordered by Palestine, Syria, Iraq, and Saudi Arabia with a total area of 89,342 km². Jordan has a population of 10,162,808 inhabitants (World Population Review 2020).

Jordan is a constitutional monarchy, which gained independence in 1946. Since its independence agriculture has played a major role in its economy but has been in decline ever since. During the early 1950s, agriculture constituted almost 40 percent of GDP declining in the mid-1980s to about 6 percent to 5.6 percent today (Department of Statistics 2018). Many reasons contributed to this decline such as rural to city migration, immigrants, water scarcity, desertification, climate change, urbanization, agricultural policies, economic restructuring as whole, miss management of the water resources, the increase of big land ownership on the account of the small farms and the formation agricultural unions and associations.

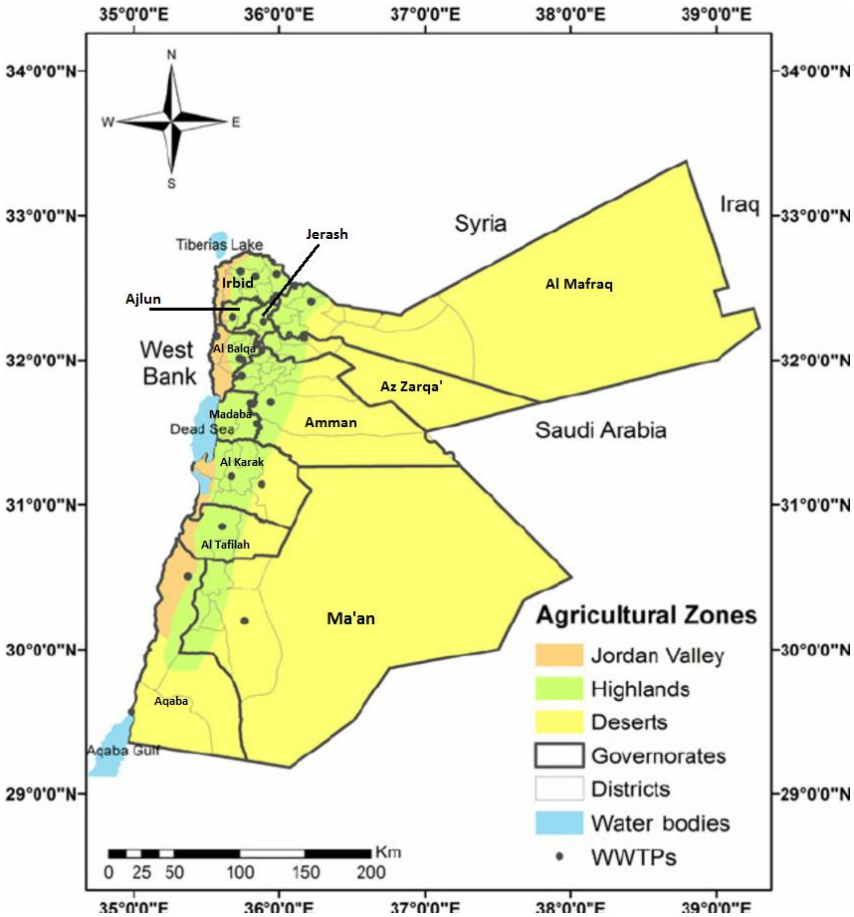
Jordan is a heavily urbanized, lower middle-income country**.** the Urban population 91.4% of total population (2020) at annual rate of 1.62.43% (2015-2020 est.). (Source CIA Factbook; www.cia.gov/library/publications/the-world-factbook/geos/jo.html) . In July 1017 the World bank reclassified Jordan as lower middle income country from being upper middle income in July of the previous year 2016, this classifications are based on Gross National income per capita (GNI/Capita) of the country and world basis it's clasificatiocation on the previous year's GNI per capita estimates. The estimate for Jordan's 2016 GNI/capita places it in this year's Lower-middle income group. Last year's classification based on the 2015 GNI/capita estimate placed it in the Upper-middle-income group.

Due to non-stop conflicts in the region starting in the early 20th century; Jordanians have provided a safe haven for the refugees and the persecuted, yet this trait has led to massive increase in population in the shape of refugee influxes during short periods of time, usually too fast for the planning and development processes to cope with. Consequently, the total population of Jordan has grown since 1948 from approximately 600,000 to 10.11 million in 2017. For instance, the capital city Amman had 60,000 inhabitants in 1948 compared to 4 million in 2017, comprising almost 40% of the total population. (Department of Statistics), the significant growth in population can be attributed to fertility rate and the refugees / immigrants the country received through the years. In terms of fertility the rate in 1955 was 7.38% and by 1970 reached 8% then it started a steady decline ever since. (https://www.worldometers.info/world-population/jordan-population/). Following Arab-Israeli 1948-war about 506,200 Palestinians settled in Jordan, and after the Israeli occupation of West Bank and East Jerusalem in 1967, about 240,000 Jordanians of Palestinian origin fled from the West Bank, 1988 between 1990 - 1995 The Gulf War brought a new wave of refugees from Iraq, and from 2003 invasion of Iraq, exceeding one million today. Also, around 300,000 Jordanian evacuees returned to Jordan after the Gulf War, many of whom are of Palestinian origin. Starting in 2011, the Syrian civil war has resulted in large numbers of Syrian nationals fleeing to neighbouring states, by April 2013, according to the UNHCR, 424,771 Syrian nationals reached Jordan (MPC – MIGRATION POLICY

CENTRE - MIGRATION PROFILE Jordan 2013). Now Jordan is considered the most refugee hosting country; 2.8 million refugees registered by UNHCR and UNRWA.

Such population growth has led to major implications regarding civil services, along with scarcity in natural resources to back up the economy, the government debt has grown threefold since the year 2000 (The World Bank) with minimal development to the quality of life and economic growth. In Addition, Jordan is amongst the top four countries globally regarding water scarcity, water supply has also become a great challenge for local authorities.

The country is divided into twelve governorates in three regions: the North Region: Irbid, Ajloun, Jerash, Mafraq, the Central Region: Balqa, Amman, Zarqa, Madaba, and the South Region governorates: Karak, Tafilah, Ma'an, Aqaba.



2. HISTORICAL BRIEF

The country is named for the River Jordan which means "to descend" or "flow downwards". Jordan being part of the Levant region played a key role through ancient civilization in the development of agriculture. Until 1921 Jordan did not have a separate political identity. It is earlier in history, that the Amirate of Transjordan was established under the British patronage on the East Bank by the Hashemites who were the rulers of Mecca. It was until 1946 that Britain abolished its mandate on the area and declared it as The Hashemite Kingdom of Jordan.

As part of the Fertile Crescent and with the earliest traces of first farmers in the world in northern Jordan and southern Syria dating approximately 7000 BC. Agriculture is deep rooted in the local culture and identity, from folk dances and music to everyday language and proverbs. The diverse climatic regions now forming Jordan has allowed the local communities to produce essential commodities such as wheat, barley and other field crops from north to south, along with a wide variety of vegetables, fruits, olives, citrus and other products. Which makes Jordan unique when it comes to the capability of producing various crops all year round.

Historically, Petra, an ancient metropolis with a state-of-the-art agriculture, water harvesting systems and urban water distribution for that era was established by the Nabataeans (400 B.C. and A.D. 106) who were famous for their distinct techniques in agriculture. In the early stages of their history, religion and traditions prohibited the Nabataeans, under threat of punishment, to grow wheat, trees and wine and to live in stone houses. Afterwards this changed quickly. As early as the Hellenistic era, they turned to agriculture and became experts in water management and hydraulic techniques. They constructed the necessary aqueducts, cisterns, channels, dams and water reservoirs. Furthermore, Nabataeans had mastered their unique art of irrigation and enjoyed rich harvests of cereal and fruits from across the kingdom. (Agriculture in sixth-century Petra and its hinterland, the evidence from the Petra papyri, Arabian Archology and Epigraphy, 2012)

In 106 AD Petra became part of the Roman Empire. In the era of the Roman rule in the region, cities of Philadelphia (Amman), Gerasa (Jerash), Gadara (Umm Qais), Pella and Arbila (Irbid) joined with other cities in Palestine and southern Syria to form the Decapolis League. Those cities were the first line of defense against the Persian Empire and produced a big percentage of the empire’s food consumption, mainly wheat and barley. In the mountains and highlands of the west, agricultural development led to demographic and economic development, mostly focused on olive trees, through the proliferation of villages, increased road network density and the growth and development of towns. (Atlas of Jordan: History, Territories and Society, 2013)

During the Byzantine period, 324 AD -636 AD a major part of construction took place throughout Jordan. All of the main cities of the Roman Empire continued to flourish, and the regional population grew. The economy remained principally based on the traditional cultivation of vines and olive trees.

The Petra region during this period was part of a network of agricultural sites and provided an important market for local agricultural products. Agriculture was the spine of its economy in the sixth century, particularly in its hinterland. The possessed orchards, vineyards, threshing floors, grain land and other properties of an agricultural nature such as farmsteads and farmhouses. (Agriculture in sixth-century Petra and its hinterland, the evidence from the Petra papyri, Arabian Archology and Epigraphy, 2012)

In the year 636 AD Arab Muslims conquered the lands of Syria including Jordan. The Umayyad Period was a period of transition between the Byzantine and Islamic world in Jordan. During the Early Islamic period (Umayyad and Abbasid) saw the introduction of numerous new crops into the Middle East area, causing an Agricultural revolution. Many of these new crops, as sorghum, Asiatic rice, wheat, barley, sugar cane, cotton, citrus fruits, banana, watermelon, and spinach, among others, are from the tropical climate of South Asia did not match the cooler and drier climates of the Middle East; but, except for rice planting all of these new crops proved successful in Jordan. (The Abbasid Occupation at Gadara (Umm Qais), 2011 Excavation Season, 2015)

In regards of its economic significance, the use of farmland in Jordan reached its maximum potential by the Mamluk state to support the financial and social reinforcements of its military. The basis of the Mamluks' agricultural regime was grains; Jordan was a key supplier of wheat to Cairo and the rejoin in times of shortages. During this period the peasants of the area proclaimed control over their own natural resources and markets rather than being passive participants. (The Role Of Agriculture In Mamluk-Jordanian Power Relations, Department of History, Grand Valley State University)

In 1516 CE, the Ottoman Turks defeated the Mamluks, Jordan became part of the Ottoman Empire and continued to be so for the next 400 years. In general, during this period, Jordan faced lack of progress. The Ottomans were mainly interested in Jordan in terms of its importance to the pilgrimage route to Mecca al-Mukarrama. The Hejaz railway was constructed, linking Istanbul and Mecca. The railway across Jordan was constructed separating the landscape climatically, with the areas to the west of the railway being arable and east of it being non-arable, which mainly comprised of desert and steppe regions. Over the course of Ottoman rule, many towns and villages were abandoned, agriculture declined, families and tribes moved regularly from one village to another. (An Agricultural Question in Jordan, 1991)

In the early 20th century, post the First World War and fall of the Ottoman Empire, Jordan became under British rule, appointing -later King- Prince Abdullah I as ruler of Transjordan under the British mandate. With the decline that the area faced throughout the ottoman period Jordan lacked agricultural resources, the British Mandate authorities also was only was interested in

Jordan’s strategic location in the Levant. Thus, the development of agriculture in Jordan under the British Mandate was on a limited scale, and the cultivated land compared to the area of arable land continued to be limited. (An Agricultural Question in Jordan, 1991)

In 1946, Prince Abdullah negotiated a new Anglo-Transjordanian treaty, ending the British mandate and gaining full independence for Transjordan, the Transjordanian parliament proclaimed Abdullah king, while officially changing the name of the country from the Emirate of Transjordan to the Hashemite Kingdom of Jordan.

Agriculture in Jordan contributed considerably to the economy at the time of Jordan's independence, but it then underwent a steady decline for decades. In the early 1950s, agriculture constituted almost 40 percent of GNP; on the eve of the June 1967 War, it became 17 percent, including the yields from the West Bank which was under Jordan's mandate at the time.

By the mid-1980s, due to many factors, agriculture's share of GNP in Jordan became only about 6 percent. With the Israeli occupation of the West Bank, Jordan lost major farmland that was part of it since 1949. The inability of agriculture to keep pace with the growth of the rest of the economy caused insufficiency in domestic food supply. Accordingly, Jordan needed to import many food staples such as cereals, grains, and meat. . (Chapin Metz, Helen (1989). "Jordan: A Country Study: Agriculture". Library of Congress, Washington D.C).

2. JORDAN AGRICULTURE NATURAL RESOURCES

2.1. CLIMATE

Jordan is a dry, semi-arid and drought prone country, ranging between hot dry relatively uniform summers, and cool variable winters. The rainy season is between October and May with 80% of the annual rainfall experienced between December and March. The temperature mildly increases from North to South of Jordan except for some parts in the south which are known as the Southern Highlands, though it varies from year-to-year and season to season, where the temperature may drop below zero in the coldest months with frost formation in some places, such is the case in the mountainous areas, on the other hand it may reach 50ºC in locations such as the area covering entire length of the eastern part of the country which is known as the Rift Valley.

Jordan has three notable agro-climatic zones: the Jordan Valley, The Highlands, and the Marginal Areas and Eastern Deserts:

1) The Jordan Valley is part of the Rift Valley and covers over 5.6% of Jordan's total area and can be divided into the Jordan Valley, the Dead Sea and the Araba Valley, extends from the northern border of Jordan to the Dead Sea with altitudes ranging between 220 m below sea level to 407 m below sea level at the Dead Sea. It's the most fertile area in the country, and due to the warmer climate in winter, and availability of water for irrigation, it has year-around agricultural production.

2) The Highlands extend from the north to the south throughout the western part of Jordan, with elevation varies from 600 m to about 1500 m above sea level. This area receives the highest rainfall in Jordan, and the climate can be described as Mediterranean with a hot dry summer and a wet winter with two short periods of Fall and Spring.

3) The Marginal area and the Eastern Desert. The Marginal area is located to the east of the Western highland, and has an arid and semi-arid climate and where almost half of the irrigated lands are located (Dr. Ahmad Shukri Al-Rimawi, 2001, STRUCTURE & ADMINISTRATION Of HOLDINGS BY AGRO-CLIMATIC ZONES IN JORDAN, Department of Statistics) , as underground water is the main source of irrigation, the main crops grown in the area are melons, tomatoes, cucumber, apples and peaches which are under irrigation specifically drip irrigation, grains are also produced in this area, but under rain-fed conditions making it a miner production. as for Eastern Desert which covers around 88% of Jordan's total area which is arid with hot dry summers and cold dry winters, it's elevation between 600 m to 900 m above sea level, the rainfall in this region is very low all throughout the year, which does not allow crop cultivation however this region is the home to the traditional sheep and goat herders who provide part of the meat for the rest of the country, as for the temperatures it varies strongly between day and night in both summer and winter.

The winter months have moderately cool too very cold weather, averaging about 13°C, and January typically being the coldest month, also frost can be expected during the winter with occasional snow in the western and northern highlands. Summers are the longest, starting from the middle of May to the end of September, which reach a peak during August with daytime temperatures often exceeding 36°C and an average of 32°C. Before summer's dry season a hot and dry air from the desert is expected, due to low pressure, this is called the (khamasini) which are strong winds from the south or southeast that sometimes reach storm force usually accompanied by large dust clouds and a drop in relative humidity to about 10% and temperature rise to a 10°C to 15°C, these typically last for a day or more and can have significant effect on the rainfed crops. Also between June and September there is the Shamal wind from the north and northwest this is characterized by nighttime breezes that are usually dry and causes high daytime temperatures that become moderate after sunset.

In terms of rainfall, Jordan is generally arid with more than 90% of Jordan's total area receiving less than 200 millimeters rainfall per year, and more than 70% of the country receiving less than 100 millimeters, and only 2% of the area located in the north-western highlands has an annual precipitation exceeding 300 millimeters reaching as much as 600 mm, noting in general the amount of rainfall decreases from north to south and from west to east. (Medicinal and Herbal Plants Cultivation, for MOA/NCARTT 2002). The rain normally falls during winter and spring starting as early as November sometimes extending to April, with maximum amount being during January and February, most of the rainfall is in the form of rain or drizzle, but snow may fall on highlands and also hail is not unusual as it is associated with instability during winter fronts or thunderstorms.

As for rainfall in relation to crops, in the cultivated areas, where field crops and trees are grown, it has a high variability from season to season, even between months within the same season. This seriously affects crops productivity over the years.

Jordan is vulnerable to climate change and according to the National Biodiversity Strategy and Action Plan 2015-2020 it is predicted that the temperatures will increase 1-2 degrees centigrade by 2030-2050, as well as increase in evaporation from by soil moisture reduction, ass well as diminished recharge of aquifers and oasis, with projected shrinkage of grasslands that cover over 10% of Jordan, the strategy also projected a shift of semi-arid rangeland to become arid desert. Based on these implications on biodiversity Jordan deemed it necessary to Improve and continue its conservation planning and management.

2.2. WATER

Today, Jordan is going through a severe water scarcity, one of the ten most water scarce countries in the world, characterized by not enough freshwater resources to meet the water demand. Jordan lies in the heart of the Middle East landlocked with minimal coastline. Its drying climate, population increases through a succession of shocks of refugees along with the disadvantaged downstream location on the Yarmouk-Jordan River, will further increase the

vulnerability of the country's freshwater resources. Jordan is facing a deepening freshwater crisis due to the long-term decline in rainfall and declining groundwater levels and the closing of water resources from Israel as well as regional conflict and immigration. Jordan's per capita water availability has decreased from 3600 million cubic meters year in 1946 to 135 million cubic meters/year in the recent years putting the nation far below the 500 million cubic meters/year level of "absolute scarcity" (Research Article: Climate Change Effects: Increasing Drought In Jordan in Science Advances 2017)

The total annual renewable amount of water is about 789 million cubic meters, out of which 505 million cubic meters from surface water and 275 million cubic meters from groundwater resources. (Assessment of the Agricultural sector in Jordan, EU report 2012) Non-renewable groundwater resources are estimated at 240 million cubic meters per year in Disi and Jafr Basins. (Assessment of the Agricultural sector in Jordan, EU report 2012) Groundwater makes 70% of water in Jordan and groundwater aquifers were over pumped in 2006 which led to severe decline in the groundwater level. (Assessment of the Agricultural sector in Jordan, EU report 2012) The annual supply of surface water is 214.69 million cubic meters, with the Jordan Rift Valley contributing 108 million cubic meters. Springs account for 57.2 million cubic meters and base flows and floods account for 49.4 million cubic meters. Most of the surface water (73.5%) is allocated for agricultural activity, with about 152 million cubic meters allocated for the purpose of irrigation. Most surface water used for irrigation is used in the Jordan Valley. (Assessment of the Agricultural sector in Jordan, EU report 2012)

Irrigated agriculture is the major water consumer and accounts for 66% of the water consumed in year 2000 (Medicinal and Herbal Plants Cultivation, for MOA/NCARTT 2002). With the high population growth and the increase in industrial requirements It is expected that the demand for water from different sectors will grow fast, as a result irrigated agriculture will face serious problems in the future, and have to depend more on other water sources, such as treated wastewater. As well as the demand to introduce new technologies, crops and cropping patterns that could save water and maximize the return and also can grow and produce by using low quality water.

The Ministry of Water and Irrigation gave projections for the available water for the different sectors, it indicated that after 10 years, agriculture will have less fresh water, and will have to be more reliant on treated wastewater and by 20 years from now that will amount for around 30% of the available water for agriculture. Noting the amount of water available for agriculture will not change, it's just its quality that will significantly decline.

The water resources of Jordan consist of surface water, groundwater, treated wastewater

1) Surface water

The resources are unevenly distributed among 15 basins. River flows are generally of a flash-flood nature, with large seasonal and annual variation. The largest source of external surface water is the Yarmouk River and it is also the main source of water for the King Abdullah Canal that is considered to be the backbone of development in the Jordan Valley. The water

of Yarmouk River enters from Syria after first forming in the border, then it joins the Jordan River coming from Palestine. The natural annual flow of the Yarmouk River is estimated at about 400 million cubic meters , of which about 100 million cubic meters are withdrawn by Israel (FAO Irrigation in the Middle East region in figures – AQUASTAT Survey 2008).

The total actual flow is much lower at present as result of the upstream Syrian development works that started in 1980s as well as a result of the drought, today decreased to 83-99 million cubic meters (UN-ESCWA and BGR (United Nations Economic and Social Commission for Western Asia; Bundesanstalt für Geowissenschaften und Rohstoffe, 2013).. Inventory of Shared Water Resources in Western Asia- Jorden River B.) There is also the Zarqa River that is considered the main branch of the Jordan River, and controlled by the King Talal Dam and also feeding the King Abdullah Canal. There are also 10 small rivers, called “Side Wadis” going from the mountains to the Jordan Valley. Other basins include the Mujib, the Dead Sea, Hasa and Wadi Araba.

2) Groundwater

This resource is distributed among twelve major basins, ten of which are renewable groundwater basins and two in the southeast of the country fossil groundwater aquifers. At the present most of it is exploited at maximum capacity, in some cases beyond safe yield. From the twelve groundwater basins, six are being overexploited, four are balanced and two are underexploited. The overexploitation of groundwater resources has decreased the water quality and reduced exploitable quantities, resulting in the abandonment of many municipal and irrigation water-well fields.

Total internal renewable groundwater resources have been estimated at 500 million cubic meters per year, of which 253 million cubic meters per year constitute the base flow of the rivers. Groundwater resources are concentrated mainly in the Yarmouk, Amman–Zarqa and Dead Sea basins. The safe yield of renewable groundwater resources is estimated at 275.5 million cubic meters per year (Assessment of the Agricultural sector in Jordan, EU report 2012).

The main non-renewable aquifer is the Disi aquifer (sandstone fossil) in southern Jordan and it is presently exploited, with a yield estimated at 125 million cubic meters per year for 50 years. Other non-renewable water resources are found in the Jafer Basin, with the annual yield of 18 million cubic meters. The Water Authority of Jordan estimates that the total yield of fossil groundwater is 143 million cubic meters per year for 50 years. (FAO Irrigation in the Middle East region in figures – AQUASTAT Survey 2008)

Ten dams have been constructed in the last five decades with a total reservoir capacity of around 275 million cubic meters. The main dam is the King Talal Dam on the Zarqa River, with a total reservoir capacity of 80 million cubic meters. The Unity Dam on the Yarmouk River shared between Jordan and Syria with a total reservoir capacity of 110 million cubic meters. All the dams are built on the Side Wadis with their outlets to Jordan River with the exception of the Karamah Dam on Wadi Mallaha. They are used to store floods and base flows and to

regulate water and release it for irrigation. A regulating dam was built on the Yarmouk River downstream of the diversion point of King Abdullah Canal, in accordance with the Jordanian Israeli treaty's water annex. (FAO Irrigation in the Middle East region in figures – AQUASTAT Survey 2008).

Below map shows the location of the rivers and dams:

Dams along rivers and side valleys in Jordan, (Fanack after Jordan's Water Resource Challenges and the Prospects for Sustainability Amelia Altz-Stamm GIS for Water Resources Fall 2012)

3) Treated Wastewater

Over the last three decades sewage water networks have been constructed in cities and towns with twenty-three sewage treatment plants in operation to serve around 70% Jordan and this treated wastewater is used in irrigation. More than 80% of sewage water of the Greater Municipality of Amman is treated in four plants and then released into the Zarqa River. The mixed water is then stored in the King Talal Dam reservoir to be used in irrigation in the middle Jordan Valley irrigation schemes which constitute 78% of the treated wastewater. A small quantity of around 9 percent is used for irrigation in the Zarqa River

catchment area. Treated wastewater from the other plants is used around the plants and/or mixed with surface water to irrigate areas in the Side Wadis. (FAO Irrigation in the Middle East region in figures – AQUASTAT Survey 2008)

As mentioned earlier, rapid population growth coupled with increased urbanization and industrialization are leading to the over-exploitation of aquifers adding to this the contamination of diminishing supplies through: Inadequate industrial and municipal wastewater treatment capacities; the location of industrial plants near or immediately upstream from freshwater supplies; and overuse and misuse of pesticides, insecticides, fungicides and fertilisers leading to pollution of ground and surface water resources by irrigation drainage. Other surface waters affected by pollution are wadis, creeks, rivers and dams lying downstream from wastewater treatment plants and solid waste disposal sites. (Environmental Issues in Jordan, Solutions and Recommendations article in American Journal of Environmental Sciences, 2007)

The King Talal Dam reservoir, Jordan's largest surface reservoir is not a dependable long-term water source, as it is threatened by the emission of untreated waste into the reservoir's tributaries, raising salinity and levels of chemical and metal. In addition, many valleys are dammed which means that their waters are collected in reservoirs, these too are reported to be overly enriched with minerals and nutrients which induce excessive growth of algae that resulted in oxygen depletion of the water. (Environmental Issues in Jordan, Solutions and Recommendations article in American Journal of Environmental Sciences, 2007) Noting that Groundwater salinization and agricultural residues also influence surface waters.

The chaotic nature of the surface water levels frequently minimizes levels of trapped water, sometimes reducing them to below the dam's holding capacity of 86 million cubic meter. Meanwhile, pollution has played a role in these reduced water supply levels as factories dispose of untreated waste materials in the tributaries leading to the dam, rendering this water supply not useful due to the raised levels of chemicals and metals. Also, some water wells in the Amman-Zarqa catchments area in 1990 showed heavy contamination with TDS, Na, Cl and NO3. (Evaluation of chlorinated pesticides residues in foodstuff of animal origin from middle districts of Jordan in 2013–2014)

2.3. SOIL

The distribution of soils in Jordan follows closely the climate and topography, the geology includes basaltic rocks, sandstone, limestone, chalks, marls and cherts (Soils of Jordan 2001), This wide range in physical features has produced an equally wide range of soils and landscapes. Many soil surveys were carried to classify and the soil in Jordan and started in 1947 using the US soil classification system of 1938, other surveys also conducted using this classification in 1959 and 1974 and twelve great soil groups are recognized:

Terra Rossa, Red Mediterranean Soil, Basalt Soil, Grumusol, Rendzina, Mountain Marl, Regosols and Lithosols, Yellow Mediterranean Soil, Chernozemic-like Soils, Yellow Soil, Yellow Steppe Soil, Grey Desert Soil, Jordan Valley or Alluvial Soils, Solonchak, Gypsum Soils.

other surveys were conducted in specific areas of Jordan using U S Soil Taxonomy which became the official classification of soil , adopted by the World Reference Base for Soil Resources (WRB) and accordingly classified the soil in Jordan by their taxonomy to four great groups namely:

Aridisols (Soils with aridic moisture regime), Vertisols (Deep cracking soils, mostly red), Entisol (Very weakly developed initial soils) and Inceptisols(Moderately developed soils, in Jordan mostly red) (Atlas of Jordan: History, Territories and Society 2013)

However, the classification of the soil according to topography will be discussed here as follows:

1) Highlands are non-cracking soils and cracking with a texture clayey to shallow heavy loamy, this soil is mainly red and yellow Mediterranean soil with high water holding capacity. The soils are generally calcareous which have a fair nutrient level but suffer from nitrogen and phosphorous deficiency and in many areas suffer iron and manganese deficiency.

2) Steppe region (marginal areas) soils are deep to moderately deep, slightly gravely, with fine siltloam texture composed of sand, silt and some clay found in the surface and subsoil layers. The subsoil layers are characterized as rich in CaCO3, and the surface layer is dark, yellowish brown to brown in color. The high silt content of the surface soil and the absence of suitable organic content makes the soil low in water storage capacity due to the poor penetration rate of the water. This cripples the vegetation growth and more soil degradation occurs. These soils suffer from deficiencies of nitrogen and phosphorus and are highly prone to water and wind erosion particularly when disturbed by ploughing or grazing.

3) Jordan Valley and Wadi Araba. The soils are weakly-developed soils mostly alluvial, saline, sandy and granitic. In the north of the Valley, the soils are deep and of moderate to medium structure. These soils have good water holding capacity and are relatively fertile.

4) The Desert region soils are in general low in organic matter, sandy to sandy loam in texture, often highly saline or alkaline with no vegetation growth, these soils have a very low water holding capacity and fertility. Additionally, the soil depth varies considerably from one place to another. In the north it is considered basalt area with soils are deep clay and well-structured and occur below the moderately weathered basalt pavement. Recent soils are saline, rather silty either due to the effect of wind residues or are like the soils which occupy the mudflats, on the other hand older soils are clayey, deep, and contain higher amounts of CaCO3. In the middle of Badia and to the south of Azraq area the soils become saline and contain gypsum. In the south around Disi and Mudawwara the soils are sandy formed from the weathered sandstone shale and granite. (Assessment of the Agricultural sector in Jordan, EU report 2012)

3. BIODIVERSITY

Jordan's distinctive location at the intersection of three continents renders it as a rare case of rich biodiversity, as Jordan comprises four different bio-geographical regions: The Mediterranean, Irano-Turanian, Saharo-Arabian, and the Sudanian Penetration. The existence of those different regions in a small country embraces the richness of landforms and biological diversity in terms of species, landscapes and ecosystems. The four regions provide the natural habitats for over 4,000 species of fauna and flora that fall into thirteen types, whether it is terrestrial, marine or freshwater environments as well exotic genetic resources.

The country is home to around 2543 species of vascular plants representing 1% of the world flora. It also hosts 644 animal species of which: 83 are mammal species, 436 species of birds, 348 species of fish and around 300 species of soft and hard corals. The formation of the Jordan Rift Valley many millions years ago is a major reason for the country's diversity, as its formation also produced the high western mountains causing a great fluctuation in altitudes from around 400m below sea level in the Dead Sea up to more than 1850 m at the southern heights. Besides that, the rest of Jordan is mainly desert consisting of basalt or Hammada, a unique ecologically rich ecosystem that is recognized in Jordan and Syria. As for the classification of Jordan's biodiversity, it is mainly based on the country's eco-regions, ecosystems and vegetation types. (Jordan Biodiversity First National Report 2001)

3.1. Bio-geographical Regions

Mediterranean

It is limited to the highlands starting from Irbid in the north to Ras Al-Naqab in the south in addition to some isolated areas in the mountains of Wadi Rum in the South. Altitudes vary from 700 to 1850 m above sea level. The rainfall ranges from 300 to 600 mm. The minimum annual temperature ranges from 5-10º C and the maximum from 20-30º C. Soil is mainly red and yellow Mediterranean soil. This region includes the most fertile part of the country and inhabits 90% of the population.

Irano-Turanian

A thin strip of varied width that surrounds all the Mediterranean eco-zone apart from the north. It does not contain any trees, but mainly consists of small shrubs and bushes. Altitudes vary from 500-700 m, and rainfall from 150-300º mm. Annual minimum temperatures range from 5-2º C, and mean annual maxima range from 15-25º C. Soil is calcareous or transported by wind.

Saharo-Arabian

This is the eastern desert (Badia) that encompasses the largest part of Jordan covering around 80% of the country's total area. Altitude is between 500-700 m. The mean annual rainfall is from 50-200 mm; mean annual minimum temperatures are from 15 -2º C and mean annual maxima are from 25-40º C. The soil in this region is poor (clay, hamada, saline, sandy or calcareous). Vegetation consists mainly of small shrubs and annuals in the wadi beds.

Sudanian Penetration

This region begins from the northern part of the Dead Sea and ends at the tip of the Gulf of Aqaba in the south along the Dead Sea depression and Wadi Araba. This region is considered the lowest point on earth (410 m below sea level near the Dead Sea). Rainfall is from 50-100 mm, the mean annual minimum temperature is from 10-29º C, and mean annual maximum temperatures are from 20-35º C.Soils are mostly alluvial, saline, sandy and granitic. The only inland sand dunes are present in this region. The vegetation is known for tropical tree elements along with few shrubs and annual herbs. (Atlas of Jordan 2013)

3.2. Vegetation Types

The vegetation map of Jordan developed by Al-Eisawi in 1985 and 1996 is the main scientific reference to the classification of floral biodiversity. It was then updated by The Royal Society for The Conservation of Nature (RSCN) in cooperation with the Ministry of Environment, academia and other international partners as follows: (The Plants of Jordan, An Annotated Checklist, Royal Botanical Gardens 2016)

- Pine forest (Pinus halepensis)
- Evergreen Oak forest (Quercus calliprinos)
- Deciduous Oak forest (Quercus ithaburensis)
- Juniper forest
- Mediterranean non-forest region
- Steppe vegetation (Ziziphus lotus, Ferula communis)
- Halophytic (Haloxylon persicum, Arthrocnemum spp.)
- Sandy dunes
- Hammada (Retama raetam, Artemisia herba-alba, Tamarix spp. Astragalus spp., Anabasis spp.)
- Tropical
- Acacia and rocky vegetation
- Hydrophytes
- Mud flats

3.3. Plant Genetic Resources

Jordan is considered a center of origin to a great diversity of landraces, old cultivars, wild species and wild relatives of wheat and barley, legumes, olives, lentils, chickpeas, almond, grapes and figs. These crops and products derived from them play a central role for the food security and livelihood of Jordanian farmers.

Many crop species are on the verge of extinction, as plant diversity is facing major decline and are on a high risk of extinction. At present, around 200 and 250 plant species are nationally rare and 100 to 150 species are nationally threatened.

Triticum dicoccoides the direct ancestor of durum wheat is one of the most threatened species in Jordan, other crops such as wild almond and ancient olive trees are on the verge of extinction as during the course of history they were replaced by new varieties. Wild plants' diversity is also radically decreasing and now are rarely found in the wild. This is the consequence of many actions, whether political, economic or social, that are leading to the destruction of natural habitats and ecosystems. Furthermore, proper studies on genetic diversity for various species are lacking such as Sumac, native pomegranate, figs and pistachios. (Draft, The Second Country Report on the State of the Plant Genetic Resources for Food and Agriculture,National Center for Agricultural Research and Technology Transfer)

3.4. Challenges

Despite its rich biodiversity, Jordan's nature is facing numerous threats and challenges; from the loss and degradation of habitats, extensive agricultural, over exploitation and over harvesting of plant species, introduction of invasive species, water shortages, intensive use of agro-chemicals, population pressure, land use legislations, pollution, climate change, overgrazing and urbanization. These challenges highly affect all production systems of crops, forestry, and livestock all over the country affecting its biodiversity. (The National Biodiversity Strategy and Action Plan (2015-2020), Ministry of Environment).

Additionally, existing local policies on loss of biodiversity for food and agriculture are not effective and need to be revised, as thorough national studies, regarding fauna for food and agriculture are limited and lack proper scientific documentation. In November 2015, the Royal Botanical Gardens published The Jordan Plant Red List, Volume 1, which only includes the natural wild flora species.

Other issues pose challenges to biodiversity are related to the existing scientific studies that lack accuracy in terms of numbers and need significant validation, and plant diseases lack proper research, as well as the effect of climate change on the production systems biodiversity is unidentified.

In addition, one of the most critical challenges that is facing the different production systems and affecting the country's biodiversity is the lack of connection between science and development. As various studies and research is being carried out with little implementation on the actual ground.

3.5. Biodiversity and Traditional Knowledge

Traditional knowledge on biodiversity for food and agriculture in Jordan is decreasing and is limited to the elderly, this cultural heritage highly vulnerable and in danger of getting extinct as it is not documented and researched properly. Economic, social and political factors influenced conservation of this knowledge and its passing from a generation to another.

Although some forms of use of resources for food and medicine are previously documented (NCARE, 2008) with special interest on the sustainable cultivation of medicinal wild plants, most of the plants that are used in traditional medicine are still not registered in any official sources and have not been properly studied or researched. The existing studies focus mostly on the medicinal herbs of Jordan rather than all edible plants and crops. (FAO, 2013, Country Report: Jordan: The State of Jordan's Biodiversity for Food and Agriculture)

3.6. PROJECTS OF INTEREST ALREADY IN TERRITORY

A. The National Center for Agricultural Research and Extension (NCARE)

An agricultural research and extension center mainly working on agricultural sectors research and development; bee keeping, biodiversity, field crops, horticulture, livestock, olive trees, plant protection, range and forestry, socioeconomic, water soil and environment.

Examples of related projects:

1) NCARE established a full Program of Biodiversity, Plant Genetic Resources and Medicinal Herbal Plant; this program hosts the national seed gene bank that contains crop wild relatives and land races conserved seeds exsitu, where more than 4000 accessions are documented for use.

2) Agrobiodiversity Project (2001-2004): The project focused on the issues and the solutions to agrobiodiversity threats for 16 target species and was mainly a learning project. Its primary results and objectives were awareness raising, capacity building and knowledge creation.
3) Jordan Conservation of Medicinal and Herbal Plants 2008-2010: design and test models to improve the conservation of medicinal and herbal plants and the livelihood of rural communities. The project places emphasis on improving water resource management and environmental protection as a means to fight poverty.

4) National Programs of NCARE for Conservation of Wild Species from 2015-2018: Survey, collecting and hot spot identification of CWR and of selected Jordanian vegetable crops and their wild relatives.

5) NCARE Herbarium. (Continuous Project): Floral survey of all local ecosystems for authenticating vegetation cover of different habitats and conservation of herbarium specimens representing native species.

6) Badia Ecosystem Livelihood Project Component of Vegetation Assessment and Restoration (2010): Determination of Floral covers and status reports of vegetation cover of 3 designated range land reserves (Wadi Bayer, Husineyh and Hashimeyh). Restoration of the habitats with certain emphasis on endangered species.

7) Collection, Conservation and Utilization of Crop Wild Relatives of Vegetables Native to Jordan.(2015-2020).
8) Collecting Wild Relatives of Barely (Hordeum vulgare ssp. spontaneum) in Jordan,(2012): Collecting seeds for further diversity analysis. Comparing new samples with old germplasm to assess changes in genetic diversity and adaptation to environmental changes over time.

B. The Royal Society for the Conservation of Nature (RSCN)

The Royal Society for The Conservation of Nature (RSCN) is an independent voluntary organization devoted to the conservation of Jordan's natural resources. RSCN has the mission of protecting and managing the natural resources of Jordan, for it is responsible for protecting wildlife and wild places.

Examples of related projects:

1) Establishing seven protected areas covering over 1200 square kilometers. These areas comprise of wild plants, animals and other natural resources.

2) Sustainable Use & Conservation of Herbal & Medicinal Plants: This project aims to improve the conservation of medicinal and herbal plants.

C. Ministry of Agriculture(MOA)

The Ministry of Agriculture is a governmental institute, its main role is regulation of the agricultural sector in line with national goals to contribute to the achievement of sustainable development with the preservation of the environment and agricultural resources and promoting self-sufficiency, rural development, linking production requirements of the internal and external markets.

Examples of related projects:

1) The establishment of The Forestry Department/ Ministry of Agriculture on the Sustainable Use of biodiversity.

2) The Seed Centre at the Forestry Department/Ministry of Agriculture, which focuses on genetic materials and biodiversity conservation. Its activities include collecting indigenous and threatened species, documenting accompanying data, and carrying out experiments to determine best germination procedures for each species. The Seed Center has seeds of about 100 forest trees and rangeland shrubs species preserved and provides forest nurseries with seeds every year.

3) The adoption of the bylaw (G9/2008) under the agricultural law No. 44 of the year 2002 which deals with positive incentives given to communities in and around forestry areas by allowing local communities –under special regulations- to collect fruits and wood logs and to cultivate mushrooms in caves located near to their residence. Moreover, each family is allowed to make benefit of bare forest area (1,000 m2) to cultivate medicinal and ornamental plants as an income generating project. In return the local community members are expected to help in forestry resources protection efforts. Nowadays, about 50 families are benefiting from this project.

4) National reserves established by MoA, and Royal Society for Conservation of Nature (RSCN) that improved the Ecosystem services in temperate, sub-tropic and Badia production systems.

D. The Ministry of the Environment (MOE)

The ministry was established in 2003, the ministry seeks to maintain and improve the quality of Jordan 's environment, conserve natural resources and contribute to sustainable development through effective policies, legislation, strategies, monitoring and enforcement and by mainstreaming environmental concepts into all national development plans.

Examples of related projects:

The ministry developed the Biodiversity strategy and action plan 2015-2010

E. Royal Botanic Garden (RBG)

Is a non-governmental non-profit entity that was founded in 2005 to conserve the flora and biodiversity of Jordan by propagating and displaying native plants, rehabilitating habitats at the whole-systems level, conducting research, demonstrating sustainable practices, and sharing information.

Examples of related projects:

1) Habitat Re-Creation Project**:** Restoring three Jordanian Habitats and demonstrating two at the Royal Botanic Garden

2) National Herbarium of Jordan

The National Herbarium of Jordan launched the National Virtual Herbarium (NVH) on January 12, 2012, to allow online consultation of specimens from all of Jordan's herbaria. More than 2,700 specimens are now available onscreen at the NVH, and specimens will continue to be added until the entire flora of Jordan is represented.

3) Preparation of several Native Plant Conservation Strategies:
   - Flora of Jordan;
   - The Jordan Plant Red List;
   - Wild Socioeconomic Plant Conservation Strategy for Jordan;
   - The Plants of Jordan - An Annotated Checklist;
   - Native Plant Database

4) Seed Bank
   In 2009, the RBG Seed Bank began collecting seeds from native plants growing at Tal AlRumman site. So far, the bank contains seeds for around 180 plant species of Jordan. (The State of Jordan's Biodiversity for Food and Agriculture, Country Report, Joran, FAO 2013)

4. AGRICULTURE PRODUCTION SYSTEMS

The agricultural sector is equally shared by two subsectors: 55% livestock production and 45% cropping. About 4.7% (4.20 million dunum) of the land surface is considered cultivable land of which 25% is under irrigation and 75% rain-fed (Assessment of the Agricultural sector in Jordan, EU report 2012). The most fertile and productive agricultural areas are in the Jordan Rift Valley in the west part of the country, mainly based on marginal water resources, whereas irrigation in the highlands is based on groundwater.

4.1. Crop Based Production Systems

Farming system in Jordan is mainly dependent upon water availability. Due to scarcity of water and low rainfall only about 380 KM2 are suitable for cultivation and only 17% of this area is irrigated. (Medicinal and Herbal Plants Cultivation, for MOA/NCARTT 2002).

4.1.1. Rain-fed Production Systems

This system comprises of 89.3 million d**unum** and is distributed in the highland to the east of the Rift Valley; in Irbid, Ajloun and Jerash in the north, Amman, Madaba in the center, and Karak, Tafelah and Showbak in the south. These areas are highly populated having the country's labor force and the major local markets. The system is based on annual rainfall and land characteristics, and can be divided into: arid zone which receives less than 200mm annual rainfall, the marginal zone region which receive 200-350 mm, the Semi Arid Zone which receive from 350-500 mm, Semi Humid Zone which receive around 500 mm annual rainfall. (THE STATE OF JORDAN'S BIODIVERSITY FOR FOOD AND AGRICULTURE, Country Profile FAO 2013) This system includes the fruit trees, forestry, wheat, barley, and the range land.

1) Fruit Trees Production System

This system is located in the areas which receive more than 400 mm of annual rainfall, with hilly and mountainous land. It covers the hills and mountains in Ajloun, Jerash, Salt, Amman, Madaba, Karak, Tafeleh and Showbak. By the year 2000 the area planted with fruit trees was 539 thousand **dunum**, 89% was occupied with olive and the rest of the area planted with grape, fig, apple, almond, peach, apricot, pear and plum. (Medicinal and Herbal Plants Cultivation, for MOA/NCARTT 2002).

2) Forestry Production System

Jordan has limited forest resources, with about 1 percent of the country classified as forest rain-fed (Assessment of the Agricultural sector in Jordan, EU report 2012). However these forests are generally neither productive nor capable of producing good quality wood for commercial or industrial purposes, still they provide important services, including contribution to soil conservation, watershed management, aesthetic and recreational value, biodiversity

conservation and carbon fixing. The forests in Jordan consist of natural and man-made forests and are in government owned areas. The forest cover and diversity were affected by urban and agricultural development, deforestation, and deterioration of rangelands by overgrazing and soil erosion. Forests in Jordan play only a modest role in meeting the needs for timber products, however, The existing limited industry produces firewood, Furniture, and fruit boxes, as well as some mushrooms, wild fruits, aromatic and medicinal plants.

Natural Forests represent only 0.44 % of Jordan's total land area 500,800 dunum and over half are considered to be degraded by having a very poor density of less than 20 % and very limited capacity to only be regenerated by rain (Assessment of the Agricultural sector in Jordan, EU report 2012). These forests are mainly in northern-west areas of the country in Ajloun/Jerash/Irbid highlands with dominance of Oak species. They are mainly considered degraded forests. They are not commercial timber producing forests, however, a significant number of rural communities depend on them for their daily life needs and occasionally for small scale trade.

Planted Forests were established on public lands that cover an estimated 450,000 **dunum** which less than 0.5% of the area of the country mainly planted during the 1960s-1980s located where rainfall is above 200 mm, distributed mainly to the north and middle mountains of the rift valley in the regions of Irbid, Ajloun, Jerash, Balqa, Amman, Madaba, and Karak and Dana occupy between 20-30% of their land area rainfed (Assessment of the Agricultural sector in Jordan, EU report 2012). These forests are mainly Pine, Cyprus, and mixed forests dominated by non-native species and mainly have recreational functions for domestic tourism. The ministry of agriculture often uses them for greening and soil conservation.

3) Wheat Production System

Located in areas that receive between 300 to 400 mm annual rainfall, with a land slope less than 9% (Medicinal and Herbal Plants Cultivation, for MOA/NCARTT 2002). This area is the main field crop production characterized by high rainfall and small farming properties. The production system is based on wheat that occupy more than 70% of the total cultivated land in these areas, with flexible two years or three years crop rotation, that easily accommodate new winter and summer crops. The crop rotation is usually with food legumes (lentils and chickpeas), and also includes summer crops such as summer vegetables and tobacco, also some medicinal and herbal plants such as cumin, anis,and fenugreek. In the last three years, fruit trees, mainly olives, started to enter the production system in these areas. The strategy in the past is to plant field crops in land with a slope less than 9%, and fruit trees in areas with slopes exceeding 9%, this has not been strictly followed, and more olive trees are now planted in areas suitable for annual field crops.

4) Barley Production System

This system is located in areas that receive between 200 to 300 mm annual rainfall extending from the north to the south of Jordan and located to the east of the Western Highland, and to the west of the desert. The major crops grown are barley and some wheat, both are grown in

rotation with fallow. The productivity of these areas is usually unstable and depends on the amount of rainfall received. Farmers in these areas, usually own small ruminants (sheep and goats) are traditionally raised on rangelands where animals graze the natural vegetation and those who do not own animals, sell their products to the sheep owners. In dry years, the crop is grazed directly by animals.

5) Range Land Production System

This system occupied the largest area in Jordan the Badia and occupy around 80% of the land mass (Assessment of the Agricultural sector in Jordan, EU report 2012), located in the eastern part of the country it consists of the range land area and the desert, and the highest productive areas are located in the very low annual rainfall zones 100-250 mm mainly steppe grassland and brush and it is dominated by the natural range land plants, some of which are important medicinal and herbal plants such as Yarro, Lavender Cotton, Alhagi, Aloe, Worm Wood, Caper Bush, Cactus Pear, Peganum, and Headed Thyme. The inhabitants of the area are the Bedouins who are using these plants to cure certain ailments in humans and animals. Currently range vegetation provides between 0-90 days of supplemental grazing each year to Badia livestock depending on the location and the rainfall. Grazing is performed twice: in the spring and in the autumn. However, the natural vegetation is severely degraded due to overgrazing by sheep and goats, uprooting the whole plant to be used for fire or cooking, and forging to be used in folk medicine.

4.1.2. Irrigated Production Systems

As mentioned before, the irrigated areas in Jordan are located either in the Jordan Valley or in the highland. The major irrigation water in the Jordan Valley is the surface water from the Yarmouk river that is collected in dams such as King Hussein dam, as for the highlands the water source is mainly from underground water.

1) The Jordan Valley Production System:

The Jordan Valley is considered a natural greenhouse with some 0.3 million dunum cropped land (Jordan, Water Along the Food Chain, FAO/EBRD 2015), depends largely on irrigation where farmers are using mostly drip irrigation systems to save the water as it is a scarce resource in Jordan. Greenhouse cultivation systems increase productivity and allow for two or sometimes three seasons of vegetable production. The Jordan Valley is characterized by its fertile soil and unique climate with long day hours and high temperatures and the ability to produce fresh products in winter. Also the area is considered the food basket of Jordan where high quality and high return fruit and vegetables are being produced outside the season. Accounts for a limited 23% of the entire Jordanian fruit and vegetable land use but it produces almost half of the national output of these crops. Over half of Jordan Valley lands are used for vegetable production, while more than one-third is under fruit crops.

Fruit trees are grown on 35% of the cropped lands; 18 % of which is citrus, 7% is banana which is a profitable and the most water-consuming crop grown, date palm was 3% by 2015 and is expanding rapidly, 19 % of the area is farmed with mixed fruit trees including grapes and peach (Jordan, Water Along the Food Chain, FAO/EBRD 2015). Vegetables land use includes mainly tomatoes, squash,cucumbers and eggplants. In terms of output, tomatoes are the leading crop, followed by cucumbers and eggplants. While vegetables in the valley are mainly produced in the winter, few farmers, with modern greenhouses (temperature controlled) and proper management systems, produce summer vegetables in a profitable way.

The Jordan Valley is where a variety of long-term intensive greenhouse agricultural activities (i.e., irrigation, fertilization, etc.) are undertaken.it is also where the presence of pesticide residues in soil is a matter of serious concern as many compounds have been shown to produce adverse effects. (Jordan, Water Along the Food Chain, FAO/EBRD 2015 Extensive use of pesticides of all kinds has created severe problems related to pesticide residues in soil, pest resistance to pesticides, and health hazards including high residue of chemicals in breast milk for women in the Jordan Valley.

2) The Highlands Production System

The production system in the highland depends mainly on fruit trees and vegetable plantations. Large areas were planted with olive and other stone fruit such as apples, peaches and almond. Farmers have also successfully grown oregano, mint and sage and made good profits. The vegetables in the highlands are being produced in two seasons: winter and summer.

4.1.3. Medicinal Herbs And Aromatic Plants Production System

This system possesses higher water use efficiency, relatively higher economic returns to conventional crops, and the potential to add value by processing and marketing. Utilizing the unique climate and diverse agro-ecosystems of Jordan allows production on large and small-scales across all seasons of the year. Production and export of fresh herbs is very feasible in Jordan. Fresh herbs can be produced around the year in Jordan due to the multiple ecosystems in the country but particularly because of warm conditions in the Jordan Valley during the winter. The crops traded in local markets are: – mint, parsley, sage, oregano, fennel, purslane, coriander, cumin, anis and fenugreek are the most prevalent. The demand for fresh herbs is generally increasing. The amount of herbs marketed reached 15,000 Tonnes in 2004 (Assessment of the Agricultural sector in Jordan, EU report 2012).

4.1.4. Organic Farming Production System

Starting in 2008 and by 2009 Jordan developed a National Program for Organic Farming, and then the Ministry of Agriculture established a separate organic farming section to enhance the

productivity of organic farming and successfully enrolled part of the local community in this field, now more than 98 farmers started to shift to organic farming. In 2015, new organic farmers' markets have been opening in Amman promoting sustainable development and local organic produce and vegetables, a small community of like-minded farmers and consumers is slowly raising awareness about the importance of sustainable farming practices and healthy eating. (Critical Obstacles to Adopt the Organic Farming in Jordan: From Marketing Perspective, 2019).

However, there are obstacles facing farmers in regard to organic methods such as the high cost of producing organic crops due to higher cost of fertilizer for organic crops, crop rotation, post-harvest handling cost, organic certification and cost of covering higher loss. In addition to the weak financial capacity of farmers, the absence of a specific market for organic products, and the brokers who share profits with those farmers. In addition to the weakness of knowledge regarding the organic farming among farmers all are critical factors that affect the adoption of organic farming in Jordan.

Also, a large obstacle to the promoting organic farming is the lack of an organization to assess and give certification to organic produce (Towards a Green Economy in Jordan, 2011). In addition to the lack of an organization that can independently assess if the produce sold by farms are organic for real. Also, the organic farmers are failing to compete with the prices of conventional vegetables. (Critical Obstacles to Adopt the Organic Farming in Jordan: From Marketing Perspective 2017)

4.1.5. Aquaponics Production System

Aquaponics in Jordan is very recent and was first introduced in 2012 through a partnership with ETH Zurich sustainability summer schools utilizing Jordan's advanced greenhouse horticulture production practices, this system is considered one of the best techniques for country, as this system provides a reliable, predictable, and consistent food production and has proven to be suitable for arid and semi-arid regions as it targets the two main growing concerns including the diminishing soil quality and availability, and water scarcity and in general hydroponic farming has also shown to be economically and environmentally advantageous to traditional soil farming.

Now, there are about 12 domestic / small-scale systems in Jordan, though only half are currently operational. They range in size from 25 to 30 m2 and use tilapia often situated on rooftops. (Report of the FAO Technical Training Workshop On Advancing Aquaponics: An Efficient Use Of Limited Resources, 2015) More recently, applied experiments have been conducted by the National Centre for Agriculture Research and Extension (NCARE) of the Ministry of Agriculture in three different locations, each of these projects uses single-span plastic greenhouses of about 500 m2. In addition, the Bait Ali Hotel in Wadi Rum uses a small aquaponic system located within a 100 m2 greenhouse to supplement the restaurant's needs and provide educational opportunities.

The most common aquaponic vegetables are strawberry (50 farms; 75 ha), cucumber (9 farms; 13 ha), ornamental plants (30 farms; about 45 ha) as well as lettuce and herbs (few). Most farms use plastic-covered raised beds with micro drip irrigation under greenhouse / high-tunnel conditions. (Report of the FAO Technical Training Workshop on Advancing Aquaponics: An Efficient Use Of Limited Resources, 2015)

4.2. Livestock Production Systems

More than half of the agricultural holders were found to keep animals, and the animal production accounted for 55% of the agricultural gross domestic product in 2006 (MOA, 2007). Most livestock in Jordan consist mainly of small ruminants of sheep and goats, cows, poultry, however horses (estimated to be around 400 heads), camels (11 thousand) and donkeys (estimated at about 18, 000 heads) are also raised for labor although camels produce milk but it is mostly for the use of the small rural communities in the Badia regions.

4.2.1. Small Ruminants (Sheep And Goats)

They are the most important livestock breeds raised in Jordan, the main production system is semi intensive and depends mainly on rangeland and stubble grazing, the intensive system is so rare and only found in few governmental stations and private farms. Sheep are distributed mainly in the east and south of Jordan while goats are mainly concentrated in the mountainous areas, however many farmers mix sheep and goats in one flock, Sheep and goats are raised in Jordan for multiple purposes; milk products, meat, wool, hair and hides, Sheep contribute up to 28% of locally produced milk, while goats represent about 6-8% of the fresh milk supply. About 57% of the small ruminants are raised in Northern Jordan, 27% in the Center and 16% in the South. Although the number of small ruminants has increased slightly over the years, the number of livestock producers has been declining indicating an increase in large scale commercial operations and movement of small herders out of their traditional livelihood occupation as the number of sheep and goat keepers was reduced from 29,650 families in 2010 to 25,469 in 2011 (Assessment of the Agricultural sector in Jordan, EU report 2012).

4.2.2. Cows and Dairy Farming

Cattle in Jordan belong to several breeds, during the last two decades most of the farmers have replaced their local cows with high yielding Holstein Friesian due to its high productivity as local cows yield less milk and have low growth rate and fertility. The main system for cattle is the intensive system and cows raised under this system are totally imported cows (Holstein-Friesian), however the local breeds and crossbreeds are raised under semi-extensive system.

The dairy industry plays an important role in the economy of Jordan. In the early 70's, Jordan established a program to promote dairy farming - new breeds of more productive dairy cows were imported, farmers learned to comply with top industry operating standards. Today there are 25 large dairy companies across Jordan. While milk production continues to steadily increase at 78% of the market demand in 2015 according to the Ministry of Agriculture—the country is

well below the production levels required for self-sufficiency. (Market System Assessment for The Dairy Value Chain Irbid & Mafraq Governorates, Jordan March 2017).

Cattle farms are scattered all over the countryside but concentrated in middle and northern parts of Jordan specifically Mafraq and Irbid and characterized by industrial-scale farms, processing plants, small-scale farms and dairy shops respectively. 50% of the farms are located in Mafraq governorate and 15% in Irbid, according to the Ministry of Agriculture (Market System Assessment for The Dairy Value Chain Irbid & Mafraq Governorates, Jordan March 2017). The Mafraq dairy market is large and medium sized industrialized dairy farms with 200- 4000 cows who sell to supermarkets in major cities, still there are also small farms and herders, as well as household dairy processing operations. As for Irbid dairy market it entirely small dairy farms (up to 40 cows), Small-scale production systems also exist in other different regions in the country where the farm size ranges from 1 to 10 dairy cows, particularly in the northern highlands where they have been rearing cows a long time ago using local breeds, and in the Jordan Valley (Ghor region). However the production systems in the Jordan Valley region are slightly different from dairy farming in the highlands, as the dairy in Highlands is fed from fodder (e.g. alfalfa) and grain crops grown under irrigation in quantities and quality that meets the nutritional demands of the cows.

4.2.3. Poultry

Forty-five years ago Jordan was completely dependent on the small-scale production of poultry to meet the consumption requirements of chicken meat and table eggs, with a quantity of table eggs being imported to satisfy the market requirements. The commercial poultry industry has undergone a rapid development in recent years due to shortage in the supply of competitive products (red meat) and their high prices production cost compared to that of poultry, as a result poultry production in Jordan achieved a high level of self-sufficiency, whereas broiler meat reached 95% and egg production 100% (Poultry sector country review FAO 2008). Poultry production falls under three distinctive systems: Industrial, other commercial and village/backyard productions.

1) Industrial integrated system

What makes this system distinctive is that the producers establish integrated production systems with sophisticated modern farms and marketing facilities. This system consists of the boiler meat and egg production that are marketed commercially. The broiler meat represents around 35% of the broiler market, and the production companies have their own breeding farms, hatcheries, broilers farms, feed factories, slaughterhouses and marketing facilities.

The production period for this system: broilers are sold at 36 – 40 days of age while keeping layers for 52 weeks in production (Poultry sector country review FAO 2008)

2) Other Commercial Poultry Production Systems

This system includes the traditional commercial broiler and egg production of which those marketed commercially the farms with birds kept indoors continuously strictly preventing

contact with other poultry or wildlife, and caged layer farm with birds in open shed with poultry spending time outside the shed (both chickens and waterfowl).

The production period for this system: the broilers are sold at 40 – 45 days age while keeping the layers for 20 weeks rearing and 60 weeks in production. (Poultry sector country review FAO 2008).

This system includes four different productions: egg hatcheries, broiler meat, table eggs and other birds' production:

- Egg hatcheries

The number of operating farms solely hatcheries in Jordan by 2017 reached 38, producing eggs for hatching amounted to 282.613 million eggs producing 165.22 million chicks as 14 million of these eggs were exported. The number of licensed layer mothers' farms is 333, producing 7.6 million birds in 2017. (Statistical Annual report, MOA 2017)

- Broiler meats

The total farms by 2017 reached 1645, with the capacity of 116 thousand while the total produced boiler meat reached 290 thousand tons (Statistical Annual report, MOA 2017), The total distribution of broiler farms in Jordan according to governorates, the highest proportion of broiler farms is in Irbid, (24.2%) followed by Amman 17.3%, and Al Mafraq 15.2% . (Poultry sector country review FAO 2008)

- Hen table eggs

In 2017, layer farms in Jordan reached 333 farms with a total capacity of 7.6 million birds and producing 1403 eggs, the actual production of table eggs was around 949.26 million eggs, 98% produced from layer farms while the rest were produced from mothers' of broilers and layers unsuitable for hatching. (Statistical Annual report, MOA 2017)

- Other birds production

Include ostriches and quail farms. There are 6 ostrich farms; two farms located in Amman governorate and one in Balqa, Madaba, Karak, and Ma'an governorates. The largest one is located in Karak with a capacity of two thousand birds, while those located in Balqa and Ma'an have a capacity of 500 and 300 birds respectively. The capacity of other farms ranges between 50-80 birds. There is one quail farm located in Jerash governorate. (Poultry sector country review FAO 2008)

3) Village or backyard production

The main purpose of domesticated bird-keeping is home consumption. The local chicken primary functions were egg production for home consumption 65% of households, 35% to generate cash income (Poultry sector country review FAO 2008). Domestic birds in Jordan are kept in backyards; they move around the home in free areas where they are exposed to wild birds. Their feeding system depends mostly on some grains or food leftovers and water which are provided

in open dishes outside their pens. Other domestic birds kept in Jordan are pigeons that are local & mixed breeds, ducks, geese and turkey that are completely local breads. Since the last agricultural census the chicken is still the main bird kept for home consumption and the pigeon is the second.

4.3. Bee Keeping

Jordan gave special importance to the Honey bee Sector in which local breeds are under conservation and local honey producers are being encouraged. Accordingly between 2003 and 2017 there more than 3,000 beekeepers in Jordan by 2017 the number of hives reached 60,000 hives and produces about 590 Tons of honey (Statistical Annual report, MOA 2017), 85% of beekeepers are poor low income producers (Assessment of the Agricultural sector in Jordan, EU report 2012).The two main honey-flows occur in the spring, one coming from the Jordan Valley citrus trees, and the other from the mountainous areas. The indigenous honey bee is Apis mellifera syriaca that is found throughout Jordan. Sadly, due to a half-century of foreign bee importation and inter species breeding, pure syriaca bees are now difficult to find. Recently, a new bee species has come to Aqaba threatening the local bees, Apis florea a dwarf honey bee that is originally native in South-east Asia.

4.4. Fishery And Aquaculture Production System

The total production of this system was estimated in 2001 at 540 tons of which around 80 tons (15%) were freshwater species such as carp and the rest were salt-water tilapia production (Jordan, FISHERY COUNTRY PROFILE, FAO 2003). Freshwater aquaculture production has been in decline for some years as water resources came under pressure from alternate uses and environmental degradation.

1) Marine fisheries

The marine fishing industry in Jordan is small and is based in Aqaba on the Red Sea coast. The fishery is entirely artisanal consisting of approximately 85 fishermen and 40 boats. This number remained static in recent years, worth noting that there are no cold storage facilities and catches are sold upon landing. The total catch in 2001 was only 170 tons of which about 65% of the catch were tuna, compared with catches from 1995 of 150 mt, and 103 mt recorded for 1993 (Jordan, FISHERY COUNTRY PROFILE, FAO 2003). Also, recreational SCUBA divers are reported to collect a small number of aquarium fish but with no specific data. The development of marine fisheries in the Red Sea is limited by the availability of suitable sites and environmental concerns, particularly the impacts of nutrient enrichment by aquaculture on Jordan's extensive and important coral reefs and seagrass nursery areas.

2) Aquaculture

Recently National Agricultural Research Center (NCARE) along with the private sector and with support from The Japan Cooperation Association (JICA) a production system is under

implementation at the Jordan Valley near the Dead Sea due to availability of artificial lakes that are used for crop production, 16 farmers were selected to implement this technology (The State Of Jordan's Biodiversity For Food And Agriculture, Country Profile FAO 2013). In this system intensive salt-water aquaculture production of Tilapia species is carried out, with the largest producer being Jordan Valley Fisheries (JVF) a company that operates a modern salt water Tilapia farm which can produce up to 700 ton per year (Jordan, FISHERY COUNTRY PROFILE, FAO 2003). The farm incorporates an intensive system based on solar technology and a 'green water' system for algal production and heating. This system has expanded in recent years and appears a viable industry although the capital-intensive nature of its development may affect further significant expansion.

5. MAJOR CROPS AND ANIMAL BREEDS

Crops

1) Fruit Trees

Olives, Wild Almonds, Bitter Almonds, Apples, Figs, Grapes, Peach, Pear, Apricots, Plums, Prunes, Orange, Lemon, Clementine, Pomelo, Grapefruit, Banana, Date, Pomegranate, Mulberry, Quince.

2) Legumes and Cereals

Wild Lentils, Wild Chickpeas, Wild Barley, Corn, Fava Beans, Wheat; Cultivated durum (Triticum durum) and bread (Triticum aestivum) wheat, wild wheat forms; Triticum monoccocum, T. beoticum, T. turgidum, T. dicoeccum, T. dicoccoides, and wild relatives of wheat, the Agilops spp.

3) Green Leaves, Medicinal and Herbal Plants

Roman Lettuce, Spinach, Faiteh (White Mustard), Molokhiah (Jute Mallow) , Morrar(Iberian Centaury),Hendeba (Wild Chicory) , Khabaisah (Little Mallow), Humaith (Red Sorrel), Faijan (African Rue), Lsaineh (Bugloss), Sheeh (Jerusalem Sage), Chamomile, Cumin, Black Cumin, Anise, Fenugreek, Mint, Parsley, Sage, Oregano, Purslane, Coriander, Rashad (Garden Cress), Germander, Watercress, Sumac, Wild Celery, Capers, Thyme, Bongardia

Vulnerable Species: Akoob (Gundelia), Syrian Oregano.

Near Threatened Species: Hwairneh (Giant Reed), Wild Beet, Fennel, Botom (Atlantic Pistachio). Endangered: Luff (Green Arum), Common Cyclamen, Eminium, Roman Nettle.

4) Fruits and Vegetables

Tomatoes, Eggplants, Squash, Strawberry, Cucumber, Snake Cucumber, Broad Beans, Cabbage, Onion, Garlic, Potatoes, Watermelon, Melon, Okra, Bell Peppers, Green Beans, Cauliflower, Peas, Cactus, Globe Artichoke, Fennel, Carrots, Beets, Turnip, Radish,Hot Peppers, Baby marrow, Broccoli, Cow Peas.

Animal Breeds

1) Livestock

- Sheep The main sheep breed in Jordan is Awassi, Najdi Assaf and Chios
- Mountain Black Goat, Desert Goat, Dhaiwi Goats and Shami (Damascus)
- Cows Holstein-Friesian and Baladi
- Camels Baladi (The Dromedary)

2) Poultry

- Chicken layer: Haysesex, Babkok, Lohman and Haylayan breeds, Broiler Hybrid and Lohman, Roos.
- Pigeons Baladi.
- Duck Baladi.
- Turkey Baladi.

3) Fish

Carp, Salt-Water Tilapia, Yellowfin Tuna

6. ECONOMIC AND SOCIAL CONTEXT

Jordan's Agriculture sector from the mid-1990s till 2000 faced many challenges; including the decrease of the annual GDP, the urban development at the expense of agriculture land, climate change affected the consistency of the amount of rainfall, and many economic changes influenced the agriculture market and trade. However, it was part of the structural reforms by the World Bank including the Agricultural Structural Adjustment Program (ASTAP) and the Agriculture Structural Adjustment Loan (ASAL) which aimed to minimize the effect of the challenges and ensuring a balance between the use of natural resources for agricultural and non-agricultural uses.

Therefore, Jordan has experienced significant structural change in the agriculture sector of the economy, generally moving from growing cereals to fruits and vegetables. As a result this pushed Jordan to import practically all the wheat and other cereals consumed in the country.

The first National strategy for Agricultural development was developed for the period of 2002 – 2010 to implement strategic planning for the sector on a national level, involving the private sector and the agricultural businesses along with related government bodies.

According to the Department of Statistics agriculture in Jordan accounts for 5.6 percent of the country's GDP in 2018. One quarter of total agricultural exports are vegetables and fruits, which are mainly exported to other countries in the MENA region. On the other hand Jordan imports partly basic food commodities (wheat, legumes, red meat and fish), and some vegetables, while rice and sugar are completely imported. This constitutes the highest share of agricultural imports, resulting in 91 percent of all agricultural products being imported, making the agriculture sector export oriented, with 23 percent of all agricultural products are exported, 40 percent of which are vegetables and fruits (The Role of Agriculture and Agro-processing for development in Jordan, 2018) The WTO Committee on Agriculture classified Jordan as "a net food importing developing country".

Although agriculture currently has a low share of the national economy, this was not the case in earlier years as agriculture in Jordan contributed substantially to the economy since the time of Jordan's independence. In the early 1950s, agriculture constituted almost 40 percent of GDP but it subsequently suffered a decades-long steady decline. On the eve of the June 1967 War, the percentage became 17 percent, and by the mid- 1980s agriculture's share of GDP in Jordan was only about 6 percent. (NATIONAL AGRO-FOOD POLICIES IN JORDAN, SUSTAINMED Project , 2012)

The sector has displayed promising growth rates over the past few years, its contribution to GDP doubled between the years 2000 and 2015 from 2.3 to 4.2 percent due to the increase in domestic demand, and between 2010 and 2015 it reached a compound annual growth rate of 12 percent. Despite the recent increase in the contribution of agriculture to Jordan's economy the share of agriculture in 1970 was 11.6 percent compared to 4.2 percent share in 2015 according to the department of statistics (The Role of Agriculture and Agro-processing for development in

Jordan, IFPRI Middle East and North Africa Jan. 2018), showing that the importance of agriculture to Jordan's economy is significantly less now than it was four decades ago, this is attributed mostly to the reduced agricultural areas, fragmentation of agricultural holdings, the number of holdings within medium-sized groups and decreased agricultural land per capita. In addition to the fact that the Jordanian economy is going through structural transformation with the significant growth of the industry sector.

Most small-scale agriculture in about 50% of the agricultural areas in Jordan is family farming, which is aimed for the local or domestic consumption. However, larger farming activities are taking place in the Jordan Valley in the form of larger production farms which are mainly geared towards export, these farms are dependent on foreign (non-Jordanian) labor force.

Agriculture plays a significant social role, especially in the rural areas, where the 20% below poverty line of Jordan's population live. This is evident in the broad participation of the Jordanian family in agricultural work, according to the Ministry of Agriculture 80 thousand families are dependent on agriculture as the main source of income (National Strategy for Agriculture Development Document 2016-2025) which amassed in livestock breeding farms and possession of small agricultural land. Thus, family labor is the main supporter of agricultural work in Jordan regardless of space, agriculture type, province, or rain region. Although youth in rural areas are steering away from agriculture as employment preferring government appointment, agriculture will always be constituted as an important source of employment in such rural communities. According to official statistics released by the Ministry of Agriculture (2010) about 81 thousand laborers are working in the Agricultural sector, (10%) of the total workers are Jordanian, and most of them women. It is considered important to maintain the family farming activities for social reasons to maintain the rural production areas, in addition to economic reasons to improve the living situation of rural families; also for environmental reasons because the use of chemicals and energy sources is low in family farming.

Between 1991 and 2000 the agriculture sector created 41 thousand and up to 114 thousand work opportunities of which 31% to 55 % were Jordanians. Full time workers in the Jordan Valley area reached 60 % on account of just 9% in the highlands. (Agriculture in Jordan Article 7 March 2019, www.foodprotection.news)

The role of the agriculture sector for employment has been decreasing, the number of population active in agriculture in 2005 was 194 thousand which accounts for 9.8% of the economically active population that year (FAO Irrigation in the Middle East region in figures – AQUASTAT Survey 2008), by 2011 the sector employed 124 thousand which is 7.7% (Assessment of the Agricultural sector in Jordan, EU report 2012), and according to the Department of Statistics in 2018 the percentage of Jordanians actively employed in the agriculture sector was 1.7% of the total economically active population 2% male and 0.9% women, as for non-Jordanians legally employed in this sector the number was 87338 workers of these 85780 men and 1558 women.

This decrease came together with an increase in the importance of industry and services. However agriculture is more important in rural than in urban areas, by 2015 the share of

agriculture in total employment was 5.0 percent in rural areas and 1.3 percent in urban areas (The Role of Agriculture and Agro-processing for development in Jordan, IFPRI Middle East and North Africa Jan. 2018). While the share of Jordanians working in agriculture has gone down it remains important for migrant laborers, as many refugees are employed in the sector. According to the Department of Statistics, non-Jordanians constitute the majority of labor in agriculture – about 85 percent of livestock workers and 92 percent of crop labor in 2015 were non-Jordanians and permanent employment is far more important than seasonal and casual employment. At the same time, employment in crops has been decreasing between 2013 and 2015, years during which Jordan experienced a large influx of refugees.

Due to the influx of more than a 1.4 million Syrian refugees in the past years the country's population increased, in addition to the Kingdom's population of about 6.7 million people (National Strategy and Action Plan For Sustainable Consumption And Production In Jordan | 2016 – 2025). This led to a significant increase in the consumption of food items, putting a high demand to provide food that keeps up with population growth which translates to the need to increase agricultural production. This can be achieved by increasing the cultivated and irrigated areas and thereby optimizing the use of water resources (treated wastewater and saline water) for irrigation purposes.

7. DESCRIPTION OF FOOD CONSUMPTION PATTERNS

In Jordan, cereals, wheat in particular, is considered staple food and is commonly eaten in form of bread, rice has also become a staple, although it is not native to the land, it is consumed nowadays cooked accompanied with local stews and dishes. Vegetables either cooked or consumed fresh occupy an important place in the diet. Dairy products such as cheeses and yogurt are also a staple, eaten fresh or used in cooking some dishes. Consumption of fruit also plays a major role in the local diet and varies according to season. Many dishes with legumes such as chickpeas and lentils are also typical and consumed often. As for meat, lamb is typical of Jordanian cuisine, poultry and beef are used nowadays with minimal consumption of fish and seafood.

There are three main meals in the Jordanian diet during the day. Breakfast is essential and the traditional one is diverse and consists of different dishes such as fried or boiled eggs, labaneh (drained yoghurt), cheese, zaatar (thyme with sesame seeds and sumaq) with olive oil, hummus, falafel, Mankeesh (dough topped with Zaatar, cheese, or ground meat) and some fresh vegetables such as tomatoes and cucumbers along with bread and a cup of tea.

Lunch is considered the main meal of the day; a typical meal normally consists of a main dish made of rice or legumes, meat (mainly chicken, beef or lamb) or cooked vegetables accompanied with bread. Traditionally lunch is eaten while the family is gathered but with the changing pace of life, time and place of consuming the lunch meal has changed. However it is still an important aspect of lunch whether it is consumed at home among family members or at work with coworkers and friends. As for dinner, it is generally very similar to breakfast. It is diverse, could consist of several types of food, and normally is enjoyed with family members and friends.

Monueh still plays a major role in the Jordanian food consumption habits, the act of storing food that is abundant in its season using different methods for yearlong storage, traditionally households used to allocate a sizable cool or a shaded space to store those products from jams, pickles, dried yogurt, ghee, olive oil, dried legumes, vegetables and fruits. Whereas modern families nowadays keep their Mouneh in kitchen cupboards, refrigerators, or tiny shelved pantry rooms. Nowadays the food products either are still processed by the family in their households or bought from local markets or directly from small producers that are producing in their homes in local communities.

Jordan has been witnessing a change in food consumption patterns since the mid of the last century (Nutrition in Jordan: A review of the Current Nutritional Trends and Major Strategic Directions of the National Food and Nutrition Policy, 2006). Urbanization played a major role in this transition in food consumption habits, the percentage of urban population went from 46.3 in 1960 to 82.6 in 2010 and to 90.3 years in 2016, while the percentage of rural population decreased from 53.7 in 1960 to 17.4 in 2010 and to 9.7 in 2016 (Department of Statistics, 2016, 2011). This rapid change in the demographic structure had a socio-economic influence on the

new urbanized communities that got reinforced with the effect of globalization on markets resulting in the adaptation of westernized food style.

Poverty is also one of the major factors affecting food consumption habits; the wealth of families is a major factor in food selection. Unemployment rate, especially amongst women, is high affecting the poverty rate, which according to World Bank data was reported to be 14% in 2010 and reached 18.6% in 2015. Noting that a third of the population in Jordan live below the poverty line, at least one quarter of the year which is known as transient poverty. (World Bank, 2016).

Agricultural policies that affect relative food prices also played a role in changing the food consumption patterns.

In the past few decades, dramatic changes have occurred in the food consumption patterns in Jordan and the region due to multiple factors including changes in the lifestyle and socioeconomic and political situations that has led to this transition. In Jordan, the following trends have been noticed since the mid of the last century:

1) Consumption of foods of animal-origin increased, while the consumption of foods of plant-origin decreased. Based on the Jordanian Household Expenditures and Income Surveys (JHEIS) from 1992 to 2010 the energy intake in 2010 was higher than in the years 1992 to 2006-2007 for foods of animal origin: meat and poultry, fish, dairy products and eggs, whereas it was lower for foods of plant origin: legumes and fruits and vegetables. The consumption of meat, especially poultry showed a four-fold increase over the 1960s to 1980s; and has remained rather stable since. The consumption of milk and milk products almost doubled between 1965-1967 and 2005-2007 due to the increase of local production of meat (caused by barley subsidization) specifically for poultry and eggs as they are sufficiently produced in the country with relatively cheap prices. The increased imports of beef has also contributed to the higher consumption. Consumption of fish is still low but it has also shown a large increase over the last four decades. The higher intake of fish may be due to the fact that most of the marketed fish in Jordan is the cheap imported frozen fish.

2) The diet is shifting towards the consumption of high-energy and poor nutritional foods. The population's consumption of fast foods is increasing, including ready-to-eat processed foods, rich in fat, salt, sweeteners and soft drinks. The demand for ready to eat meals is higher due to the increasing number of working women and the long working hours. In rural areas, the diet is still more traditional; households depend mainly on homemade food and less on ready-to-eat food. Although signs of a change in food consumption habits are also currently appearing in rural areas.

3) As for carbohydrates, consumption of cereals, mainly of wheat and to a lesser extent rice has been stable since the early 1980s. Although consumption of rice increased slightly over the period. Consumption of potatoes has more than doubled over the last four decades, due to the support of both the government and the private sector in providing access to land and

water to grow potatoes, in addition to an increase in imports. (Food and nutrition profile, Jordan. Nutrition and Consumer Protection Division, FAO, 2011)

4) Consumption of sweeteners and vegetable oils increased considerably in the last decade. The consumption of locally produced olive oil has decreased to the advantage of the imported soybean, sunflower and palm oil that are less expensive than olive oil. (Food and nutrition profile, Jordan. Nutrition and Consumer Protection Division, FAO, 2011)

5) Due to these changes in food consumption patterns and practices, the rate of many diseases such as obesity, diabetes, mellitus and cardiovascular diseases have also increased in the last decade (Trends of Energy and Macronutrients Intakes in Jordan as Obtained by Household Expenditure and Income Surveys, University of Jordan, 2019).

8. POLITICAL CONTEXT

As mentioned before Jordan's agriculture faced many challenges throughout the years. Politics played a significant role in these challenges, whether because of internal government policies, or external political actions and instability in the region. Nevertheless, at certain times these were happening simultaneously or one being the outcome of the other.

Jordan's economy, people and agriculture have been heavily affected by the repercussions of conflict and instability in the region since 1948, including the Palistinean crisis, the gulf war, iraq invasion, and the syrian conflict.

As the Isreali- Palestinian conflict started 1948 up untill the occupation of the West Bank in 1967 Jordan was directly affected, as in 1950 the Israeli army began to expand into Jordan. Israeli forces crossed the Jordan River and seized territory in the northern al-Baqura seizing an estimated 1,390 dunums (1.39 sq. km). After 1967 following what was known as the Six-Day War, Israel occupied a vast area of Jordanian territory in Wadi Araba south of the Dead Sea and changed the border in Wadi Araba by placing military and security installations and in certain regions the area reached up to 8 km. Afterwards, Al Ghamer area totaled approximately 4,000 dunums (4 sq. km), of which 1,000 dunums (1 sq. km) was cultivated (Will Jordan reclaim its territory from Israel in the next year? Article, www.7iber.com, 2018), and fell just one kilometer from the old Dead Sea Highway. Other agricultural lands were seized by Israel through the years of the war, decreasing the jordanian areas of land suitable for agriculture. On October 26, 1994 a Jordan-Israel Peace Treaty was signed in Wadi 'Araba. The treaty stated Jordan's restoration of its occupied land mentioned earlier (approximately 380 square kilometers) and assured the Kingdom an equitable share of water from the Yarmouk and Jordan rivers. Jordan, as part of the agreement, placed al-Baqura and al-Ghamr on lease to Israel for a period of 25 years. And both sides are entitled to inform the other party of any desire to end this agreement within that time period. Jordan was able to regain sovereignty over them in November 2019, restoring these agricultural lands is expected to have a positive impact on the agriculture sector in the long run.

In addition to the above, Jordan and Israel had political tension regarding water involving Syria as well. For most of its surface waters, Jordan is dependent on the Yarmouk and Jordan Rivers, whose waters both Syria and Israel have overused, as both have retained significant control over them, on one hand Syria has carried out unilateral water projects in the Upper Yarmouk basin, and Israel has carried out projects in the Upper Jordan River and the Golan. Their actions have violated long-standing agreements, and left Jordan with under 10% of the total flow of the freshwater resources of the Upper Yarmouk and Jordan Rivers. This could cause further conflict in the region especially as climate-related changes are expected to impact the water resources

In the 1970's many changes and policies took place starting with 1974 when the gulf states initiated an oil embargo on many counties as an effort to put pressure on Israel, subsequently raising the price of oil significantly which revived the economy in the Gulf as well as the Jordanian market, as many Jordanians where working in the gulf by then. The price of land and real estate in Jordan went up with that the government issued a three year development plan

1973-1975 aimed at urban development and allowing building in low population areas, agricultural, and industrial sectors areas in hopes of creating more job opportunities for the population. This development came to be faster than any policies that protected the agriculture lands from being taken over by urbanization that by 1975 the agriculture cropped land especially wheat decreased by half and kept on decreasing from that point onwards without any sign of stopping. By now it has reached 250 thousand dunums, in addition to the fact that wheat farming returned little profit for the farmer while the price of land reached 1000 JD for a dunum putting the farmer in a difficult situation either keep growing wheat or sell the land. Adding to this the unstable rainfall seasons due to climate changes and the migration of Jordanians to the gulf state for better work opportunities. As the wheat production came down by 1976 the import of wheat had increased significantly from the west especially the USA which was supplying its wheat at very low prices as part of its policy of subsidizing it to the world. (Why Jordan stopped producing wheat, www.7iber.com 2018).

The first and second Gulf wars also influenced the agriculture sector, as it was affected by the external markets that were completely closed for Jordanian agriculture exports. Once the first gulf war started, the UN Security Council passed Resolution 661 which invoked economic trade sanctions against Iraq. Jordan complied with the resolution and this affected Jordan's interests and economy as a whole as Iraq was the largest Jordanian trade partner for the previous ten years before the war. Many Jordanian companies lost large amounts of money because Iraqi companies were unable to pay their debts and all the key Jordanian economic sectors that were mainly serving Iraq such as transportation, agriculture, and industry were severely affected by the resolution. At some point Jordan supported Iraq during the war, as a result Gulf countries cut off their support as well as many European countries, the U.S. and Japan took the same steps (a situation not reversed until Jordan became involved in the peace process with Israel). In addition, it is worth noting that Iraq and Kuwait themselves had previously been the source of 30 percent of the total financial aid received by Jordan (The 1991 Gulf War and Jordan's Economy, 2002). Jordanian exports especially agriculture to Arab and other countries declined drastically, as Kuwait and Saudi Arabia prohibited the import of Jordanian products because of Jordan's political position during the war. Jordanian agriculture, industry and trade sectors were thus shut out of the most important Gulf markets.

Recently, Iraq and the Syrian instability and crises both affected the exports negatively especially by instability in Syria and Iraq, the major exporting markets for the Jordanian agriculture products, with the closing of both the north border with Syria and the east border of Iraq, which were the main export portal for agriculture products to Turkey, Lebanon and eastern European countries. This closing resulted in the production accumulating in the Jordanian market and many farmers protested by dumping their produce in the streets. **(**Ministries and field experiments-12- Agriculture Article, 2019, www.sarayanews.com)

As mentioned in the introduction and background section Jordan witnessed many weaves of refugees starting from the 1948 with Palestinian Refugees, to the Gulf war 1991 and after that the Invasion of Iraq in 2003 with Iraqi refugees and immigration, and up till recently the Syrian refugees. The weaves of refugees and immigration to the country led to the population growth

which in turn increased the demand on food consumption and water resources and rapid urbanization. The Jordanian government sought to ensure food security by attempting to increase agriculture which lacked proper planning, and also produced structural distortions in the water sector. This expansion of agriculture dramatically increased total water demand, with irrigated agriculture taking a large share of available resources, at the same time the urban population was growing fast contributing to the increased demand on water resources. (Politics matter: Jordan's path to water security lies through political reforms and regional cooperation, National Centre of Competence in Research Working Paper No 2013/19, April 2013). Refugees and immigrants through the years played a significant role on the rapid urbanization due to population growth, which forced urban development in areas needed for agriculture. noting only 10% of Jordan's land is suitable for agricultural production, and most of it lies in the areas where population is already concentrated at high density. This has pushed agriculture to marginal areas in the Badia which already suffers from drought and soil degradation and will be suffering further from climate change in the coming years.

Internally government policies and strategies have impacted the agriculture sector starting from the structural reforms mentioned earlier. In the years before 1989, food security in Jordan was not considered an issue of great urgency compared to other political, social and economic problems facing Jordan and the region. A Ministry of Supply was established in 1974, with the task of securing basic food commodities at reasonable prices to consumers. It controlled external food trade, imported strategic food items, food and feed prices and subsidized consumption and production of basic food commodities. Since 1989, Jordan started on liberalizing its domestic and foreign trade as part of the ongoing structural adjustment program. (Jordan Agriculture Ministry Agriculture report for Jordan's National Report 16/17 to the Sixteenth Session of the Commission on Sustainable Development-UN)

In 1993, Jordan applied to join the the General Agreement on Tariffs and Trade (GATT) to be integrated into the international economy. Then in 1994 the government adopted the policy of trade liberalization as part of the Agricultural Structural Adjustment Program (ASTAP), and the Agriculture Structural Adjustment Loan (ASAL) provided by the World Bank then came the implementation of changes related to Jordan's joining the WTO (K4D Helpdesk Report: Jordan's environmental policies and engagement on climate change, 10 June 2019), Jordan subsequently took numerous measures to liberalize its domestic and international trade in agricultural commodities, all measures undertaken for the protection of local production from external competition where abolished and subsidies have been totally lifted such as removal of direct subsidies and removal of feed subsidy and non-customs protection, reducing support to irrigation water, and abolishing the monopoly of the Agricultural Marketing and Processing Company (AMPCO) for importing fresh vegetables and fruit short on the market. which resulted in the national agricultural products having to compete with imported goods in the domestic and export markets. These developments came with a decline in the quality and quantity of water available for irrigation, which affected crop productivity and quality of produce and its competitiveness in both quality and price in domestic and export markets. (Jordan Agriculture Ministry Agriculture report for Jordan's National Report 16/17 to the Sixteenth Session of the Commission on Sustainable Development-UN)

In 1995 the government reviewed the means and largely reduced subsidizing bread. In May 1995, the Government removed quantitative restrictions on all imports, re-approvals were stopped and customs duties on imports were reduced to a maximum of 30 percent. In 1996, the Government adopted a comprehensive Agricultural Policy Charter prepared by the Ministry of Agriculture, which aimed at achieving an integrated social and economic development while decreasing the impact of trade liberalizing in agricultural commodities. In 1998, Jordan joined the Great Arab Free Trade Zone, which required phasing out customs duties by 10 percent annually until it was completely canceled by 2005. (Jordan Agriculture Ministry Agriculture report for Jordan's National Report 16/17 to the Sixteenth Session of the Commission on Sustainable Development-UN)

In April 2000, Jordan signed the Jordan-EU Association Agreement, which provides for the establishment of a free trade area. The agreement provides facilities and exemption in customs duties on Jordanian exports of agricultural products. This agreement was implemented in May 2002. In May 2000, Jordan became a full member of the WTO. Thus, Jordan's local and foreign trade became subject to the provisions of the WTO agreements. (Jordan Agriculture Ministry Agriculture report for Jordan's National Report 16/17 to the Sixteenth Session of the Commission on Sustainable Development-UN)

In 2001, Jordan signed the Free Trade Agreement (FTA) with the United States of America (USA). This agreement provides for a wide range of Jordanian agricultural products to enter the U.S market exempted from customs duties or at reduced rates. In May 2004, Jordan signed the Free Trade Agreement with Singapore and implemented in August 2005, which provides for the establishment of a free trade area. The agreement provides facilities and exemption in customs duties on Jordanian exports of agricultural products. Since then Jordan also signed several bi-lateral trade agreements to establish free trade zones with some Arab countries. (Jordan Agriculture Ministry Agriculture report for Jordan's National Report 16/17 to the Sixteenth Session of the Commission on Sustainable Development-UN)

Most Government efforts have focused on developing agriculture production, which resulted in over-supply of some products, and wasting large quantities of produce because of imbalance between supply and demand, non-market-oriented production and poor relation between marketing and production sectors, due to government failure in involving the production sector in developing the marketing sector in maintaining free competition in the market, providing marketing support services in research and extension as well as credit and information. involving the production sector will help ensure the stability and suitability of policies and mechanisms for direct economic intervention in the market, including support, protection, and promotion of investment. Also, the small size of the local market, subjecting the marketing of produce to the effects of regional markets, this adds to the challenges facing Jordanian produce as it already weak in competitiveness due to the small size of marketing entities and companies, which prevents them from benefiting from the economies of scale of large establishments. The government of Jordan / Ministry of Agriculture signed a loan agreement with World BANK to implement The Horticultural Exports Promotion and Technology Transfer Project, with total cost of (US $ 5 million) with end of 2007. The objective of this project is to assist the Government of

Jordan to improve horticultural export marketing by establishing A system of out grower farming between large and small / medium scale farmers in order to achieve " critical mass" or " bulk volumes" demanded by target markets and improve the income of participating farmers, and building the technological capacity of farmers, especially the out growers, to improve crop husbandry practices and their produce quality to satisfy the requirements of target markets and reduce the rejection rates of exported consignment., the agreement included that a new national company to market horticultural produce will be established before the end of 2007 with capital of US$ 10 million. (Jordan Agriculture Ministry Agriculture report for Jordan's National Report 16/17 to the Sixteenth Session of the Commission on Sustainable Development-UN)

Jordan is currently implementing a two agricultural development policy: The long-term strategy which aims at to increase the total area under cultivation by better harnessing water resources to increase irrigation of arid desert areas for the cultivation of cereal crops, the country's most pressing need. In the short term, the government is attempting to maximize the efficiency of agricultural production in the Jordan River valley through rationalization or use of resources to produce those items in which the country had a relative advantage. However many policies, laws, bylaws and strategies were initiated since the end of the 1950's, either directly related to the agriculture sector or indirectly affecting the sector, below listed are the most noteworthy (taken from the Assessment of the Agricultural sector in Jordan, EU report 2012):

In 1959 the most unworthy was the **Law of Agricultural Credit Corporation" (50) /1959** This law addresses Credit sources and credit policy in which it unified the agricultural credit sources and set a credit policy based on sound scientific, economic and technical bases, including securing an effective monitoring on the spending of the loans as per their purposes and objectives.

In 1988 the **Water Authority Law No 18 of 1988** was initiated. This law established the Water Authority of Jordan (WAJ) as an independent corporate body in terms of finance and administration. The law describes the Mandate of WAJ, in which WAJ is fully responsible for providing municipal water and wastewater services, and development and management of groundwater resources. It also clarifies WAJ's relationship with the Ministry of Water and Irrigation.

In 1992 came the **Ministry of Water and Irrigation By Law No 54 of 1992** It established that the Ministry of Water and Irrigation is given the full responsibility for water and public sewage in the country as well as all the related projects, includes formulation of the water policy and submitting it to the Council of Ministers for adoption. It also gives the Ministry full responsibility for the economic and social development of the Jordan Valley as well as carry out all the works which are necessary to see the objectives through.

Also in 1992 the government initiated the **National Environmental Strategy (NES)** . This strategy includes all environmental pressures and problems and offers many specific recommendations and suggested actions in the field of environmental protection and conservation in the country.

In 1995, three years after the National Environmental Strategy the government passed the **Jordan Environmental Law**, this law provided the appropriate legislative context for issuing the regulations and instructions regarding the protection of the environment.

In 1997 **The cooperative law number (18) for the year 1997 was issued this** law recognized the Jordan Credit Cooperatives officially as a general institution that is independent financially & administratively. The law also addressed restructuring the cooperative sector in adherence to implementing the valid active rules & laws in Jordan according to the Cooperative law.

Also in 1997 Jordan initiated **Jordan's Water Strategy**, this document helps describe Jordan's responsibility towards its water sector through: resource development, resource management, legislation and institutional, shared water resources, public awareness, performance, health standards, private sector participation, financing and research development.

In 1998 **Groundwater Management Policy** was issued, this policy aims to outline in more detail the statements contained in "Jordan's Water Strategy", it states the Government's policy and intentions regarding groundwater management including the development of the resource, its protection, management and measures needed to bring the various renewable aquifers' annual abstractions to their sustainable rate.

Also in 1998 the **Irrigation Water Policy** was also issued, this policy addresses water related issues of resource development: agricultural use, resource management, and the imperative of technology transfer, water quality, efficiency, cost recovery, management and other issues. It also includes separate chapters for the linkages with both energy and the environment. Noting this policy is compatible with the Water Strategy confirming its long-term objectives.

In the same year the **Wastewater Management Policy** was also issued and it also aimed to outline in more detail the statements contained in the document entitled "Jordan's Water Strategy" to set out the Government's policy and intentions concerning wastewater management aiming at the collection and treatment of wastewater from different locations, as well as the reuse of treated wastewater and sludge.

By 2001 Jordan initiated the **National Rangeland Strategy** developed with the main objectives of controlling deterioration of the rangelands and reversing desertification through increasing sustainable livestock production by restoring the productivity of rangelands and increasing sustainable range feed production by supporting it's production in order to encourage intensive breeding through encouraging local communities and sheep breeders to adopt intensive breeding techniques to regulate supplying rates.

Also in 2001 **Jordan Valley Law** was issued to develop the water resources of the Valley and utilizing them for irrigated farming, domestic and municipal uses, industry, generating hydroelectric power and other beneficial uses, also their protection and conservation and the carrying out of all the works related to the development, utilization, protection and conservation of these resources.

By 2002 the government issued **Agriculture Provisional Law No. (44)/2002,** aiming to organize and develop the agricultural sector to reach a developed, growing, diversified, and integrated agricultural production that conserves the environment and natural resources, also to enhance the local dependency while fitting the international, regional and domestic requirement.

In the same year the **Underground Water Control By-Law No 85 of 2002** was issued, this by-law describes and entails the different procedures that are needed for controlling groundwater resources in Jordan. It helps explain the utilization and extraction quantity allowed, and also includes conditions about licenses and their cost for borehole drilling and water extraction fees.

As mentioned earlier 2002 saw the development of the first **National Strategy for Agricultural Development 2002-2010**, to discuss the role of the agricultural sector in social and economic development in achieving a sustainable agricultural and rural development taking into consideration the protection and conservation of agro-biodiversity. The strategy presents proposed projects in the five agricultural sub sectors: rainfed agriculture, irrigated agriculture in the Jordan Valley, irrigated agriculture in the highlands, livestock and rangelands and marketing of agricultural produce.

Also 2002 the government initiated the **Poverty Reduction Strategy,** this strategy aims at improving living standards of all poor segments of the society, also to alleviate poverty includes short, medium, and long-term initiatives in each area of the policy.

In 2003 **Jordan's Valley Authority Strategy Plan for 2003 – 2008** was initiated, it came after **Jordan Valley Law** this five year strategy describe the responsibility towards its water sector by the following four major goals: water resource management and development, water supply and distribution, land development and management, organizational performance improvement and development

In 2006 the government launched it's **National Strategy and Action Plan to combat desertification,** this strategy includes six major project-based programs related to desertification monitoring and control, capacity building, natural resources rehabilitation and development.

The National Agenda 2006 -2017 was launched in 2006 as a comprehensive political and socio economic reform plan for the country with the main goal to achieve consistent policies and ensure that they will not be subject to government change while taking into considerations the need to regularly develop and update these policies

In 2008 the **Irrigation Equipment and System Design Policy** was issued it follows through with the longer-term objectives outlined in the Water Strategy and supplements the Irrigation Water Policy establishing a policy on irrigation equipment and system design standards. The policy includes defining and updating equipment standards, raising farmers' awareness of standards, testing and enforcement of standards, training and certifying drip system designers, and institutional responsibilities.

Also in 2008 the **Irrigation Water Allocation and Use Policy** was issued also following through with longer-term objectives outlined in the Water Strategy and elaborates on priorities specified in the Irrigation Water Policy by updating and extension of selected elements of the in that policy. In particular it establishes and elaborates on the elements of that policy relating to farm water management, management and administration, water tariffing, and irrigation efficiency. It also addresses: defining and updating crop water requirements, water allocation and billing practices, building farmers' water management skills, using reclaimed water, measuring deliveries and delivering water to groups.

In 2009 **Jordan's Water Strategy 2008-2022: Water for Life** was developed, this is the most recent strategy that specified drinking water as the main priority in water allocation, followed by industry and agriculture. It includes specific actions and plans with targets to be achieved and emphasis on the two mega projects; the Disi water conveyance and the Red-Dead seas Canal, and the reduction of the Non-Revenue for Water (NWR) by having cost reflective tariffs and restructuring the water sector institutions.

In 2016 the latest **National Strategy for Agricultural Development 2016-2025** was initiated following up on the National Strategy for Agricultural Development 2002-2010, and in line with Jordan Vision 2025 in the aim of sustainability and development of agricultural resources, preserving plant biological diversity, improving the investment environment in the agricultural sector, enhancing integration between animal and plant production, and strengthening the relationship between the agricultural sector and other economic sectors, also the development of agricultural research and extension and the use of modern technology in agriculture and improving the competitiveness of quality and price agricultural products. the vision and goals of the strategy will be achieved through projects and administrative and legislative procedures to be implemented over the life of the strategy distributed over 6 main sectors and there 25 sub-categories, the main sectors being: agriculture resources, animal production, plant production, forestry and rangeland, marketing, and the supporting environment.

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