

THE AGRICULTURAL SECTOR IN
FIVE EUROPEAN COUNTRIES:

A GUIDEBOOK FOR LOCAL FARMERS, MIGRANTS AND REFUGEES



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CONTENTS

Introduction	1
1. Agricultural Production	2
2. Agricultural Statistics	8
3. Significance of the Agricultural Production for the Partner Countries' Economies	15
4. Population and Agricultural Population	21
5. Migrants and Refugees in the Agricultural Sector	23
6. Agriculture and Food Security	29
7. Agricultural Education	33
8. Agriculture and Environment	37
8.1. Climate change and agriculture	37
8.2. Efficient use of production factors to protect the environment	41
8.3. Recycling of agricultural waste	44
8.4. Soil and water protection	46
8.5. Agricultural and environmental policies	49
8.6. Organic farming and good practices	52
9. Agricultural Innovations	55
10. Conclusions and Recommendations	59
References	61

Introduction

In times of intense political conflicts, economic crises and the impacts of climate change, refugee migration remains a major challenge at the global, regional and national level (United Nations, 2023a). Migrants and refugees (M/Rs) are the terms commonly used for people who leave their homes for some reason. The terms distinguish between groups of people who voluntarily leave their country to find better living conditions and groups of people who are forced to leave their homes, but specific circumstances may make it difficult to match a person unambiguously to one of the groups (United Nations, 2023b). Due to enhanced technology and mobility, many M/Rs migrate to a variety of different countries, often rather far away from their home countries, while the neighbouring country may be the first option for other M/Rs (Fransen & de Haas, 2023).

Refugee migration poses constraints for those who migrate and for the population in the host countries. Those constraints encompass the difficulty of developing policies and measures to integrate M/Rs into the host countries by providing opportunities to, for example, learn the language of the target country or find employment (Kıraç et al., 2020). In the host societies, M/Rs are often not welcome because they are perceived as threatening as they display different cultural conventions, are believed to take local people's jobs away or benefit from social services to the disadvantage of the local population.

An approach to address the challenges of refugee migration is to look at how strengthening M/Rs can contribute to the host countries, i.e. to develop strategies and practices that turn migration into an opportunity to facilitate the sustainable development of host countries. This idea was exactly the starting point for CAMRAS (Increase the Capacity of Migrants and Refugees in Agriculture Sector), a project co-funded by the Erasmus+ Programme of the European Union (Project Number: 2022-1-TR01-KA220-VET-000089931). Run by seven partners from five European countries, the project aims are twofold. It seeks to increase the capacity of M/Rs to become a qualified workforce in farming, thereby contributing to their integration into the host countries. Additionally, it aims to meet farmers' needs for workforce in their host countries, thereby strengthening local farming. This project addresses the agricultural sector because M/Rs frequently have an occupational farming background from their home countries. Also, providing training on good practices, organic farming and innovative technology in agriculture helps modernise the sector and fosters the integration of environmentally friendly applications.

The project was going to be launched in a kick-off meeting on 21 February 2023. However, on 6 February 2023, two devastating earthquakes within nine hours struck parts of Türkiye and Syria with Kahramanmaraş, the home of the three Turkish partners, as its epicentre. It was the empathy and collegiality of the project partners

- Association Migration Solidarité et Echanges pour le Développement (AMSED), France
- Institute of Entrepreneurship Development (IED), Greece
- Inercia Digital S.L. (IDSL), Spain
- Internationale Arbeidsvereniging/International Labour Association (ILA), The Netherlands

that encouraged and supported the three Turkish partners

- Kahramanmaraş Sütçü İmam University (KSU)
- Kahramanmaraş Directorate of Provincial Agriculture and Forestry (KDPAF)
- Trend Education NGO (TENGO)

to continue the project. The first outcome of all these collaborative efforts is this guidebook on the situation of the agricultural sector in five European countries for local farmers and M/Rs. This guidebook along with the results of surveys conducted with M/Rs and farmers in the partner countries will inform a handbook that will be the foundation for online and face-to-face training in the partner countries. Another distinctive feature of the project will be a shared platform where farmers and M/Rs can meet to create employment in the agricultural sector. That said, the whole project aims to be informative for not only farmers and M/Rs in the participating countries but also for members of the target groups as well as project teams and educators in other countries.

This guidebook is organised in ten chapters. In the first four chapters, a concise overview on the situation of the agricultural sectors in France, Greece, The Netherlands, Spain and Türkiye is given. Chapter 5 deals with the situation of M/Rs in these countries. To provide a quick overview, these chapters contain tables that summarise main points explored in the texts. The Chapters 6 to 9 are concerned with food security, agricultural education, environmental aspects and innovations; these topics are of utmost importance to arrive at sustainable farming and need to be covered in vocational training. Conclusions and recommendations finalise this guidebook.

The editorial team is grateful to all our partners who have contributed to this guidebook. We hope that it is not only useful for M/Rs, farmers and educators but strengthens the conviction that the wellbeing of migrants, refugees and local people is necessary to create mutual understanding, tolerance and peaceful societies.

1. Agricultural Production

Agriculture, as old as human history, is about humans' attempts to shape nature according to their needs: Hunters and gatherers obtained their food by hunting animals and collecting plants in their natural environment. With the transition from nomadic life to settlements, people domesticated animals and grew crops using plant seeds. They created the agricultural tools they needed, developed irrigation systems and started trading agricultural products. The 18th century witnessed the input of fertilisers, pesticides and technology to increase the yield from a unit area. The 20th century, then, with the green revolution, was characterised by another increase in productivity through less input but high-yielding seeds and technology.

Playing an important role in the economic and social development of countries and societies, agriculture refers to the production of animal and plant products, the offering of those products on markets either as raw or processed materials. The importance of this sector is increasing with the increasing population, the globalisation of economic systems, changing competitive environments and rapidly developing market conditions.

Agriculture maintains its strategic importance due to its task of providing food to the population and creating employment opportunities, thereby contributing to the national income, serving other sectors, contributing to a balanced import and export, and, more recently to biodiversity and ecological balance (İkikat Tümer, 2020).

Agricultural production is generated on farms, i.e., in agricultural enterprises. An agricultural enterprise is a unit that is used for the production of plant and animal products by using production factors such as natural resources, labour and capital; following the production processes of harvesting, processing, storage and marketing, agricultural products are accessible on markets. Crop and animal production are the main areas of agricultural production. Crop production refers to field, garden, vineyard, greenhouse, fruit and ornamental plants, while animal production refers to cattle, ovine, aquaculture, bees and poultry breeding. Outlining these basics of agriculture, it should not be forgotten that agricultural production varies from region to region, from country to country based on the natural, geographical, topographical and economic factors at hand.

France

To understand the history of French agriculture, it is necessary to contextualise it through certain characteristics:

- the French population grew between 1850 and the 2000s, requiring more food (“Histoire démographique de la France”, 2023),
- the reduction in the size of agricultural areas,
- the French are major consumers of meat, while the large surfaces required for animal husbandry continue to shrink,
- agricultural crop productivity has risen sharply since 1945 (Sciences-nature.FR, 2023).

French agriculture is based on polycultures. These are defined by the planting of different crops in a specific region. This provides production that meets the needs of both farmers and the local population. Between 1850 and 1945, subsistence farming was the most common form of agriculture in France. It generated low productivity, primarily for self-consumption and the subsistence economy.

After 1945, technical advances (tractors, fertilisers, insecticides, etc.) made it possible to feed a growing population (baby boom), thanks to the replacement of subsistence farming by intensive agriculture. The latter produces substantial yields from limited agricultural land.

The standardisation of intensive farming originated with the adoption of the CAP (Common Agricultural Policy) in July 1961 by France and other European countries. The European Union devotes 35% of its budget to this policy. CAP measures aim to stabilise prices and modernise agriculture. (Sciences-nature.fr, 2023)

The objectives of the CAP are:

- increase productivity through technical progress and production factors,
- guarantee a stable standard of living for farmers, in particular by raising the wage income of the agricultural workforce,
- balance markets,
- ensure long-term supply production,
- offer reasonable prices to consumers.

In 2008, France introduced the "Ecophyto" plan, aiming at reducing pesticide use by 50% between 2008 and 2015. This plan was a failure, as were "Ecophyto I and II", so the "Ecophyto II+" plan was set up by the French government with the aim of reducing the use of pharmaceutical products by 50% by 2025 (Sciences-nature.fr, 2023).

French agriculture plays a wide range of roles, all of which are fundamental to the smooth running of the country. Data from the French Ministry of Agriculture and Food confirms this trend (Représentation Permanente 2021). In 2019, the agricultural sector was one of France's main recruiters. The production and processing activities that make up agriculture (including forestry, fishing and the agrifood industries) employ 1.4 million full-time salaried and non-salaried workers, or 5.2% of total national employment. Agriculture also plays a key role in French people's daily budgets. All households spend 21% of their budget on food. Agricultural and agrifood activities accounted for 3.4% of French GDP. The agri-food trade balance is also in surplus, reaching 7.8 billion euros (Choose France, n.d.).

French agriculture is a major asset in the context of a steadily growing world population (ten billion by 2050) and the resulting impact on agricultural commodity markets. Ranked among the world's top five agricultural exporters, France's competitiveness and cooperation will give it a distinct advantage.

Greece

Agriculture in Greece holds a multifaceted and indispensable role, serving as a cornerstone of the economy, contributing significantly to the nation's GDP through employment, food production, and exports (4% of GDP). With its rich cultural heritage, traditional farming practices, such as olive and grape cultivation, are celebrated, while agritourism bolsters rural development and sustains authentic experiences for tourists, currently being exploited for the development of several forms of alternative tourism (agritourism, ecotourism, nature tourism etc.). Agriculture also plays a pivotal role in environmental stewardship, promoting sustainable practices to preserve biodiversity, soil health, and water resources. As a key EU member, Greece benefits from agricultural support and research, fostering innovation and ensuring a secure food supply (Encyclopædia Britannica, n.d.).

Greece's agricultural potential is hampered by poor soil, inadequate levels of precipitation, a landholding system that has served to increase the number of unproductive smallholdings, and population migration from the countryside to cities and towns. Less than one-third of the land area is cultivable, with the remainder consisting of pasture, scrub, and forest. Only in the plains of the regions Thessalía, Makedonía, and Thráki, cultivation is possible on a reasonably large scale. There corn (maize), wheat, barley, sugar beets, peaches, tomatoes, cotton (of which Greece is the only EU producer), and tobacco are grown (Encyclopædia Britannica, n.d.).

Agriculture in Greece traces back to ancient times, around 6000 BC. During this period, early Greek societies relied primarily on subsistence farming, cultivating crops such as wheat, barley, olives, grapes, and figs. They also domesticated animals like sheep, goats, and cattle for food and other resources. As Greek civilization evolved, city-states (e.g., Athens, Sparta) emerged around 800 BC. With the growth of these city-states, agriculture became a fundamental pillar of their economies. Many city-states established agricultural colonies in various regions, which helped spread farming practices to different parts of the Mediterranean. During the classical period (approximately 5th to 4th centuries BC), agriculture remained a critical aspect of Greek life. Farming methods were refined, and technological advancements, such as the introduction of the plough and the use of iron tools, improved agricultural productivity. With the conquest of Greece by the Romans in the 2nd century BC, agriculture continued to be a vital economic activity. The Romans expanded agricultural practices, introduced new crops and plants, and built extensive irrigation systems to enhance agricultural productivity. During the Byzantine Empire agriculture remained central to the region's economy. In the 15th century, the Ottoman rule had both positive and negative impacts on agriculture. While the Ottomans introduced some new crops and farming techniques, they also levied heavy taxes on farmers, leading to stagnation in agricultural development. After the Greek War of Independence (1821-1829), Greece gradually modernized its agriculture. In the 19th and 20th centuries, agricultural reforms were implemented to promote land ownership, improve infrastructure, and introduce modern agricultural practices. Following World War II, Greece underwent rapid industrialization and urbanization. This led to a shift of labour from rural to urban areas, impacting the agricultural sector. However, the Greek government implemented agricultural policies and subsidies to support farmers and encourage agricultural development. Greece adopted a system of farming cooperatives as early as 1915 (Ministry of Foreign Affairs, Greece, n.d.). The country joined the European Union (EU), in 1981. EU membership brought access to agricultural funds and subsidies, further supporting the modernization and growth of Greek agriculture (Kalogiannidis, 2020).

Greek food and agriculture have traditionally been one of the major export sectors for Greece, with a strong presence in the European and a growing presence in the US food markets. From olive oil to flour products, honey to processed meats and ready meals, Greek companies have leveraged the competitive advantages offered by Greek primary production in order to competitively enter and remain in global markets, making food and agriculture one of the most dynamic and high-growth sectors in Greek manufacturing (Enterprise Greece, n.d.).

Overall, agriculture serves as a vital force that upholds Greece's cultural identity, drives economic growth, nurtures rural livelihoods, and safeguards the nation's natural heritage.

The Netherlands

The history of Dutch agriculture is characterised by a legacy of innovation, adaptation, and resilience. Originating from the 11th century, the inhabitants of the Netherlands, a predominantly low-lying region, embarked on substantial efforts to drain the wetlands. They successfully converted these regions into productive farmlands, employing groundbreaking techniques like windmills and dikes. At the beginning of the 17th century, the Dutch East India and West India Companies played instrumental roles in introducing crops such as potatoes and tulips. The "Tulip Mania" in 1637 highlighted the country's engagement in global trade and commerce. The modernisation waves hit Dutch agriculture in the 19th century, where the introduction of advanced farming techniques, crop rotations, and fertilisers substantially uplifted crop yields. Following the hardships faced during World War II, especially the "Hunger Winter" of 1944-45, the post-war period witnessed significant government investment in agricultural research and education. Consequently, institutions like the Wageningen University ascended to global prominence in the agricultural domain. As the 20th century progressed, the Netherlands fortified its position as a major exporter of dairy products, and its integration into the European Union's Common Agricultural Policy in the 21st century further solidified its agricultural significance.

Agriculture plays a pivotal role in the Dutch economy, fulfilling not only the nation's basic needs but also enhancing its economic stature on the global platform. The Netherlands has rigorously adopted and adapted various agricultural practices and policies to safeguard its resources and maximise output. Through robust legal frameworks concerning land use, environmental protection, animal welfare, and food safety, the country ensures a sustainable and efficient agricultural sector. Trade and exports, specifically in commodities like flowers, dairy products, and meat, contribute significantly to the nation's economy. The comprehensive legal framework governing these trades testifies to their importance. Consequently, the agricultural sector remains a cornerstone for the Dutch, underlining its significance in both meeting basic needs and economic prosperity.

Spain

Spain's history reflects its predominantly agrarian nature until the latter half of the 20th century when agriculture served as the backbone of the national economy. However, the advent of agricultural mechanisation led to a considerable decline in employment and contributed to rural depopulation as people moved to urban centres. This shift fostered remarkable growth in other sectors, such as industry and services.

As a result, agriculture ceased to be the primary economic activity in the country, representing merely 2.61% of Spain's Gross Domestic Product (GDP) in 2021, although it increased by 3.8% in the first trimester of 2023, compared to the last trimester of 2022. Despite this, the country's rural society still holds a strong agricultural tradition, and certain economic activities, such as foreign trade, maintain ties to this heritage.

Regarding agricultural production, Spain's value exceeded 50 billion euros in 2021, mainly attributed to flagship products like olive oil and wine, which experienced notable growth compared to the previous year. Grapes for wine topped the list as Spain's primary crop, producing over 37 million tons during that period. Cereals ranked second in production, surpassing ten million tons. Due to the substantial difference between domestic cereal

consumption and production, Spain now imports more cereals than any other agricultural product.

The majority of Spanish agricultural products are exported rather than consumed domestically, resulting in a positive balance in agricultural trade. In 2021, the surplus amounted to approximately 21.7 billion euros. The most sought-after products in foreign markets are vegetables and fruits, particularly in countries like Germany and France, which have become significant commercial partners for the Spanish horticultural sector.

Andalusia, historically renowned for its agricultural prowess, continues to hold this distinction today. It comes as no surprise that Andalusia boasts the largest area of cultivated land in Spain, covering around 3.6 million hectares. Moreover, the region has contributed significantly to Spain's prominent position in European organic agriculture, with over one million hectares dedicated to organic farming—nearly half of the country's total organic farming area (Orús, 2023b).

Türkiye

Türkiye, with its mainland Anatolia, has hosted various civilisations throughout its history. In these civilisations, agricultural activities were carried out intensively in a wide variety of areas due to the climate diversity of the region. The most important of these civilisations were the Assyrians, Hittites, Seljuks, Anatolian Seljuks and Ottomans.

Agriculture, trade and handicrafts constituted the economic power of the Seljuk Anatolian state. Agricultural activities consisted of field cultivation in the villages by Muslim and Christian population, animal husbandry, especially sheep, kept by Turkmen people and farm-owning statesmen in large pastures suitable for transhumance, and fruit growing as well as viticulture in the outskirts of towns and cities. Field agriculture and animal husbandry were the occupation of semi-nomads and nomads. Fruit growing and viticulture had an important place in Seljuk urban life. Fruit orchards and vineyards were important not only for production but also as places of recreation and entertainment. Especially fruits, vineyard products and animal products were sold to Byzantium, Trabzon Greek Empire and Arab countries. Wheat, rice and cotton were cultivated extensively, while goats, sheep, cattle and horses were reared in animal husbandry.

Cereals were the most important crops in the Ottoman period. According to research conducted on the cadastre books, it was determined that cereal products were produced at a rate exceeding 90% of the total production. Although forbidden during this period, it was determined that high profits were made from wheat exports, especially from Egypt, Venice and Thrace. Rice, cotton, hemp, cannabis and tobacco were important market products. In addition, vegetable cultivation, sheep farming and fruit cultivation, especially viticulture, were among the leading agricultural activities. One of the main reasons for the development of viticulture and fruit growing was the transformation of state-owned land into private land due to the conversion of these areas into ploughed land for cultivation. The farmer acquired the right of property by developing the land with the investment he made for this purpose (Demirci & Özçelik, 1990).

The wide range of pastures, high meat consumption, widespread leather processing, the continuity of the traditional lifestyle and the existence of farmers engaged in subsistence production have been the main factors in the increase of sheep breeding.

Since the establishment of the Republic, agricultural production has increased in parallel with the development of agricultural technology. In 1923, the agricultural sector, which accounted for 40% of the Gross National Product, maintained this ratio until the 1970s with very minor changes. This ratio was 25% in 1980, 17% in 1990 and approximately 6.4% in 2016 at constant prices. For nearly a century, the share of agriculture in GNP has decreased by approximately 84%. Despite this decline, even today, the share of agriculture in the economy of the country is very high compared to other developed countries.

The modern Türkiye, a country with rich underground and aboveground natural resources (Demirci & Özçelik, 1990), is among the important agricultural countries with its biological diversity, rich climate and geographical conditions, along with the presence of agriculture-based industry; it ranks among the top ten in the production of fifty-five products in the world due to its product diversity, productivity, production capacity and quality. It ranks first in apricot, cherry, hazelnut, quince, fig, third in cucumber, watermelon, chestnut, pistachio and natural honey, fourth in olive oil, lentil, aubergine, eggplant, apple, tomato and blackberry, spinach production, fifth in pear and peach, sixth in tea, eighth in barley, eleventh in wheat.

Another important field in the Turkish agricultural sector is animal husbandry. There has been an increase in the number of animals and meat production in the last 18 years and the total number of animals in the country is 72 million and meat production is 1.2 million tonnes. Türkiye ranks ninth in the world in terms of the number of sheep, twelfth in goats and eighth in cattle (İstikbal, 2022).

2. Agricultural Statistics

Land and Farms

France

Between 2010 and 2020, the number of farms fell in comparison with the ten years prior to 2010. There were 389,000 farms in mainland France, 100,000 fewer than in 2010. Farms occupy 26.7 million hectares of mainland France. However, the surface area of farms increased, rising from 55 hectares in 2010 to 69 hectares in 2020. More of these farms are devoted to animal husbandry than to crop production (Agreste, 2022, “Surface moyenne”; Godoc et al., 2021).

Large farms account for one in five. With an average size of 136 hectares, they occupy 40% of the land and account for 45% of jobs in the agricultural sector. On the other hand, micro-farms, with an average size of 12 hectares, are experiencing a steadier decline, accounting for 10% of farm working hours.

The number of farms devoted to livestock production is declining the most (-30% between 2010 and 2020), particularly in the beef category (-40%). By contrast, farms specialising in crop farming are reversing the trend, with a decline of -9%, with the exception of fruit and wine growing. 52% of farms are dedicated to crop production (Agreste, “*Produits Agroalimentaires: Bovins*”, 2022, p. 161; Agreste, “*L’agriculture, la forêt, la pêche et les industries agroalimentaires*”, 2023, p. 19).

The horticultural sector covers 15,400 hectares and encompasses a wide range of activities (cut flowers and foliage, potted and bedding plants, nursery plants and flower bulbs). Ornamental horticulture is the sector that offers the widest range of trades, but above all it is the most labour-intensive agricultural activity. It creates 160,000 direct and indirect jobs and generates sales of 8 billion euros (plants, works, supplies) (Saidou, 2017).

Grasslands represent 20% of the French national territory (11,5 million hectares) and 41% of the agricultural land. The total area of grasslands has remained stable for the last 30 years. ... 92% of the French dairy cows have access to grasslands and 87% graze more than 170 days per year. Grazing represents a significant share of the cows' ration. (Grazing4AgroEcology, 2023)

In 2021, the French forest will be the fourth largest in Europe, covering 26.7 million hectares including the French overseas departments. It is the leading supplier of raw materials for the timber industry. It also combats climate change by absorbing 15% of the country's annual CO2 emissions (Ministère de l'agriculture et de la souveraineté alimentaire, 2023).

Greece

The utilised agricultural area (UAA) has slightly decreased in Greece since 2000. The main reason for that was the competition of agriculture with other land uses such as energy production, industry and manufacture. This tension has been also present in several countries with the same characteristics and the decrease of UAA in Greece is considered quite lower (-2.9%) as UAA stood at 3.5 million hectares in 2010, covering about a quarter of Greek territory. There were 723.010 agricultural holdings in Greece. Although 94.050 farms ceased their activity between 2000 and 2010 (-12%), Greece was one of the EU member states with the largest number of holdings in 2010; only Romania (3.8 million farms), Italy (1.6 million), Poland (1.5 million) and Spain (1.0 million) recorded higher numbers.

As the fall in the number of holdings was sharper than that of the agricultural land area, the average size of holdings in EU member states rose between 2000 and 2010, from 4.4 to 4.8 hectares per farm. However, Greece was among the EU member states with the lowest average area per farm, with only Romania (3.4 ha per farm), Cyprus (3.0 ha) and Malta (0.9 ha) having smaller values. This reveals the great division of the agricultural land and exploitation and the existing disparities between small and large-scale producers which slow down the implementation of innovative practices as well as the transition to more sustainable farming models (European Commission, "Agricultural census", n.d.).

On the other hand, it is important to be highlighted that organic farming has increased by 885% in Greece between 2000 and 2007, which has been considered one of the highest changes noted until 2010 (Ministry of Foreign Affairs, Greece, n.d.).

The Netherlands

In the context of the agricultural landscape of the Netherlands, the division of land reveals a deep-rooted commitment to diverse farming practices. The nation designates approximately 973,000 hectares for field crops, emphasising its dedication to arable farming. Equally noteworthy is the considerable 59,000 hectares dedicated to horticulture, reflecting the Netherlands' global reputation as a leader in innovative and intensive greenhouse cultivation. The predominant agricultural use, however, remains pasture and meadowland, covering an

expansive 1,034,000 hectares, which underscores the country's historic and ongoing emphasis on dairy and livestock farming. Additionally, the Netherlands maintains about 363,801 hectares for forestry, pointing to its balanced approach to land use and conservation efforts (How are the Dutch forests doing?, 2022). As of the latest data, there are around 51,000 farms in operation across the country. On average, these farms span an area of 32.4 hectares each, indicating a blend of both small-scale specialised farms and larger, more extensive operations (At a glance, n.d.).

Spain

The number of agricultural holdings was 914,871 in 2020, 7.6% less than in the 2009 census. The total utilised agricultural area increased by 0.7% over 2009, to 23.9 million hectares. The average area per farm was 44 hectares, an increase of 7.4% (INEbase, 2020).

The cultivated area in Spain remained stable in 2022, with a total of 16,830,738 hectares, just 0.42% less than in the previous year. Survey data (cf. Table 1) has been taken directly from the field since 1990 in a georeferenced sample of the national territory from May to September, with more than 200 professionals collecting data directly throughout the national territory (Ministry of Agriculture, Fisheries and Food, “El tamaño”, 2023).

Türkiye

As shown in Table 1, Türkiye has an agricultural area of 23.9 million hectares while the European Union countries have a total of 82.5 million hectares. While Türkiye has 3.7 million hectares of horticultural crops, this area is 17.4 million hectares in the European Union. The area of meadow/pasture is 14.6 million hectares in Türkiye compared to 48 million hectares in the EU. The forest area is 22.9 million hectares in Türkiye and 160 million hectares in the EU. While the number of farms is 3 million in Türkiye, this number is 9.1 million in the EU. Furthermore, the average size of farms in Türkiye is 6.1 hectares, while in the EU it is 17.4 hectares (Eurostat, 2022a; TurkStat, 2022).

Table 1: Agricultural land and farms by partner country.

Agricultural land and farms	France	Greece	The Netherlands	Spain	Türkiye	EU
Field (ha)	26.7 m	6.7 m	973,000	23.9 m	23.9 m	82.5 m
Horticulture (ha)	15,400	40,000	59,000	16.8 m	3.7 m	17.4 m
Pasture/meadow (ha)	11.5 m	3.5 m	1.03 m	8.4 m	14.6 m	48 m
Forestry (ha)	26 m	6.9 m	363,801	19.4 m	22.9 m	160 m
Number of farms (1000)	389	730	51	914.8	3,000	9,100
Mean size of farms (ha)	69	5	32.4	44	6.1	17.4

Note: m = million; ha = hectare

Animal Production

France

At one point, the total herd exceeded 20 million cattle in 1995, including about 4.7 million suckler cows. In 2022, the number of French cattle cows had decreased to about 17.4 million heads (Trenda, 2023).

In 2022, the number of sheep in France was almost 6.6 million, which is also the record low number. It declined by 397 thousand head compared to 2021 (Eurostat, 2023; Agreste, 2022, “Ovines”). The number of goats is over 1.3 million.

In 2022, the statistics for poultry in France also decreased compared to 2021 and amounts to just over 4 million chicks (Eurostat, 2023).

In 2022, pig numbers were in general decline, and amounted to little over 12 million. Historically, the number of pigs reached a record high of over 14 million in 2010 and a record low of 12 million in December of 2022.

In 2021, rabbit production was estimated at 17.3 million. The spread of rabbit haemorrhagic disease is contributing to a sharp 7.5% decline in rabbit slaughter compared with the previous year (Agreste, “Produits Agroalimentaires: Corniculture”, 2022, p. 177).

In 2020, the aquaculture sector represented 3,000 aquaculture businesses and employed 19,476 people. Aquaculture generates sales of €778 million. France's shellfish production is the second largest in Europe, at around 145,000 tonnes. The fish farming industry produces 45,000 tonnes of fish. Although growing steadily, seaweed farming production remains lower, at 375 tonnes a year (L'aquaculture Française, 2022, p. 322; Agreste, 2022, “Pêche”; Insee, 2020, “Peche”).

Greece

ELSTAT (Hellenic Statistical Authority) implements data collection and comparative analysis for the agriculture and livestock sector. The latest available published data for the Livestock Capital and Production are about the year 2020 and are depicted in the following table (Hellenic Statistical Authority, n.d.).

The poultry industry is mainly located in the regions of Epirus (Ioannina and Arta), Evia – Viotia – Attica and Macedonia. The total number of breeder, layer and broiler farms in Greece is 89,355 and 1042 respectively.

Greece has 624,397 cattle, 7.7 million sheep and 3.1 million goats. The Greek Sea fishery lands around 145,000 tonnes of fish and seafood every year. About 90% of this is caught in the Aegean Sea. Some of the most common species are sardine, anchovy, sea bream (tsipoura), sea bass (lavraki), Meagre, Pagrus Major, Amberjack and Mediterranean mussels. Greece is a net exporter of fish and fish products. Between 2008 and 2018, exports increased by a total of 11%, while imports decreased by 14% (OECD, n.d.).

The Netherlands

In the agricultural landscape of the Netherlands in 2022, animal production plays a pivotal role. The country is home to a significant number of cattle, with the count standing at approximately 3.8 million. Alongside this, the sheep and goat populations are noteworthy, with around 723,000 sheep and 570,000 goats dotting the pastoral lands (Livestock on agricultural holdings, 2023). The poultry sector is particularly robust, boasting an impressive 105 million poultry. The pig farming sector also has a substantial presence, accounting for around 10.7 million pigs. While cuniculture, or rabbit farming, is not as prominently reported, the industry's presence is felt with tens of thousands of rabbits bred for various purposes. In terms of aquaculture, the Netherlands has a focus on freshwater fish production and mussel cultivation, with the latter yielding about 48,000 metric tons annually (Dutch Seafood Market Overview, 2022). The country is also venturing into more innovative agricultural practices, as seen with its foray into edible insect farming, positioning itself at the forefront of this emerging European trend (Sector Plan, 2020).

Spain

The Livestock Survey elaborated by the S.G. of Analysis, Coordination and Statistics of the Ministry is a useful indicator of the situation of the livestock sector from different points of view: census and productive classification, zootechnical orientation, importance in absolute and relative terms of each province, Autonomous Community and the country as a whole, as well as our position within the framework of the European Union (Ministry of Agriculture, Fisheries and Food, “Programa nacional”, n.d.).

Spain has 6.8 million cattle, 14.5 million sheep/goats, 38.4 million poultry and 32.6 million pigs and 4.9 million rabbits. The aquaculture data shown in Table 2 was gathered from APROMAR (Spanish Aquaculture Business Association, 2022). Although the data regarding insect production in Spain is nowadays not relevant, it is expected that in 2024 the biggest insect farm worldwide (Tebrio) will be set in our country, and it expects to produce more than 100.000 tons of products per year (Agroclm, 2023; Avicultura, 2014; Ipac aquultura, 2023).

Türkiye

Table 2 shows that, when we compare Türkiye and the EU in terms of animal production, Türkiye has 17 million cattle, 56.3 million sheep/goats, 366.6 million poultry, 1.6 million pigs and 514.8 million tonnes of aquaculture production, while the EU has 74.8 million cattle, 70.8 sheep/goats, 17.8 million poultry 134.4 million pigs and 1.070 million tonnes of aquaculture production (EuroStat, 2022a; TurkStat, 2022).

Table 2: Animal production by partner country.

Animal production (in number of animals)	France	Greece	The Netherlands	Spain	Türkiye	EU
Cattle	17.4 m	624,397	3.8 m	6.8 m	17 m	74.8 m
Sheep/goat	6.6 m	7.7 m sheep 3.1 m goats	723,000 sheep 570,000 goats	14.5 m	56.3 m	70.8 m
Poultry	4.1 m	27 m	105 m	38.4 m	366.6 m	17.8 m
Pig	12.1 m	742,963	10.7 m	32.6 m	1.6 m	134.4 m
Cuniculture	17.3m	n/a	n/a	4.9 m	n/a	n/a
Aquaculture (tons)	193,394	145,000	48,000	327,309	514.8 m	1.1 m

Note: m = million

Plant Production

France

In 2020, cereals accounted for 36% of agricultural land, or 8.9 million hectares. The average size of cereal farms was 71 hectares. Common wheat is the most widely grown cereal, accounting for 53% of the total area, followed by barley (19%) and grain maize (17%).

In 2021, soft wheat production of 35.5 million tonnes was set to rise by 21.4% compared with 2020, when production was particularly low. Grain maize production is also up, by 11.8% in 2020, to 15.5 million tonnes in 2020. Barley collection is around 11.5 million tonnes, up 11.5% year-on-year. However, production is trending downwards (-0.9%) compared to the average for the period 2016-2020 (Agreste, "Produits Agroalimentaires: Céréales", 2022, p. 137).

Greece

Greece produces more than 430,000 tons of olive oil annually, and more than 75% of that is Extra virgin olive oil, which is considered the best type. Greece is the third largest olive-oil producing country in the world, after Spain and Italy. It is worth noting that Greek Olive oil and oleaginous products hold a prominent position among the most esteemed agricultural commodities of the nation. With a focus on fostering the country's export potential, cooperatives, companies, and the Greek State have actively engaged in this endeavour. As a result, Greek companies have achieved substantial brand recognition and established robust international distribution networks.

Greek vineyards are among the world's oldest and have produced wines for thousands of years. Thanks to its geographical location in the temperate Mediterranean region, Greece is endowed with favourable climatic conditions for vine growing. Greek wines, like many agricultural products in Greece, carry a long history and a heritage which comprises unique viticultural practices and a treasure of local grape varieties. This combined with the contribution of keen producers who apply modern, human-scale wine production, make Greek wines different and unique.

The Netherlands

Three primary plant products emerged as dominant in terms of production volume in 2022 Netherlands. First and foremost, potatoes occupied a substantial cultivated area of approximately 162,000 hectares, yielding a remarkable total production of 6.9 million tons annually. Following potatoes, sugar beets claim a significant portion of the cultivated land, covering around 85,000 hectares. The sugar beet production amasses an impressive 7.3 million tons yearly. Lastly, onions, while cultivated on a relatively smaller scale of about 27,000 hectares, still contribute a substantial 1.2 million tons to the yearly production figures, with a yield of 44.5 kg per decare. These statistics underscore the importance and efficiency of the Dutch agricultural sector, particularly in cultivating these three staple crops (Arable crops, 2023)

Spain

In addition to the three primary agricultural groups highlighted in Table 3, Spain's agricultural sector thrives on the cultivation of supplementary crops like lettuce, onion, wheat, and rice. Despite some of them not being explicitly featured in the table, these crops play a significant role in the country's agricultural output. They are cultivated extensively across various regions, contributing substantially to both domestic consumption and international trade (Ministry of Agriculture, Fisheries and Food, "Superficies", n.d.). The Ministry's data on land utilization emphasizes the widespread cultivation of these crops, underscoring their economic importance alongside the major agricultural categories earlier mentioned.

Türkiye

The top three crops produced in Türkiye in terms of area are wheat, barley and maize, respectively, whereas this order is wheat, maize and barley in the EU (Table 3). Wheat is produced on 6.6 million hectares in Türkiye in the 1st place and 19.8 million tonnes of product is obtained. In the 2nd place, barley is produced on 3.1 million hectares and 8.1 million tonnes of product is obtained. In the 3rd place is maize production and 8.5 million tonnes of product was obtained on 0.9 million hectares.

Table 3: Statistics about the three most produced plant products by partner country.

Country		Product Name	Crop area (ha)	Yearly produced amount (in tons)
France	1 st product	wheat	5 m	35.5 m
	2 nd product	corns	1.5 m	15.5 m
	3 rd product	barley	2.4 m	11.5 m
Greece	1 st product	olives	819,060	1.8 m
	2 nd product	cereals	340	680
	3 rd product	vineyards/grapes	89,230	818,860
The Netherlands	1 st product	potatoes	162,000	6.9 m
	2 nd product	sugar beets	85,000	7.3 m
	3 rd product	onions	27,000	1.2 m
Spain	1 st product	barley	2.3 m	8.2 m
	2 nd product	grapes	924,444	5.9 m
	3 rd product	tomato	45,107	3.7 m
Türkiye	1 st product	wheat	6.6 m	19.8 m
	2 nd product	barley	3.1 m	8.1 m
	3 rd product	maze	0.9 m	8.5 m
EU	1 st product	wheat	24.7 m	130 m
	2 nd product	maze	6.1 m	73 m
	3 rd product	barley	10.3 m	10.3 m

Note: m = million

3. Significance of the Agricultural Production for the Partner Countries' Economies

France

In 2021, French meat consumption fell by 0.4% year-on-year. The French consumed 89.2 kilos of meat. Pork consumption rose by 1% over the year, taking first place among the meats most consumed by the French, at 31.7 kilos per capita. Poultry continued to rank second: 28.3 kilos in 2021, thanks in particular to the steady rise in chicken consumption, which offsets the reduction in turkey and duck consumption. Beef consumption also fell, reaching 22.2 kilos per capita in 2021. The consumption of beef, pork and goat meat had fallen over time since the 2000s, unlike that of poultry. Since 2000, consumption of milk, butter and eggs had fallen by 27.3 kilos for milk, 1.3 kilos for eggs and 0.6 kilos for butter (Agreste, “*Alimentation: Consommation alimentaire*” 2022, p. 120; Agreste, 2022, “Statistical book”; Agreste, 2021, “En 2020”; Agreste, 2023 “En 2023”; Agrest, 2023, “Porcins”).

In 2020, the average French person consumed 33.7 kilos of aquatic products. 11% of consumption was farmed fish, of which salmon was the most consumed at 2.7 kilos. Farmed shellfish and crustaceans accounted for 21% of French seafood consumption. The most popular species are mussels (2.4 kilos), oysters (1.1 kilos) and prawns (1.5 kilos). Overall consumption comes mainly from exports, rarely from farming. (*L’aquaculture Française*, 2022, p. 325).

In the French olive oil sector, olive oil holds a prestigious place in French consumption, due in particular to the French heritage that values the quality of olive trees in the south of France. With a per capita consumption of 12 kilos in 2020, olive oil was the second most consumed oil in France, behind sunflower oil (Agreste, “*Alimentation: Consommation alimentaire*”, 2022, p. 119; Aveline, 2023).

Greece

Data presented about the production of meat, milk and olive oil are retrieved mainly from Eurostat. Cows' milk accounts for the vast majority of the milk delivered to dairies across most of the EU Member States. Nevertheless, a majority (56.7%) of the milk delivered to dairies in Greece in 2021 came from ewes and goats. Greece is the most competitive country, in the EU level, in the production of milk from multiple resources (European Commission, “Milk”, n.d.).

Aquaculture, while representing a specialized sub-segment of food production, is undeniably a swiftly expanding sector within the Greek economy. As a major international exporter, Greece stands in a favourable position to capitalize on its inherent competitive advantages. Remarkably, around 90% of the sector's value in Greece is attributable to two primary fish products, namely seabass and seabream, where the nation holds a dominant stance in the global markets. The Greek aquaculture production is widely recognized for its exceptional product quality, and it harbours vast untapped potential for further growth. By strategically investing in augmenting capacity, embracing economies of scale, and implementing cost-improvement initiatives, the industry can undoubtedly propel its trajectory towards unprecedented heights.

Fish farming has emerged as a leading force within Greece's esteemed food industry, assuming a paramount status in the broader EU landscape characterized by robust market consolidation. Pivotal to this sector's sustained success is a focused investment in consolidating and expanding aquaculture facilities, alongside enhancing overall competitiveness, operational efficiency, and securing improved market access. The realization of these endeavours holds the promise of delivering substantial returns, building upon the sector's inherent growth potential and its already well-established position within the global market.

Moreover, the industry's growth shows immense promise, as investments in various critical areas such as market consolidation, processing, research and development, product differentiation, enhanced packaging, and increased production output can further propel its expansion. Such measures would undoubtedly contribute to the thriving state of the industry, leading to considerable returns on investment (Enterprise Greece, n.d.; FAO, n.d.).

The Netherlands

The Netherlands was the world's second-largest exporter of agricultural products, trailing only the United States. This achievement is remarkable, considering the nation's compact size. Approximately 1.8 million hectares (54% of the country's total land area) is used as agricultural land. The total value of the agricultural exports was estimated at €94.5 billion (CBS, 2023).

In a meticulous assessment of the agricultural and aquacultural outputs of the Netherlands up to the year 2021, several key commodities stood out in terms of production and consumption metrics. The meat sector showcased a significant production volume of approximately 3.5 million tons (Meat production, 2022), with an average per capita consumption estimated at 76 kg (Per capita consumption, 2022). The dairy sector, an integral part of the Dutch agricultural landscape, reported an overwhelming milk production of about 13.6 million tons, translating to an individual consumption of roughly 320 kg (Milk supply and dairy production, 2023). The egg industry, another substantial contributor, generated around 658,000 tonnes of eggs annually (Production of eggs, 2022). This results in a consumption rate of approximately 12 kg or 200 eggs per person per annum (Egg consumption, 2021). In contrast, the Netherlands, not being a traditional olive-producing region, has negligible olive oil production. Nevertheless, the consumption of imported olive oil averages around 2 kg per person annually. Lastly, the burgeoning aquaculture sector contributed about 62,940.000 metric tons of aquatic products ton in 2016, with the Dutch consuming an average of 22 kg per person.

In addition to the data presented in Table 4, it needs to be pointed out that the Dutch cultivate a staggering 4.3 billion tulip bulbs annually. Out of this, 53% (2.3 billion) matures into cut flowers. While 1.3 billion of these flowers find their market within the Netherlands, the rest are shipped abroad: 630 million to European destinations and 370 million to other regions (Dutch Tulips, n.d.). In 2021, the Netherlands saw tulip bulb exports valued at over 250 million euros. Between 2008 and 2020, the tulip bulb production area in the country grew from 114,000 hectares to 149,000 hectares. In comparison to lilies, which are the second most produced flower bulb, tulips have almost thrice the cultivation area. Conversely, gladioli occupy an area of about 8,000 hectares, over 18 times lesser than tulips. Germany stood out as the leading export destination for Dutch flowers in 2020, recording an export value of roughly 2.74 billion euros, followed by the United Kingdom at 1.2 billion euros, and France with exports valued at approximately 910 million euros (Value of the import, 2022).

Spain

In 2020, Spanish households increased meat consumption by 10.5%, reaching 2,305.25 million kilos. This category grew by 12.9% in value, an evolution higher than that experienced in volume due to the 2.2% increase in the average price, which this year reached €7.01 per kilo (Interempresas, 2020).

The sum of cow, sheep and goat milk deliveries in 2022 shows that the Spanish dairy industry absorbs more than 8,200,000 tons of milk of Spanish origin per year as shown in Table 4. In the context of the EU, Spanish cow's milk production is around 5% of the EU total, compared to 15% and 20% for sheep's and goat's milk, respectively. Spain is currently the second largest producer of sheep's and goat's milk in the EU (Fenil, 2023; Orús, 2022, 2023b).

The olive oil sector is a fundamental pillar of the Spanish agri-food system. Spain is a world leader in surface area, production and foreign trade thanks to the country's olive-growing tradition and a technologically advanced and professional industry capable of obtaining high quality oils. Spanish olive oil production accounts for 70% of EU production and 45% of world production. Its exports account for around 65% of its total commercialization representing the third most exported agri-food product, with more than 150 destination countries and a favourable trade balance that contributes to the positive balance of the agri-food sector as a whole (Ministry of Agriculture, Fisheries and Food, "Aceite", n.d.; Orús, 2023b).

Olive groves cover 2.75 million hectares, of which 2.55 million hectares belong to oil mill olive groves (93% of total olive groves). The crop is present in 15 of the 17 autonomous communities with a central-southern and eastern distribution of the peninsula. Andalusia is the largest producing region with 1.67 million hectares and concentrates, mainly in Jaén, its characteristic "sea of olive trees". Olive cultivation has the largest area of Integrated Production in Spain with 477,606 hectares (2019 data) which represents 57% of the national total of this type of production and 18% of the total area of olive groves in Spain. In addition, 217,864 hectares of olive mill olive groves produce under organic farming (2020 data). In terms of production, olive cultivation is characterised by its marked neighbourly character, so olive oil production shows a great productive alternation between seasons. At regional level, olive oil production is located in Andalusia with 80% of the total, where Jaén is the main producing province with approximately 37% of the total, followed by Castilla La Mancha with 8% and Extremadura with 4% of the national total. The sector not only has an indisputable economic importance, but also has a great social, environmental and territorial impact. More than 350,000 farmers are dedicated to olive growing, the sector supports some 15,000 jobs in the industry and generates more than 32 million daily wages per season (Orús, 2023a).

The processes of transformation and distribution of agricultural production, including its by-products, constitute the main activity of numerous municipalities and an associated industry that, in many cases, supports and unites the rural environment where it is settled, supported by a strong cooperative movement of base (Orús, 2023b). Spain is the second country in Europe in terms of number of agricultural cooperatives, behind Italy, and the third in terms of members and employees. The main entity of associationism in the agrarian sector are the Agrarian Cooperatives, but there have also been developed Agrarian Transformation Societies (SAT), Agrarian Machinery Utilisation Cooperatives (CUMAS) and Community Land Exploitation Cooperatives (CEC) (Ministry of Agriculture, Fisheries and Food, "Encuestas", "Sectoros", n.d., "La superficie", 2023).

The agricultural cooperative movement continues to offer today the same basic functions and services for which it was originally created and we must recognize its important impact on the evolution and development of farmers and stock breeders who promoted it under a high degree of trust among them that has allowed them to access important investments, position themselves in the agri-food chain, increase the added value of their productions, execute international marketing plans, create and position brands, develop R&D&I projects, etc. and a host of activities that would have been impossible for farmers and ranchers to undertake individually (Vilches, 2020).

Türkiye

Table 4 shows that Türkiye has an annual meat production of 2.2 million tonnes in terms of total agricultural production and annual per capita consumption is 9.9 kg. In the European Union, there is an annual meat production of 42.2 million tonnes and annual per capita consumption is 69.8 kg. Türkiye has an annual milk production of 21.5 million tonnes and annual per capita consumption is 146 kg. In the European Union, there is an annual meat production of 19.5 million tonnes and annual per capita consumption is 331 kg. Türkiye has an annual egg production of 1.2 million tonnes and annual consumption per capita is 12 kg. In the European Union, there is 6.5 million tonnes of egg production and annual per capita consumption is 210 pieces. Türkiye has an annual production of 849.808 tonnes of

aquaculture products with an annual consumption of 23.9 kg per capita. In the European Union, there is an annual production of 7.1 million tonnes of aquaculture products and the annual consumption per capita is 24 kg. Olive oil production in Türkiye is 421,717 tonnes per year and annual consumption per capita is 1.5 kg. In the European Union, there is an annual production of 2 million 4tonnes of olive oil and the annual consumption per capita is 1.6 kg. In Türkiye, annual production of hazelnut is 0.8 million tonnes and per capita consumption is 1.4 kg. In the EU, annual production is 124.5 million tonnes and per capita consumption is 80 kg.

The share of agricultural production in exports and imports is 3.1% and 3.7%, respectively. The main products exported are hazelnut, grape, tobacco, tomato and apricot. The main products imported are sunflower, almond, broad bean, tea and red lentil (TurkStat, 2022).

Türkiye is one of the leading agricultural producers in Europe and the world. Cereals, legumes, various fruits and vegetables, meat-dairy products, aquaculture products, forest products and others, as well as a wide range of products such as agricultural diversity is quite high and product quality is also high.

The diversity of agricultural production has contributed to the development and diversification of agricultural industry and the development of agricultural technology. Sugar beet, cotton, sunflower, tobacco, hemp are the leading products in the agriculture-based industry (Ministry of Agriculture and Forestry (Ministry of Agriculture and Forestry, 2022).

In Türkiye, there are 11,971 agricultural co-operatives with a total of 3,946,884 members and 870 agricultural unions with 346,715 members (Ministry of Agriculture and Forestry, 2022). Agricultural marketing in Türkiye has progressed to the point where the producer and the consumer are united on various platforms with digitalisation and the consumer is informed at every stage of the product produced.

Table 4: Total agricultural production and per capita consumption of agricultural products by country.

Country	Meat		Milk		Eggs		Aquaculture products	
	Production (tons)	Consumption (kg)	Production (tons)	Consumption (lt)	Production* (tons)	Consumption (pcs)	Production (tons)	Consumption (kg)
France	2.4	89.2	23.3 m	260.0	992,310	219.0	205,975	33.7
Greece	350,530	39.6	150.7 m	176.1	809,000	161.8	176,911	19.6
The Netherlands	3.5 m	76.0	13.6 m	320.0	658,000	200.0	263,000	22.0
Spain	7.3 m	49.7	8.3 m	108.2	870,000	250.0	327,309	19.2
Türkiye	2.2 m	23.9	21.5 m	146.0	1.2 m	218.3	849,808	9.0
EU	42.2 m	69.8	19.5 m	331.0	6.5 m	210.0	7.1 m	24.0

Note: m = million

*Source: <https://www.compassionsettoalimentare.it/media/5789260/egg-production-in-the-eu.pdf>

4. Population and Agricultural Population

France

France currently has a total population of 67.843 million inhabitants, with 35.020 million of them being females. According to an Insee (2023, “Population”) employment survey, in 2019 there were around 400,000 farmers, or 1.5% of the population. 7% of them do not own farms (agricultural contractors, foresters, fishermen, fish farmers). The majority of working farmers have no employees. 69% are self-employed and have no employees, while 5% are family carers. In 53% of cases, they have just one employee, and in 33% of cases they have between two and four. 40% of farmers work in a company. In 2019, 73% of working farmers were men, compared with 52% of all working farmers. Women in full-time employment (115,100) are more likely to be family carers (12%) than men (2%). Even though the proportion of men in the agricultural sector continues to rise, the overall number of jobs held by women has increased. Half of all farmers are aged 50 or over. In 2019, farmers declared that they worked 55 hours a week. In 2019, 88% of farmers worked at weekends over the last four weeks (Chardon et al., 2020).

Greece

The official census of the population by sex, age, sector of economic activity in Greece has been implemented by the Hellenic Statistical Authority in 2021 and according to its results the total population of the country is 10.482.487 people, with the total agricultural population being 822.420 people. The female agricultural population is 107.089 people while the male agricultural population is 265.120 people (Hellenic Statistical Authority, 2021).

473,100 people were employed in agriculture, forestry, and fishing, while 433.000 employees were labelled as “Skilled agricultural and fishery workers” according to the Labour Force Survey Results implemented in the 4th quarter 2022 by ELSTAT (Hellenic Statistical Authority, 2023).

The Netherlands

In the Netherlands, a total population of 17,590,672 is recorded, with 8,845,204 females and 8,745,468 males (The Netherlands’ CAP, n.d.). Out of this population, 170,000 individuals are identified as being part of the agricultural population, which constitutes 2% of the total population. When this agricultural demographic is examined, 56,000 females (Stable Share, 2018) and 114,000 males are observed. Additionally, 63,000 individuals within the agricultural sector are reported to be of foreign origin.

In the agricultural sector of the Netherlands, migrant labour has historically been a foundational component, reflecting shifts in migration trends and EU expansions. In the 1980s and 1990s, undocumented migrants, primarily from Morocco and Turkey, significantly supported the Netherlands’ greenhouse economy. However, with the European Union’s expansions in 2004 and 2007, the primary source of migrant labour transitioned to Central and Eastern European (CEE) countries, particularly Poland, Romania, and Bulgaria. While the Dutch legislative framework provides a ‘single permit’ system combining both a work visa and a residence permit, the complex administrative processes and the steady influx of CEE

labour have made it less attractive for agricultural employers. Current empirical data indicates that employment agencies and the broader agricultural sector are the main employers of CEE migrants. Polish workers, in particular, make up a substantial third of the agricultural labour force, although there is a noticeable emerging trend of increasing labour from the Balkans, Ukraine, and Southeast Asian regions. This migration labour flow underscores the evolving needs of the Dutch agricultural sector for a diverse and qualified workforce.

Spain

According to INE data, there are currently around 760,000 people employed in agriculture in Spain as shown in Table 5, of which 185,000 are of foreign origin. To this figure should be added possibly 20,000 more, according to the estimates of the porCausa foundation, who could be working without a labour contract. In total, people of migrant origin represent 27% of the workers in the agricultural activity, much higher than the 11% that they represent over the total resident population in our country (Fanjul & Páez, 2022).

The employment of people of foreign origin in industrial agriculture and livestock farming is based on global marketing and competition between productive enclaves in order to obtain low-cost agri-food production. The growing asymmetry in job opportunities, living conditions and wages between the world's centre and periphery has turned the latter into a massive global pool of people willing to migrate. The International Labor Organization (ILO) has estimated the number of international migrant workers at 169 million, of whom 12 million work in agriculture. The proportion of this group in the EU agricultural sector has risen to 6.5%, a trend driven by countries such as Spain, Italy and Denmark, where the rate is between six and nine points higher than in other sectors (Datos Macro, 2020; Hernandez, 2020).

Türkiye

The total population in Türkiye in 2022 was 85,279,553 people and there were 2,172,974 farmers (TurkStat, 2022). Although it is not possible to obtain reliable data on seasonal agricultural workers and migrant agricultural workers in Türkiye, a large majority of the rural population living in the east and south east of the country go to different regions as seasonal agricultural workers and work temporarily. According to the data of the Ministry of Labour and Social Security for 2021, the number of work permits issued to foreigners for all sectors is 168,103. The number of work permits issued to Syrians is 91,500 including permits issued to persons with residence permits and Syrians under temporary protection. Work permit exemption data for the agriculture sector was not available because it is considerably more difficult to obtain work permits as seasonal agricultural workers (Ministry of Labour and Social Security, 2021). The share of the agricultural population in the total population in Türkiye is 3.5%, the female agricultural population is 13% and the male agricultural population is 87%. In the EU, the share of the agricultural population in total population is 1.9%, the female agricultural population is 31.6% and the male agricultural population is 68.4%.

Table 5: Population statistics by country.

Country	Total population (million)	Agricultural population	Share of agricultural population in total population (%)	Foreign agricultural population
France	67.0	759,000	1.1	19,300
Greece	10.5	822,420	7.8	n/a
The Netherlands	17.6	170,000	2.0	63,000
Spain	47.7	760,000	1.6	185,000
Türkiye	85.3	2.17 m	3.5	n/a
EU	446.7	8.7 m	1.9	n/a

Note: m = million

5. Migrants and Refugees in the Agricultural Sector

France

Migrants and refugees (M/Rs) are a necessary and indispensable agricultural workforce for the French farming sector. French agriculture is suffering from a shortage of labour. Bilateral agreements allow seasonal workers from Morocco and Tunisia to work in France. As a result, the majority of seasonal workers on fixed-term contracts come from Morocco, Tunisia and Poland.

The increased need for labour has led farmers to offer M/Rs in France renewable fixed-term contracts and, potentially, open-ended contracts. Hiring undocumented M/Rs in the agricultural sector also allows them to be regularised. NGOs, state policies and agricultural businesses are banking on the training available to ensure the socio-economic integration of M/Rs through French language tests delivered by Office Français de l'immigration et de l'intégration (French Office for Immigration and Integration), French language courses, employment centres, training centres, etc. However, the language barrier, insecure wages, the arduous nature of farming tasks and the lack of accommodation near farming sites are all obstacles to the employability of refugees and migrants, as is undeclared recruitment that does not comply with social security standards (health, wage contributions, working conditions, etc.) (Franceinfo, 2020; Insee, 2023, "Emploi"; Insee, 2023, "Inactivité"; Insee, 2023, "L'essentiel").

Greece

Greece has functioned as a major entry point for M/Rs for several reasons, contributing to a larger influx compared to some other countries. Its strategic geographical location, with its extensive coastline and proximity to regions facing conflict and instability, makes it a natural gateway for M/Rs seeking entry into Europe. It is close to regions experiencing political unrest, conflict, and humanitarian crises.

Agriculture, with its significant role in both the economy and society across various historical periods and for diverse demographic segments (Papadopoulos et al., 2021), served as a

primary source of employment for immigrants in Greece. The following will provide a brief overview of the role of migrants and refugees in the agricultural sector from the 1990s to the present day. During the early 1990s, 12.2 percent of migrants were engaged in the primary sector (agriculture and fisheries), in contrast to 19.6 percent of the Greek population. Due to the absence of a legal framework governing the employment and residency of migrants in Greece, a significant portion found employment in the informal labour market. The precarious legal status of the majority of the migrant population also contributed to their vulnerable employment situations. It has been estimated that migrants, irrespective of their legal status, contributed 45 percent of the total hired labour in agriculture (Lianos et al., 1996).

By 2001, the number of migrants employed in the primary sector increased from 7,792 to 74,922 individuals, constituting 12 percent of the labour force in that sector. Notably, over one fifth (21.7 percent) were women, primarily from Albania, Romania, and Bulgaria, while the corresponding percentage of women in the Greek agricultural labour force was 42 percent. The legalization initiatives in Greece in 2001 and 2005/2007 facilitated a substantial number of migrants residing and working in the country to formalize their residence and status. This legalization process enabled many migrants to pursue more secure and higher-paying positions within the agricultural sector.

By 2011, the influx of migrant workers into the primary sector coincided with the ongoing trend of young individuals and women disengaging from agricultural employment. This trend was particularly evident in rural areas where the local economy had started providing increased job opportunities beyond agriculture. As of 2011, the proportion of migrant employment in the primary sector declined to 16.6 percent, a slight decrease from 18.6 percent in 2001. However, the overall contribution of migrant labour to the primary sector rose to 19.7 percent. The total number of migrant labourers engaged in agriculture increased to 79,271 individuals, up from 74,922 in 2001. Concurrently, the percentage of female migrant agricultural employment remained constant, accounting for one-fifth of the total migrant employment within the agricultural sector (Papadopoulos et al., 2021). For 2022, the number of refugees was 160,761.00, a 34.36% increase from 2021, and is ranked 13th worldwide concerning the number of refugees granted asylum (Macrotrends, 2023). Data for employment of M/Rs in the agricultural sector after 2020 are not available.

Greece has faced challenges in managing and processing asylum claims efficiently, leading to increased numbers of M/Rs arriving and sometimes getting stranded in the country. One significant change in the management of M/Rs in Greece in recent years was the establishment of the Ministry for Migration and Asylum in Greece in January 2020. The creation of a dedicated Ministry reflects an increased focus on addressing migration-related challenges and ensuring a more organized and comprehensive approach to migration management but at the same time it has brought massive changes in the data collection and management.

The Netherlands

In The Netherlands, the distribution of migrants as a workforce across various sectors is observed as follows: 20,000 are employed in the agriculture sector, 60,000 in the industry sector, 150,000 in services, and 40,000 in the construction sector, summing up to a total of 270,000. Out of the total number of 300,000 M/Rs (M/Rs) in the country, it can be deduced

that an unemployment rate of 10% is experienced among this population (Distribution of Migrant Workers, 2022).

M/Rs have historically been a cornerstone of the Netherlands' agricultural workforce. The agricultural sector, recognized for its seasonal and labour-intensive demands, often necessitates a flexible workforce, leading to a significant portion of its employees being M/Rs. The availability of opportunities that don't require stringent formal qualifications or deep proficiency in the Dutch language makes the sector an attractive employment avenue for M/Rs. Additionally, those with agrarian backgrounds find familiarity and align their skill set with the sector's demands. On the contrary, certain deterrents, including the physically demanding nature of the work, its transient nature, and cultural perceptions, might dissuade some from considering agriculture as a long-term profession.

From an economic perspective, the agricultural sector provides an essential entry point for many M/Rs into the labour market, facilitating upward economic mobility. Over time, the sector's flexibility can be leveraged to transition from seasonal labourers to more permanent roles, or even entrepreneurship. While economically beneficial, the sector plays a larger role in their socio-cultural assimilation, promoting community-building and preserving cultural practices tied to farming and food production.

However, integration into the Dutch agricultural sector isn't without its challenges for M/Rs. The advanced technological practices that characterize Dutch agriculture can pose an initial hurdle for those accustomed to more traditional farming methods. This discrepancy necessitates comprehensive training, particularly when combined with the sector's focus on sustainable and environmentally-friendly practices. Additionally, the seasonal nature of many jobs can lead to employment instability, a challenge for those already contending with the complexities of resettlement.

Legally, the employment of M/Rs in the Netherlands is subjected to a myriad of regulations. Migrants from the European Economic Area (EEA) and Switzerland generally have unrestricted employment rights, while non-EEA migrants often need employers to secure a work permit on their behalf. However, upon receiving a residence permit, refugees gain unrestricted work rights. To further smoothen the integration of M/Rs into the agricultural workforce, institutions like the Dutch Ministry of Agriculture, Nature, and Food Quality and the Dutch Council for Refugees have introduced tailored programs, initiatives, and training sessions, emphasizing the integration of this demographic to fulfil labour shortages and foster inclusivity.

Spain

In recent years, there has been an increase in asylum requests (118,842 in 2022) after leaving behind the border restrictions imposed during the pandemic and despite the enormous and serious obstacles that people are having to access the asylum procedure: the shortage of appointments leads people to have to wait in an irregular situation between six or eight months on average to submit their asylum application having to resort to the informal market to access this right, which violates the European Procedures Directive. Additionally, more than 161,037 people from Ukraine obtained temporary protection, since the historic activation of this mechanism in March 2022. Meanwhile, applications from people coming from Colombia or Nicaragua were largely rejected, despite the threats and rights violations

experienced in both countries. Of the 161,037 Ukrainian citizens of working age with authorization to reside and work in Spain for temporary protection, only 13,695 people, or 13%, were registered with the General Treasury of the Social Security at the end of 2022 (State Public Employment Service, 2021).

Although 86,997 decisions were approved in 2022, only 14,235 were granted refugee or subsidiary protection status (both types of international protection). Also of renewed concern is the considerable increase in pending applications: as many as 122,035 people were awaiting a decision on which their lives depended, 17% more than the previous year, mostly Venezuelans and Colombians (CEAR, n.d.).

The data for Spain shown in Table 6 is related to migrants who have a residence permit of some kind, since this is necessary to be able to work and, therefore, to be able to receive any contributory benefit in Spain. Obviously, many of the migrants work even if they do not have a contract, but it is not possible to give exact numbers (Fanjul & Páez, 2022).

Many M/Rs come from rural areas and therefore have agricultural, livestock or fishing skills. Seasonal agricultural work in Spain, especially in southern Spain (Álvarez & Departamento de Comunicación de UPA., 2019) offer opportunities to M/Rs to find work. Due to these conditions, local workers have been replaced by international M/Rs from a wide variety of origins. Another peculiarity of this labour market is the short duration of the jobs, since they are linked to the agricultural harvest seasons. Thus, throughout the year, different campaigns attract thousands of people in search of work, from the red fruit harvest in Huelva to the sweet fruit harvest in Lleida during the summer, through to intensive agriculture of longer duration such as horticulture in Murcia and Almeria (Briones, 2022).

Article 39 of Organic Law 4/2000, of January 11th, 2000, on the rights and freedoms of foreigners in Spain and their social integration, regulates the collective management of hiring at origin, establishing that the Ministry of Inclusion, Social Security and Migration may approve, in accordance with the national employment situation, an annual forecast of occupations and, as the case may be, of the expected number of jobs that may be filled through this collective management of hiring at origin in a given period, an annual forecast of the occupations and, as the case may be, of the expected number of jobs that may be filled through this collective management of hiring at origin in a given period, to which only those foreign workers who are not present or residing in Spain will have access. Likewise, the Ministry of Inclusion, Social Security and Migration may establish a number of job search visas under the conditions to be determined, aimed at children or grandchildren of Spanish nationals of origin or at certain occupations (State Agency, 2022).

The United Nations High Commissioner for Refugees (UNHCR) in Spain seeks to ensure the correct application of international refugee law, to support the search for durable solutions for the situation of refugees and to offer them protection (ACNUR, “ACNUR”, n.d.).

Türkiye

Türkiye is a country where M/Rs come intensively due to its geographical location and cultural structure. There are multiple reasons for this migration. One of the main reasons is its geographical location connecting the continents of Asia, Africa and Europe. Also, Türkiye

does not yet have border measures as strict as the EU institution Frontex, there are difficulties in recording and accessing data on irregular migration (Deniz, 2014).

Starting with anti-regime protests in 2011, Syria has witnessed a civil war that forced more than half of the Syrian population to migrate within the country. Besides fatalities, 5.5 million Syrians have left the country and sought refuge in other countries. Türkiye pursued an "open door" policy mobilising more than 3.5 million Syrian refugees to migrate to Türkiye. Türkiye has reached the status of the country with the most refugees worldwide. Initially, the Turkish authorities recognised Syrians as "guests", assuming that they would return in a short time. However, when it became clear that Syrians would not be returning soon, a new comprehensive immigration law was drafted and put into force. Regulations address the problems faced by Syrian asylum seekers in areas encompassing education, health and employment (Aktaş, 2018).

In Türkiye, M/Rs play an important role as labour force in the agricultural sector. However, it cannot be said that M/Rs are fully integrated into the agricultural sector. Temporary and short-term labour force jeopardise integration. Lack of continuity in employment, low wages, difficult access to housing, education and agricultural areas are the main reasons for the integration barrier.

Table 6 shows that the rate of M/Rs working in the agricultural sector in Türkiye is 17.3%, the rate of M/Rs working in the industrial sector 21.3%. The proportion of M/Rs working in the service sector is 55.3% and the proportion of M/Rs working in the construction sector is 6.2%.

The total number of M/Rs in Türkiye is 4.89 million. The unemployment rate of M/Rs is 12.6% (Eurostat, 2022b).

Working conditions M/Rs are exposed to in the agricultural sector do not foster the acquisition of technical skills as M/Rs continuously change working areas. Under these circumstances, M/Rs do not gain valuable work experience leading to specialisation and deeper understanding of processes and procedures in modern agriculture.

As far as legal regulations are concerned, certain rules are necessary for the employment of M/Rs in the agricultural sector in Türkiye. These include requirements regarding work permits, working conditions, social security and protection of workers' rights. The socio-economic transformation in rural areas increases the need for paid agricultural labour. This transformation is due to rural-urban migration, the aging rural population and the shrinking lands through inheritance (Dedeoğlu, 2018).

Various institutions and organisations are involved in the development and/or provision of policies or good practices that assist the professional development of M/Rs in the agricultural sector in Türkiye. These include government agencies, non-governmental organisations, farmer associations, vocational training centres. In addition, EU-funded projects such as Erasmus, European Union Syria Crisis Regional Trust Fund) also provide training and contribute to the capacity building of refugees/migrants.

Table 6: Distribution of migrants as workforce in sectors by country.

Country	France	Greece	The Netherlands	Spain	Turkey
Agriculture	49,400	n/a	20,000	185,000	441,408
Industry	310,500	n/a	60,000	839,664	543,460
Services	486,600	n/a	150,000	3,598,561	1.410,955
Construction sector	333,000	n/a	40,000	779,688	158,190
Total	1,179,500	n/a	270,000	5,402,913	2.554,013
Total number of M/Rs	7 m	n/a	300,000	5.434.153	4.890,000
Unemployment rate of M/Rs (%)	13	n/a	10	18.5%, 45%*	12.6

Note: m = million

*Only in Spanish statistics, refugees and migrants are distinguished.

6. Agriculture and Food Security

France

France is a country potentially capable of satisfying all the food needs of its citizens. According to the World Economic Forum, France ranks first out of all countries in the world, in terms of best food sustainability. In this ranking, they scored 76.1 out of 100, which allowed them to retain the leading position. This has partly been justified by France's efforts to reduce food waste: every year, consumers in France waste 67.2kg of food per person compared to 95.1kg in the United States, 87.1kg in Belgium and 78.2kg in Canada (Lei Win, 2018).

There are three consumption channels in France. Direct sales from producer to consumer, mainly of fruit, vegetables and dairy products at markets or delivered to the home, is the most pragmatic. There are no intermediaries. As for the short channel, it includes the retailer who intervenes between the producer and the consumer. The long distribution chain is the most complex, involving several intermediaries: processors, supermarket buyers and wholesalers who supply small retailers (Ouest-France, 2021)

In France, 10 million tonnes of food are wasted (Ministère de la Transition écologique, 2023). Of the 1/5 of food production that is wasted, 1/3 is thrown away during agricultural production. The main causes of wastage during the agricultural production phase are: weather problems, variations in demand, technical problems, customer requirements (distribution networks, supermarkets, consumers, etc.) and storage constraints (InExtremis, 2021).

Greece

Greece's agricultural sector has traditionally been one of its key economic drivers, providing a variety of food products such as grains, fruits, vegetables, dairy, and meat. Additionally, the country has also benefited from its location and climate, making it suitable for various agricultural activities.

However, like any country, Greece faces challenges related to food security, such as climate change impacts, water scarcity in some regions, and market fluctuations. These challenges require continuous efforts in terms of policies and regulations to ensure a stable and sustainable food supply.

The European Union plays a significant role in setting food safety and security standards for its member states, including Greece. Some key EU regulations related to food security include:

- **Common Agricultural Policy (CAP):** The CAP is the EU's agricultural policy framework, which aims to ensure food security, sustainable agriculture, and rural development. It provides financial support to farmers, promotes sustainable farming practices, and helps maintain a stable food supply within the EU.
- **General Food Law Regulation:** This regulation establishes the general principles and requirements of food law across the EU. It covers areas such as food safety,

traceability, and labelling, aiming to ensure the safety and quality of food products available to consumers.

- Hygiene Package: The EU's hygiene package comprises several regulations that set hygiene standards for food production and handling. This includes regulations on food hygiene, animal by-products, and official controls on food safety.
- Plant Health Regulation: This regulation aims to protect plant health across the EU by preventing the introduction and spread of harmful organisms that can affect plants and crops.
- In addition to EU regulations, Greece has established specific national regulations and policies related to food security, agricultural practices, and food safety. These regulations address issues such as agricultural subsidies, land use, irrigation practices, and support for sustainable agriculture.

The Netherlands

Despite its compact geographical size, Dutch agricultural production operates at an efficiency level that not only meets but often exceeds the dietary needs of its inhabitants. The nation's agricultural framework, characterised by innovative practices like greenhouse horticulture, precision farming, and sustainable water management, ensures consistent and high-yield outputs. Furthermore, the robust supply chain mechanisms in place, complemented by the Netherlands' strategic position in European trade routes, guarantee that agricultural produce is readily accessible both economically and physically to the Dutch populace. The alignment of production capacities with consumer demands ensures that the Netherlands maintains a high degree of food security, effectively addressing the fundamental requirements for a healthy and productive life for its citizens.

In the intricate web of food security within the Netherlands, the processes through which agricultural products are delivered to consumers are pivotal in ensuring constant physical and economic access to food. The Dutch agricultural supply chain is emblematic of efficiency and sustainability. Initiating at the farm level, products are subjected to stringent quality controls underpinned by the nation's agricultural standards and regulations. Once harvested, these products often pass through cooperative-owned or private sorting and packaging centres, where they are prepared for distribution. Leveraging its developed infrastructure, the Netherlands utilises an integrated network of road, water, and rail transport to expedite the movement of goods. The presence of major logistics hubs, such as the Port of Rotterdam, further facilitates seamless international and domestic distribution. Retailers, ranging from local markets to major supermarket chains, then make these products readily accessible to consumers. Throughout this process, digital technologies and innovative agricultural practices are employed to minimise waste and ensure timely delivery, thereby upholding the Netherlands' commitment to food security for its populace.

The Netherlands has witnessed considerable volumes of food being lost during production, post-harvest processing, and distribution phases. Recent assessments indicate that annually, the country wastes approximately 2.5 million tons of food. This staggering figure is distributed across the entire food value chain, from primary production and processing to distribution, retail, and household consumption. Specifically, households are responsible for nearly 41% of this waste, translating to about 34 kg of food per person per year. Waste at the consumer level, driven by factors such as over-purchasing, misunderstanding of expiration

dates, and changing meal preferences, has compounded the issue. Retailers and the hospitality sector contribute to 14% and 13%, respectively, while the remaining losses emerge from other segments of the supply chain, including agriculture, processing, and transportation. Acknowledging the profound environmental, economic, and social implications of this waste – from carbon emissions to lost economic opportunities – the Dutch government has committed to the ambitious target of halving food waste by 2030. In line with the United Nations' Sustainable Development Goals, various collaborative initiatives between governmental bodies, research institutions, businesses, and civil society aim to develop innovative solutions to minimise food loss and waste, thereby ensuring a more sustainable and secure food system for the nation.

Spain

Agricultural production in Spain satisfactorily meets consumer needs, offering a diverse array of high-quality and nutritious food products. Spain's agricultural sector efficiently caters to both domestic and international markets, providing a wide range of fruits, vegetables, grains, and livestock products. Through modern farming techniques, efficient supply chains, and responsive agricultural policies, Spain successfully meets the demands of consumers for wholesome and varied food options.

The processes of delivering agricultural products to consumers in Spain are well-organised and efficient. After harvesting, the products are transported through a well-developed logistics network that includes trucks, trains, and ships, ensuring timely delivery to local markets, supermarkets, and export destinations. Spain's strategic geographical location enables easy access to European and global markets, facilitating the export of agricultural products. Additionally, advanced cold storage and preservation facilities are used to maintain product freshness during transportation, ensuring that consumers receive high-quality and nutritious agricultural products across the country and beyond.

Last but not least, food loss and waste in agriculture pose significant challenges in Spain. Despite its efficient agricultural production and supply chain, a considerable amount of food is lost or wasted at various stages, from harvest to consumption. This issue not only has economic implications for farmers but also exacerbates food insecurity and places unnecessary strain on the environment due to the resources invested in producing wasted food. Addressing food loss and waste requires collaborative efforts among stakeholders, including farmers, food processors, retailers, and consumers, to implement better storage, distribution, and consumption practices, thereby minimising the impact of food loss and waste in Spain's agricultural sector (ACNUR, “Agricultura”, n.d.).

Türkiye

In terms of agricultural production, Türkiye is a country that can meet its own needs for many products. Türkiye's agricultural sector plays an important role in the production of many products such as wheat, barley, corn, cotton, sugar beet, potatoes, olives, grapes, tomatoes, peppers, aubergines, apples, cherries, walnuts and citrus fruits. It is able to meet its own consumption to a great extent, especially in products such as cereals, vegetables and fruits. However, Türkiye is not sufficient to meet its own needs especially in tropical products such as coffee, cocoa and some products such as soya. Most of these products are imported.

The balance between agricultural production and consumer needs in Türkiye varies depending on many factors such as economic, geographical and climatic factors. Factors such as increase in agricultural production, developments in the use of technology, efficient use of water resources, supportive agricultural policies and reliable marketing mechanisms contribute to meeting consumer needs.

However, it should not be forgotten that there may be changes in agricultural production and consumer needs over time. While economy, population and social changes affect consumer habits and demand, factors such as climatic conditions, diseases and pests affect the amount of production in agricultural production. Therefore, it is important to continuously monitor and plan agricultural production and consumer needs. In order to increase Türkiye's agricultural production and meet consumer needs more sufficiently, it is necessary to focus on sustainable agricultural practices, production planning and strategies.

The process of transporting agricultural products to consumers in Türkiye involves a series of stages and a highly complex chain between agricultural producers and consumers. This process covers the journey of the product from the field to the table and passes through the steps of production, collection and classification, packaging, storage and distribution, wholesalers and retailers, markets and supermarkets.

Today, modern logistics and distribution systems are used to manage this process. The process of delivering agricultural products to consumers involves many elements including supply chain management, quality control, storage techniques and efficient use of transport. In the delivery of agricultural products to consumers, hygiene, quality and safety are important factors at every stage from the producer to the table. Therefore, careful management of each step in the supply chain is of great importance for consumer health and safety.

Food loss and wastage is a serious problem in Türkiye as it is worldwide. Food loss and wastage cause negative impacts both economically and environmentally. Food loss occurs at agricultural stages such as production, harvesting, packaging and storage. In particular, some of the products that are not stored, transported or transported under appropriate conditions are discarded. In addition, losses are also experienced in the marketing process of some products.

Food waste occurs when food purchased at the consumer level is thrown away without being used. This occurs due to consumer habits, excessive cooking, discarding products that have passed their expiry date. According to the İkiat Tümer & Ađır (2021), 6.81% of milk, 5.87% of cheese and cottage cheese, 3.94% of yoghurt, 3.59% of red meat, 6.77% of chicken meat, 5.03% of meat products, 7.60% of fish meat, 3.40% of seafood, 7.63% of eggs, 12.20% of vegetable oil, 3.52% of animal fats, 9.61% of bread, 9.61% of cereals and legumes. 40%, 7.63% of eggs, 12.20% of vegetable oil, 3.52% of animal fats, 9.61% of bread, 6.19% of cereals and legumes, 7.5% of fruit, 7.93% of vegetables, 5.55% of tuber crops, and 2.48% of water are wasted.

Food loss and wastage is also an important environmental issue. Labour, water, energy and other resources are used in processes such as agricultural production, irrigation, spraying, fertilisation. These resources are wasted along with lost or wasted food, and wasting these factors of production negatively affects the environment. In addition, food waste decomposes and produces methane gas and causes environmental pollution.

Reducing food loss and waste is of great importance for sustainability and food security. In this regard, it is necessary to raise the awareness of the society and all stakeholders and to take effective measures at the production and supply chain stages. These include the use of modern agricultural techniques, improving storage and transport conditions, raising consumer awareness and establishing policies to prevent waste.

In order to reduce food losses and waste, the "Protect Your Food, Protect Your Table" project, which was implemented in 2020 in cooperation with the Ministry of Agriculture and Forestry and the Food and Agriculture Organization of the United Nations (FAO), aims to inform both citizens of all age groups and businesses in the food sector on many issues such as planned shopping, conscious consumption, the difference between the expiry date and the recommended consumption date, shopping management, food management, storage methods, food label literacy. Within the scope of the project, activities are ongoing through Provincial Directorates of Agriculture and Forestry to raise awareness in the society.

7. Agricultural Education

France

The French Ministry of Education offers apprentices training from the fourth year of secondary school right through to a doctorate. School-based training (general, technological and vocational) offers various diplomas for work in different agricultural sectors. Some are geared towards farm management or versatility (CAP Agricultural professions, CAP Agriculture in hot regions, Vocational baccalaureate in farm management, BP Farm business manager, BTSA Farm business analysis, management and strategy, etc.). Other programmes focus on specific crops (Professional baccalaureate in horticultural production, BTSA Animal production, CAP Agricultural forestry work) (Onisep, 2023).

LMD higher education diplomas (bachelor's, master's, and doctorate) give students access to a range of professions with greater responsibilities than those listed above: agricultural engineer, landscape gardener, veterinary surgeon, specialist manager, researcher, teacher, etc.

Short-term vocational qualifications registered with the Ministry of Labour offer the opportunity to gain professional experience in the agricultural sector without having to go through the standard French school curriculum, subject to certain conditions.

Greece

In Greece, there are both public and private institutions and organisations that offer various educational and training programs in the agricultural sector. These programs aim to equip individuals with the necessary skills and knowledge to work in different aspects of agriculture, including farming, crop production, livestock management, agribusiness, and agricultural technology.

Public universities offer undergraduate and postgraduate programs in agricultural sciences. These programs cover a wide range of topics related to agriculture, including agronomy, agricultural economics, horticulture, animal science, and agricultural engineering. Additionally, public vocational schools provide more specialized training for specific agricultural occupations.

Several private institutions and organizations, such as agricultural cooperatives, training centres, and vocational schools, also offer education and training programs in agriculture. These programs often focus on practical skills and hands-on experience, aiming to prepare individuals for specific roles within the agricultural sector.

The existing programs are quite comprehensive and cover various aspects of agriculture. They aim to provide a skilled workforce capable of addressing the challenges and demands of the agricultural sector. However, there were a few challenges and considerations regarding the sufficiency of these programs to meet the workforce needs. The most important ones presented below:

- **Rapidly Evolving Agricultural Sector:** The agricultural sector has been evolving rapidly, incorporating new technologies, sustainable practices, and innovative approaches. There was a need for ongoing updates in educational programs to keep up with these advancements.
- **Attracting Young Talent:** Encouraging young people to pursue careers in agriculture has been a challenge. To address this, educational institutions needed to promote the agricultural sector as a viable and rewarding career option, especially for the younger generation.
- **Regional Specificity:** Greece's agricultural sector has regional specificity, with different regions specializing in various agricultural activities. Training programs needed to consider these regional variations and offer relevant courses accordingly.
- **Integration of Sustainable Practices:** With a growing focus on sustainability and environmental stewardship, agricultural training programs need to integrate more practices that promote eco-friendly and resource-efficient farming methods in order to accelerate the adoption of sustainable models by farmers and producers.

The Netherlands

Occupational education and training (OET) in the Netherlands' agricultural sector are both comprehensive and specialised. The nation has established a robust system that caters to different educational levels, from secondary to higher education, and extends to adult learning. Notably, "Groene Scholen" or "Green Schools" provide vocational training at the secondary level, blending theoretical and practical knowledge in agricultural disciplines. They also set the foundation for students to proceed to higher vocational or university-level education. At the university level, institutions like Wageningen University & Research stand out for their global recognition in agriculture and related disciplines. They emphasise a multidisciplinary, research-driven approach, often in collaboration with international institutions and industries. Practical experience, gained through internships and field visits, is a significant feature of these programs.

Adult education further reflects the Netherlands' commitment to continuous learning in agriculture. Various associations, private organisations, and governmental initiatives offer workshops, seminars, online courses, and short-term training. Topics range from the latest farming techniques and technologies to sustainable and environmentally friendly practices. Some institutions, like the Aeres Group, are specifically designed for adult education, tailoring their programs to cater to the unique needs of adult learners. This focus on continuous learning ensures that the existing workforce is equipped with the latest knowledge and skills.

However, while the scope of these OET programs is extensive and commendable, there are emerging challenges. The rapid transformations in the agricultural sector, driven by technological advancements, climate change, and global market shifts, have resulted in a noticeable skills gap. Areas such as precision agriculture, sustainable farming, and agri-tech are seeing an increasing demand for specialised knowledge. Thus, despite the Netherlands having a robust OET system in place, there's a growing need for specialised and continuous training to meet the evolving demands of the agricultural sector.

Spain

Training is an essential element for achieving competitiveness in any productive sector, not only in Spain. The agri-food sector is no exception, and improving the training and professional qualifications of its different actors is necessary to be able to adapt to an ever-changing market. Thus, the professional training of farmers is essential not only in terms of technical and productive knowledge, but also in terms of business and commercial management.

However, the challenge of agricultural vocational training in Spain has a series of basic problems that hinder the adaptation of the sector. Fundamentally, we refer to the problems arising from the insufficient general and technical training of the agricultural population (Farinos Dasi, 1998; González & Gómez Benito, 2000; Llopis Goig & Vidal González, 2006), an insufficiency demonstrated in the results on the training of farm managers extracted from the successive Surveys on the Structure of Agricultural Holdings (2016 and 2007).

Faced with this situation, the concern for improving professional training has led public administrations to try to professionalise the sector by financially supporting initiatives and activities aimed at improving occupational (or non-formal) training, such as the specific measures aimed at promoting agricultural vocational training incorporated in the Rural Development Plans (Ramos & Izquierdo, 2018).

Indeed, there are 11 different VET paths to be followed in order to get a qualification in this field supported by the Ministry of Education and Vocational Training, between these we can find: Basic Professional Degree in Agricultural and Livestock Activities, Agroecological Production Technician or Higher Technician in Livestock and Animal Health Assistance. One of the main aims of these VET degrees is to obtain specific technical preparation whose performance optimises the performance of farms and improves their economic results. Moreover, in 2022 the Spanish Government allocated more than 3 million euros in aid to improve the digital skills of professionals in the agri-food sector. These grants are 100% financed for national professional entities to develop different training modalities with the aim of reducing the digital gap between the professionals of the sector and the rural environment (Ministry of Agriculture, Fisheries and Food, “El Gobierno”, 2022).

Besides, in the different Autonomous Communities of Spain, there are institutions that foster these kinds of training. In Andalusia we have the Andalusian Institute for Agricultural, Fishing, Food and Organic Production Research and Training which is an institution in charge of training citizens to become able to work in the agricultural field with courses such as “Incorporation into the agricultural enterprise: Intensive agriculture”.

Last but not least, the private sector will always be there in case you do not want to wait for registration waitlists. In spite of not being financed and having to pay for the training there are a lot of alternatives, companies willing to teach and give you the title you need to work.

Türkiye

Vocational education and training programmes provided by public and private institutions in the field of agriculture in Türkiye vary. Since the agricultural sector is important for the country's economy, education and training programmes in the field of agriculture are given importance. Some educational and training programmes offered by public and private institutions in the field of agriculture in Türkiye are listed below:

- **Universities:** Many universities across Türkiye offer undergraduate, graduate and doctoral programmes in agriculture within their faculties of agriculture. These programmes provide education in various fields such as crop production, animal production, agricultural economics, plant protection, biotechnology.
- **Vocational and Technical Agricultural High Schools and Vocational Colleges:** For those who want to work in the agricultural sector, vocational high schools and colleges offer vocational training such as agricultural technician and agricultural programmes. These programmes usually focus on agricultural production techniques.
- **Agricultural Credit Cooperatives:** In Türkiye, agricultural credit cooperatives can organise vocational training programmes for farmers. In these training programmes, farmers are informed about agricultural production techniques, fertilisation, irrigation, pest and disease control, and agricultural loans.
- **Provincial and District Directorates of Agriculture and Forestry:** Provincial and District Directorates of Agriculture and Forestry can organise training for farmers working in the agricultural sector. These trainings may include topics such as agricultural policies, agricultural subsidies, methods of increasing productivity, combating diseases and pests.
- **Private Consultancy Firms:** Private consultancy firms can offer various training programmes for those who want to receive training in the agricultural sector. These institutions can provide the opportunity to specialise in specific areas such as agricultural consultancy, organic farming, greenhouse management.
- **Chambers of Agriculture:** Chambers of Agriculture organise knowledge and skill development training in the field of agriculture for their members. These trainings are on topics such as agricultural production techniques, current agricultural policies and marketing strategies.

The training programmes in this list offer various opportunities for those who want to work in the agricultural sector. Since agriculture is a constantly developing and changing sector, vocational education and training programmes should be updated over time and adapted to the needs of agriculture.

The scope of existing vocational education and training programmes in agriculture varies depending on the type and level of the programme. These programmes aim at those who want to work in various fields in the agricultural sector or those who want to improve their existing skills. Examples of trainings offered in the field of agriculture in general:

- **Faculties of Agriculture:** They are made for students who want to specialise in different fields of agriculture including Horticulture, Field Crops, Plant Protection, Agricultural Economics, Agricultural Machinery and Technologies, Agricultural Structures and Irrigation, Soil Science, Animal Husbandry.
- **Aquaculture Engineering:** Education is given on aquaculture of aquaculture products.
- **Agricultural Technician and Agricultural Management Programs:** These programs, offered in high schools and vocational colleges, aim to provide practical skills to those who want to work in the agricultural sector. They provide practical information such as agricultural production, soil tillage, irrigation, fertilisation.
- **Organic Agriculture Programs:** Organic agriculture is an important field today and teaches environmentally friendly farming practices. Organic farming programs cover topics such as organic production methods, certification processes and the benefits of organic farming.

8. Agriculture and Environment

8.1. Climate change and agriculture

France

Climate change has the capacity to significantly impact the agricultural industry in France if it is not dealt with. Scientists have already noticed that changes “including agricultural droughts lasting 35% longer, and heat waves that occur 80% more often and last 1,461% longer than they do today” (G20 climate risk atlas, 2021). Heatwaves will affect evaporation rates and rainfall patterns, increasing both the likelihood of droughts and floods, depending on the region. For instance, the number of people exposed to floods will “increase from about 25,000 in the present day to about 107,000 under SSP3 and 144,000 under SSP5 by 2050” (CMCC, 2021, p. 9). In France, “-0.4%, -1.3% and +2.7% change of the annual groundwater recharge for the period 2045-2055 compared to the timeframe 2015-2025 is expected under low, medium and high emissions scenarios” (CMCC, 2021, p. 9). Additionally, “reduction in the quantity of water resources, coupled with a potential increase in anthropogenic pressure due to demographic growth, could also have significant impacts on water quality” (CMCC, 2021, p. 8). While water demand increases, its quality is simultaneously decreasing. Water is an essential resource for plant, animal, and human life. Its availability will have severe impacts on the way we live in the future and where we congregate. At present, “France's water stress level is considered medium-high for the recent past (1960-2014 average), and it may increase in the near future (2030-2050) based on climate change projections” (CMCC, 2021, p. 9).

The rising temperatures combined with the changes in rainfall patterns and an increase in CO₂ will create “a tendency towards yield reduction for many cultivated species, accompanied by a probable decrease in food quality” (CMCC, 2021, p. 10). These changes will affect what is grown in the agricultural sector, and thus what is sold to and consumed by the public. Thus, it is pertinent that the impacts of climate change are reduced and that the world is more conscious of its pollutive emissions.

Agriculture has a major environmental impact, particularly on the climate. In France, the agricultural sector is the biggest contributor to this phenomenon, accounting for 24% of emissions in 1998.

In recent years, meat production in France is under scrutiny amid climate change. As meat consumption remains the biggest contributor to food-related greenhouse gas emissions, developing more eco-responsible habits requires changes in French diets. For livestock farmers, this translates into a need to find new ways of production (Cabot, 2023)

French people eat approximately 85 kilograms per year, which is twice the global average, according to economist Carine Barbier, researcher for the French National Centre for Scientific Research and The International Research Centre on Environment and Development. “Ultimately, the whole food industry already represents 25% of French emissions, this includes the entire process, from the production to our plates as well as imports. Animal farming alone represents 9% of total emissions” (Cabot, 2023).

According to the French Agency for Ecological Transition, a kilogram of beef represents around 14 kilograms of CO₂ equivalent (CO₂e), which includes CO₂, nitrous oxide and methane, 10 times that of poultry.

Greece

Climate change already has significant impacts on agriculture, affecting both the quality and quantity of agricultural yields in different regions around the world. Greece, as a country that is strongly dependent on agriculture, is susceptible to the effects of climate change. Some of the challenges currently arising for the agriculture sector are presented below.

Heat stress hinders plant growth and development, as well as livestock and farm management systems. Farmers have been forced to adjust providing shade and cooling systems for livestock, adjusting feeding and watering schedules and moving their herds to cooler regions for the summer period. This has increased significantly the costs for farmers and has created additional challenges for their livestock.

Greece is experiencing a huge problem with wildfires, especially in the summer period. The cumulative area burnt in our country since the beginning of 2023 has surged by a staggering +195% when compared to the average annual burnt area recorded between 2002 and 2022. This alarming statistic highlights the severity of the situation we currently face. Greece now leads among 20 Mediterranean countries in terms of burnt areas, with a staggering 281,480 hectares affected. Over the past three years alone, Greece has seen fires consume nearly 3,000,000 acres of our precious land.

In September 2023, the region of Thessaly, one of the most important regions of the country for agriculture, was hit hard by catastrophic flooding. The heavy rainfall brought by the relentless bad weather system, Daniel, has resulted in the loss of human lives, extensive damage to our fauna, and the complete destruction of entire villages. The areas that have suffered some kind of damage amount to 600,000-650,000 acres and concern crops such as cotton, industrial tomatoes, corn, etc. Livestock production in Thessaly has also suffered a major blow, where many farmers have seen their livestock completely destroyed. According to data retrieved from ELGA, so far, the declared losses in sheep and goats' amount to 67,041, in cattle to 5,698, in bees to 47,666, in pigs to 20,097 and in birds to 126,416.

The Netherlands

The intricate relationship between climate change and agriculture in the Netherlands presents a dual-edged dynamic characterised by mutual impact and interdependence. On the one hand, the agricultural sector has been increasingly buffeted by the vagaries of climate change. Notably, the Netherlands, with a significant portion of its land below sea level, has historically grappled with flooding. However, climate change has exacerbated these challenges, with sea-level rise and increased precipitation events threatening the low-lying polders crucial for agricultural activities. There is a frequency increase in extreme rainfall events by approximately 25%. Concurrently, periods of drought, intensified by shifting rainfall patterns and escalating temperatures, have strained water resources, affecting crops like potatoes, a staple in Dutch agriculture. The country experienced one of its most severe droughts in 2018, impacting crop yields and prompting water rationing in certain regions.

On the flip side, agriculture has been identified as both a contributor to and mitigator of climate change in the Netherlands. Agricultural activities, particularly livestock farming, contributed to approximately 13% of the nation's total greenhouse gas emissions in 2019. Methane from cattle and nitrous oxide from fertilised soils were significant emission sources. However, the Dutch agricultural sector, ever the innovator, has embarked on a transformative journey. Ambitious targets have been set, aiming for a 30% reduction in emissions by 2030 through practices like precision farming, sustainable livestock management, and peat land restoration.

Spain

The impact of climate change in Spain has been evident through a variety of climate-related changes, including droughts, floods, temperature rise, and other climatic shifts. As a nation with diverse ecosystems and agricultural practices, Spain is particularly vulnerable to the consequences of a changing climate. Droughts have become more frequent, there is also an increase in both the intensity and frequency of heavy rainfall events, and we have witnessed a gradual increase in temperatures over the past century. Changing climate patterns have led to shifts in the timing of seasons, affecting the traditional agricultural calendar.

On the other hand, agriculture is contributing to climate change because it is a major source of greenhouse gas emissions, it also converts natural ecosystems into agricultural lands, there is an increase in the consumption of fossil fuels and there is often inadequate water management.

Türkiye

Türkiye is among the countries at risk for the potential impacts of global climate change (Türkiye Grand National Assembly, 2008).

Türkiye is a country threatened by drought and water resources are diminishing due to low rainfall in some regions. Drought and irregularity in the rainfall regime adversely affect plant growth and can reduce agricultural production. In particular, the yield and quality of water-dependent crops such as cereals decline during drought periods. Irrigation water becomes harder to find and agricultural productivity decreases.

Considering today's climatic conditions, the effects of global climate change in Türkiye are manifested as decreased water resources, drought, heat waves, increased floods and decreased productivity in agriculture. The potential changes in the Mediterranean Basin and Türkiye, as indicated in the 5th Assessment Report (AR5) published in 2013 by the Intergovernmental Panel on Climate Change (IPCC) on the physical basis and impacts of climate change, reveal how important the situation is (Türkeş, 2012).

In Türkiye, 9% of the total 95 billion m³ of surface water is utilized, of which 79% is used for irrigation, 14% for drinking water and 10% for industry. It is estimated that the amount of water Türkiye will need in the next 25 years will be 3 times the current water consumption (Ministry of Environment and Forestry State Hydraulic Works, 2009; Ministry of Forestry and Water Affairs, 2016).

Considering that Türkiye will have a drier climate as a result of population growth and the effects of global climate change, it is estimated that the amount of water per capita in Türkiye in 2050 will be around 1,200 m³ per year. Considering that the amount and distribution of precipitation in the country is irregular except for some regions, water is limited in large cities and agricultural production, the quality of drinking, using and irrigation water is decreasing day by day as a result of environmental pollution caused by increasing industrial and other activities, and the effects of global climate change are increasing, it is obvious that Türkiye will feel the severity of drought much higher than today in a very near future (Turan, 2018).

Climate changes lead to an increase in extreme rainfall and flooding events. Excessive rainfall causes erosion and flooding in agricultural lands. Türkiye is a country where floods and flood disasters are very frequent and widespread due to its natural characteristics, socio-economic and cultural structure. Late spring and early summer are the periods when floods are more common. Floods in this period are more effective and often reach disaster proportions. In Türkiye, 51% of the floods occur in late spring and early summer, while most of the rest occur in winter and a very small portion in fall. The regions with the highest incidence of floods in the country are the Black Sea, Mediterranean and Marmara Regions, respectively (Özcan, 2006). This leads to damage to agricultural lands and crop losses.

Higher temperatures as a result of global warming affect plant growth and reduce the yield and quality of some crops. It can also create more favourable conditions for agricultural diseases and harmful organisms. Climate changes can lead to changes in growing seasons and ecosystems. Accordingly, changes in favourable conditions for agricultural production can lead to changes in agricultural activities and product diversity. Although the methods and periods used in the studies on Türkiye differ, they present common findings on the relationship between climate change and agriculture in the country. It is calculated that temperatures will increase in the next 50 years in Türkiye (Dellal & Unuvar, 2019). In addition to the direct impact on agriculture due to temperature changes, it is also expected that there will be changes in the cultivation regions of crops and shrinkage in the areas where the most important crops of Turkish agriculture such as wheat can be grown (Aydın & Sarptaş, 2018).

Changes in temperature in Türkiye over the past ninety years and changes in agricultural areas over the past fifteen years are analysed. In addition, the effect of temperature changes on agricultural areas in the recent period has been calculated by econometric analysis. According to the findings, it has been shown that temperature has increased significantly in Türkiye,

especially after the 1990s. It was determined that an increase of 1 degree of temperature decreases agricultural areas by approximately 3% to 9% (Demirdögen, 2020).

As a result, climate change negatively affects productivity and producer incomes in the agricultural sector and leads to problems in food security. Therefore, it is of great importance to develop and implement policies for sustainable and climate-friendly practices in the agricultural sector to adapt to climate change. Measures such as improving irrigation techniques, the use of climate-resilient plant varieties, and efficient use of water resources can help agriculture cope with climate change. Raising awareness on climate change and promoting environmentally friendly agricultural practices are also important steps. In Türkiye, a 5-year Drought Action Plan has been implemented by the Ministry of Agriculture and Forestry in the past years, and a 2023-2027 Agricultural Drought Strategy and Action Plan has been prepared and will be implemented in 2023.

8.2. Efficient use of production factors to protect the environment

France

To meet the environmental challenges closely linked to agriculture, the French Ministry of Agriculture is focusing on the development of agricultural production processes that are as close as possible to using natural resources while at the same time protecting them (Ministère de l'agriculture et de la souveraineté alimentaire, 2014). Protecting the environment in agriculture involves:

- Protection of resources and environments (qualitative and quantitative management, protection of soil, water, air quality, etc.),
- Protecting biodiversity,
- Use of biomass (biofuels, electricity or heat production, biomaterials, biosourced chemistry),
- Development of the circular economy,
- Preservation of agricultural land by limiting its development,
- Reducing farms' dependence on inputs,
- Improving energy performance,
- Limiting the impact of climate change.

To eliminate their waste, farmers call upon specialised collection agencies or eco-organisations (producers finance the elimination of their own waste). For instance, in 2021, agricultural professionals established the company Adivalor (farmers, distributors, and industrial partners, for energy recovery from agricultural waste) (ADIVALOR, 2021).

Greece

Greece, as a member of the European Union, is committed to aligning its policies with the EU's environmental objectives, including those related to reducing greenhouse gas emissions and protecting biodiversity. Some of the horizontal priorities, correlated with the sector of agriculture are the following:

In Greece there is promotion of sustainable agricultural practices that focus on efficient water management, reduced use of chemical inputs, crop rotation, and integrated pest management. There are sporadic applications of practices for sustainable agriculture and the aim is to expand them so that the country can minimise environmental impacts while maintaining agricultural productivity.

During the last few years, there has been a great swift to renewable energy sources, such as solar, wind, and hydropower, for industrial processes, electricity generation and also there are small scale applications for the coverage of domestic needs that in long term can significantly reduce greenhouse gas emissions. The Greek government is promoting intensively the implementation of projects for green energy by companies or individuals. At the same time, there is promotion of resource efficiency in production processes, such as using raw materials more efficiently and reducing waste generation, so that we can achieve natural resources conservation and reduction of the environmental burden.

In the framework of the circular economy, processes of recycling, reusing, and refurbishing products and materials, with the aim to reduce the pressure on natural resources and minimise waste generation are promoted.

From 1 November 2019 to 31 December 2025, the Greek government has set the implementation of “Circular Transition Business Plan of Greece”, as one of its key cross-sectoral priorities, by accelerating action at three levels:

- Setting criteria for green and circular public procurement including though incentives for enhancing secondary raw material markets and industry, as well as designing, repairing and reuse of products, aiming to "close the loop" of product life-cycles and to promote secondary use of by-products and waste in new production processes as raw primary materials, also applying in practice the “hierarchy approach” in waste management and with specific measures and targets for Plastics (single use plastics, fishing gears, etc) and food waste;
- Promoting industrial symbiosis and clustering of businesses for supporting circular entrepreneurship, environmental industry, digital transformation (United Nations, n.d.);
- Stimulating employment through measures to strengthen sharing or collaborative economy, collaborative economy and small-scale entrepreneurship (United Nations, n.d.).

In addition, there are specific measures taken for the protection of forests. Greek forests are an essential natural resource, contributing to the country's biodiversity, ecosystem services, and cultural heritage. There is provision for sustainable forest management practices, such as reforestation and afforestation that protect biodiversity and sequester carbon dioxide from the atmosphere. Forest fires remain an important problem for Greece and there are several measures taken for the prevention of this phenomenon in collaboration with civil protection Authorities and the Greek Fire Service. In the same vein, reserving natural habitats and ecosystems is essential for protecting biodiversity and ensuring the sustainability of ecological services provided by these areas.

The Netherlands

The Netherlands has showcased commendable strides in efficiently using production factors to safeguard the environment. Central to these efforts is the country's commitment to drastically reduce greenhouse gas emissions. The Dutch government pledged to achieve a 49% reduction in emissions by 2030 compared to 1990 levels. Innovative agricultural practices have been pivotal in this regard. The Netherlands, for instance, has become a global frontrunner in precision agriculture, employing data-driven methodologies to optimise the use of fertilisers and pesticides, thereby curbing emissions and minimising leaching to water bodies.

Moreover, the country's dedication to protecting biodiversity is evident in its approach to sustainable fisheries and the preservation of natural habitats. Approximately 13% of the Netherlands' total land area has been designated as Natura 2000 sites, underscoring its commitment to the European biodiversity strategy. This protection extends to natural resources, with initiatives promoting circular agriculture aiming to reduce dependency on finite raw materials and promote the recycling of nutrients. The extensive use of greenhouses in horticulture, which allows for the control and recycling of water and nutrients, further exemplifies this efficient utilisation of resources.

Spain

In Spain, efforts to protect the environment and reduce greenhouse gas emissions involve promoting renewable energy development, improving energy efficiency, and implementing comprehensive climate change mitigation plans. Sustainable agriculture practices, afforestation, and biodiversity conservation initiatives are also prioritised to preserve natural resources.

Water management, circular economy measures, and green transportation projects further contribute to environmental protection. Additionally, climate awareness and education programs engage the public and businesses in promoting a sustainable future. These collective strategies aim to achieve long-term environmental sustainability and safeguard Spain's diverse ecosystems and biodiversity.

Türkiye

In order to protect the environment in Türkiye, several important steps and policies are being implemented to reduce greenhouse gas emissions, protect biodiversity and manage natural resources sustainably. These encompass:

- Reducing Greenhouse Gas Emissions
- Türkiye aims to reduce dependence on fossil fuels by investing in renewable energy sources. Renewable energy sources such as wind, solar, hydroelectric and geothermal energy are being expanded.
- Energy efficiency is an important issue. Promoting energy-efficient technologies and taking energy efficiency measures aim to reduce greenhouse gas emissions.
- Forests absorb carbon dioxide from the atmosphere and absorb greenhouse gases. Protecting forest areas prevents the destruction of forests and the reduction of carbon absorption.

In Türkiye, it is important to utilise the renewable energy potential in order to reduce CO2 emissions, reduce external dependence on energy and overcome the supply security problem. Therefore, policies and targets have been set to increase the share of renewable energy resources in Türkiye. In addition to legislative arrangements, these policies are also included in various national documents and plans. In Türkiye's National Renewable Energy Action Plan, published in 2015, at least 30% electricity generation from renewable energy sources and 5,000 MW PV solar power installed capacity are targeted for 2023. Mechanisms and incentives have been developed to support renewable energy production while achieving these targets (Altuntaş et al., 2019).

Türkiye contributes to the protection of biodiversity and natural resources by creating national parks and natural protected areas. These areas are home to endemic plant and animal species. In Türkiye, areas where cultural and natural assets with international and national resource values that need to be protected have been registered as protected areas and are guaranteed in our constitution. In addition, for the protection of these areas, Türkiye has become a party to international conventions with the Law No. 2658 on the Protection of the World Cultural and Natural Heritage and the Law No. 3534 on the Ratification of the Convention on the Protection of the European Architectural Heritage (Ersoy, 2022).

Biodiversity is a collection of species, genes, ecosystems and ecological phenomena in a region. The fact that the country has a wide variety of ecosystem and habitat types ensures that it contains a magnificent biodiversity in terms of fauna and flora elements. In addition, Türkiye is among the countries that attract attention with its endemic species (Seven, 2020).

Conservation programs for the protection of biodiversity are established and implemented in the country. Efforts are being made to protect and rehabilitate endangered species

Conservation projects are being developed for the sustainable use of water and soil resources. Protection of water basins, erosion control and soil rehabilitation are important steps.

8.3. Recycling of agricultural waste

France

France is working to implement a new law in January 1st, 2024 that will require all households have a source and a means to sort their biodegradable waste: Local authorities responsible for implementing this provision must offer them means of sorting at source, individually or collectively, such as separate bins for specific collection, and individual or collective composting (Carpenter, 2023). This will significantly decrease the amount of biodegradable waste, which is currently estimated to be 30 kg of food per person and year, of which 7kg is still packaged (Garner, 2023). Not only is this a financial cost of approximately €16 billion, but it is an ecological cost as well. In future, this waste will instead be able to go towards fertilisation or other more beneficial efforts (Utopies, 2022).

Greece

Greece was actively implementing various recycling methods to manage and reduce waste, and this has been also an important objective for the agriculture sector. Recycling of agricultural waste in Greece involves several key methods. Composting is a widely used approach, where organic materials such as crop residues, pruning and tree trimmings, fruit and vegetable peels, and animal manure are decomposed and transformed into nutrient-rich compost. This compost is then utilised to enhance soil fertility and structure, promoting sustainable agricultural practices. Additionally, some agricultural waste, such as olive pomace and other biomass residues, is used as feedstock for bioenergy production, reducing reliance on fossil fuels and mitigating greenhouse gas emissions. The Greek government, in collaboration with the European Union, has likely implemented policies and regulations to support the proper management and recycling of agricultural waste as part of its efforts to promote a circular economy and sustainable waste management practices.

Netherlands

A significant facet of the waste pertains to agricultural wrapping, such as silage wrap, bale wrap, and twine. These materials, primarily made of plastic, pose environmental challenges due to their non-biodegradable nature. Recognising the potential implications of accumulating such waste, Dutch farmers and agricultural cooperatives have actively participated in recycling programs. Statistics indicate that approximately 65% of all agricultural plastic waste, including wraps, was collected for recycling purposes in recent years. This recycled material is then processed to produce durable plastic products, reducing the demand for virgin plastics. The Dutch government, in collaboration with industry stakeholders, has set ambitious targets to increase this percentage, aiming for a circular economy where waste is minimised and materials are continually reintroduced into the production cycle.

Spain

In Spain, recycling agricultural waste, including plastic wrapping used in farming practices, has become a priority in recent years. Agricultural plastic waste, such as mulching films and silage wraps, poses environmental challenges if not managed appropriately. To tackle this issue, Spain has established collection and recycling programs specifically designed for agricultural plastics. Farmers are encouraged to participate in these initiatives, which ensure the proper disposal and recycling of the waste. Through these efforts, the country aims to reduce the environmental impact of agricultural plastics and promote more sustainable waste management practices in the agricultural sector.

Türkiye

The agricultural waste recycling process in Türkiye involves the use of various methods to properly manage and recover waste from the agricultural sector. Agricultural wastes include organic and inorganic wastes resulting from agricultural processes such as post-harvest residues, plant roots, straw, stalks, fruit and vegetable peels. Proper management of these wastes contributes to preventing environmental pollution, efficient use of natural resources and creating economic value.

The recycling process of agricultural waste in Türkiye includes the following methods:

- Composting: Organic agricultural waste can be recycled through composting. The composting process allows these wastes to undergo natural decomposition processes, resulting in organic fertiliser. This fertiliser increases the fertility of agricultural soils.
- Animal Feed and Bedding: Agricultural waste can be used in the production of animal feed and bedding materials. For example, straw and stalks can be utilised as animal feed or used in animal bedding.
- Biogas Production: Organic agricultural waste can be used for biogas production. Biogas is an energy source obtained from the fermentation of organic matter and can be used for electricity or heat generation. The energy deficit, which is increasing day by day with the developing technology and population density, has increased the importance of renewable energy sources. One of these renewable energy sources is biogas produced by processing animal and domestic waste. Biogas production from animal, plant and garbage residues is one of the most emphasised and researched topics in recent times. It has been determined that 73 biogas plants are active in Türkiye. The production amount of these active facilities was determined to be 385 MWe (Yılmaz et al., 2017).
- Energy Production from Agricultural Wastes: Biomass power plants can be established to produce energy from agricultural waste. These plants can generate electricity or heat by burning waste. It is estimated that the current amount of agricultural and animal waste in Türkiye could meet 22-27% of Türkiye's energy consumption. However, the actual role of bio-based fuels in energy production today is very low (Öztürk & Başçetinçelik, 2012).
- Recycling and Reuse: Some agricultural wastes are used as recyclable materials.
- Agricultural Waste Processing Facilities: Special facilities can be established to collect, sort and process agricultural waste. These facilities ensure proper management and recycling of waste. In order to improve the recycling of agricultural waste in Türkiye, it is important to promote conscious agricultural practices, educate agricultural producers and raise awareness. At the same time, the support of relevant institutions for policies and regulations that encourage recycling processes also contributes to the effective management of agricultural waste.

8.4. Soil and water protection

France

The different compartments of the environment are affected by the use of pesticides. Continental surface and groundwater are subject to almost widespread contamination by these substances. Data relating to air and soil contamination remains fragmentary. However, the data collected highlight the presence of pesticides in all atmospheric matrices and examples of specific soil contamination are well known and documented (copper, chlordecone, etc.).

France aims to also strengthen the carbon storage in soil through the “4 by 1000: Soils for Food Security and Climate” initiative, which is a part of the Lima-Paris Action Programme (LPAA). Through this plan, France invites stakeholders to realise concrete actions on carbon storage in soil and the types of practices to achieve this (agro-ecology, agroforestry, etc.) (Représentation Permanente de la France Auprès des Nations Unies à Rome, 2021, “Agriculture and climate”). Thus, France is making efforts to not only remove pesticides and

harmful chemicals from the soil, but it is simultaneously reintroducing beneficial resources to the same lands.

The increased likelihood of flooding and changes in rainfall patterns will also have an effect on the erosion patterns in France. The government has asked that all 126 communes make a map of local erosion zones and come up with individualised plans for how to deal with them in a preventative manner (Gouvernement.fr, 2022). This is because the terrain in France is highly varied, and so the government acknowledges that the solutions must be equally as varied and specific to the needs of the terrain.

Greece

The measures for soil protection and water protection in Greece are integrated into the broader national and EU efforts to promote sustainable agriculture and environmental conservation. The alignment with the EU legal framework ensures that Greece follows common guidelines and best practices to address soil erosion and water management challenges in a coordinated and environmentally responsible manner. Some of the key aspects of the legal framework for the soil and water protection are the following:

- Water Framework Directive (WFD) and the Soil Thematic Strategy, which aim to protect and conserve water resources and soil quality across the EU.
- Common Agricultural Policy (CAP): The CAP is an essential EU policy that provides financial support to farmers while promoting sustainable agriculture. CAP measures incentivize farmers to adopt environmentally friendly practices, such as erosion control and efficient irrigation methods, contributing to soil and water protection.
- Rural Development Programs: Within the framework of the CAP, Greece, like other EU countries, develops Rural Development Programs (RDPs) that outline specific measures and projects for sustainable land use, including soil and water conservation initiatives.

National Legislation: Greece has its national legal framework for environmental protection and sustainable land use. Laws and regulations related to soil conservation, water management, and agricultural practices are in place to ensure compliance with sustainable practices in alignment with EU Directives.

The Netherlands

In the intricate landscape of modern agriculture, soil and water stand as two pivotal resources, the conservation of which determines the sustainability and productivity of farming practices. The Netherlands, characterised by its low-lying terrain and extensive water networks, presents unique challenges and innovations in the realm of soil and water protection. The country has made significant strides in erosion control to ensure soil protection. Deploying advanced techniques such as contour plowing and establishing windbreaks, the Netherlands has effectively reduced topsoil loss by an estimated 15% over the past decade.

Water is another resource the Netherlands has committed to preserving. Despite receiving an average annual rainfall of approximately 900 millimetres, the Dutch agricultural sector has

used efficient irrigation methods to optimise water use. Drip and sprinkler irrigation systems, for instance, have seen a surge in adoption, covering nearly 30% of irrigated farmlands. These systems not only enhance water use efficiency but also mitigate the risks of nutrient leaching, thereby protecting groundwater quality.

The Dutch commitment to water protection extends beyond irrigation. With approximately 26% of the country lying below sea level, intricate water management and protective measures are paramount. Advanced drainage systems, dykes, and the renowned Delta Works are a testament to the nation's dedication to safeguarding its lands and resources from water-induced threats.

Spain

Soil protection and water conservation are crucial aspects of sustainable agriculture in Spain. To mitigate soil erosion, which can lead to land degradation and loss of fertile topsoil, farmers implement various erosion control measures. These include contour plowing, terracing, and the use of cover crops to prevent soil erosion and promote soil health. Additionally, the adoption of minimum tillage or no-till practices helps to preserve soil structure and reduce erosion. Such soil protection practices are essential to maintain agricultural productivity and ensure the long-term sustainability of farming in Spain.

In terms of water protection, Spain faces water scarcity in many regions, making efficient water management imperative. Drip and sprinkler irrigation systems have become popular alternatives to traditional flood irrigation methods, as they significantly reduce water usage and minimise water loss through evaporation and runoff. Drip irrigation delivers water directly to plant roots, maximising efficiency and reducing wastage. Sprinkler irrigation provides controlled water application, ensuring better water distribution. These water protection practices not only conserve valuable water resources but also promote sustainable agriculture and support farmers in adapting to the challenges posed by climate change in Spain.

Türkiye

In Türkiye, the Soil Conservation and Land Use Law came into force in 2005. With this law, it is aimed to determine the procedures and principles that will ensure the protection and development of the soil by preventing its loss and loss of its qualities by natural or artificial means and planned land use in accordance with the principle of sustainable development with environmental priority.

The Regulation on the protection of drinking and utility water in the country came into force in 2017. The purpose of this Regulation is to regulate the procedures and principles regarding the protection and improvement of the quality and quantity of all surface and groundwater resources from which drinking and potable water is supplied or planned to be supplied.

Soil conservation and water conservation are important issues in Türkiye and are tried to be realised through various methods. Soil protection is legally guaranteed by the law enacted by the Republic of Türkiye. The law includes issues such as the classification of land and soil resources in accordance with scientific principles, determining the minimum size of agricultural lands and preventing divisions, preventing misuse and misuse, and establishing

methods to ensure protection. Soil protection law aims to protect the productivity of agricultural land and the quality of soil, particularly through erosion control. Water protection aims to ensure the sustainable use of water resources and the efficient use of water. Some of the methods used in Türkiye on these issues are:

- Soil Protection (Erosion Control).
- Afforestation and Forest Areas: Afforestation is an effective method in erosion control. Trees and forests protect the soil against erosion, improve soil structure and increase water retention capacity. There are 22.933.000.000 ha of forests in Türkiye and this figure constitutes 29,4% of the country (OGM, 2020).
- Protection of Soil Cover: Vegetation is important for the protection of soil against erosion. Covering the empty parts of cultivated areas or sloping areas with vegetation prevents erosion.
- Terracing: By terracing sloping land, it is possible to reduce the velocity of water and protect the soil from erosion.
- Sedimentation Ponds: Sedimentation ponds slow the flow of water, allowing transported soil to accumulate and prevent erosion.
- Windbreaks: In areas subject to erosion, windbreaks (wind barriers) are erected to prevent the wind from carrying soil.
- Water Conservation (Drip and Sprinkler Irrigation):
- Drip Irrigation: Drip irrigation is a method of delivering water directly to the root zone of plants. This method saves water and ensures that water is directed to the right places.
- Sprinkler Irrigation: Sprinkler irrigation provides irrigation by spraying water on the plants. In this method, water is distributed more homogeneously and water is prevented from falling on the transported soil.
- Efficient Use of Groundwater: Control and management of water wells is important for the efficient use of groundwater and sustainability.
- Water Conservation and Efficiency: Regulating irrigation methods and timing improves water conservation and efficiency. It is also important to adjust irrigation times and amounts during periods of low rainfall.

Soil and water conservation efforts in Türkiye are of great importance for environmental and agricultural sustainability. Proper management of soil and water resources is a critical factor for the sustainability of agricultural production and the national economy. Therefore, measures such as awareness-raising activities for farmers, agricultural policies considering soil and water conservation, technological innovations and training programs contribute to effective soil and water conservation. Every year, the Ministry of Agriculture and Forestry provides 50% grants to farmers for the spread of pressurised irrigation systems.

8.5. Agricultural and environmental policies

France

The contamination of environments (water, soil, air) by pesticides is a major problem which concerns the population and which is not without echoing the concerns that the use of certain substances and their consequences for health can give rise to. France is committed to a

process of reducing the use of pesticides with the Ecophyto II+ (Ministère de l'agriculture et de la souveraineté alimentaire, 2022).

In France, an action plan aims to reduce the risks and effects of the use of pesticides on humans and the environment. This is the Ecophyto plan, the challenge of which is to reduce the use of plant protection products by 50% by 2025, by numerous means including the improvement of application techniques for plant protection products and the development of alternative methods. to the use of plant protection products. This plan has recently been reinforced by the Écophyto II+ Plan.

France joined the Climate and Clean Air Coalition (CCAC) in 2012 and since then has demonstrated continuous commitment to slashing short-lived climate pollutants alongside carbon emissions to flatten the curve of climate change and build a healthier planet.

In 2014, France instituted the Law of the Future of Agriculture, Food, and Forestry with the objective of ensuring that 50% of French farms implement agro-ecological approaches by 2025 (Représentation Permanente de la France auprès des Nations Unies à Rome, "Agriculture and climate", 2021). France is also working with the Food and Agriculture Association (FAO) to disseminate agro-ecological practices internationally and promote sustainable livestock and limit its global carbon footprint. Further, France is working on "a development programme in West Africa for so-called 'index based' crop insurance systems, i.e. for which compensation is calculated according to a climate index (e.g. rainfall) and not actual losses" (Représentation Permanente de la France Auprès des Nations Unies à Rome, "Agriculture and climate", 2021) and they are encouraging the adoption of small-scale agriculture. These international efforts are supported by a generous budget of €30 million to be allocated across 15 countries, to support the development of resilient, low-carbon developments especially in the agricultural sector (Ministère de l'Europe et des Affaires étrangères, 2018). France is leading the world through the implementation of agro-ecology and by taking steps to found organisations that are simultaneously conscious of the needs of farmers, consumers, and the planet.

Greece

Agricultural policies in Greece encompass the following initiatives and programmes:

- Water Framework Directive (WFD) and the Soil Thematic Strategy, which aim to protect and conserve water resources and soil quality across the EU.
- Common Agricultural Policy (CAP): The CAP is an essential EU policy that provides financial support to farmers while promoting sustainable agriculture. CAP measures incentivize farmers to adopt environmentally friendly practices, such as erosion control and efficient irrigation methods, contributing to soil and water protection.
- Rural Development Programs: Within the framework of the CAP, Greece, like other EU countries, develops Rural Development Programs (RDPs) that outline specific measures and projects for sustainable land use, including soil and water conservation initiatives.
- National Legislation: Greece has its national legal framework for environmental protection and sustainable land use. Laws and regulations related to soil conservation, water management, and agricultural practices are in place to ensure compliance with sustainable practices in alignment with EU Directives.

The Netherlands

The Netherlands has crafted its agricultural policies to align with both domestic demands and international standards. The Dutch government has allocated approximately €0.8 billion annually to support its agricultural sector, fostering a conducive environment for sustainable growth. Key policy instruments encompass direct payments, income support, and subsidies for young farmers, ensuring the sector remains competitive and robust.

Parallel to its agricultural pursuits, the Netherlands prioritises environmental conservation. Recognising the potential environmental impact of intensive farming, the Dutch environmental policies aim to balance agricultural productivity and ecological preservation. The Nitrate Directive, for instance, which limits nitrogen losses to 50 mg/l in groundwater, is rigorously implemented. By 2020, around 63% of Dutch agricultural lands complied with this standard, showcasing the country's commitment to reducing nitrate leaching from agricultural sources.

Furthermore, the Common Agricultural Policy (CAP) of the European Union, which the Netherlands ardently adheres to, promotes environmentally sound farming practices by allocating funds for rural development and ecological initiatives. The Dutch government has also set ambitious targets to reduce greenhouse gas emissions from agriculture by 3.5 megatons by 2030, emphasising the transition towards a circular and climate-neutral agricultural system.

Spain

Overall, Spain's agricultural policies support and environmental policies work together to foster sustainable agricultural practices that prioritise environmental protection, conserve biodiversity, and contribute to the country's climate change and sustainability goals. These integrated efforts aim to strike a balance between agricultural development and environmental stewardship.

As Agricultural policies, we may find the Common Agricultural Policy (CAP) and the aforementioned in this document, the National Rural Development Program (PDR) (Programa Nacional De Desarrollo Rural, n.d.). In regard to the Environmental Policies in Spain, the National Climate Change and Energy Strategy (NEEAP), the Spanish Strategy on Biodiversity, the Waste Management and Circular Economy and the Water Framework Directive (WFD) can be found.

Türkiye

Agricultural and environmental policies in Türkiye include a range of support and policies that are important for agricultural sustainability and environmental protection. Agricultural policy support and environmental policies in Türkiye are listed below:

- **Agricultural Subsidies:** In order to support agricultural production in Türkiye, farmers receive various income supports. These subsidies cover agricultural production areas such as cereals, livestock, fruits and vegetables.

- **Agricultural Insurance:** Agricultural insurances are implemented to protect farmers against losses arising from natural disasters and agricultural risks. These insurances aim to secure agricultural production by reducing farmers' risks. Through TARSIM, 50-75% of the insurance premiums of producers are paid by the state.
- **Input Support:** Supporting or subsidising the prices of inputs used in agricultural production (fertilisers, seeds, pesticides, etc.) is intended to reduce farmers' costs and increase productivity.
- **Land Use and Rural Development Policies:** Policies and projects are developed for the efficient use of agricultural land and development of rural areas. It is aimed to improve agricultural production infrastructure, increase agriculture-based employment and improve the quality of life in rural areas.

The duties of the Rural Development and Organization Branches of the Provincial Directorates of the Ministry of Agriculture and Forestry include supporting farmers or enterprises engaged in agriculture-based industrial production. Every year, project calls are made and support payments are made through various projects in various fields (e.g., Irrigation Support Project, Expert Hands Project, Program for Supporting Rural Development Investments, Project for Supporting Rural and Disadvantaged Areas). Environmental Policies include:

- **Biodiversity Conservation:** Türkiye is country rich in biological diversity. Therefore, environmental policies are developed for the protection and sustainable management of biodiversity.
- **Erosion Control and Soil Conservation:** Various measures are taken to prevent erosion and soil loss. Soil conservation policies are implemented through methods such as afforestation, terracing, windbreaks and soil cover protection.
- **Management of Water Resources:** Water resources management policies are established for the efficient and sustainable use of water. The Ministry of Agriculture and Forestry supports the promotion of water-saving methods such as drip irrigation.
- **Waste Management:** Waste management policies are established to reduce environmental pollution and ensure that waste is managed properly. Policies are set on issues such as recycling, waste disposal and the use of environmentally friendly technologies.

Agricultural policy support and environmental policies in Türkiye constitute important steps towards environmental and agricultural sustainability. Effective implementation of these policies is critical for environmental protection and sustainability of agricultural production. Therefore, it is aimed to achieve better results in the field of environment and agriculture by continuously updating and improving them.

8.6. Organic farming and good practices

France

Organic farming is protected by the AB label, which requires compliance with precise and rigorous specifications. Third-party certification bodies ensure that the conditions for organic farming are applied (Helios, 2023):

- No use of chemical fertilisers or pesticides,
- Use of biological agents to combat disease and insect pests,
- Recycling of residues,
- Crop rotation to regenerate the soil,
- Preservation of natural resources and respect for the environment,
- Maintaining biodiversity by growing a variety of species.

Greece

Organic farming in Greece adheres to specific principles and good practices to ensure the production of organic food while promoting environmental protection and biodiversity conservation. The Greek government, in alignment with EU policies, provides support and incentives for farmers transitioning to organic farming practices. This support includes financial aid, technical assistance, and awareness-raising campaigns.

In Greece, the number of holdings practising organic farming increased dramatically between 2000 and 2007 from 1.460 to 27.700. In 2010, however, this almost halved to 14.530 farms, accounting for 2.0% of the country's holdings. The agricultural area under organic farming followed the same trend, increasing rapidly from 52.090 to 192.930 hectares between 2000 and 2007, then decreasing sharply to 116.420 hectares in 2010. This area accounted for 3.3% of the country's UAA (European Commission, "Archive", n.d.).

The Greek Gene Bank (GGB) by the Ministry of Agriculture and under the support of FAO, has identified and proposed for protection certain areas where traditional agricultural systems and a limited number of associated landraces still survive, resisting the pressure of modern times. They are mentioned below:

- The plateau of Lassithi on Crete Island. An impressive agricultural landscape in the island of Crete. It is a 4 500 ha fertile plain situated at an altitude of 850 m above sea level. Traditional agriculture based on diverse local germplasm is practised in a spectacular landscape. The area is mainly devoted to potato cultivation, but many other crops, i.e. vegetables, cereals, are also grown.
- The plateau of Englouvi on Lefkas island of the Ionian sea is a 300 Ha fertile plain cultivated with traditional cereal (wheat, barley, rye) and legumes (principally lentil) landraces. Agriculture is practised under harsh traditional labour-intensive conditions.
- The Aegean islands (Limnos, Lesbos, Samos etc.). Characterised by poor agricultural landscapes, cultivated with cereal landraces. These landraces give good yields despite drought and warm winds, being tall and providing straw for the livestock and bearing awns to resist the attacks of migrating birds. They are also of high quality and have good adaptation to low-input ecological farming.

The Kalavryta area in Peloponnese region, a mountainous area of approx. 1 000 m altitude, where landraces of cereals and pulses are still cultivated over large areas under traditional cultural systems.

The Netherlands

Organic farming, characterised by its dedication to sustainable practices and environmental well-being, has found fertile ground in the Netherlands. As a testament to its growing significance, the Netherlands had witnessed an expansion of organic farmland to cover over 75,000 hectares, representing a growth of approximately 10% from the preceding decade. Going against the general trend, the number of organic farms in the Netherlands actually enjoyed a growth of more than 500 farms in the last decade, from 1,511 in 2011 to 2,063 in 2021. This growth is not merely a reflection of increased land area but also an indicator of the country's commitment to promoting organic practices.

Central to the Dutch approach to organic farming is the stringent adherence to the European Union's organic standards. These standards ensure that synthetic pesticides, artificial fertilisers, and genetically modified organisms (GMOs) are eschewed in favour of natural alternatives. In tandem with these regulations, the Netherlands has championed several good agricultural practices that bolster the organic ethos. Crop rotation, for instance, is ubiquitously practised, enhancing soil fertility while breaking the cycle of pests and diseases. Intercropping and the use of beneficial insects have also been promoted as eco-friendly alternatives to chemical pest control.

The Dutch government, recognising the myriad benefits of organic farming, has instituted supportive policies to foster its growth. Financial incentives, training programs, and research initiatives have been rolled out to aid farmers in their transition to organic practices. Moreover, the consumer base in the Netherlands has exhibited an increasing penchant for organic produce, with the organic food market witnessing an annual growth rate of around 10% as of 2020.

Spain

Organic farming in Spain has experienced significant growth and recognition over the past years. As one of the leading organic producers in Europe, Spain is actively promoting and implementing organic agriculture practices to address environmental concerns and meet consumer demand for healthier and more sustainable food options.

As good practices, we may find many, but we are going to highlight “Tambor del Llano” which is a sustainable primary exploitation, dedicated to the use of a farm of agricultural, forestry and livestock interest, where traditional uses such as cork production are combined with new exploitation programs such as the cultivation of mycorrhizal mushrooms or the recovery of olive groves.

All this under the premise of integrated and organic production, in accordance with the qualification established by the Natural Resources Management Plan of Grazalema (Tambor del Llano, n.d.).

Türkiye

In Türkiye, organic agriculture and good agricultural practices are methods used for sustainable and quality agricultural production that is sensitive to the environment and health. These practices aim to conserve natural resources by reducing the use of chemical fertilisers and synthetic chemicals, prevent environmental pollution, protect soil and water resources, and protect consumer health. Organic fertilisers are used in organic farming. Natural fertilisers such as animal manure, compost, green manures are preferred.

There is a certification process for organic agricultural products. In 2021, organic agriculture in Türkiye was 1,590,086 tons in 267 product types, with 48,244 producers on 351,919 hectares (including natural collection areas), in 267 product types (Ministry of Agriculture and Forestry, 2022).

Integrated pest control methods are used in good agricultural practices. The use of chemical pesticides is limited and biological control methods are preferred. Good agricultural practices aim to increase productivity in agricultural production and improve product quality. Advanced agricultural techniques and modern agricultural management are used. Good agricultural practice certificates are issued to producers who comply with good agricultural practices. These certificates show that the products are sustainable and reliable. The use of environmentally friendly technologies is encouraged in good agricultural practices. Environmentally friendly technologies such as irrigation management and fertilisation techniques are preferred. Training and consultancy services are provided for farmers to popularise good agricultural practices. Conscious and informed farmers can use good agricultural practices more effectively. In 2021, good agricultural practices in Türkiye amounted to 18,010,163 tons on 389,484 ha with 10,265 producers (Ministry of Agriculture and Forestry, 2022).

In Türkiye, organic farming and good agricultural practices are important steps towards agricultural sustainability and the protection of natural resources. These practices ensure that agricultural production takes place in an environmentally friendly and healthy manner and contribute to the production of quality products that protect consumer health. In addition, the dissemination of organic and good agricultural practices contributes to the protection of the environment and human health and strengthening the principle of sustainability in the agricultural sector.

9. Agricultural Innovations

France

French companies focus on technological innovation for the agricultural sector. French companies specialising in technological engineering offer a range of technological products designed to improve the efficiency of French agriculture (Dos Santos, 2022; Franquesa, 2020):

- Autonomous agricultural robots,
- Applications (weather monitoring, animal weights, product origin, etc.)
- Platforms for the traceability of agricultural products and their characteristics (Blockchain),
- Digital tools to promote support for the ecological transition,
- Web tools for managing short circuits,
- Agricultural lasers that estimate the best time to harvest raw produce,
- Drones,
- Agricultural sensors that analyse the condition of agricultural plots.

Greece

Precision farming technologies, the use of remote sensing and satellite imaging and digital farm management platforms are becoming more popular in Greece to optimise the use of resources, including water, fertilisers, and pesticides. Several pilot programmes through cooperation of regional authorities with research institutes exploiting EU funds have enabled the application of precise farming in olive groves in the regional units of Ilia and

Etoloakarnania, in apple orchards and cotton farms in the Region of Thessaly, in Ptolemaida, in the Regional unit of Kilkis and many more (Fountas et al, n.d.; Liakos et al., 2014).

Greece has been also pioneering in the development of precision farming systems as the company Augmenta, founded in 2018 by University of Thessaly alumni has developed a system that was taken over by Italian-American multinational corporation CNH Industrial. The company's products around crop input management and farm analytics, from 2018 to 2023, have been in use across geographies in Europe, CIS, North and South America, and Australia (Greek-developed precision farming system, 2023).

Aquaponics and hydroponics, innovative farming systems that involve growing crops without soil, often in a nutrient-rich water solution are becoming popular in Greece. These systems are particularly suitable for areas with limited arable land. These farming systems have been adopted around major cities like Athens, Thessaloniki, and Heraklion where arable area is limited, in areas where greenhouses have been developed, in Greek islands and in tourist and resort areas. Of course, this farming system has been widely adopted by Research and Educational Institutions as it serves effectively experimental and educational purposes.

Blockchain technology is being explored to enhance traceability and transparency in the agricultural supply chain. It can help consumers and stakeholders verify the origin and quality of agricultural products. Crete, as one of the major olive oil-producing regions in Greece, has been at the forefront of exploring blockchain technology for traceability in the olive oil industry. The implementation of this technology in Greek agriculture is likely to expand and evolve over time (Mavridis & Gertsis, 2021).

The Netherlands

In the realm of agricultural innovation, the Netherlands consistently pushes the boundaries of what's achievable through technology. The Dutch agricultural sector has witnessed a surge in the integration of cutting-edge technologies, aiming to enhance productivity, sustainability, and overall efficiency.

Digital marketing has emerged as a transformative tool, bridging the gap between producers and consumers. Dutch farmers utilise online platforms for direct sales, a testament to the growing importance of digital avenues in agricultural commerce.

Agricultural drones have flown in the Dutch skies, playing pivotal roles in crop monitoring, soil analysis, and even pest control. By 2020, over 35% of large-scale arable farms in the Netherlands had integrated drone technology, capitalising on their ability to provide real-time, high-resolution data.

The realm of irrigation has not remained untouched by technological advancements. Automated irrigation systems equipped with sensors to detect soil moisture levels have been adopted across 28% of irrigated Dutch farmlands by 2021. These systems optimise water use, ensuring that crops receive precise amounts, minimising waste and enhancing yield quality.

Although the Netherlands exercises caution with genetically modified crops, research into their potential benefits and applications remains robust. The Wageningen University &

Research Center, a leading institution in agricultural sciences, has conducted extensive studies on the potential of GM crops to resist pests and adapt to changing climate conditions.

Precision farming stands as a cornerstone of Dutch agricultural innovation. Utilising GPS, IoT devices, and real-time data analytics, around 60% of Dutch farmers have implemented some form of precision farming technique by 2021, ensuring optimal use of resources and maximising yields.

Lastly, the livestock sector has seen the advent of animal tracking collars. These devices, equipped with sensors, monitor the health, location, and behaviour of livestock. By the end of 2020, approximately 25% of Dutch dairy farms utilised such technology, paving the way for enhanced animal welfare and productivity.

In the evolving landscape of agricultural production in the Netherlands, contemporary technological advancements and innovative farming methodologies present an alternative paradigm with the capacity to profoundly modify the sector's environmental impact. Incorporating tools such as unmanned aerial vehicles (commonly referred to as drones), satellite systems, the Internet of Things (IoT), and Artificial Intelligence (AI), technological progression is fundamentally transforming agricultural practices. Notably, the global market for smart farming has witnessed consistent growth in recent years, and forecasts suggest an acceleration in this trend in the foreseeable future.

Concurrently, indoor farming emerges as a burgeoning alternative agricultural method, diminishing dependency on meteorological conditions, expert labour, superior soil fertility, and extensive water usage. This approach facilitates a more uniform and dependable yield across seasons, substantially mitigating risks associated with diseases and pest invasions. Furthermore, the utilisation of vertical space in indoor farming obviates the demand for expansive land and construction endeavours, enhancing its allure, particularly in densely populated urban regions.

Spain

Spain's agricultural sector has witnessed significant technological innovations that have revolutionised agricultural production. Precision farming techniques, including GPS-guided tractors and drones, enable farmers to optimise irrigation, fertilisation, and pesticide application through real-time data collection. Smart irrigation systems, such as drip irrigation, conserve water and enhance water use efficiency. Automation and robotics in agriculture have improved labour efficiency and product quality in tasks like harvesting and pruning. The Internet of Things (IoT) provides real-time monitoring and decision-making tools for farmers, while agricultural apps and software offer weather forecasts, disease alerts, and market prices for better farm management.

Additionally, Spain has embraced vertical farming and greenhouse technologies for year-round produce cultivation, reducing transportation emissions. Biotechnology advancements, including genetic improvement, enhance crop traits like drought tolerance and pest resistance. Data analytics and artificial intelligence support data-driven decisions in farm management, while renewable energy integration helps reduce the carbon footprint. Blockchain technology is explored to enhance transparency and traceability in the food supply

chain. Overall, these innovations have increased productivity, sustainability, and competitiveness in Spain's agricultural sector.

The general director of Rural Development, Innovation and Agri-Food Training in Spain, Isabel Bombal, said that innovation and digitization of the entire value chain of the agri-food sector are key tools to boost competitiveness, sustainability and traceability. Bombal stressed that modernization and the incorporation of technological and digital innovations in agri-food production will enable the necessary transition to a more sustainable and efficient agriculture and livestock, in line with the recommendations of the new EU Green Pact and its Farm to Table Strategy (Ministry of Agriculture, Fisheries and Food, “La directora general”2022).

Türkiye

Farmers in Türkiye seek to deliver their products directly to consumers by eliminating intermediaries as much as possible. In this context, the producers of fresh fruits and vegetables have started to see the convenience of finding buyers in the digital environment and have increasingly started to find markets in the electronic environment.

The Ministry of Agriculture and Forestry in the country has started implementing a new project called Digital Agricultural Market (DİTAP), which aims to bring producers and consumers together in a digital environment, eliminating intermediary systems and enabling producers to earn more.

In Türkiye, the use of drones for agricultural applications is increasing day by day. Using drone technology in agriculture, it is possible to control the crops produced. During this monitoring, it can be determined whether there is a disease or pest outbreak anywhere in the field without damaging the product. Likewise, spraying can be done more precisely and quickly than alternative methods, providing a cost advantage. If situations such as disease and insect outbreaks are detected in advance, spraying only the detected areas with variable rate spraying provides great benefit in terms of protecting soil health as well as reducing costs (Teknofest, 2020). It is estimated that approximately 1500 drones are used for agricultural purposes in Türkiye.

As a result of the grant programs provided to farmers by the Ministry of Agriculture and Forestry in Türkiye, the use of pressurised irrigation systems is increasing day by day. Thanks to these systems, it is aimed to use water effectively and efficiently.

Being competitive in agriculture-based production is a priority. Discussions on genetically modified products continue in Türkiye as in the rest of the world. The import, processing, export, control and supervision of genetically modified organisms are regulated by the published regulation. GMOs can provide advantages in agriculture such as resistance to insects and viruses and increase in yield.

In Türkiye, the transition from traditional agriculture to precision agriculture is increasing in parallel with technological development. With the increase in land consolidation, parcel sizes have increased and devices such as CPS, sensors and drones have started to be used in agricultural practices.

Livestock tracking collars are not widely used in Türkiye. They are used in a small number of large enterprises. This situation may cause disruptions in the early diagnosis of animal health problems, such as how much milk each animal gives or how much the decrease or increase in milk yield is. Ear tags are attached to all bovine and ovine animals by Ministry of Agriculture and Forestry personnel.

10. Conclusions and Recommendations

Agriculture plays a critical role for the national economy as it contributes to food security, employment, rural development, GDP, and other sectors. Responding to the challenges of increasing pressure on natural resources, climate change and the need to meet consumer expectations in terms of sustainability, the agricultural sector has developed various strategies to achieve a prosperous and environmentally friendly future.

Organic farming and good sustainable farming practices have been widely promoted in the countries covered in this guidebook, supported by financial incentives, training programmes and growing consumer demand for environmentally-friendly products. These approaches have helped preserve biodiversity, reduce the use of chemical inputs, and improve the health of soils and agricultural ecosystems.

Technological innovations such as agricultural drones, precision farming and automated irrigation systems have also played a key role in improving the efficiency and sustainability of the countries' agriculture. These technologies have facilitated a more precise management of resources, efficient use of water and agricultural inputs, and more informed decision-making for farmers.

The demographic landscape of the countries has also played a pivotal role in the evolution of agriculture. As urban areas expand and younger generations lean towards careers outside of farming, there's been an observable shift in the sector's labour demographics. Herein, the contribution of migrant workers becomes paramount. They not only offset potential labour shortages but also introduce diverse agricultural knowledge and practices from their countries of origin, enriching the agricultural tapestry of the host country.

Training for M/Rs in the agricultural field is crucial for several reasons. Firstly, the agricultural sector heavily relies on a seasonal workforce, and M/Rs often fill this labour gap, contributing significantly to the country's agricultural production. Providing them with adequate training ensures that they possess the necessary skills and knowledge to perform their roles effectively, enhancing overall productivity and quality of agricultural output. Secondly, training empowers these individuals with new opportunities for employment and economic integration, fostering their social inclusion and reducing the risk of labour exploitation. Moreover, training in sustainable agricultural practices can promote environmental stewardship, encourage responsible farming methods and contribute to the countries' broader efforts towards a more sustainable and resilient agricultural sector. Ultimately, investing in training for M/Rs in the agricultural field not only supports the workers but also contributes to the growth and sustainability of the agricultural industry as a whole.

National and international agricultural research institutions, universities and private enterprises collaboratively pioneer advances in various areas including precision farming, water management, innovation and sustainable agriculture. These innovations have not only increased productivity but also reduced the environmental footprint and set a global benchmark for sustainable and efficient agriculture.

As a result, the consortium countries of the CAMRAS Project have the potential to contribute to the development of the agricultural sector in Europe and elsewhere by sharing valuable knowledge on how traditional farming wisdom, a diversified workforce and a focus on research and development can be utilised to further sustainable economic development.

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