

# Greenhouse Horticulture Algeria

## Quick Scan



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## FOREWORD

The agricultural relations between the Netherlands and Algeria already exist for decades and are tight. 'Les Pays-Bas' or 'la Hollande' is a strong brand when it comes to several agricultural products, such as seed potatoes, vegetable seeds and heifers. In the light of Algeria's ambitions to increase food production for local consumption and in a later stage on export, combined with the impact of climate change, more opportunities for cooperation emerge. Dutch knowledge, technology and inputs can help Algerian farmers to achieve higher yields, increased quality of the produce, while using natural resources and inputs efficiently, helping to further develop the sustainability of the Algerian sector.

Algeria is a country where doing business often is perceived as complex. Compared to some other countries this may be the case, but at the same time, Dutch companies are working in a satisfactory way with their Algerian partners for a long time. A new generation of agricultural producers is emerging: studious, determined and with an increasing international focus in order to develop a modern agricultural sector. Investing time and effort to get to know them and to build a personal relationship can lead to fruitful partnerships.

After a period where COVID limited many activities for business and cooperation, the agricultural team at the Dutch Embassy in Algiers considered 2022 a good moment for a sector study on Algerian greenhouse horticulture and the opportunities for cooperation in the sector. This study forms the basis for further exploration of opportunities for cooperation in the sector. It is financed by the Ministry of Agriculture, Nature and Food Quality (LNV).

I believe this study contains useful and practical information for Dutch interested companies potentially interested in working in Algeria. If you see opportunities for your company do not hesitate to contact the Dutch embassy in Algiers ([ALG-LNV@minbuza.nl](mailto:ALG-LNV@minbuza.nl)) and RVO.

January 2023

Sabrina Waltmans  
Agricultural counselor  
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## ABBREVIATIONS

**ALGEX:** National Agency for Foreign Trade Promotion  
**ANDI:** National Investment Development Agency  
**ANGEM :** National Agency for Micro Credit Management  
**ANPI:** National Investment Development Agency  
**ANSEJ :** National Agency for Youth Employment Support  
**APFA:** Access to agricultural land ownership  
**AU:** African Union  
**BADR :** Bank for Rural Development  
**CAW:** Chamber of Agriculture of a wilaya (province)  
**CI:** Continental Intercalary  
**CNAC:** National Unemployment Insurance Fund  
**CNCC:** National Center for Control and Certification of Plants and Seeds  
**CNI:** National Investment Council  
**CNIS:** National Council for statistical information  
**CRSTRA:** Scientific and Technical Research Center for Arid Zones  
**DSA:** Directorate of Agricultural Services, representation of the Ministry of Agriculture and Rural Development in each wilaya (province)  
**EU:** European Union  
**FAO:** Food and Agriculture Organization of the United Nations  
**FNDA:** National Fund for Agriculture Development  
**FNRDA:** National Fund for Agriculture and Rural Development  
**GAP:** Good Agricultural Practices  
**GCI:** Global Competitiveness Index  
**GDP:** Gross Domestic Product  
**GIZ:** German International Cooperation agency  
**Ha:** hectare  
**ICT:** Information and Communication Technology  
**IMF:** International Monetary Fund  
**IMP:** Integrated Pest Management  
**INPV:** National Institute of Plant Protection  
**INRAA:** National Institute of Agricultural Research of Algeria  
**IPCC :** Intergovernmental Panel on Climate Change  
**ITCMI:** Technical Institute of Horticulture and Industrial Crops  
**ITDAS:** Technical Institute for the Development of Saharan Agronomy  
**MADR :** Ministry of Agriculture and Rural Development  
**NENA :** Middle East and North Africa  
**ONS:** National Office of Statistics  
**OPEC:** Organization of the Petroleum Exporting Countries  
**PASA:** Programme for Support of Agriculture Sector  
**PNDA :** National Agricultural Development Plan  
**TC:** Terminal Complex  
**UAA:** Useful Agricultural Area  
**UN:** United Nations  
**VAT:** Value-Added Tax  
**WTO:** World Trade Organization

# TABLE OF CONTENTS

- FOREWORD ..... 3
- ABBREVIATIONS ..... 4
- TABLE OF CONTENTS..... 5
- EXECUTIVE SUMMARY ..... 7
- 1 INTRODUCTION ..... 10
  - 1.1 Background ..... 10
  - 1.2 Objective ..... 10
  - 1.3 Methodology ..... 10
  - 1.4 Reading guide ..... 11
- 2 COUNTRY PROFILE ..... 12
  - 2.1 Introduction ..... 12
  - 2.2 Geography, climate and climatic zones ..... 12
  - 2.3 Natural resources ..... 13
    - 2.3.1 Arable land ..... 13
    - 2.3.2 Natural oil and gas reserves..... 14
    - 2.3.3 Water resources ..... 14
  - 2.4 Population..... 16
  - 2.5 Political situation ..... 16
  - 2.6 Economy ..... 17
    - 2.6.1 Gross Domestic Product ..... 17
    - 2.6.2 Import/Export ..... 17
    - 2.6.3 Food import/export ..... 18
    - 2.6.4 Currency..... 19
    - 2.6.5 Access to funding..... 19
  - 2.7 Infrastructure ..... 20
    - 2.7.1 Transport & Logistics ..... 20
    - 2.7.2 Energy ..... 20
    - 2.7.3 ICT 21
  - 2.8 Enabling environment..... 21
    - 2.8.1 Government policy on agriculture and horticulture..... 21
    - 2.8.2 Investment climate and trade policy ..... 22
    - 2.8.3 Business climate ..... 23
    - 2.8.4 Land ownership ..... 24
    - 2.8.5 Phytosanitary regulations ..... 25
- 3 The Algerian horticulture sector ..... 26
  - 3.1 Introduction ..... 26

3.2 Analysis of the current situation of vegetable production .....	27
3.3 Analysis of the current situation of vegetable crops in greenhouses.....	29
3.4 Focus on the Biskra region.....	31
3.4.1 Location .....	32
3.4.2 Climate.....	32
3.4.3 Water resources .....	33
3.5 Description of the horticulture value chains .....	33
3.5.1 Suppliers of agricultural inputs.....	33
3.5.2 Nurseries.....	35
3.5.3 Vegetable distribution and marketing actors .....	35
3.5.4 Sector support bodies and research actors .....	37
4 GREENHOUSE TECHNOLOGY IN ALGERIA.....	39
4.1 Greenhouse structures .....	39
4.3 Greenhouse climate management .....	39
4.4 Water management.....	40
4.5 Cultivation and crop protection.....	41
4.6 Post-harvest and value addition .....	42
4.7 SWOT Analysis .....	42
5 POSSIBILITIES FOR NETHERLANDS – ALGERIAN COOPERATION .....	44
5.1 Introduction .....	44
5.2 Current Dutch presence in the horticulture sector of Algeria .....	45
5.3 Interest of the Dutch private sector .....	46
5.4 Interest of the Algerian sector .....	46
5.5 Business opportunities .....	47
5.6 Opportunities for joint projects .....	49
5.7 Opportunities for government-to-government cooperation .....	50
6 Market entrance .....	52
6.1 Local partner search .....	52
6.2 Project acquisition phase.....	52
6.3 Project implementation .....	53
7 CONCLUSIONS AND RECOMMENDATIONS .....	54
REFERENCES .....	57
ANNEX 1 Contact list interviewed Dutch entrepreneurs .....	59
ANNEX 2 Contact list of field visits in Algeria .....	60

## EXECUTIVE SUMMARY

Algeria has a large horticulture sector comprising of over half a million hectares of vegetable production, with more than 21,000 ha of greenhouse production. Algeria is the largest country on the African continent, but with the Sahara occupying 80% of the country, only 8,5 million ha is available for agricultural production. Despite the ongoing efforts made by the government to develop uncultivated land, arable land remains limited and its per capita availability continues to decrease to 0,2 ha per capita at present.

With a population estimated at close to 44 million in 2020 and that is increasing by an estimated 1 million a year, Algeria has a growing number of mouths to feed. It is Algeria's strategy to reduce its reliance on imports but the country continues to rely heavily on import of agricultural commodities and food annually. In search of strengthening its food security the country has adopted policies to rehabilitate the agricultural sector in the face of two major constraints: access to land and water resources. The NENA region to which Algeria belongs is among the most water-stressed regions in the world and according to the thresholds of water scarcity proposed by Falkenmark in 1989, Algeria is classified among the countries where water scarcity is absolute. At present 59% of the available water comes from ground water and 24% from surface water, of which around 65% goes to agricultural and 32% to domestic use. The groundwater resources are in heavy use in Algeria and the region but remain largely unregulated, leading to rapid depletion of aquifers and deterioration of water quality.

The Algerian horticulture sector can provide interesting opportunities for Dutch suppliers because of its size, the low technology level and the countries' development aims and needs. The growing population and year-round fresh produce consumption pattern of Algeria demands increasing production of vegetables of fruits, either by production intensification or expansion.

Besides food security, agriculture development and modernization is also pursued by the Algerian government as a means of diversifying the economy and attracting foreign and domestic investment outside the energy sector. Following the hydrocarbon crisis that hit Algeria in 2014, local investors from other sectors have become interested in the horticulture sector. These new investors are result-oriented, receptive to modernization of production techniques and have a good financial base.

The Dutch horticulture sector is front runner in the field of horticultural knowledge, research and the development of sustainable technologies that can be customized to specific cultivation conditions on the ground. At this moment in time the Dutch presence in the Algerian horticulture sector is mostly limited to Dutch vegetable seed breeders. A rather small number of other Dutch horticulture suppliers have gained experience in doing business in the horticulture sector in Algeria. Amongst them are mostly suppliers of various kinds of greenhouse technology and companies active in young plant propagation.

The objective of this quick scan study is to therefore to give insight in the situation, the (expected) developments, challenges and needs of the Algerian greenhouse horticulture sector and to link this with business opportunities for Dutch companies in greenhouse technology, starting materials and inputs.

The Algerian agricultural sector has 1,2 million farms and it is estimated that vegetable crops are grown on nearly 20% of the farms. The area under vegetable crops has grown with 24% over the period 2010-2019, from 429,417 ha to 533,060 ha. According to provisional data, the production area fell by nearly 3% in 2021 compared to 2020. This decrease in the area of open-field vegetable crops may be the consequence of drought. In terms of farm size, agriculture remains largely dominated by small farms. Tomato is the second vegetable product, after potato. During the past years, the tomato production has come close to reaching the saturation level of the market. The government has therefore made an effort to regulate the problem of overproduction through the development of processing units and the ban on the import of double and triple concentrated tomatoes.

Greenhouse production has developed from 7.859 ha in 2010 to 19.573 in 2020 ha, a development of 249%. According to the latest data provided by the MADR (data not yet published), the area of greenhouse production has continued to grow during 2021 to reach 21,106 ha, but has shown a slight decline in 2022 down to 21,025 ha. This decline is a reduction in the use of tunnel greenhouses. In Biskra and El Oued the areas of greenhouse production have increased with 200 ha and 50 ha respectively.

The most popular greenhouse products are tomatoes, melons, watermelons, peppers and hot peppers. In terms of production, tomatoes provide the largest share of production (41%). The productivity level for tomato is estimated at around 12,2 kg/m<sup>2</sup> per year in greenhouses.

The technology level of the Algerian horticulture sector is low. Three types of greenhouses are found, being tunnels, Canarian greenhouses and multispan greenhouses. Tunnels are the dominant type in all different production regions. In 2009 the Canarian greenhouse has been introduced in Biskra, which has a construction that is more resistant to winds. Since it has ensured better yields the share of this type of greenhouses in Biskra has grown. Multispan greenhouses are mostly found in the Mediterranean region and is especially at nurseries.

Greenhouse climate management is usually limited to the basic possibilities for ventilation and shading. Only in nurseries, more advanced technologies such as pad and fan systems are used to create the right conditions for the propagation of young plants.

The main source of water for irrigation is ground water. The water supply systems mainly are of the traditional type, automated systems and substrate can be found in nurseries and at top end producers, mostly in the Mediterranean region. The Mediterranean region has sufficient rainfall for rain water collection systems to provide a significant part of the irrigation water. At Multispan greenhouses often gutter systems are installed, however usually no connection is made to a basin so rain water is not being used.

In production greenhouses cultivation is done in the soil, without applying crop rotations. Disease problems are therefore reported, especially in tomato. Nurseries use substrate for their production of seedlings, this is often a mixture between locally available materials and low-cost imported products. Farms usually do not have cold storage facilities as all produce goes directly to the market.

Farmers are increasingly interested in mechanization and automation in order to deal with the lack of workers the sector is experiencing.

The Algerian horticulture sector is currently applying technology of suppliers from different countries such as Turkey, Italy and France. Cooperation with foreign suppliers of seeds, fertilizers and crop chemicals is taking place, but there is a clear demand to expand the network with new trade partners and to get access to the latest technology and products. The private sector is looking at the Netherlands in specific when it comes to cooperation with seed breeders and access to biological crop protection.

The business-to-business opportunities that have been identified during this study include

- The supply of inputs, including vegetable hybrid seeds, biological products to enhance soil conditions and conventional fertilizers, hormones and crop protection chemicals
- The transition from the traditional fertigation method into an automated mid-tech level fertigation system, ideally combined with a substrate cultivation system for drain water re-use and prevention of the development of soil-borne diseases
- Rain water collection and improved water storage systems
- Optimizing the greenhouse climate management by automated ventilation, screening, cooling and heating systems
- Replacement of tunnel greenhouses and expansion by MultiSpan greenhouse to improve productivity levels
- Value addition in the form of on-farm cold storage facilities to have more control over the marketing process and to reduce losses, and in the form of processing to replace imports.



In order for Dutch suppliers to become successful in Algeria it should be noted that it will be of vital importance to provide a sufficient amount of technical assistance with the products and to find a good local installer or distributor to provide support. Individual market entrance is well-possible but has shown to be difficult, especially for horticulture technology suppliers. Several efforts of the Dutch private sector have stranded in the past, this is due to the pandemic but also the complexity of the market. First contacts with local partners and clients can be made by activities organized by the NL government, after that it will be important to build long term relationships and make on-site visits on a regular basis. In general a lot of knowledge and information will need to be transferred on available technologies and the business case.

Business-to-business projects including demonstrations and knowledge transfer may be instrumental for market preparation, suggested project topics include the calculation of the business case for turn-key greenhouse projects, 'measuring is knowing' and integrated pest management.

In order to support the possibilities for Dutch companies to do business in Algeria topics for government-to-government have been identified including support to the development of farmer organization, import permission for natural enemies for IPM and organic production, and creating awareness on food safety of fresh produce for the local market.

# 1 INTRODUCTION

## 1.1 Background

Food security has been a priority for the authorities in Algeria since independence of the country. Only a mere 17.4% of Algeria's total amount of land is viable for agricultural farming, according to a 2016 study by the World Bank. Algeria has a growing number of mouths to feed, with the population that was estimated to be close to 44 million in 2020 and that is increasing by an estimated 1 million a year. Although Algeria's strategy is to reduce its reliance on imports the country continues to rely heavily on import of agricultural commodities and food annually, valuing about \$8 billion over 2016 (Agricultural Fact Sheet, USDA, 2018).

The government of Algeria is pursuing agriculture development and modernization as a means of diversifying the economy and attracting foreign and domestic investment outside the energy sector. The country has adopted a policy to rehabilitate the agricultural sector in the face of two major constraints: access to land and water resources. The implementation of the Law on Access to Agricultural Land Ownership (APFA) in 1983 has facilitated the emergence of new systems based on more intensive production techniques such as greenhouse cultivation.

Protected cultivation in Algeria has experienced rapid growth from 4.300ha in 2001 to 19.573 ha in 2020. The majority of the greenhouses consist of tunnels and since 2009 the surface of Canarian greenhouses is growing to currently around 2.000ha. Multispan greenhouses are not much used, but there are some initiatives ongoing, mainly in nurseries. To further improve and increase local production of fresh produce, the way forward for the horticulture sector is to improve its productivity level at the current production acreage while minimizing water use. In addition, optimization of the full value chain is needed to ensure that produced food will reach the consumer without high losses in the value chain.

The Dutch horticulture sector is front runner in the field of horticultural knowledge, research and the development of sustainable technologies that can be customized to specific cultivation conditions on the ground. The Netherland is a globally respected supplier of integrated growing systems and thereby ideally positioned to contribute to the development of sustainable food production in Algeria. At this moment in time the Dutch sector's presence in the Algerian sector is rather limited. The 'Greenhouse horticulture in Algeria' quick scan helps to facilitate and stimulate more cooperation between the sectors by identifying business-to-business and government-to-government opportunities for improved sustainable greenhouse production in Algeria.

## 1.2 Objective

The objective of this quick scan study is to give an insight in the situation, the (expected) developments, challenges and needs of Algerian protected cultivation and to link this with business opportunities for Dutch companies in greenhouse technology, starting materials and inputs. The study aims to provide information on the potential for cooperation between the horticulture sectors of the Netherlands and Algeria, both on a business-to-business and government-to-government level.

## 1.3 Methodology

For this study Green Works Consultancy teamed up with a local consultant with a broad knowledge of and a lot practical experience in the Algerian horticulture sector. The local consultant also had an extensive network on all the different levels of the sector.

The approach for this study consisted of the following elements:

- Desk study, including a review of relevant documents on the Algerian economy, the horticulture sector, market situation, greenhouse technologies and water management

- Interviews with a selection of Dutch horticulture sector parties including horticulture suppliers that have experience in doing business in Algeria or are interested to start activities in the country (see Annex 1)
- Field visit programme in the main horticulture production areas, including production sites in the north and Biskra to assess the specific characteristics and conditions of greenhouse production and marketing in these areas and the possibilities to improve them by means of implementing higher technology knowledge and equipment. In addition visits were made to relevant sector stakeholders including sector organisations, government bodies, knowledge institutions and research institutes (see Annex 2)
- Focus group meeting to inform the Algerian audience about sustainable and economically viable models of protected horticulture through a presentation. The presentation included trends and developments in the international horticulture sectors, the role of the Netherlands worldwide and relevant examples of projects on high, medium and low tech level in countries in the Middle East and Africa.
- Webinar to inform the Dutch audience about business opportunities in Algeria

#### 1.4 Reading guide

In the following chapter general information on Algeria will be provided in a country profile including amongst others information on geography, climate, population, economy and international relations. Chapter 3 provides a more detailed description of the horticultural sector of Algeria, including its most important value chains, its actors and regional aspects. In Chapter 4 the greenhouse horticulture related technologies that are found in the sector are described with a focus on greenhouse structures, greenhouse climate management and water and fertigation management. At the end of this chapter the analysis of the Strengths, Weaknesses, Opportunities and Threats (SWOT) of the sector is presented.

The possibilities for cooperation between the Dutch and Algerian sector are described in Chapter 5. This chapter includes the observed business opportunities, suggestions for projects on private sector and government level, and insights on how to access the Algerian market. The final chapter presents the conclusions and recommendations.

## 2 COUNTRY PROFILE

### 2.1 Introduction

Algeria is a country in North Africa, part of the Maghreb, with an area of more than 2 million km<sup>2</sup>, which provides it with a lot of natural wealth, including gas, oil and other valuable resources.

The Algerian population has exceeded 44 million inhabitants with a median age of 28.4. The economy has grown strongly in recent years, mainly due to the rise in oil and gas prices in recent decades, and strong demand on world markets.

Economic growth has therefore been good, up to +6% per year. But Algeria remains very dependent on oil revenues, which account for up to 85% of its exports.

Over the last two decades, Algeria has embarked on the development of its infrastructure: ways, dams, electricity and seawater desalination stations. Parallel to that, an economic recovery plan has been put in place, particularly for the agricultural sector, which currently contributes to 14% of the GDP and employs 2.7 million people.

### 2.2 Geography, climate and climatic zones

With an area of 2,381,741 km<sup>2</sup>, Algeria is the largest country on the African continent, the Arab world, the Mediterranean basin and the 10th in the world. Algeria shares 6734 km of land borders, with Tunisia to the northeast (1034 km), Libya to the east (989 km), Niger to the southeast (951 km), Mali to the southwest (1359 km), Mauritania and Western Sahara to the west (490 km), and finally Morocco to the northwest (1941 km).

The Sahara occupies 80% of the country's area. The rest of the remaining 20% of the area is in the north of the country is crossed by two mountain ranges which are the Tellian Atlas and the Saharan Atlas. Between these two ranges are the plains and the Highlands, and the majority of agricultural land. Algeria comprises three distinct major regions: the Tell bordering the Mediterranean Sea, the steppe in the center (regions of the highlands and plains) and the Sahara in the south.

Fig. 1: Map of Algeria



Source: <https://www.axl.cefan.ulaval.ca/afrique/algeriecarte.htm>

In terms of climate, a decrease in rainfall and increase in temperature is observed from north to south and east to west. The Tell, in the north of the country, has a Mediterranean climate, the summers are hot and dry and the winters are mild and rainy. This is the wettest area in Algeria, it is characterized by an annual rainfall that varies between 400 and 1 000 mm of water.

Further in the south, the Highlands or the steppe zone are characterized by a semi-arid climate with hot summers, cold winters and rainfall between 200 and 400 mm/year.

In the Sahara, the climate is characterized by extreme temperatures (winter and summer) with rainfall of less than 130 mm/year. The aridity of the climate is accentuated by the very strong evaporation and sand winds.

**TAB. 1:** Climate zone in Algeria

Zone	Climate	Seasonal conditions	Annual rainfall
Tell	Mediterranean	hot and dry summers, mild and rainy winters	400 - 1.000 mm
Highlands/steppe	Semi-arid	hot summers, cold winters	200 - 400 mm
Sahara	Arid	extreme temperatures in winter and summer	<130 mm

According to a recent FAO report there is evidence of consistent warming trends across the region since the middle of the 20th century, with a significant increase in the frequency of warm days and higher temperature values. Precipitation analyses show greater variability and less significant trends than for temperature, but subregional and country studies point to downward trends overall (Crumpler, 2022).

Current projections for climate change suggest an increase in the frequency, intensity and duration of droughts accompanied by a decrease in precipitation. Mean temperatures are expected to increase by 2.6°C by 2050, with more frequent heat waves and fewer frost days. Precipitation is expected to reduce (by a maximum of 16%) in March-May and increases are projected during September-November, related to an increase in rainfall intensity of 7% and a general increase of rainfall of 6%. Higher-resolution (finer spatial scale) climate models project that Algeria will become wetter by the end of the century (Langenberg, 2021).

## 2.3 Natural resources

### 2.3.1 Arable land

The total Algerian agricultural area is estimated at nearly 44 million hectares which represents only 18% of the Algerian territory. Most of this land (75%) is rangeland, leaving less than 9 million ha to arable land. In addition, about 33% of arable land is fallow annually and 12% is intended for permanent crops.

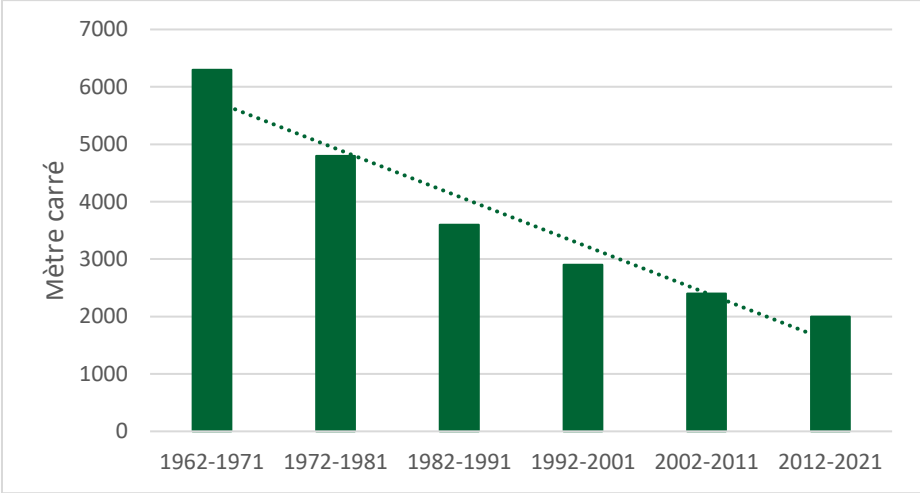
**TAB. 2:** Agricultural land use

Category	Area (ha)	% Area of the country
Herbaceous crops	4 682 024	
Land at rest	2 848 556	
Fruit plantations	910 322	
Vineyards	68 649	
Natural grasslands	54 117	
Useful agricultural area	8 563 669	3.59
Grazing and courses	32 752 530	
Unproductive farm land	2 652 454	
Total land used by agriculture	43 968 653	18.46

Source: MADR; 2019

Despite the ongoing efforts made by the government since independence to expand the area of arable land through the development of uncultivated land, mainly in the steppe and Saharan areas, arable land remains limited and its per capita availability continues to decrease. These availabilities decreased from 0.77 ha/inhabitant in 1962 to 0.20 ha at present (see figure 2).

**Fig. 2:** Development of agricultural land availability per capita



Source: Daoudi; 2021

### 2.3.2 Natural oil and gas reserves

Algeria is the 17th oil producer, the 10th producer of natural gas and the 7th exporter of natural gas in the world (2021). Algeria's oil reserves rank 15th in the world and that of natural gas 13th in the world. Algeria's natural reserves are still largely underexplored and there are big opportunities to find new deposits.

In addition to oil and gas, Algeria produces iron, steel, metals such as gold and silver, industrial minerals including baryte, bentonite, cement, crushed stone, gravel, gypsum, helium, limestone, marble, nitrogen fertilisers, phosphate, pozzolan, quartz, salt and sand in all its states. It also has large deposits of unexploited minerals. These include diamond, manganese, crystalline quartz, rare earth minerals, tungsten and uranium, and silicon (Belgacem, 2016).

### 2.3.3 Water resources

The NENA region to which Algeria belongs is among the most water-stressed regions in the world, with 6% of the global population but only 0.6% of the world's accessible renewable water. According to the thresholds of water scarcity proposed by Falkenmark in 1989, Algeria is classified among the countries where water scarcity is absolute (< 500: Absolute water scarcity, 500 -1000: Chronic water shortage (Scarcity), 1000 -1700: Moderate water stress, > 1700: No water stress).

The potable water supply in Algeria relies mainly on ground water and the desalination of seawater. The coast of Algeria has 21 seawater desalination stations spread over the 14 coastal wilayas that supply 6 million people with a volume of 2.6 million m<sup>3</sup>/day.

In agriculture ground water is the main water resource for irrigation, besides water from dams. Treated wastewater is very rarely used. According to a study commissioned by the Agricultural Offices of the Dutch Embassies in Algiers and Rabat in 2021, the groundwater is being exploited over recharge level (Langenberg, v, 2021). The groundwater resources are in heavy use in the whole region but remain largely unregulated, leading to rapid depletion of aquifers and deterioration of water quality.

Renewable surface water is estimated at nearly 10 billion m<sup>3</sup>/year for the whole country while renewable groundwater is estimated at 1.5 billion m<sup>3</sup>/year. These aquifers are mainly fed by rainfall, which has been irregular and rare in recent years. In the south of the country, groundwater resources from the Northern Sahara Aquifer System (SASS) are very large but weakly renewable.

The total renewable resources are estimated to 11.67 billion m<sup>3</sup>/year offering an availability of 276 m<sup>3</sup>/year/inhabitant (Aquastat, 2018). In 2019, Algeria had 80 dams with a capacity of 8,300 million m<sup>3</sup>, five other dams are under construction with a total capacity of 300 million m<sup>3</sup>.

**TAB. 3:** Availability of renewable water resources in Algeria (2018)

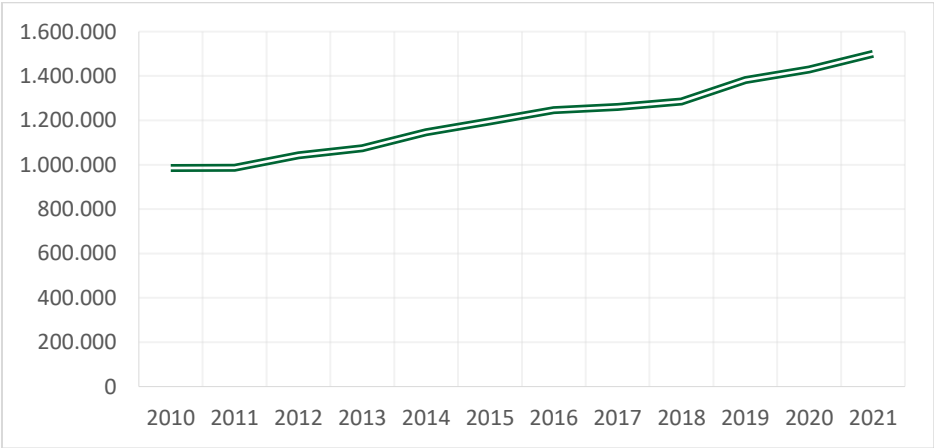
Total renewable surface water resources (10 <sup>9</sup> m <sup>3</sup> /year)	10.15
Total renewable groundwater resources (10 <sup>9</sup> m <sup>3</sup> /year)	1.517
Total renewable water resources (10 <sup>9</sup> m <sup>3</sup> /year)	11.67
Total renewable water resources per capita (m <sup>3</sup> /inhab/year)	276.3
Source: Aquastat, 2022	

The 2022 data provided by the ministry in charge of water resources indicate that the national water potential amounts to 18 billion m<sup>3</sup>/year with a mobilized volume of 11.2 billion m<sup>3</sup>/year respectively from:

- Groundwater 6.60 billion m<sup>3</sup> (≈59%);
- Surface water: 3.80 billion m<sup>3</sup> (≈34%);
- Seawater desalination: 0.76 billion m<sup>3</sup> (≈7%);
- Treated wastewater: 0.05 billion m<sup>3</sup> (≈0.4).

Most of this water is used by agriculture with 7.31 billion m<sup>3</sup>/year (65%), followed by domestic with 3.60 billion m<sup>3</sup>/year (32%) and finally industry and services with 0.30 billion m<sup>3</sup> /year (3%). The irrigated area increased during these few last years. The irrigated area, which was 985,220 ha in 2011, increased to 1,5 million ha in 2021 and the estimate is that it has reached more than 1.6 million ha by the end of 2022. Fruit arboriculture remains the most irrigated speculation at 34%, followed by vegetables production and cereal with 29% and 20% respectively. Agriculture will consume more water because Algeria aims to reach 2 million hectares of irrigated area, which represents 24% of the useful agricultural area.

**Fig.2:** Development of irrigated areas (ha)



Source; made by the author from series B data; MADR

In the new water policy, the reuse of treated wastewater has become a priority in order to meet the growing water needs of the agricultural sector. Algeria has 200 wastewater treatment plants in operation, for a total capacity of 0.942 billion m<sup>3</sup>. Investments have been made in the rehabilitation of old wastewater treatment plants and in the construction of new ones. Projections for 2030 indicate a mobilizable volume of 2 billion m<sup>3</sup> of purified water available for irrigation which would be sufficient to irrigate about 200,000 ha.

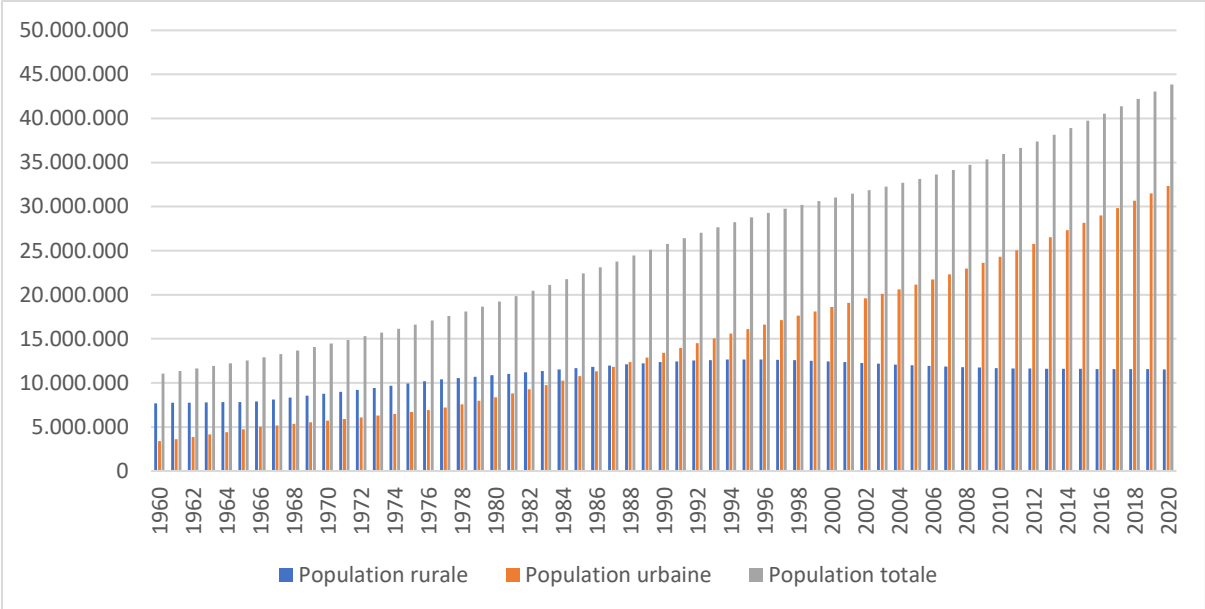
### 2.4 Population

In 2020, Algeria's population was nearly 44 million, half of whom are under the age of 25. The National Office of Statistics (ONS) estimates that the population will reach 51 million by 2030 and more than 70 million by 2050. Since independence, the Algerian population is multiplied by four.

Algeria ranks first in Africa by the Human Development Index (HDI) which stood at 0.748 in 2019. This means that Algeria counts among the countries with a high human development.

Over the years a shift has taken place with regard to the distribution of the population in urban and rural areas. The rural population represented 69% of the total population in 1960, while in 2020 it represents only 26% of the total population (Figure 3).

**Fig.3:** Development of the rural and urban population



Source: World Bank data 2022

### 2.5 Political situation

The president is the head of state in Algeria and the head of the council of ministers. The prime minister serves as the head of the council of ministers and head of government together with the president. The president is elected by absolute majority vote through a two-round system, after that the prime minister is appointed by the president.

The country is divided into 58 administrative divisions, called Wilaya (provinces), each of which is headed by a “Wali”. An elected assembly manages the wilaya.

All ministries have a representation on wilaya level, for the Ministry of Agriculture this is the Directorates of Agricultural Services.

Algeria has been a member of the United Nations (UN), the African Union (AU) and the League of Arab States practically since its independence in 1962. It joined the Organization of the Petroleum Exporting Countries (OPEC) in 1969.



Although Algeria had succeeded in lifting a good number of reservations issued by the WTO which hindered its accession, the country is not yet a member of the WTO.

After a period of high oil prices, Algeria managed to lift most of its external debt in 2008. The country invested in infrastructure projects conducive to economic growth and implemented social policies that contributed to poverty reduction and significant improvements in human development indicators. The popular movement that started on February 22, 2019 (El Hirak), during which the people expressed their strong aspiration for change, social justice and the rule of law led the government to revise the constitution and commit to economic recovery. Several resolutions to create an environment conducive to investment have been adopted, in particular the revision of the investment law.

2.6 Economy

2.6.1 Gross Domestic Product

Algeria had the 4<sup>th</sup> GDP of the African continent in 2020 and the highest GDP per capita in the Maghreb. The country’s economy is based essentially on oil rent and its wealth is correlated with the fluctuating price of a barrel of oil.

During the 2000s, the rise in the price of hydrocarbons on international markets allowed the authorities to have significant resources. This enabled the implementation of ambitious economic and social policies, particularly in the financing of agriculture through several development programs.

The agricultural sector accounts for 14.7 % of GDP in 2022, up from 8.5% in 2010. A positive development that has allowed Algeria to improve its food security and reduce the unemployment rate. Agricultural employment represents 2.7 million employees, or nearly 25% of the active population. According to statements by the Minister of Agriculture the growth rate of the sector should be around 2.4% for the next five years.

**TAB. 4:** Share of agriculture in GDP

GDP (\$ billion)		GDP per capita (current US\$)		GDP Agriculture (\$ billion)		% Agriculture (GDP)	
2010	2020	2010	2020	2010	2020	2010	2020
161.2	145	5455.7	3306.9	1.4	20.4	8.5	14.1

Source: World Bank;2022

The COVID-19 pandemic had, as in the majority of countries, a negative impact on the Algerian economy in 2020. GDP fell by 5.5% because of measures imposed to limit the spread of COVID-19 and the fall in hydrocarbon production, as Algerian oil production fell below the quota set by OPEC for the country.

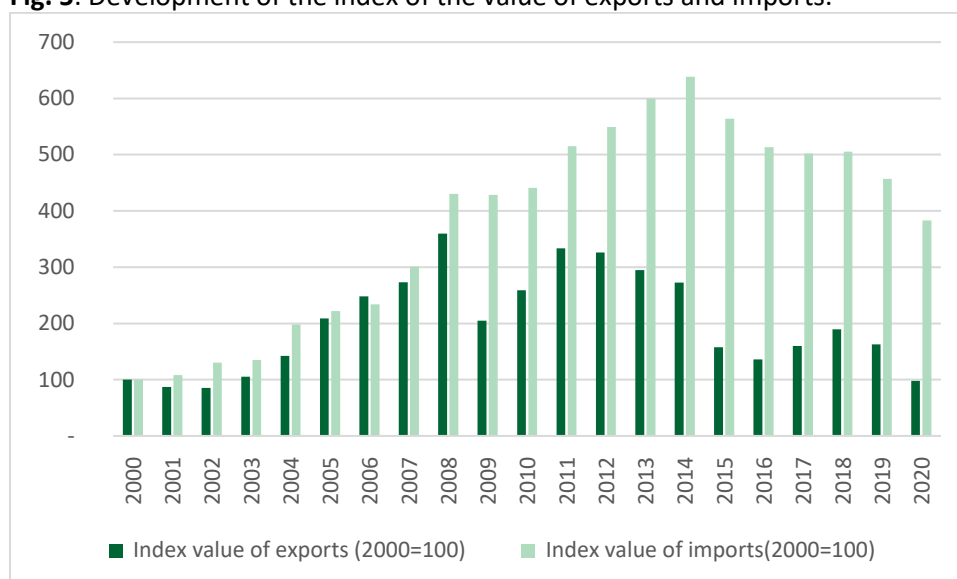
According to International Monetary Fund (IMF) the Algerian economy is gradually recovering from the two shocks that hit it simultaneously in 2020: “The COVID-19 pandemic and the decline in oil prices. After a decrease in 2020, GDP grew by 2.3% year in the first quarter of 2021, driven by the recovery in hydrocarbon prices and production and the easing of containment measures (IMF,2021).

2.6.2 Import/Export

The country's energy resources allow Algeria to meet the increasing demand of the population for the importation of several products and productions.

Over the last two decades the import bill of Algeria represented 40 billion dollars on average annually. While it represented only \$ 6 billion in 1970 and \$ 14 billion in 1990, it rose up to \$ 34.4 billion in 2020. The development of imports (Figure 6) follows an upward pattern since 2000 with a peak recorded in 2014 and an estimated bill of 64 billion dollars. From this year, the trend is downward following the fall in the price of oil and the measures of the government to rebalance the trade balance.

**Fig. 5:** Development of the index of the value of exports and imports.



Source; made by the author from World Bank data;2022

At the end of 2020, foreign trade in goods recorded (CNIS, 2022):

- An overall value of imports of USD 34.39 billion,
- An overall value of exports of USD 23.80 billion,
- Final hydrocarbon exports amount to USD 16.42 billion; a trade balance deficit of around USD 10.60 billion.

For 2022 the trade balance deficit is expected to reach 17.7 billion USD.

### 2.6.3 Food import/export

The food imports bill amounts to USD 8.5 billion (average 2016-2020) and represents 26.34% (2020) of the total imports. Table 5 gives an overview of the development of imports of foodstuffs.

**TAB. 5:** Development of imports of foodstuffs

Chapter	Products	Year 2019		Year 2020		Development %
		Value (\$ million)	%	Value (\$ million)	%	
<b>Cereals</b>	Wheat and maize	2706,1	34	2813,8	35	4
<b>Milks and bedding products</b>	Milk and creams	1245,91	15	1549,4	19	24
<b>Sugar</b>	Corn or beet sugar	726,61	9	774,47	10	7
<b>Others</b>		3393,65	42	2957,24	37	13
<b>Total</b>		8072,27	100	8094,91	100	0.28

Source: CNIS;2022

The "Food Goods" group comes in second place in the structure of imports made during the year 2020, with a share of nearly a quarter of the total value. In terms of the structure of the group, cereal products represent 34.76%, milk and dairy products represents 19.14%, sugars and sweets represent 9.57% and residues and waste from the food industries represent 4.53%.

For exports, in 2020, hydrocarbons represented 90.52% of the overall value. Non-hydrocarbon exports remain marginal with only 9.48% of the overall value which corresponds to 2.2 billion USD. Exported food goods are worth USD 0.4 billion (CNIS, 2022). The most important product exported in 2020 in value and quantity remains refined sugar followed by dates and soybean oil.

### 2.6.4 Currency

The Algerian dinar (DZD) is the currency unit of Algeria since April 1, 1964. The dinar has experienced a successive depreciation against the dollar to reach an exchange rate of 1USD ≈144DZD average over the first half of 2022. The dinar is non-convertible.

The depreciation has contributed to the worsening of the food bill and the incrementation of production costs, particularly in the agricultural and agri-food sector, via the import of agricultural inputs (fertilizers, phytosanitary products, equipment, etc.). Figure 6 displays the devaluation of the Algerian Dinar over the past decade.

**Fig.6:** Development of the exchange rate of the Algerian Dinar



Source: <https://www.xe.com/>

### 2.6.5 Access to funding

Depending on the conditions, several organizations can contribute to the financing of projects with follow-up in the exploitation phase and benefits granted, provided that the investors mobilize a personal contribution.

- ANADE (National Agency for Support and Entrepreneurship Development, formerly known as ANSEJ); is aimed at the unemployed, between 19 and 35 years. For the manager, the age can go up to 40 years with commitment to create three permanent jobs (including the partners) for a maximum amount of investment of the value of 10,000,000 DA (72.000\$). [promoteur.anade.dz](http://promoteur.anade.dz))
- The ANGEM (National Agency for Micro Credit Management) is aimed at people over 18 years without income or with unstable and irregular income and have knowledges in relation to the projected activity, for a loan of 30,000 to 400,000 DA (300 to 3000\$). <https://www.angem.dz/>)

- The CNAC (the National Unemployment Insurance Fund) is aimed at unemployed between 35 and 50 years and for a maximum investment amount of the value of 10,000,000 DA (72.000\$). [www.cnac.dz](http://www.cnac.dz)

In terms of agricultural credits, several types are offered to farmers. These loans are granted by the Agriculture Bank for Rural Development (BADR) and are subsidized (0% interest) or partially subsidized. The loans are including:

- The agriculture credit "R'FIG": a credit intended for farmers / breeders for a period of 2 years for the acquisition of inputs necessary for their agricultural activities (seeds, seedlings, fertilizers, phytosanitary products, etc.). The total coverage of interest charges is borne by the Ministry of Agriculture and Rural Development.
- The "R'FIG FEDERATIF" credit: meets the same requirements as the RFIG credit but concerns actions related to the processing and valorisation of products.
- The investment credit "ETTAHADI": is a partially subsidized investment credit, intended for new agricultural and livestock farms or projects located on unused agricultural land, it concerns agricultural irrigation development operations, the acquisition of all the means of production (equipment, inputs, etc.) and the construction of the various infrastructures, such as the multispan and canarian greenhouses.
- The investment credit "ETTAHADI FEDERATIF": meets the same requirements as the ETTAHADI credit but concerns actions related to the processing and valorisation of products.

However, farmers who can afford to invest without borrowing prefer this solution. Getting a loan is not really easy. The administrative aspect of loan applications is considered too cumbersome. Interest rates would be around 5% in public banks and 7% to 9% in private banks. Banks also ask for guarantees, including land titles, which can be problematic in many cases. Many farmers also refuse to take out loans with interest, following the precepts of Islam.

## 2.7 Infrastructure

### 2.7.1 Transport & Logistics

The Algerian Road network is one of the densest and most important in the Maghreb region and the African continent. Its length is estimated at 108,302 km of roads. The road network has been in full development thanks to the program of modernization of road and rail transport with the realization of the East-West Highway that connects the far east (the border with Tunisia) with the far west (the border with Morocco), the Highway of the Highlands and the Trans-Saharan Road (North-South) which will cross Algeria from North to South.

The rail network is estimated at 4,200 km in 2022, it has recently undergone electrification at certain sections which will lead to the installation of high-speed trains to connect the most important cities of the country.

Algeria has 36 airports, 13 of which are international. The most important is Algiers Airport with a capacity of 22 million passengers per year.

Almost all international trade is carried out by sea, via eleven trading ports. The Port of El Hamdania (100 km west of Algiers) is a deep-water port project in Algeria that is relaunched in 2020 by the government. The port is planned to be connected to the Algerian road network and the rail network. It is intended to become the largest port in Algeria with 23 quays and a processing capacity of 6.5 million containers and 25.7 million tons of goods per year.

### 2.7.2 Energy

Nowadays Sonelgaz, as a public company, has achieved an electrification rate of 99.8% and a gas penetration rate of 57%. Algeria has an electricity production capacity of around 24,000 Megawatts for an average annual consumption that does not exceed 14,000 Megawatts.

The Ministry of environment and Renewable Energies aims to boost the implementation of the renewable energy program which can be an alternative for farms, especially those in isolated regions, to use this type of energy.

### 2.7.3 ICT

In Algeria, several operators are active in the telecom sector including Algeria Telecom which is the national operator managing all telephone lines and fixed internet as well as another mobile phone network. Two other international private operators are also active in the field of mobile telephony. In terms of telecommunications, the situation as at 30 June 2020 shows:

- Fixed telephony subscribers: 4,709,374 (52%)
- Mobile phone subscribers: 44,411,730 (99%)
- Fixed Internet subscribers: 3,675,926(41%)
- 3G subscribers: 10,637,991 (28%)
- 4G subscribers: 26,329,792 (59%), (<https://www.mpt.gov.dz/>)

The ICT Development Index (IDI) published by the International Telecommunication Union (ITU) is the main index for the telecommunications sector. Published from 2009 to 2017, the IDI is a composite index designed to assess and compare the state of ICT development within and across countries. The aim was to track changes in ICT development over time. The score accorded for Algeria is going upward from a year to another.

## 2.8 Enabling environment

### 2.8.1 Government policy on agriculture and horticulture

In search of strengthening its food security, Algeria has engaged in public policies in agriculture especially since the 2000s through various agricultural development programs (FNDA, FNRDA, PNDA, Rural Agricultural Renewal). After a period of latency this sparked renewed interest in the agricultural sector. The agricultural development programs have been aimed at improving the mobilization of water resources, energy and support for agricultural equipment and inputs. Over the years this dynamic initiated by the public authorities and driven by the actors on the ground, has resulted in self-sufficiency in fruits and vegetables, white meats and eggs, and red meats for the largest part.

The agricultural and rural renewal policy which was the last and the most important program has benefited from a budget of €6 billion over 5 years (2010-2014). On the agricultural side, this policy aimed to develop agricultural production through the increase of production and productivity, for the majority of the subsectors. The policy has also provided for a program to strengthen human capacities and technical support for producers and technical management.

For the coming years the MADR roadmap (2020-2024) identifies 8 areas of intervention:

- The development of agricultural production, through the extension of irrigated areas;
- Increased production and productivity;
- The rational exploitation of agricultural land;
- Agricultural and rural development in mountain areas;
- The preservation, development and enhancement of the forest heritage;
- Agricultural and rural development in steppe and agropastoral areas;
- Development and promotion in the Saharan territories;
- The integration of knowledge and digitalization in the programs of development.

The horticulture sector is thus included through most of the areas of intervention mentioned above. The roadmap also targets specific objectives for increasing areas and production by 2024 for certain horticultural products, in particular potatoes, industrial tomatoes and garlic.

Subsidies are currently granted for the acquisition of water-saving irrigation equipment (localized irrigation), the construction of small accumulation basins, the acquisition of a water pump and the purchase of fertilizers.

### 2.8.2 Investment climate and trade policy

Any national or foreign investor, wishing to invest in Algeria, can benefit from various investment measures. These measures relate to project financing, taxation, land and customs rules. Investors can contact the specialized public agency Algerian Investment Promotion Agency (AAPI) (before September 2022 known as the National Investment Development Agency (ANDI)) and the National Investment Council. International accountancy and advisory company KPMG publishes a yearly investment guide for Algeria in French at <https://home.kpmg/dz/fr/home.html>.

Interest rate subsidies on bank loans are granted to SMEs in the phase of starting up or extending their activities and to public support programmes for the upgrading of enterprises. Examples of the latter are the realization of investments in desalination of seawater and production of electricity and gas. Crowdfunding from the National Investment Fund may be granted to Joint Stock Companies whose capital is greater than 100 million DA (720 000 \$). Participation can be up to 34% of equity. The financing of equipment by leasing is very attractive thanks to the numerous tax measures granted to financial leasing institutions.

An investor can benefit from several tax exemptions on customs duties and VAT on imports as well as on transfer duties on real estate acquisitions. Since 29 December 2011, the implementation of investment projects has been exempted from registration fees, land registration fees and State remuneration for acts of concession of real estate assets. During the first three years of operation, the investor benefits from the exemption of corporate income tax and the tax on professional activities. If the investment is made in an area of particular interest to the national economy, the investor can benefit from additional advantages such as the realization of infrastructure works by the government and the exemption from VAT for up to 10 years (instead of 3 years). Other advantages may be granted by the National Investment Council (CNI) for investments deemed to be of particular interest to the national economy. In this regard, land concessions on the domain of the State can be granted with reductions on the price of the concession. Depending on the location of the project this can go up to a symbolic dinar per square meter in the wilayas of the Great South.

A new law relating to the promotion of investment, modifying the law of 2016 was adopted from July 2022. This law aims to fight bureaucracy, through the digitization of procedures via a one-stop shop. It facilitates investors by reduction of the processing time of their application to one month, the digitization of procedures and a broader guarantee for the non-resident investor on the transfer of the invested funds and their receipts. The law also aims to create more stability in the investment climate as it will be valid for a period of 10 years.

The law on investment represents a break with certain measures that were very restrictive, including the so-called 49/51% rule, which has been abolished except for strategic projects in international partnership, such as hydrocarbons, mining, natural resources and the pharmaceutical industry.

Investments benefit from the following advantages:

- Exemption from customs duties for imported goods directly involved in the investment.
- Exemption from VAT for goods and services imported or acquired locally, which are directly involved in the realisation of the investment.
- Exemption from transfer duties and land registration tax for all real estate acquisitions made in the context of the investment concerned.
- Exemption from registration fees payable for deeds constituents of companies and capital increases.
- Exemption from registration fees, land registration tax and of the State's remuneration for concessions of built and unbuilt real estate for the realisation of investment projects.
- Exemption from property tax on real estate for an investment, for a period of ten (10) years, as from the date of acquisition.

- Exemption from corporation tax (IBS)
- Exemption from the tax on professional activity (TAP).

The law provides for sanctions against those who would hinder the procedures related to the application of the new legal framework, including the freedom to invest, transparency and equal treatment of investment files.

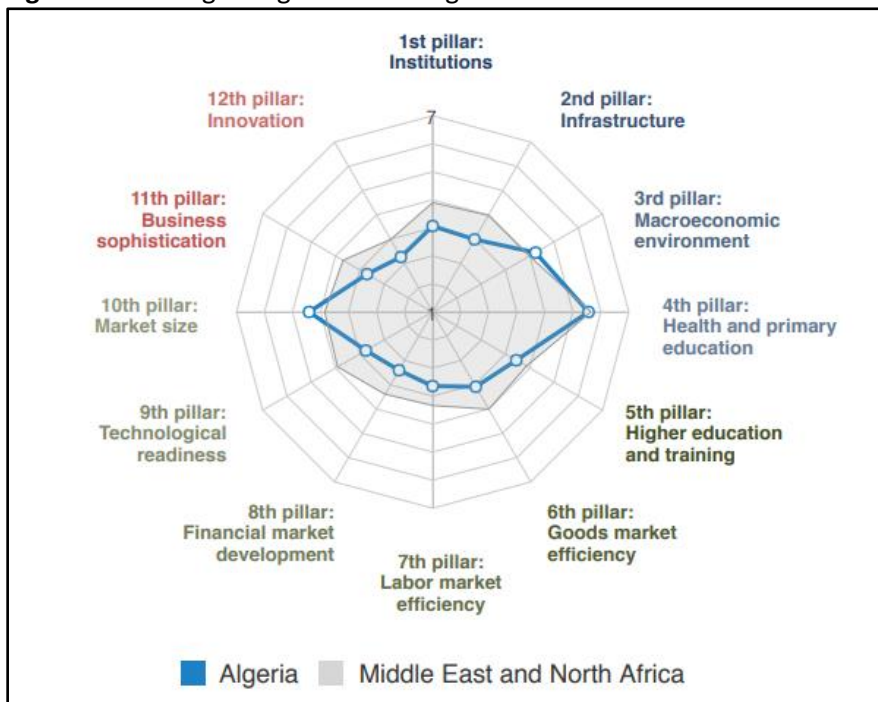
### 2.8.3 Business climate

Decades-long efforts to improve the business climate have not translated into the World Bank's improved ranking of Algeria in terms of ease of doing business. In 2020, Algeria was ranked in 157<sup>th</sup> position, very far from its neighbours Morocco and Tunisia and from Egypt who were ranked in 53<sup>rd</sup>, 78<sup>th</sup> and 114<sup>th</sup> position respectively.

The Global Competitiveness Index (GCI) of the World Economic Forum which tracks the performance of nearly 140 countries based on 12 pillars of economic competitiveness ranked Algeria 86<sup>th</sup> out of 137 countries in 2018, Morocco 71<sup>st</sup>, Tunisia 95<sup>th</sup> and Egypt 100<sup>th</sup>.

The following figure shows the positioning of Algeria in the MENA region according to the different pillars.

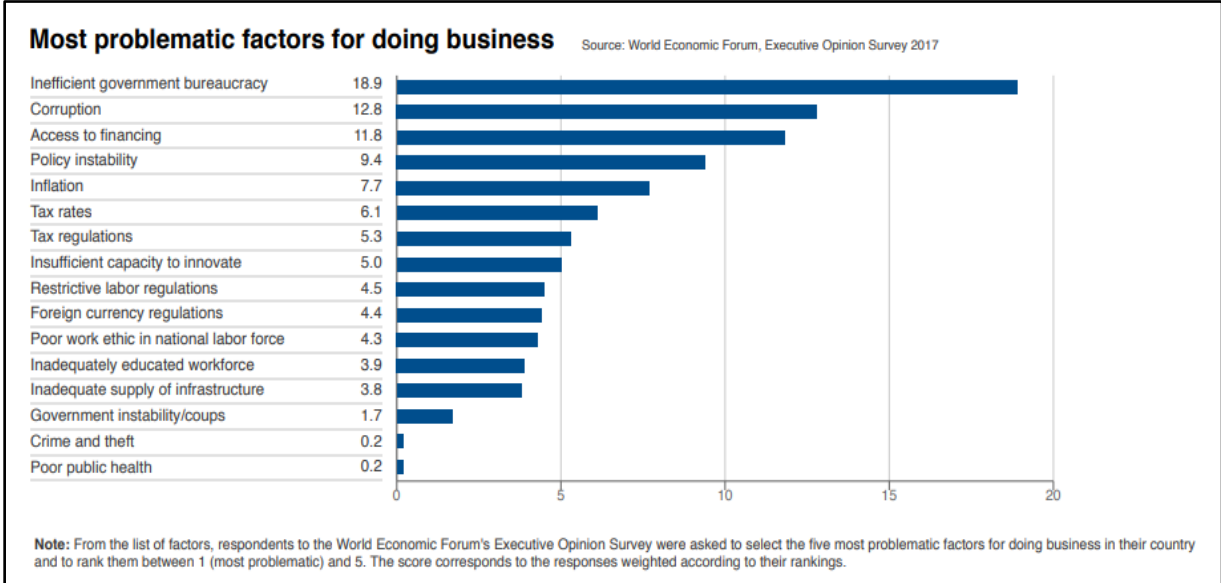
**Fig. 7:** Positioning of Algeria according to the different indicators in the MENA region



Source: The Global Competitiveness Report 2017–2018

The report of the World Economic Forum (2017-2018) highlights the most problematic factors for doing business at the level of each country. The results, that are based on an opinion poll, are represented in the following figure, the most representative factors are bureaucracy, corruption and access to finance.

**Fig.8: Most problematic factors for doing business**



Source: The Global Competitiveness Report 2017–2018

**2.8.4 Land ownership**

The 1<sup>st</sup> reform that allowed the acquisition of land was initiated in 1983, with a law on access to agricultural land ownership through development (APFA). This permitted private appropriation by nationals of land in the public domain, located mainly in Saharan and steppe zones. The APFA grants a private property right to land in the private domain of the State after it has been developed, which means there is irrigated cultivation. Development must take place within five years after the assignment of the transfer order.

Development and equipment for things like opening of tracks, electrification and collective drilling are provided by the government, the cultivation is the responsibility of the beneficiaries and therefore requires the commitment of resources such as labour and investments related to production (Daoudi et al, 2015).

In 2008 a new law specified that the mode of exploitation of agricultural land falling within the private domain of the State, is the concession. In a concession the State grants a natural person of Algerian nationality the right to exploit agricultural land in the private domain of the State as well as the attached superficial property. "Superficial property" means all property attached to the agricultural farm, in particular constructions, plantations and hydraulic infrastructure. A concession is granted on the basis of regulated specifications for a maximum period of forty years that can be renewed. Owners can benefit from exemption from taxes, duties and fees on capital goods and supplies necessary for the implementation of their activities. They can also benefit from repayable assistance in the form of credits to finance their projects.

Within the useful agricultural area (UAA) currently an estimated 5.6 million ha is private land and 2.8 million ha is in the private domain of the state. The agricultural land in the north is locked which means all land is allocated. The only acquisitions that are available are in the Saharan zone through the allocation of new concessions by the state.

All procedures related to the acquisition of land by the concession are to be done through a digital platform.



### 2.8.5 Phytosanitary regulations

The phytosanitary law promulgated in 1987 has the merit of making the two essential actors in plant protection responsible, namely the farmer and the Government.

Farmers are responsible for:

- The protection of their crops by ensuring a good sanitary state in order to safeguard the production;
- Reporting to the phytosanitary services any appearance of organisms dangerous for crops;
- The application of the prescriptions of the phytosanitary technical services.

The responsibilities of the government through technical institutes (CNCC and INPV) are summarized in the following points:

- Prevention of the introduction of organisms dangerous to crops across borders;
- Prevention within the country by detecting and eradicating crop-damaging organisms;
- Control of pesticides intended to be made available to farmers;
- Ensuring the harmonious functioning of the global system of phytosanitary prevention.

The phytosanitary law does not mention the control of agricultural production within the country, it only mentions the aspect of border control in relation to quarantine organisms.

### 3 THE ALGERIAN HORTICULTURE SECTOR

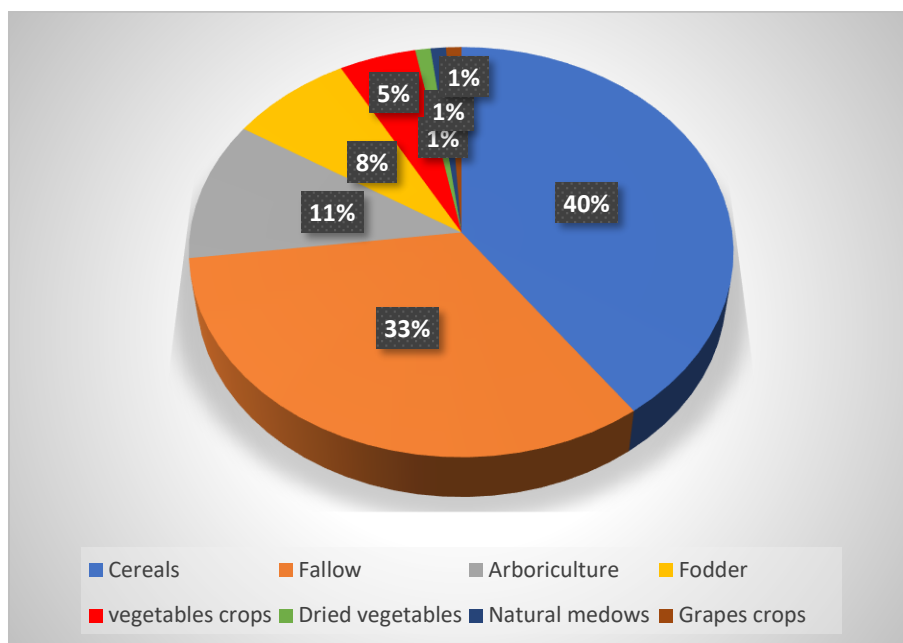
#### 3.1 Introduction

Horticulture is of capital interest in Algerian agriculture. Its importance is justified by its weight in the agricultural economy and the place it occupies in national consumption. Also, because the sector provides employment and is a factor in the development of other economic sectors, such as the agro-industrial sector.

In Algeria, the useful agricultural area is 8,563,669 ha (MADR, 2019). Cereals occupy 40% of the useful agricultural area (UAA), with fallow land in second place with 33% of the UAA. The horticulture sector occupies only 5% of the UAA, ranking 5<sup>th</sup> after arboriculture (11%) and fodder (8%) (see figure 9). During the last 10 years, the government has opened many horticultural perimeters in sub-Saharan areas with the aim of developing this sector through the granting of land and subsidies.

Although horticulture crop areas currently occupy only 4 to 5% of the UAA, the production represents 40% of agricultural total production, practiced on more than 500,000 ha, with a consumption availability of more than 300 kg per inhabitant per year. These figures are including potatoes.

**Fig. 9:** Distribution of the useful agricultural area in Algeria



Source: Made by the author from series B data; MADR

The agricultural sector has 1,260,000 farms. It is estimated that vegetable crops are grown on nearly 20% of farms. In terms of farm size, the latest general census of agriculture indicates that agriculture remains largely dominated by small farms: 72% of farms are less than 10 ha in size, of which 55.7% are less than 5ha.

The small-scale farming sector, which accounts for the vast majority of farms, does not have the capital needed to make the various investments. Small farmers are unable to intensify production, they are rarely organized, have poor access to credit, low qualifications and therefore find it difficult to take advantage of technological advances (FCE, 2016).

The database of the National Chamber of Agriculture and on the basis of membership cards attributed to farmers, shows a number of nearly 77 thousand vegetables producers and nearly 12 thousand greenhouses producers (2018).

Following the hydrocarbon crisis that hit Algeria in 2014, investors from other sectors (construction, industry) became interested in the horticulture sector. The new investors are result-oriented and very receptive to modernization of production techniques, but above all have a good financial base.

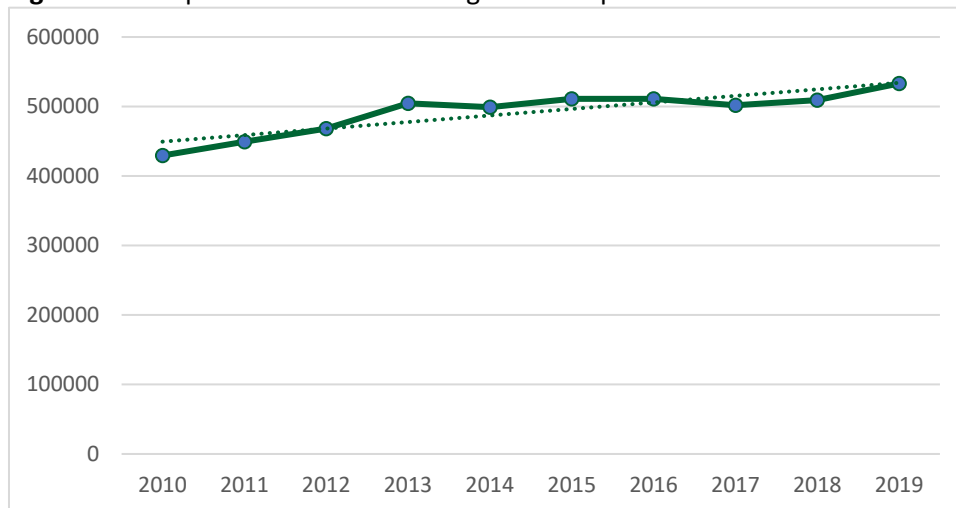
### 3.2 Analysis of the current situation of vegetable production

Estimated at 533,060 ha in 2019, the area under vegetable crops has shown a significant upward trend over the period 2010-2019 (figure 11). It has increased from 429,417 ha to 533,060 ha, i.e. a development of 24%.

A report carried out in 2020 on the impact of Covid on the agricultural and food sector in Algeria concluded that farms were not affected by COVID despite a 56% drop in agricultural equipment imported in 2020 compared to 2019 (Daoudi, 2021). What impacted agricultural investments was the devaluation of the Algerian dinar, which drove up the prices of agricultural inputs.

According to the provisional data provided by the MADR (data not yet published), the area of horticulture production fell by nearly 3% in 2021 compared to 2020 (533,173 ha in 2020 and 517,424 in 2021). This decrease in the areas of open-field vegetable crops may be the consequence of the drought.

**Fig. 10:** Development of the area of vegetable crops



Source: Made by the author from series B data; MADR

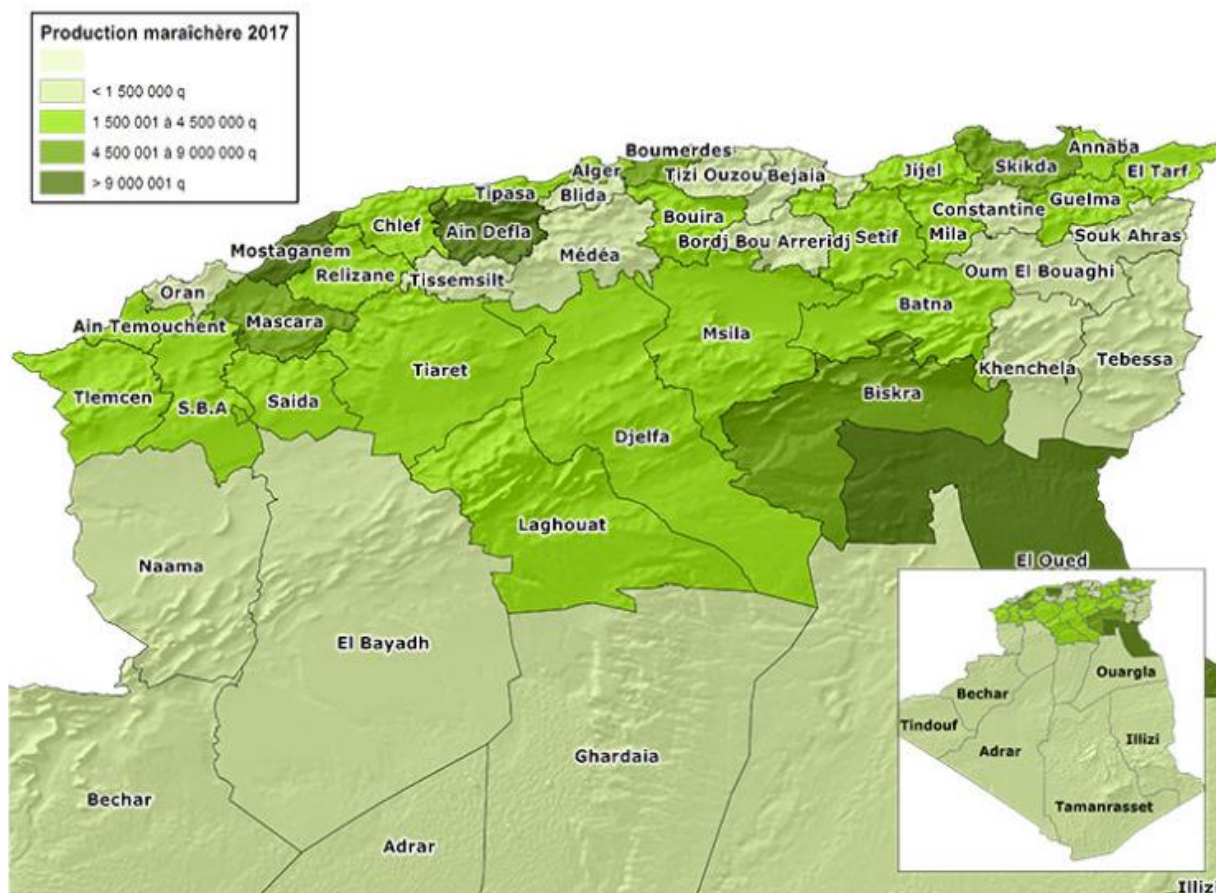
The vegetable crops that grow well in the diversity of bioclimatic zones in Algeria, offer a wide production period from extra early in the season from the south to late in the season from the coast. This allows them to be grown in almost all regions of the country, even in the most remote areas. Figure 14 show the locations of vegetable production in Algeria and the production levels of 2017 (q=0,1 ton).

The most important areas used for the production of vegetable crops are located in the wilayas of El-oued, Mostaganem, Ain-defla, Mascara, Tlemcen, Skikda, Biskra and Relizane with areas ranging from 21,000 to 51,000 ha. These wilayas alone account for 47% of the production area in Algeria. The wilaya of El Oued comes first, accounting for 10% of the total surface area intended mainly for the production of field potatoes, which is considered a vegetable in Algeria. Figure 12 and 13 display the distribution of the area under vegetable crops and the distribution of the production levels over these areas.

Looking at production levels, nearly 15 million tons of vegetables were produced in 2019. With most of the production (51%) coming from El Oued, Ain Defla, Mostaganem, Biskra, Mascara, Tlemcen and Tipaza. El Oued ranks first with a production of nearly 1.8 million tons.

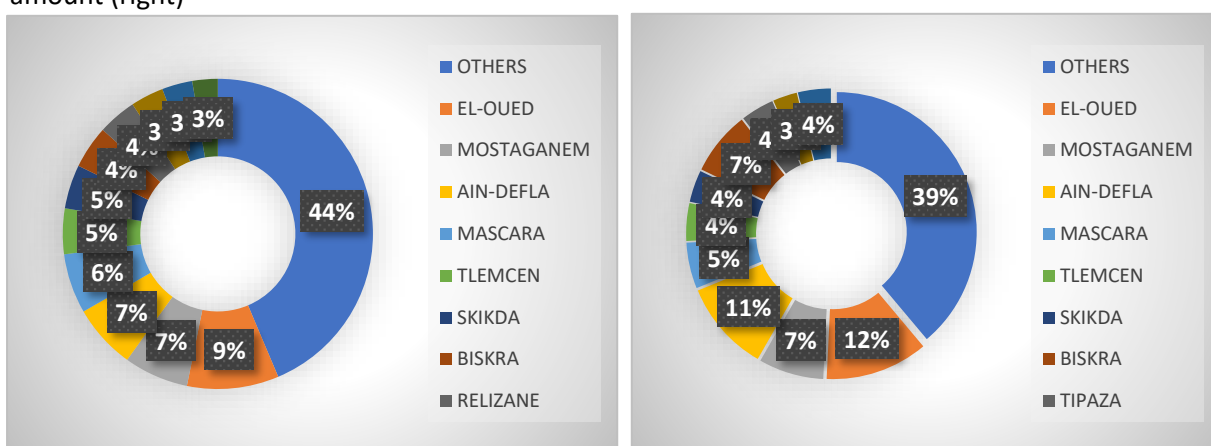
In terms of surface area and production, it should be noted that the wilayas mentioned above, with the exception of Biskra and Tipaza, owe their rankings to the surface area and production of potatoes.

Fig. 11 : Location of vegetable crops in Algeria.



Source: MADR;2022

Fig. 12 & 13: Distribution of the area under vegetable crops (left) and distribution of the production amount (right)



Source: Made by the author from series B data; MADR

The areas and production levels of the most important vegetable crops are listed in Table 6. Potato cultivation accounts for the largest share in terms of area (30%) and production (34%). It is a strategic cultivation in Algeria because it is the first product on the shopping list for household consumption. Melon and watermelons (12%), onions (9%), peas (7%), beans (6%) and tomatoes (5%) are also important products in terms of area size. These crops are produced in the open field with the exception

of tomatoes, watermelons and melons which are grown in the open field or in greenhouses depending on the region.

Tomato is the second vegetable product because of the place it occupies in the eating habits in Algeria. Although the area allocated to tomato represents only 5% of the total horticulture area, the production of tomatoes represents 10% of total vegetable production. During the past years, the tomato production has come close to reaching the saturation level of the market. The government has therefore implemented an action plan to regulate the problem of overproduction, through the development of processing units in the east of the country and also the ban on the import of double and triple concentrated tomatoes in 2018. After the ban, this market for began to organize itself and nowadays forms a well-functioning value chain. The cultivated area for double and triple concentrated tomatoes is around 25,000 hectares of open field production, of which 80% can be found in the east of the country and 20% in the west.

The development of processing activities remains very limited for most of the vegetable products and consumption is mainly on the basis of fresh products. In total there are approximately 17 industrial processing complexes in Algeria where amongst others tomato, pepper and fruit (for jam and drinks) are processed.

**TAB. 6:** Areas and vegetable production according to species

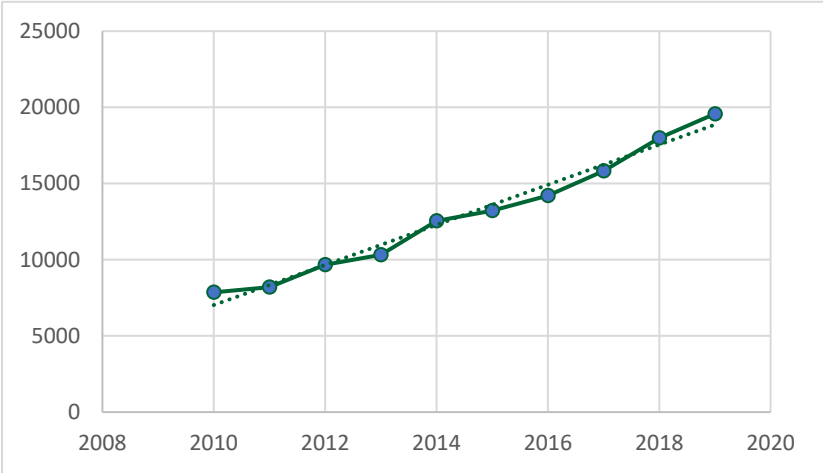
	Area (ha)	%	Production (tons)	%
Potatoes	157864	30	5020249,9	34
Melon and watermelon	62652	12	2206866,6	15
Onions	50292	9	1 613 729,8	11
Green peas	38959	7	200 025,8	1
Green beans	33078	6	298 483,7	2
Tomatoes	24994	5	1 477 878,6	10
Carrots	17469	3	419 534,4	3
Zucchini	14372	3	420 135,4	3
Garlic	13403	3	223 311,3	2
Green beans	12706	2	95 022,6	1
Pepper	11381	2	366 885,7	3
Chili pepper	10348	2	308 282,3	2
Cauliflowers	8629	2	205 439,5	1
Turnips	8328	2	149 906,7	1
Eggplant	6027	1	184 145,7	1
Artichoke	5792	1	119 636,3	1
Green cabbage	4317	1	116 426,5	1
Cucumber	4078	1	166 045,6	1
Others	48373	9	1 078 035,3	7
Total	533061	100	14 670 041,3	100

Source: calculated from series B data; MADR

### 3.3 Analysis of the current situation of vegetable crops in greenhouses

As for open field vegetable crops, greenhouse production has experienced a development of surface area from 7.859 ha in 2010 to 19.573 in 2020 ha, a development of 249% (figure 14). Surfaces have more than doubled during this decade, this is partly linked to the development of the hybrid seed market through the availability of varieties adapted to the local climatic conditions with very high yields, which has an impact on profitability.

**Fig. 14:** Development of greenhouse areas



Source: Made by the author from series B data; MADR

The examination of the location of greenhouses in Algeria shows that it exists across several wilayas of the country. However, 80% of the greenhouses are found in six wilayas: Biskra, Ouargla, Tipaza (Figures 15 and 16), Jijel, Mostaganem and El Oued. Two distinct agro-climatological zones can be distinguished:

- The coastline represented by the wilayas of Tipaza, Jijel and Mostaganem which are the traditional areas of greenhouse production (22% of the total area of greenhouse production);
- The Sahara represented by the wilayas of Biskra, Ouargla and El Oued which are the new areas of greenhouse production (67%).

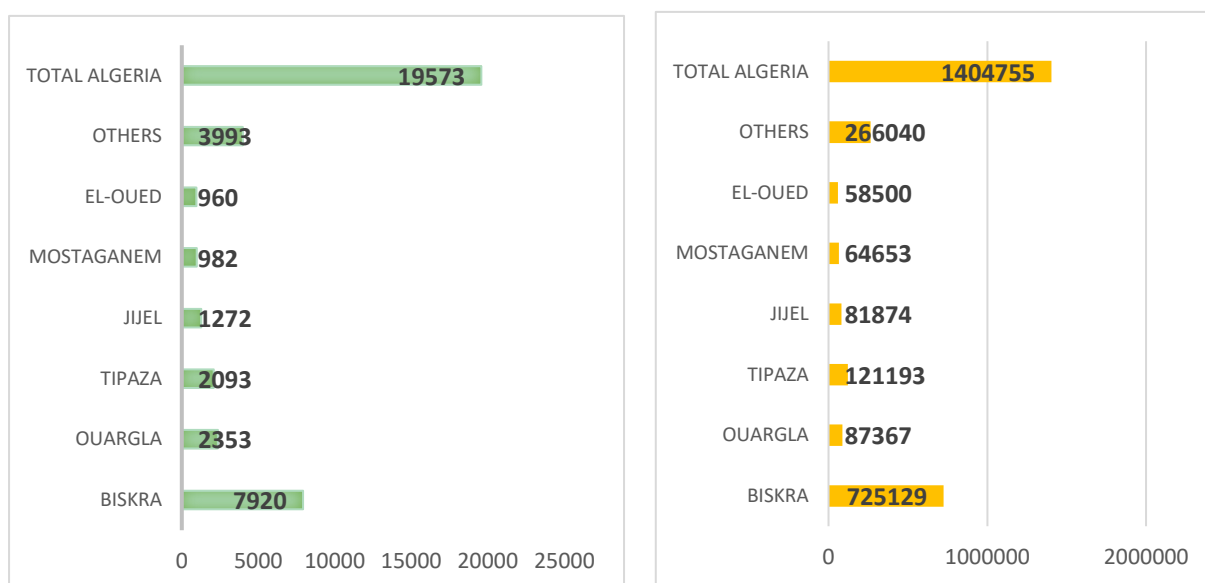
According to the latest data provided (data not yet published), the area of greenhouse production has continued to grow during 2021 to reach 21,106 ha, but has shown a slight decline in 2022 down to 21,025 ha. This decline is a reduction in the use of tunnel greenhouses. In Biskra and El Oued the areas of greenhouse production have increased with 200 ha and 50 ha respectively.

**Fig. 15 & 16:** Greenhouses in the north of Algeria (Tipaza)



Due to large scale urbanization in the north, the southern wilayas are taking over in terms of greenhouse production. In the southern regions the availability of agricultural land makes it possible to continue the expansion of the greenhouse production area. Nowadays 52% of production is coming from Biskra and 6% from Ouargla. Figure 17 shows the distribution of the acreages of greenhouse production and figure 18 the total amounts produced for the different wilayas.

**Fig. 17 & 18:** Location of greenhouse crops (ha) (left) and origin of production (tons) (right)



Source: Made by the author from series B data; MADR

The most popular greenhouse products are mainly tomatoes, melons, watermelons, peppers and hot peppers (table 7). In terms of production, tomatoes provide the largest share of production (41%). As a reference, the productivity level for tomato based on these figures would be 12,2 kg/m<sup>2</sup> per year.

**TAB. 7:** Areas and vegetable production in greenhouses according to species

	Area (ha)	%	Production (tons)	%
<b>Tomatoes</b>	4 747	24	578 674	41
<b>Melons and watermelons</b>	4 655	24	194 377,9	14
<b>Peppers</b>	2 460	13	177 153, 6	13
<b>Hot peppers</b>	2 400	12	174 234, 1	12
<b>Zucchini</b>	1 396	7	68 345,3	5
<b>Cucumber</b>	1 022	5	93 819,7	7
<b>Eggplant</b>	787	4	50 522,5	4
<b>Green beans</b>	239	1	2 730,4	0
<b>Others</b>	1 867	10	64 897,6	5
<b>Total</b>	19 573	100	1 404 755	100

Source: Calculated from series B data; MADR

### 3.4 Focus on the Biskra region

Since the discovery of its water potential and the reduction in the cost of water mobilisation, and with the promulgation in 1983 of the law on Access to Agricultural Land Ownership (APFA), the Algerian Sahara has been considered the hope of Algerian agriculture. Massive access to groundwater has, in some areas, profoundly changed the landscape of the oases, shifting in some regions from traditional oasis agriculture to pivot-irrigated crops or to agriculture combining palm trees and endless tunnel greenhouses.

Biskra is one of the wilayas where agriculture has undergone a remarkable development, particularly thanks to horticulture in greenhouses which has developed in some parts of the wilaya, along with palm trees. Greenhouses in Biskra has given a new boost to Saharan agriculture by allowing the

diversification of agricultural production systems. The productive performance of greenhouses and its knock-on effects on the local economy are very satisfactory.

The development of greenhouses in the wilaya of Biskra is the result of the following factors:

- Availability of agricultural land;
- Adequate conditions for cultivation during the late season (from September to June);
- Availability of hybrid seed varieties adapted to the local climatic conditions;
- The topography which is a little rugged, facilitates the installation of greenhouses and the conduct of work;
- Availability of ground water resources and development of the drip irrigation system (since 2010);
- Proximity to the northern regions for the marketing of products;
- The launch of the National Program of agriculture development (PNDA) in 2000.

**Fig. 19 :** Aerial photo of the M'ziràa area in Biskra



Source: Google earth.

### 3.4.1 Location

The wilaya of Biskra is located in the south-east of Algeria between the Aurès region and the Ziban and extends over an area of nearly 2,167.20 km<sup>2</sup>. The Ziban are located at the foothill of the Saharan Atlas, 446 km southeast of Algiers. This geographical area is limited to the north by the wilayas of Batna and M'sila, to the east by Khenchela, to the west by Djelfa and to the south by Ouargla and El-Oued (see Figure 20).

**Fig.20:** location of the Biskra wilaya in Algeria



Biskra belongs to the Saharan bioclimatic stage, characterised by a mild winter with little rainfall and a dry, hot summer. Rainfall rarely exceeds 250 mm per year and the dry period is spread over almost the whole year.



### 3.4.3 Water resources

The south of the country, where the wilaya of Biskra is located, has two large aquifers. That of the continental intercalary (CI) which extends to a depth of several hundred meters: its roof is between 50 and 2,300 meters below the surface, depending on the location, and contains around 20,000 billion cubic meters of water. The second aquifer is the Terminal Complex (TC), which contains a further 11 trillion cubic meters.

In total, the Northern Sahara aquifer covers more than one million square kilometres and contains about 31,000 billion cubic meters of water. Unfortunately, following the intensification of production systems, groundwater levels are lowering every year.

### 3.4.4 Characteristics of farms and operators

The total lack of training of the farmers has negative repercussions on the technical aspects of farming. Horticulture is practiced with other crops including cereal and dates trees which remains the main production of the Biskra region. The production used to be entirely sold on local and national markets (Belhadi and al,2015), but nowadays a number of farmers is active in exporting to Europe.

A survey of 132 farms practicing greenhouses horticulture in Biskra revealed the following points:

- 46% of farmers are between 30 and 50 years old;
- 54% of farmers have no education;
- 36% of the farmers has an area < 5 ha, 57% has an area between 5 and 20 ha, and 7% has > 20 ha

## 3.5 Description of the horticulture value chains

The value chain of the Algerian horticulture sector is organized following the schematic overview that is mapped in Figure 21.

### 3.5.1 Suppliers of agricultural inputs

The first link in the marketing circuit of agricultural inputs (seeds, plant protection products and fertilizers) is represented by importers. Retailers of agricultural inputs are the first partners of importers who sell most of their products. They ensure the marketing and often the technical support of the farmers which allows them to develop their customer portfolio at the level of their respective regions. For the large account distribution channel, the supplier deals directly with them, without going through the retailers.

The horticulture sector remains dependent on the import of seed with the import of nearly 95% of the hybrid vegetable seed. The agricultural market is supplied with vegetable seeds by a number of importers through exclusive contracts on certain brands signed with multinational firms.

The origin of vegetable seed is diversified from three continents namely Europe, America and Asia. However, six countries have held the bulk of Algeria's vegetable seed supplies for two decades (89%). These are the Netherlands, France, Denmark, Belgium, the United Kingdom and the United States of America. The Netherlands is among the top 3 of these suppliers.

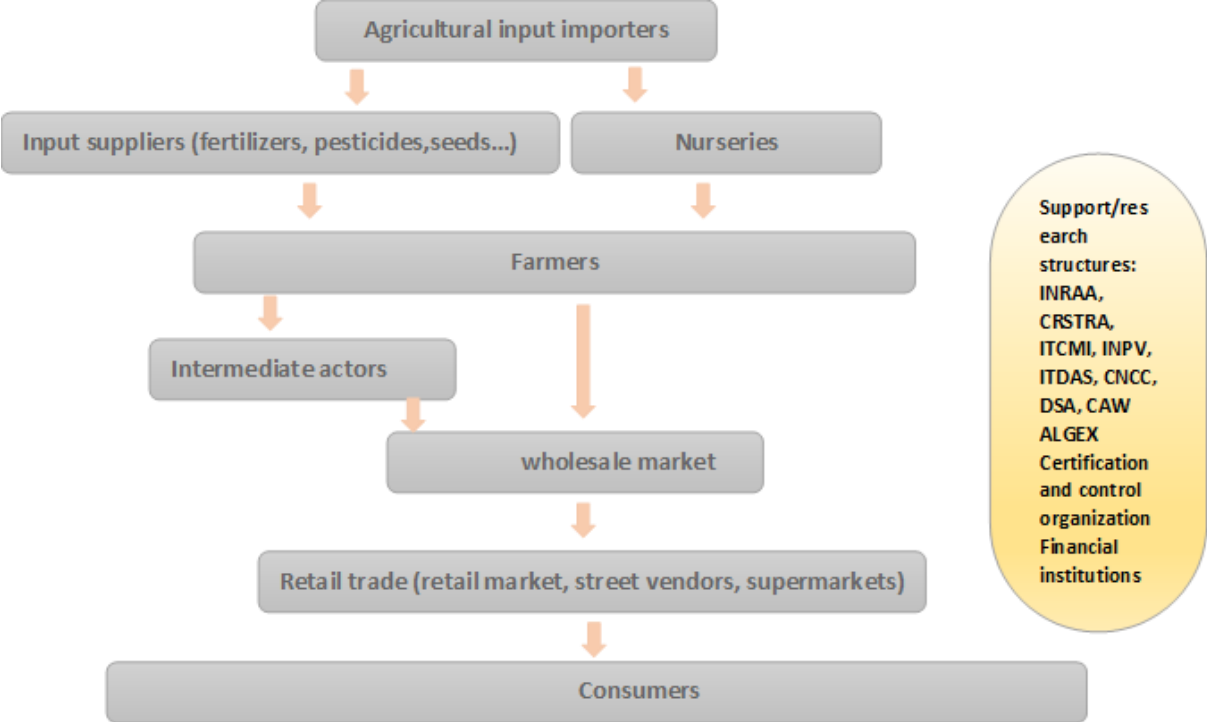
Plant protection products are supplied by multinationals that produce in Europe, Asia and America such as Syngenta crop protection, Bayer crop science, Basf chemical, Corteva. These companies supply Algeria with generic products and have representatives in the country in the form of a liaison office.

Algerian companies such as Profert, Agrichem, Srid, Agroseed, Doudah, Filahya, Casap d'Alger, Aci, Agromosta, Debbane and Agrorayan provide import and distribution. These companies are the main actors in the import and distribution of phytosanitary products and seeds in Algeria.

In terms of integrated pest management (IPM) and to meet the needs of organic farming, the solutions offered by the input market are very limited or not available, especially beneficial organisms are

lacking. The biological products that are offered in the market include organic fertilizers and hormones. For these products cooperation exists with German suppliers and according to the suppliers the demand for these products is high. Also bumblebees are being used that originate from Koppert in the Netherlands but that are supplied via other European companies that operate in between.

**Fig. 21:** Mapping of actors in the horticultural value chain



Source: Made by the author

Fertilizers are also imported, however, two Algerian companies, one public (Fertial) and the other private (Profert) contribute to the supply of fertilizers to the market as well. Fertial is a company resulting from a partnership between the Algerian group Asmidal and the Spanish group Grupo Villar Mir with an annual capacity of one million tons of ammonia. Part of this production is reused for the production of a varied range of nitrogen and phosphate fertilizers intended to cover a large part of the needs of Algerian agriculture and exported to various foreign markets. Profert is a private company that produces fertilizers and provides Algerian farmers with different ranges of solid and soluble fertilizers. The only foreign company present in Algeria is Timac Agro, a subsidiary of the Roullier group from France, specializing in the production and distribution of fertilizers of biological origin which promote the vision of sustainable agriculture.

Imports of agricultural inputs and technologies are generally facilitated by the government. A government instruction dating from October 2022 allows the import of all types of agricultural equipment, less than five years old, as well as its spare parts by individuals or companies. In Biskra the suppliers of agricultural inputs are relatively young (38 years old on average) and well trained (university graduates, including agricultural engineers). They sell all types of agricultural inputs and small equipment. Their product ranges are very wide and frequently renewed, in line with the new products introduced by the agricultural supply companies. The Biskra region represents 18% of the agricultural inputs market. According to the suppliers, the prices of agricultural inputs have greatly increased over the past few years, up to 200% for some products. Market prices of vegetables have not risen sufficiently to compensate for this increase in costs according to some suppliers and this has impacted the

development of the sector. In September 2022 some farmers decided not to plant all the greenhouses they have.

### 3.5.2 Nurseries

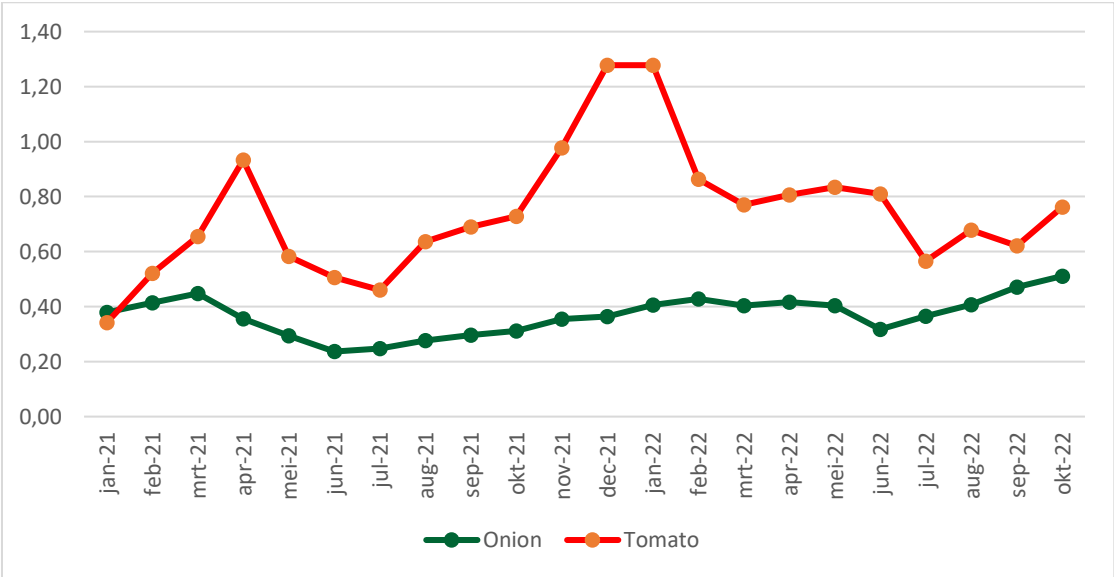
The production of vegetable crop plants is an important segment of the horticultural value chain. An estimated 80 to 90% of the plants produced go through nurseries. Farmers increasingly prefer to buy seedlings from nurseries than to produce their own seedlings themselves.

The infrastructures used in the nursery vary from tunnels, Canarian greenhouses to multispans greenhouses depending on its functionality and the location. Nurseries are equipped with modern technology. There are seven large nurseries which dominate the seedling production market and supply almost 95% of the seedlings. These nurseries are very receptive and open to partnership and new technologies.

### 3.5.3 Vegetable distribution and marketing actors

Fresh fruit and vegetables occupy an important place in household consumption, many vegetables are consumed daily and in significant quantity. The price elasticity of these widely consumed vegetables is low, especially for products that are produced simultaneously in the north and south of the country. However, some products experience increases in prices which generally correspond to a period following the end of production in one region and the start of production in another region. The following graph gives an example of the development of the average monthly price of onions and tomato during 2021/2022. Tomatoes from the open field are said to fetch around 0,25 EUR per kg on average, for tomatoes from the greenhouse this would be on average 0,80 EUR per kg.

**Fig. 22:** Development of the onion and tomato prices (EUR/kg)



Source: Made by the author from ONS data; 2022

Almost all agricultural produce is sold in bulk. The distribution of fruits and vegetables in Algeria is done through different channels dominated by informal traders. The number of existing wholesale markets is 45 markets located throughout the country, particularly in the wilayas with an agricultural vocation. The prices of the different products are subject to supply and demand and the government does not intervene in the regulation and setting of selling prices. All is controlled through the wholesale market.

The retail trade of fruit and vegetables is provided by:

- Local fruit and vegetable markets

- Shops specializing in the sale of fruits and vegetables
- Street vendors

The number of local fruit and vegetable markets amounts to more than 1.500 markets throughout the country. The majority of the municipalities has a fruit and vegetable market. Large urban agglomerations may have more than one convenience market which are covered or open-air spaces allocated to retail merchants. In these daily markets, products are presented and sold in bulk. These areas are very frequented by the inhabitants and are the main supply area for fruits and vegetables. Fruit and vegetable shops exist at the neighbourhood level. These businesses stock up on wholesale markets and sell to customers, usually as a convenience store.

Street fruit and vegetable vendors are the second largest retail distribution channel. The number of these traders is very large and is constantly increasing. These traders source directly from the nearest wholesale market and move through the neighbourhoods to resell their goods. These merchants play a key role in supplying citizens especially in cities, and their service is appreciated by consumers for their proximity and the prices applied.

**Fig. 23 & 24:** Wholesale market of Attataba (west of Algiers) and local market El Harrach in Algiers



In Algeria, there are very few supermarkets and their place in the distribution of fruits and vegetables is marginal. The 3 supermarkets that exist in Algeria are UNO, carrefour and Ardis. The 1<sup>st</sup> and most important is UNO with 5 hypermarkets and 1 supermarket since its creation in 2007. These supermarkets are usually located in large cities. In recent years, the development of the number of these supermarkets has stagnated.

With the exception of dates, Algerian exports of fruits and vegetables are very low. For vegetables, exports mainly concern potatoes. There is a public company that exports fruits and vegetables. Created in 2010 FRIGOMEDIT specializes in the import/export and marketing of fresh fruits and vegetables. FRIGOMEDIT has a storage capacity of 300,000 m<sup>3</sup> and provides its customers with optimal conservation, thanks to its large network of refrigerated complexes that meet international standards. These complexes specializing in collection, processing, distribution and logistics are present in the majority of agricultural production areas.

At present the number of the most regular and serious Algerian private exporters does not exceed ten but the interest to explore international markets is growing. Recently a large group of farmers from the Biskra and El Oued region took part in a Global GAP training. This training was provided by the PASA programme that is implemented by the German organization for development cooperation (GIZ). Within this programme advisors have also been trained to support the farmers. In early 2023 a study visit will be organized for a selected group of small and medium sized exporters to the international fruit and vegetable exhibition FruitLogistica in Berlin.

### 3.5.4 Sector support bodies and research actors

The government plays a very large role in the Algerian agriculture sector. There are several institutes that fall under the supervision of the Ministries that provide support to farmers on all aspects from production to sale. These institutes are:

- **Technical Institute of Horticulture and Industrial Crops (ITCMI)** through its stations has four essential tasks, the promotion of vegetable and industrial crops in particular through the production of basic plant material, the training of farmers and executives of the sector and the extension of the results of experimentation and agronomic techniques adapted to different crops and regions. ITCMI is also in charge of demonstration trials related to the registration of new pesticides and seeds.
- **National Institute of Plant Protection (INPV)** is responsible for phytosanitary control and supervision of farmers on aspects related to the fight against pests and diseases. INPV is also in charge of issuing the phytosanitary certificate for export.
- **Technical Institute for the Development of Saharan Agronomy (ITDAS)** produces adapted and efficient technical references to improve species and varieties in Saharan agriculture and popularizes them to farmers.
- **National Center for Control and Certification of Plants and Seeds (CNCC)**, whose role is the control of the multiplication and production of seedlings and seeds. CNCC is also in charge of the certification of seeds and seedlings whether in local production and/or import.
- **Directorate of Agricultural Services (DSA)** is located at the level of each wilaya, it identifies the agricultural development objectives of the wilaya and promotes agricultural investment. It provides support and guidance to the agricultural sector. The DSA is the official representative of the Ministry of Agriculture at the wilaya level.
- **Chamber of Agriculture (CAW)** is located at the level of each wilaya, this organization contributes to the development and implementation of the national policy for the development of agricultural activities and their diversification while protecting the professional and social interests of its members (farmers).
- **The National Agency for Foreign Trade Promotion (ALGEX)** contributes to the development of Algerian exports excluding hydrocarbons. ALGEX is responsible for developing, for the Ministry of Commerce, periodic reports on foreign trade, impact assessments of trade agreements on the Algerian economy, notes conditions in the commodities imported by Algeria and market analyses, product analyses and sector views. Its teams provide Algerian companies with advice and information on the public device export support, international trade regulations and business opportunities in order to help them to access to foreign markets particularly through its helpline and counselling, the House of Exporters (Dar-El-Moussadder).

Under the Ministry of Agriculture and the Ministry of Higher Education and Scientific Research the following organizations are responsible for research activities:

- **National Institute of Agricultural Research of Algeria (INRAA)** Through its stations and its research units is active in the development of fundamental knowledge and the analysis of problems in the field of agricultural sciences.
- **Scientific and Technical Research Center for Arid Zones (CRSTRA)** is responsible for financing, carrying out and coordinating fundamental and applied research projects in the Saharan and steppe regions (including protected vegetable crops).

Besides the government support, there are private consulting firms or individual consultants that support farmers in their investment project, but their number remains limited. They usually work for large investors or groups of investors.

Donors are also active in training farmers and exporters, the most important ones are activities by the FAO and the PASA programme that was mentioned in the previous paragraph, which is financed by the EU and executed by GIZ.

There are several organizations activate in Algeria in the certification of agricultural products but the level of certification remains very low and it is considered as very expensive by farmers. Examples of certification bodies are the foreign Ecocert and national Biocert Algeria.

There are very few accredited analysis laboratories, for contaminant analysis there is no loal laboratory. A pesticide residue (MRL) analysis laboratory that is being funded by the European Union will be established in the wilaya of Biskra in early 2023.

## 4 GREENHOUSE TECHNOLOGY IN ALGERIA

In this chapter the greenhouse technologies that are mostly applied in the Algerian horticulture sector with respect to its greenhouses, water systems including fertigation, cultivation and value addition. As a synthesis of chapters 2 to 4, the Strengths, Weaknesses, Opportunities and Threats (SWOT) of the Algerian horticulture sector is presented in the last paragraph of this chapter.

### 4.1 Greenhouse structures

In Algeria three types of greenhouses can be found, being tunnels, Canarian greenhouses and multispan greenhouses (Figures 25, 26 and 27). Tunnels are the dominant type in all different production regions and are usually found in rows of tunnels next to each other. The standard surface area is 400 m<sup>2</sup> with a length of 50 metres and width of 8 metres. The tunnel heights vary from 3,5 to 6 metres, most of the tunnels are on the low side though. The structures and the plastics that are being used are usually not very resistant against heavy winds, which occur regularly in the Biskra region.

In 2009 the Canarian greenhouse has been introduced in Biskra, which has a construction that is more resistant to winds. The canarian type greenhouse has ensured better yields and since then the share of this type of greenhouses in Biskra has grown to 2.000 ha in 2021 (Langenberg, 2021). The Canarian greenhouses can be extended up to a size of 1 hectare, the width of a single span is 10 metres and heights are 4 metres on the side and 4,5 metres in the top. The plastics that are being used are white, yellow and green-yellow and need replacement every 2 to 3 years.

**Fig. 25, 26 & 27** Tunnel and Canarian greenhouse in Biskra, multispan greenhouse in Zeralda



Multispan greenhouses are mainly found in the Mediterranean region, especially at nurseries, but also in Biskra some multispan greenhouses can be found nowadays. The size of a single span is usually 600 m<sup>2</sup> and often one closed span is followed by a span that has flexible ventilation in the top.

### 4.3 Greenhouse climate management

The growing climate inside the greenhouses is heavily depending on the greenhouse structures, dimensions and technologies applied for ventilation, heating and cooling. The simplest method of cooling a greenhouse is by means of natural ventilation with large roof ventilation.

The tunnel greenhouses have very limited ventilation, through the front and end only. Usually no additional measures are taken to improve the greenhouse climate. At nurseries, tunnels with pad and fan systems are used to create the right conditions for the propagation of young plants (Figure 31). Cooling systems such as fogging systems or cooling under the plant roots are hardly found or absent in the sector. The relative humidity in Biskra is low, which makes it possible to cool a greenhouse with evaporative cooling. In Algiers, the humidity is higher and therefore the cooling potential is less (Os, v. E, 2012).

**Fig. 28 & 29** Screening and side ventilation in Canarian greenhouses in Biskra



In the Canarian greenhouse better growing conditions can be created for the crop. It has a larger air volume, shading nets are used and by lifting the side plastics the inside can be ventilated (Figures 28 and 29). The choice in plastic may have an impact through blocking the incoming radiation. According to local suppliers and farmers temperatures inside the Canarian greenhouse can still rise up to 30-35 °C in winter time and up to 55 °C in summer in Biskra. In winter, temperatures as low as 0 °C are observed. The heating of Canarian greenhouses forms a handicap. Although a traditional technique of diesel heating is used by some farmers, recent frosts in Biskra area (January 2021), affected more than 30% of the cultivated area (Langenberg, 2021). Also in Algiers the minimum temperatures are under 10 °C in winter. This is rather cold for plant production, but heating systems are hardly being used.



**Fig. 30 & 31** Nurseries in Zeralda

The multispan greenhouses in Algeria mostly have manual side and top ventilation, often one closed span is followed by a span that has flexible ventilation in the top. In these greenhouses often pad and fan systems are installed, both in the Mediterranean region and Biskra. To facilitate an even temperature distribution inside the greenhouse, nurseries sometimes use plastic sheets through which heated gas is blown (Figure 30 and 31). A nursery in the Mediterranean region reported maximum and minimum temperatures of 38 °C and 9 °C in their multispan greenhouse. According to them the gas heating system enabled them to increase the temperatures in winter to 18 °C.

In the propagation tunnels that were visited (Figure 31) also a permeable metal wall was installed at the front of the tunnel through which water was continuously pumped to increase the relative humidity inside.

#### 4.4 Water management

The water supply systems mainly are of the traditional type. The systems consist of i) a pumping system to extract borehole water, ii) a water dam to store the stock of irrigation water, iii) manual addition and mixing of fertilizers and iv) the piping system to the irrigation driphoses. Figure 32 shows an example of a commonly used water dam and a fertilizer mixing can.

As described in Chapter 3 the main water source for horticulture is ground water. Depending on the location the ground water is extracted from depths varying from around 1 to 10 metres in the



Mediterranean region to depths of more than 50 metres in the Biskra and El Oued region. (Langenberg, 2021). Individual farmers in the Biskra region mentioned depths of 200 metres.

The Mediterranean region has sufficient rainfall for rain water collection systems to provide a significant part of the irrigation water. At Multispan greenhouses often gutter systems are installed, however usually no connection is made to a basin so rain water is not being used.

Ground water is pumped up before irrigation and stored for a few days to weeks, depending on the frequency and amount of irrigation supplies. Mainly uncovered water basins that are rather shallow are found. During a large part of the year the water in these dams will be prone to high evaporation rates and possibly deteriorating quality because of the high temperatures and radiation levels. No data is collected on the volumes of ground water that are being pumped up and how much remains available for irrigation. In the Biskra region several of the farmers mentioned that ground water has to be extracted from increasingly greater depths. The prospector depth for a new borehole for one of these farmers was at 200 metres depth.

**Fig. 32** Water dam and fertilizer mixing can



**Fig. 33 & 34** Automated fertigation system at a nursery



Automated systems and substrate can be found in nurseries and at top end producers, mostly in the Mediterranean region (Figure 33 and 34). In the Biskra region only a handful of these systems can be found. For one interviewed farmer in Biskra the shortage of labour was the reason to invest in automated fertigation. The irrigation water is supplied to the crop via driphoses, drip irrigation on individual plant level via Microtube drippers is mainly found in nurseries only.

#### 4.5 Cultivation and crop protection

In production greenhouses the cultivation is done in the soil, without applying crop rotations. Disease problems are therefore reported, especially in tomato. Farmers use fumigation of the soil during the hot summer months to clean the soil. In the south the solar radiation alone can already be sufficient. Nurseries also mention that they graft their plants to make them less susceptible to diseases.

Nurseries use substrate for their production of seedlings, this is often a mixture between locally available materials and imported products. The impression is that the lowest cost substrates are often being used which will not provide the ideal growing conditions for the seedlings.



**Fig 35** Seed planting line

Farmers are increasingly interested in mechanization in order to deal with the lack of workers the sector is experiencing. Some farmers use small tractors and other machinery that can fit in the greenhouse to work the soil. In nurseries mechanization is found in the shape of for instance seed planting lines like in figure 35.

Crop protection is mainly done using conventional methods and basic materials and equipment. When visiting one farm where spraying was taking place it was observed that protective clothing and masks were only partly used and no warning signs were set up to prohibit visitors to enter the greenhouse.

Biological solutions are not widely available but some products like hormones and biological fertilizers are available at suppliers who state they have many clients for it.

#### 4.6 Post-harvest and value addition

During the visit for this study no cold storage facilities were encountered at the farms that were visited. As described in Chapter 3, all produce goes directly to the market. The export value chain can make use of refrigerated facilities provided by the airport. Processing technology is also rarely found on farm level.

#### 4.7 SWOT Analysis

In this paragraph the Strengths, Weaknesses, Opportunities and Threats (SWOT) of the Algerian horticulture sector are assessed. Based on this overview the key points that should be addressed to enhance further development of the sector can be linked to the possible support and solutions the Netherlands has to offer. It can therefore be used as a means to devise a strategy for cooperation between Algeria and the Netherlands in the future. The full SWOT analysis is provided in Figure 36.

**Fig. 36** SWOT Analysis

## STRENGTHS

- Large open field and protected horticulture sector
- Climatic conditions allow for year round production
- Natural gas reserves; low power costs
- Large year-round domestic market for fresh produce
- Young educated labour force; half of population <25 y
- Potential to develop uncultivated, flat land in the steppe and Sahara region
- Low costs for land and water
- Access to finance
- Government subsidy on fertilizer and irrigation materials for registered farmers

## WEAKNESSES

- Availability of water; ground water depletion
- Outdated technologies and knowledge; low mechanization and automation level
- Low productivity level and low water use efficiency
- Local market is not well organized; no production specifications, no cold storage or logistics
- Some stagnation in sector and market development
- Very limited value addition; only tomato processing
- Easy of doing business (157 in 2019); inefficient government, bureaucracy
- Language; limitations in access to international information and network
- Low availability of spec. fertilizers, organic inputs, suboptimal availability of imported hybrid seeds
  - No farmer organization; no negotiating power on input purchase or market pricing
  - No crop rotation; disease problems in tomato
  - Limited data collection and data-based decision making
  - Shortage of field workers



# SWOT Analysis

## OPPORTUNITIES

- Worldwide increasing prices for energy
- Proximity to the EU and ME market
- Possibility to supply EU within market window
- EU project to develop MRL lab in Biskra
- New law allows import of 2-nd hand equipment (max 5 yrs old)
- Growing (world) population and changes in eating habits with an increasing demand for fresh produce
- New regulations to improve business climate
- Project for the construction of a large port (hub) west of Algiers

## THREATS

- Worldwide increasing prices for horticulture inputs; chemicals, seeds and transport
- Impact of worldwide economic developments and inflation on purchasing power
- Climate change; increase in frequency of warm days, higher extreme temperatures, - especially for western Algeria: decreasing precipitation totals and reduced length of precipitation episodes
- Ground water depletion by neighbouring countries

## 5 POSSIBILITIES FOR NETHERLANDS – ALGERIAN COOPERATION

### 5.1 Introduction

The Dutch horticulture sector is front runner in the field of horticultural knowledge, research and the development of sustainable technologies that can be customized to specific cultivation conditions on the ground. The Netherlands is a globally respected supplier of integrated growing systems and thereby ideally positioned to contribute to the development of sustainable food production in Algeria.

In many countries in the world intensification of agricultural production is essential to improve the current food security situation and anticipate on future population growth, shortages of important resources and the impact of climate change. In general the aim is to produce more food on a smaller area with less use of resources such as water to assure local and national food security. Intensification of agricultural production can be assisted by technological innovations, knowledge and skills offered by the Dutch sector. Optimisation of production levels and also quality can be realized by applying the best suitable technologies, improved seed varieties and management practices. Also reduction of inputs and outputs will support the efficiency of the sector. When it comes to environmentally sustainable technologies, the Dutch sector can create added value through technological innovations in the field of water saving technologies, clean energy solutions, waste management and solutions in the field of data management and ICT.

Algeria is a country with a lot of potential for the Dutch horticulture sector. It is a very large country with a growing population that was close to 44 million people in 2020 and is expected to reach 51 million by 2030. The consumption pattern is to consume fresh fruit and vegetables year round and it thereby creates an enormous local market for horticulture products. The development of the local market prices for horticulture produce seem to have stagnated somewhat in the years of the covid pandemic and current worldwide economic crisis. Still there is room to grow the production of fruits and vegetables, either for fresh consumption, export or processing.

So with an eye on the further growth of the population and the country's ambition to reduce food imports, good opportunities can be found in supporting Algeria into becoming more self-sufficient in food production and invest in horticulture development. The ambitions to venture into more (organic) exports to Europe adds to Algeria's need for modernization of the sector.

Algeria has a significant existing greenhouse horticulture sector on a low to mid-tech technology level that could benefit from technical innovations from the Netherlands. It also has large areas of open field horticulture that could partly be developed into greenhouse horticulture. The country is also continuously exploring opportunities to develop uncultivated, flat land in the steppe and Sahara region and to modernize the sector.

However, there is a gap between the technologies the Dutch sector has to offer and the development needs of the Algerian sector, at least in how these needs are being perceived locally. In its aim to develop the agricultural sector Algeria has to face two major constraints being access to land and access to water resources. The lack of available land in the Mediterranean region has resulted in a shift of the main horticulture production area to Biskra in the south-east. In this region there is enough land available for further expansion but water availability is limited to (nearly non-renewable) ground water.

In the northern production region sector parties have become more interested in production intensification rather than expanding in other regions. Also many nurseries are found here that are operating on a higher level of technology, but that can use upgrading. Here linkages can be made to Dutch horticulture technologies.

Both in the north and the Biskra region however the general consensus is that enough ground water is available to fulfil the production requirements of the country for many years to go. Awareness of the long term impact of ground water depletion and the possibilities to increase water use efficiency while improving production results at the same time is very limited. Knowledge on the technologic possibilities the Dutch sector has to offer that can enhance the sustainability and profitability of the

horticulture sector is low. In addition the long-term benefit of the more expensive higher technology of the Dutch sector need to become clear. This requires a different investment mentality. An easy match between the Netherlands and Algeria is not yet there, but with time and attention both parts will be able to come closer to each other.

## 5.2 Current Dutch presence in the horticulture sector of Algeria

At this moment in time the Dutch presence in the Algerian horticulture sector is mostly limited to Dutch vegetable seed breeders. Several vegetable seed breeders are currently active in Algeria and work together with local partners to serve the market with hybrid seeds for open field and greenhouse production. Also a Dutch-Algerian joint venture has been established in the field of young plant propagation

A number of other Dutch horticulture suppliers have gained experience in doing business in the horticulture sector in Algeria. Amongst them mostly suppliers of various kinds of greenhouse technology, for both plastic and glass greenhouses. The companies that have started up their business activities in Algeria or are investigating the sector's opportunities all had previous experiences in the region or in countries with comparable production conditions.

Some Dutch horticulture businesses have started up a local business together with a local partner. The partners that have set up a cooperation with a local partner often found their partner through their contacts in the region or by taking part in a trade mission and following up on the contacts made in the years after.

Wageningen University and Research Centre has been active in the country for a longer period. In 2012 the university published a study report "Modern, sustainable, protected greenhouse cultivation in Algeria". The study included the advice for the development of horticultural production systems using adaptive greenhouse systems that would be fitting the specific conditions of Algerian growing regions. The aim was to develop a Public Private Partnership for the realization of the practical greenhouse systems for Algerian conditions. A project was developed under a Dutch subsidy programme for a high-tech pilot Algeria in combination with a mid-tech and standard tech pilot in South Africa and Rwanda respectively. After the inception phase the activities in Algeria unfortunately came to an end because the local partner had to withdraw from the projects. The rules and regulations of the funding programme for the local partner were rather demanding and the partnership only found a suitable local partner for the high-tech pilot in another country.

At present the university is finalizing a project with the École Nationale Supérieure d'Agronomie (ENSA), a smaller agronomic university in Algeria, to develop a model greenhouse for per-urban food production for the cities in the northern region. It is a high-tech level model greenhouse designed for demonstration and testing of technologies, that will be interesting for Algerian investors. ENSA is planning to build the model greenhouse in the coming years at their premises.

The Dutch Senior Exports Programme (PUM) is also active in Algeria. PUM cooperates with the local agriculture association (Chambre de l'Agriculture) in Biskra and the Algerian Ministry of Agriculture to develop an incubator. This cooperation is planned to result in a group of successful innovative start-ups that will receive PUM's support in setting up a business plan and financial calculations. PUM is also supporting a number of producers in Biskra on adapting their production for higher quality production and on improved agrolistics.

In the period before covid-19 came up some initiatives were ongoing to develop horticulture projects in which Dutch suppliers and Algerian partners would cooperate. The Dutch companies in these initiatives however experienced challenges in organizing the complete funding of the proposed cooperation projects and then the pandemic brought everything to a still stand. At present some of these companies have restarted their activities in Algeria but mostly on an individual level.

### 5.3 Interest of the Dutch private sector

For this study a selected group of horticulture suppliers and investors were questioned about their interests in becoming active and/or expanding their activities in Algeria. Dutch vegetable seed suppliers see good opportunities for increasing their sales of hybrid vegetable seeds in the country, both for open field and greenhouse production. They are either interested in starting up in the country or they are aiming at expanding their activities by enlarging their network of local distributors throughout the country.

The interest expressed by Dutch technology suppliers lies in the development of turn-key projects in which greenhouse constructors work together with suppliers of technical installations to deliver a complete greenhouse project. In addition there is interest for the supply of technical installations and equipment for inside the greenhouse separately. Suppliers of biological solutions also see good opportunities in Algeria and would like to access the market. The admission of certain products however have to be arranged first.

Dutch companies with experience in Algeria notice that many Algerian horticulture entrepreneurs are keen on learning about new technologies and innovations, and have access to finance to fund new projects.

The preferred way of becoming active in Algeria is in close cooperation with a local partner or distributor through which long term relationships can be build up with individual clients and the sector. Interviewed Dutch horticulture suppliers and investors mostly classify Algeria as a country where it is rather difficult to do business.

### 5.4 Interest of the Algerian sector

During the visit and interviews with local private sector parties it became clear that the Algerian sector is interested in and open to cooperation with the Dutch private sector. Most entrepreneurs stated to be interested in new technologies and products from abroad in general.

When discussing the interest in modernization of technologies and the challenges they would like to address, the main improvements that are mentioned lie in the field of supplies of inputs. Producers and distributors all mention access to and local availability of new, good quality hybrid vegetable seeds, biological crop protection and fertilizers. For this a good role is foreseen for the Dutch horticulture sector.

Besides the supplies of inputs, the expertise of the Dutch is mostly requested for the development and management of high quality nurseries, including the required technologies, technical advice and overall management. The number of nurseries producing the seedlings for the sector is large, as the activity is spread over many small to medium sized companies.

The Algerian private sector is currently applying technology of suppliers from different countries such as Turkey, Italy and France. Cooperation with foreign suppliers of seeds, fertilizers and crop chemicals is also taking place, but a clear wish was expressed to expand the network with new trade partners to get access to the latest technology and products. The private sector is looking at the Netherlands in specific when it comes to cooperation with seed breeders and access to biological crop protection.

Surprisingly, technologies for water saving and improving the water use efficiency in horticulture production are not mentioned by the private sector. Even while the sector is experiencing a significant increase in cost price due to the rise in fertilizer prices, technology that could reduce the use of fertilizer is not acknowledged as potentially interesting for cooperation with the Netherlands. Also for improvement of the greenhouse climate, there does not seem to be a question for technologies that can reduce the temperature extremes in the greenhouse. The reason for this most probably lies in the fact that most actors in the sector do not consider the availability of water in Algerian as an issue. Most entrepreneurs mention good availability of water as a strength and also the growing climate is considered to be very good.

Besides that, a small but growing group of producers is becoming active as an exporter of vegetables into Europe. As a result of that they are interested in European buyers and packaging solutions. Government and government related organisations strongly advocate their plans for developing more horticulture export. They are highly interested in cooperating with the Netherlands on the transfer of technology for export of (organic) vegetables to the EU by training of staff of government bodies and universities, and farmers. Additional topics include marketing, packaging, improvement of cold chain logistics for the export value chain and the development of local certification bodies. Government officials would also like to see investors from the Netherlands coming in and invest in rose production like in east Africa and in cold chain facilities.

Government organisations including research stations expressed their interest in cooperating with the Dutch private sector on improvement of the import of hybrid seeds so that more stock is available in the country. Although a first national seed bank has been established in May 2022, they are also requesting more assistance in developing a seed bank for conservation of local varieties. They stressed the importance of preserving varieties that are adapted to the local conditions and use of it in propagation.

Also the development of a Plant Variety Protection system would be beneficial. Algeria has not decided yet on becoming an UPOV member and is considering starting first with the implementation of a national system for breeder’s rights protection. The development of a local seed sector is a priority for Algeria. The Dutch Naktuinbouw is currently exchanging information on this topic with the Ministry of Agriculture and its institutes.

The government institutes that were visited during this study expressed a strong wish to cooperate on seed multiplication in large volumes, improvement of seed quality, and learn how to breed hybrids themselves in the future.

A third topic is the development of a fertigation project to do research on modern technologies, including substrate cultivation, in greenhouses. The main reason for this is the problem the sector has with soil diseases.

5.5 Business opportunities

The business opportunities for cooperation between the Dutch and Algerian horticulture sector presented here vary with respect to their target groups, the applicable region and expected period of successful implementation. The subdivision of farm sizes is based on the survey held in Biskra as described in Chapter 3; small scale farmers < 5 ha, medium scale farmers 5 and 20 ha and large scale farmers > 20 ha. It should be noted that - especially for opportunity 2 to 6 - it will be of vital importance to provide a sufficient amount of technical assistance with the products to make the project successful for the farmer. Also the support of a good local installer or distributor will be of great importance.

1. Input supplies	
Supply of vegetable hybrid seeds, biological products, pollinators, conventional fertilizers and crop protection chemicals.	
Target groups	Small, medium and large scale farms and nurseries
Regions	All
Expected term	Short term

The supply of inputs, including vegetable hybrid seeds, biological products to enhance soil conditions and conventional fertilizers, hormones and crop protection chemicals can be started up or expanded on the short term rather easily. This is provided good local distributors or serious, large clients can be found. The local interest in biological solutions is significant so there clearly is a good market for natural enemies once admission of import is approved. The sales of small mechanization equipment such as tractors that can be used inside greenhouses also provides food opportunities.

A very important step for the Algerian sector would be the transition from the traditional fertigation method into an automated mid-tech level fertigation system. This transition includes the change from using composite fertilizer mixed with water manually in a tank to a system based on optimized supply of irrigation water providing the needed amount of water and fertilizer based on an automatically prepared recipe.

2. Fertigation systems	
Transition from the traditional fertigation method into an automated mid-tech level fertigation system	
Target groups	Medium and large scale farms and nurseries
Regions	All
Expected term	Short to medium term

Ideally this is combined with a substrate cultivation system whereby fertigation is supplied on individual plant level via Microtube drippers, and recycling of the drain water. In case recycling into the substrate system seems too complex and expensive at the beginning, a start can be made with reusing the drain water in nearby soil cultivation.

Promoting the optimized supply of water and fertilizer will appeal to the current problems farmers are experiencing with the increasing fertilizer prices. In time the appreciation of using less water may follow. Use of the substrate system will provide an answer to the challenges the sector is facing with soil borne diseases, especially in tomato. Since Algerian farmers do not tend to apply rotation practices in their greenhouses, substrate cultivation will enable farmers to continuously cultivate the crops with the highest profitability in the greenhouses.

When properly managed this fertigation system can accommodate intensification of production in the regions where land is scarce as well.

3. Rain water collection and improved water storage systems	
Introduction of closed water storage solutions and rain water collection	
Target groups	Medium and large scale farms and nurseries
Regions	All, rain water collection at Multispan greenhouse in the northern region
Expected term	Short to medium term

Although rainfall in the northern region is not very high, still collection of rain water can add to the water demands of the horticulture sector. The northern region is the wettest area in Algeria and is characterized by an annual rainfall that varies between 400 and 1,000 mm. Especially when the rainfall is in the top end of this range, the contribution of the rain water to the total amount of irrigation water supplied will be significant. Many of the Multispan greenhouses in this region already have the rainwater collection gutters that can be connected to water basins or silo's.

The open water basins that are currently being used can better be replaced by covered water storage systems with better conditions to avoid evaporation of the water and keep out contamination. The current large and shallow water basins cause a lot of evaporation and the basins also take up a lot of space, which is an issue in the northern region. Especially when farmers move to improved fertigation systems and substrate cultivation there is a need to transition to protected storage of the daily stock, drain water and other water types.

Optimizing the greenhouse climate management will be instrumental in improving the growing conditions for the crops, reduce stress levels of the plants and through that improve the vitality and productivity level. Average daily temperatures can be improved by reducing extreme peak temperatures in the hot and cold periods.



4. Greenhouse climate management systems	
Automated ventilation, screening, cooling and heating systems	
Target groups	Large scale farmers and nurseries
Regions	Northern region for the nurseries
Expected term	Depending on the investment level and target group: short, medium and long term

Improved greenhouse climate management can also assist the sector in prolonging the greenhouse production period which now runs from September (sowing, planting) till June (harvesting). The start of the growing season can become more variable which would facilitate a better spread in the time of marketing and also makes it possible to turn (part of) the open field vegetable production into much more efficient greenhouse production systems.

5. Greenhouses	
Replacement of tunnel greenhouses and expansion by MultiSpan greenhouse with better quality plastic or other materials with a longer lifespan.	
Target groups	Large scale farms and nurseries
Regions	Northern region for the nurseries
Term	Depending on the investment level and target group: short, medium and long term

Replacement of tunnel greenhouses and expansion by MultiSpan greenhouse will provide much better growing conditions for the plants, as described for the previous opportunity. It will lead to a significant improvement in production results and creates the opportunity of rain water collection. Greenhouses with better quality plastic or other materials that have a longer life span will reduce operational costs significantly as the plastic will not have to be replaced every 2 years and this will also lead to a lot less waste.

The final opportunity is on value addition, starting with on-farm cold storage facilities for medium or at least the large scale farms. It will ensure more control over the marketing process and will reduce losses. When it comes to opportunities for specific processing equipment, a more detailed analysis may be required to find out exactly for which processed products market access by individual farmers will be most beneficial. Most probably equipment for canning of tomato will be on the shortlist. Another target group for processing equipment is formed by the large processing factories in the country

6. Value addition	
On-farm cold storage facilities to have more control over the marketing process and to reduce losses. Any value addition activity in the field of processing to replace imports.	
Target groups	Medium to large scale farms
Regions	All
Term	Depending on the investment level and target group: short, medium and long term

## 5.6 Opportunities for joint projects

In this paragraph suggestions are provided for business-to-business projects that would support the market entrance for Dutch horticulture suppliers in Algeria.

The first project will be very instrumental in explaining the Algerian sector how they will benefit from investment in more advanced Dutch technologies that aim at improving productivity and product quality, reduction of input use and thereby reduction in operational costs. It will provide a step-by-

step approach to change the mindset of farmers, investors and banks and move away from the current low investment mentality. The project will also be insightful for the Dutch suppliers to better understand what investment level is affordable in Algeria based on the specific market a client is targeting.

1. Business case calculation turn-key greenhouse projects on 2 technology levels	
Development of financial information on investment level and return on investment for different technology levels and markets	
Target groups	Medium and large scale farmers, nurseries, investors and banks
Regions	All
Type	Desk study and training/workshops

At present the sector has a very limited idea on what exactly is going on at farm level. This makes it very difficult to assess what the impact is of a certain product or technology on the farming results and to make (investment) decisions for improvement of the performance of the operation.

A project focussing on data collection on the use of inputs, production results, post-harvest losses, income generated will be instrumental to assist the sector in making more data-based decisions. It will also create more awareness on the level of sustainability of the sector. This project would ideally include different greenhouse types in order to also compare their different performances.

2. Measuring is knowing	
Learning how to collect the relevant data and make data-based decisions on investment level and farm management practices.	
Target groups	Small, medium and large scale farmers
Regions	All
Type	Demonstration project and training/workshops

The local interest in biological solutions is significant but very few products are available on the market and the level of knowledge and experience is low as well. Implementation of integrated pest management systems always requires a relatively high level of knowledge and skills, and fully organic production even more. Costs of these products are substantial so this market opportunity requires optimized use to create a financially attractive solution to farmers. Demonstrating and training will be instrumental in preparing larger groups to start with IPM or organic production. Due to the ambition to venture into exports to the EU market the expectation is that activities on this topic will attract a lot of attention in the sector.

3. Integrated pest management	
Knowledge and skills development on the implementation of IPM to fully organic crop protection	
Target groups	Medium and large scale farmers, exporters, nurseries
Regions	All
Type	Demonstration project and/or training/workshops

In this paragraph 3 individual project ideas are described, however, the expectation is that a more over-all approach covering more or all of the proposed activities would create more impact. For a project with a more over-all approach a larger group of Dutch companies with varying expertise together with local companies would be required to cooperate for successful implementation.

## 5.7 Opportunities for government-to-government cooperation

In order to support the possibilities for Dutch companies to do business in Algeria several topics have been identified that would benefit from the support of the Dutch government. The proposed topics could be shaped into government-to-government projects with the input from the private sector.

1. Farmer organization development programme	
Increase bargaining power, shared learning and joint investments	
Beneficiaries	Small and medium scale farmers, local supporting bodies
Regions	All
Type	Capacity building, organisational support

At present farmer organization is low which results in an absence of bargaining power when it comes to purchase of inputs and market price setting. Due to the low level of organization farmers will also have less possibility to learn from each other and jointly bring their business performance to a higher level. Increased farmer organization could also facilitate more investments in hardware that can be used by cooperating farmers such as post-harvest handling and processing equipment and cold storage facilities. The government is providing a lot of support to farmers, but the expectation is that it will be more efficient and will stimulate the entrepreneurial spirit of farmers if they can have more control themselves and other like-minded farmers.

2. Import of beneficials	
Arrange the required permissions for the import of natural enemies for IPM or organic production of fruit and vegetables in Algeria	
Beneficiaries	All farms, local distributors, Dutch suppliers
Regions	All
Type	Government-to-government project

While also government institutions that were interviewed for this study expressed their clear interest in biological solutions for crop protection, it is currently not possible for Dutch companies to supply natural enemies to the country. The government has the ambition to increase exports to the EU's high price markets and a laboratory for the analysis of maximum pesticide residue levels (MRLs) is being developed in Biskra with EU funding. Admission of natural enemies would be a next step to reduce the use of chemicals in the sector, improve the food safety situation for domestic consumption and make it easier to comply to Global GAP export regulations.

3. Food safety on the domestic market	
Create more awareness on the food safety situation on the local market in relation to chemical residue levels of fresh produce	
Beneficiaries	Algerian consumers, farm employees, local suppliers of responsible products and advice, Dutch suppliers
Regions	<i>n.a.</i>
Type	Government-to-government project

When it comes to food safety and traceability on the domestic market a lot can be gained in Algeria. Currently, fresh produce for the domestic market has no certification nor specifications on food safety. There is no control on the chemicals applied by farmers in the horticulture sector and inspection before marketing is mainly based on visual parameters such as size and damages. Traceability of fresh produce is hardly possible because it is sold in bulk and there is no packaging or labelling. Setting a food safety standard for the domestic market would be beneficial to consumers as well as farm employees that have to work with the chemical substances. Dutch technologies in general aim to improve the growing conditions for a crop to such an extent that crop protection measures can be minimized. This, in combination with the Dutch solutions for integrated pest management and organic production, can aid the Algerian sector to reach a quality level of fresh produce that is more safe to consume. The first step could lie in creating more awareness for food safety, as a follow up support in the development of a Local GAP standard could become relevant.

## 6 MARKET ENTRANCE

As was described in Chapter 2, the ease of doing business in Algeria is rated low by the World Bank. Also Dutch entrepreneurs with experience in Algeria stated the Algerian market is difficult to operate in. The first barrier for many Dutch companies is found in the language being Arabic or French, although English is here and there spoken by especially young people. Besides that, cultural differences require attention when attempting to enter this market successfully. In the coming paragraphs advices are given to Dutch entrepreneurs wanting to become active in Algeria in the phases of local partner search, project acquisition and project implementation.

### 6.1 Local partner search

As in most international trade and investment the choice of the local partner is considered to be one of the critical factors for success. Dutch horticulture companies that have invested in a local business together with a local partner and shared their experiences painted a varying picture on their experiences. Some were fortunate enough to establish a well working partnership with the local partner, others struggled on several matters.

A first step in developing a local network was often made by taking part in activities organized by the Dutch government, such as a visit programme or participation in the SIPSA FILAHA exhibition. After that follow-up contact and visits led to the selection of a local partner.

Differences between the Dutch and local way of doing business sometimes can lead to challenges in the cooperation. The way of doing business in Algeria could be described as more informal than what is common in the Netherlands. Examples of challenging differences in 'doing business' that that were mentioned by Dutch entrepreneurs included:

- the level of detail and accuracy of the business administration
- arrangements with employees with respect to contracts and insurances
- situations in which a local partner manages several other types of businesses whereby the joint business sometimes receives less attention and detailed understanding than desired
- the Dutch appreciation of stimulating individual development of their personnel and developing a team in which employees, management and owners can be of added value to each other does not entirely match with the prevailing local situation. In Algerian companies you often find a stronger hierarchy that – in the eyes of the Dutch - can limit the well-functioning of the business.

The companies emphasized that a good mutual understanding of each other's expectations and critical success factors in combination with mutual trust is required to be able to make the cooperation work. Making detailed agreements on finance has formed a fundamental point of attention in setting up and maintaining a good cooperation. Ideally the partners benefit from each other at a comparable level. Other aspects mentioned were to make clear agreements over the shares division, size and planning of investments to be done by the Dutch and local partner and on the level of control of both parties.

### 6.2 Project acquisition phase

Networking in Algeria requires time and attention. Making a successful sale often requires a long term period of relationship building with your client and regular on-site visits. Due to the gap in knowledge and information on available modern technologies, a lot of explanation and product information will need to be provided to the client. This is also part of the longer period required to build the relationship.

Dutch companies with experience in Algeria however notice that many Algerian horticulture entrepreneurs are keen on learning about new technologies and innovations and have access to finance to fund new projects. This combination makes it worthwhile to invest time and energy in educating and informing the client.

In the preparation of greenhouse projects horticulture suppliers often make use of available information and statistics to come to the best matching design under the given climatological and

economic conditions. Often they combine turnkey project quotations with business plans. The required statistics and information however are often not there or incomplete which can make a solid preparation difficult.

### 6.3 Project implementation

Once contracts have been completed and the process of implementation of the project can be started, it is good to keep in mind that timelines for every step in the process will be long. Challenges that were mentioned by horticulture suppliers that have experience with export of equipment to Algeria include:

- The custom procedures for exporting goods to Algeria are complicated
- Government procedures in general take very long and the bureaucracy level is high. For new horticulture projects, long delays should be taken into account when the local entrepreneur needs acquire land or receive permits for infrastructure works.
- When government incentives such as subsidies are involved for certain aspects of a project only, misunderstandings can easily arise over the funding of the complete set of costs for a project
- For the local partner or client it is hard to find and keep qualified and trained personnel, employees are often bought away by other, new companies. This is especially a challenge in the case of managing mid-tech and high-tech greenhouses. In that case it is essential to accompany sales of products with technical assistance

## 7 CONCLUSIONS AND RECOMMENDATIONS

### Current situation and expected developments of the Algerian horticulture sector

- Over the period 2010-2019 the area under vegetable crops has grown with 24%, from 429,417 ha to 533,060 ha. According to provisional data, the production area fell by nearly 3% in 2021 possibly because of drought.
- Greenhouse production has seen an enormous growth from 7.859 ha in 2010 to 19.573 in 2020 ha, a development of 249%. According to the latest data (data not yet published), the area of greenhouse production has continued to grow during 2021 to reach 21,106 ha, but has shown a slight decline in 2022 down to 21,025 ha. This decline is a reduction in the use of tunnel greenhouses. In Biskra and El Oued the areas of greenhouse production have increased with 200 ha and 50 ha respectively.
- At this moment in time the expectation is that – despite some stagnation in the growth of the greenhouse acreage due to the pandemic and worldwide rise in input costs and inflation – the acreage will keep on growing.
- The traditional areas of greenhouse production used to be along the coastline but nowadays the Mediterranean region represents only 22% of the total area of greenhouses. Due to land shortage, a move was made to the steppe and Sahara of which Biskra is now by far the most important region with 52% of the greenhouse production located there. Most nurseries are located in the coastline region.
- The estimated number of greenhouse producers is around 12.000. A survey among the greenhouse farmers population in Biskra revealed that more than half of them have no education, and 36% of the farmers has < 5 ha, 57% has an area between 5 and 20 ha and 7% has > 20 ha. Besides the 'traditional' greenhouse farmers, investors from other sectors became interested in the horticulture sector in recent years.
- The majority of the greenhouses consist of tunnels and since 2009 the surface of Canarian greenhouses is growing to currently around 2.000ha. The acreage of Multispan greenhouses is low, but there are some initiatives ongoing, of which the majority is for nurseries.
- The most popular greenhouse products are tomatoes (41% production share), melons, watermelons, peppers and hot peppers. The productivity level is low, for tomato it is estimated at around 12 kg/m<sup>2</sup> per year. Also the water use efficiency is low.
- The sector currently operates based on outdated technologies and knowledge and automation and mechanization is very limited. Greenhouse climate management is usually limited to the basic possibilities for ventilation and shading. Only in nurseries, more advanced technologies such as pad and fan systems are used. The water supply systems mainly are of the traditional type, automated systems and substrate can be found in nurseries and at top end producers, mostly in the Mediterranean region.
- The main source of water for irrigation is ground water, it is extracted from depths varying from around 1 to 10 metres in the Mediterranean region to depths of up to 200 metres and more in the southern regions. On country level the ground water sources are reported to be exploited above recharge level. Although the Mediterranean region has sufficient rainfall for rain water collection systems and Multispan greenhouses often gutter systems are installed, rain water is not being used.
- In production greenhouses cultivation is done in the soil, without applying crop rotations. Disease problems are therefore reported, especially in tomato. Nurseries use substrate for their production of seedlings, this is often a mixture between locally available materials and low-cost imported products.
- Farms usually do not have cold storage facilities at their farm as all produce goes directly to the market. The large majority of the produced fruits and vegetables is marketed as fresh product at local, unregulated markets with little product quality demands. Supermarkets and export markets play a marginal role, but the interest in exporting is growing. Value addition

through processing is limited, but one well-developed value chain exists for double and triple tomato concentrates for which the government banned import in 2018.

- Farmers are increasingly interested in mechanization and automation in order to deal with the lack of workers the sector is experiencing

#### Challenges and needs of the sector

- The growing population and year-round fresh produce consumption pattern of Algeria demands increasing production of vegetables of fruits. The government's ambition to reduce the forex expenditure on food imports and increase the forex income through exports of fresh vegetables and fruit could also add to the demand to increase production levels in the future.
- The country is facing two major constraints: access to land (in the north) and water resources. The available arable land is limited and in the north large scale urbanisation is competing with the sector over the availability of land. The solution can be found in production intensification by using improved greenhouse technology, at least in the coastline region, and possibly expansion of the production acreage in the steppe and Sahara region. The latter however will have to make use of the fossil water that is only partly renewable.
- The sector is operating with outdated technologies and knowledge and access to the international network is somewhat limited due to language barriers. The government plays a large role in supporting the sector's development but for Algeria to reach a higher productivity and water use efficiency level and improve the performance of the horticulture value chains more international cooperation on capacity building and knowledge exchange is required, preferably also more on a private sector level.

#### Potential for cooperation between the Dutch and Algerian horticulture sectors

- The Algerian horticulture sector provides interesting opportunities for Dutch suppliers because of its size, the low technology level and the countries' development aims and needs. The Dutch horticulture sector is interested but – besides the vegetable seed breeders - has experienced difficulty in accessing this market.
- Both the Algerian government and private sector have expressed their wish to modernize the technologies applied in the sector. Cooperation with the Dutch sector is welcomed; especially on inputs direct opportunities exist.
- The main target group for the Dutch suppliers of technology includes the nurseries in the Mediterranean region, the large scale/top-end producers and investors that target high price markets and exporters. These groups operate at a level that they are ready to cooperate with the Dutch sector to make a next step in the technologies in their business. The investors and investor groups are very result-oriented, receptive to modernization of production techniques and have a good financial base.

#### Business opportunities for Dutch companies

- The supply of inputs, including vegetable hybrid seeds, biological products to enhance soil conditions for which admission is granted, and conventional fertilizers and crop protection chemicals can be started up or expanded on the short term rather easily. This is provided good local distributors or serious, large clients can be found.
- Improving the water use efficiency of the sector is not considered a high priority by the majority of the farmers. The wish to increase productivity, the increasing fertilizer prices and low availability of farm workers however create an incentive for investing in automation and mechanization. This creates opportunities for automated fertigation systems. Soil diseases add to the interest in substrate cultivation for tomato production. In nurseries the substrate systems can benefit significantly from innovations as well.
- The transition from tunnel to Multispan greenhouses and investment in automated and improved greenhouse climate management will provide the sector with the opportunity to

increase the productivity level significantly. Optimizing the greenhouse climate management can also assist the sector in prolonging the greenhouse production period which now runs from September (sowing, planting) till June (harvesting). The start of the growing season can become more variable which would facilitate a better spread in the time of marketing. It also makes it possible to turn (part of) the open field vegetable production into much more efficient greenhouse production systems.

- Recent years of low rainfall and climate change expectations may be instrumental in moving towards more rain water collection and improved water storage systems.
- On-farm cold storage facilities for medium or at least the large scale farms. It will ensure more control over the marketing process and will reduce losses.

#### Recommendations

- In order to tap into the opportunities of Algerian market on a significant scale, the low knowledge level on horticulture technologies and the prevailing investment mentality will need to be addressed.
- Individual market entrance is well-possible but has shown to be difficult, especially for horticulture technology suppliers. Several efforts of the Dutch private sector have stranded in the past, this is due to the pandemic but also the complexity of the market.
- It is recommendable to work together with a local partner that knows the sector well. First contacts with local partners and clients can be made by activities organized by the NL government, after that it will be important to build long term relationships and make on-site visits on a regular basis. In general a lot of knowledge and information will need to be transferred on available technologies and the business case.
- Upon project implementation it is advisable to take into account long timelines due to a high level of bureaucracy in the country, especially for land acquisition and permits, and complicated export procedures.
- Business-to-business projects including demonstrations and knowledge transfer may be instrumental for market preparation. Suggested project topics include the calculation of the business case for turn-key greenhouse projects, 'measuring is knowing' and integrated pest management.
- In order to support the possibilities for Dutch companies to do business in Algeria topics have been identified that would benefit from the support of the Dutch government including support to the development of farmer organization, import permission for natural enemies and creating awareness on food safety of fresh produce for the local market.



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## ANNEX 1 Contact list interviewed Dutch entrepreneurs

	<b>Name of organization</b>	<b>Type of organization</b>	<b>Contact person</b>
1	AVAG	Associations for greenhouse installers and	Annie van de Riet
2	Bakker Brothers	Vegetable seeds breeder	Rene Rijs
3	BOM Group	Turn-key greenhouse projects	Ruben Kalkman
4	Bosman Van Zaal	Turn-key greenhouse projects	Rami Alsouqi
5	Holland GreenTech	Supplier	Norbert van der Straaten
6	Koppert	Biological Systems	Yassin Lahiani
7	Patron Agri Systems	Turn-key greenhouse projects	Ronald Begelinger
8	Patron Agri Systems	Turn-key greenhouse projects	Pieter Jan Robbemont
9	Plantise / GrowGroup	Plant propagation	Jan Mulder
10	RijkZwaan	Vegetable seeds breeder	Edwin van der Klugt

## ANNEX 2 Contact list of field visits in Algeria

	<b>Name of organization</b>	<b>Type of organization</b>	<b>Contact person</b>
1	Agrichem	Supplier	Mounir Smatti
2	Agrichem	Supplier	faycal Ismail
3	Agrichem	Supplier	Rachid Bouzouane
4	Agrichem	Supplier	Reda Aissiou
5	Agrivil	Supplier	Mouloud Boudoudou
6	Chambre d'Agriculture de Biskra	Government	Ouamene Sofiane
7	Chatalat	Nursery, producer	Ben Abass abd el Djabar
8	Conseil National Interprofessionnel de la filière cultures maraichères (CNIF) /Heraki Brothers /Atif Agro	Producer association, producer/exporter, supplier	Atef Heraki Haah
9	Direction de la Régulation et de Développement de la Production Agricole (DPDRA)	Government	Ali Zoubar
10	Directorate of Agricultural Services (DSA),	Government	Samia Zahaf
11	École Nationale Supérieure d'Agronomie (ENSA)	Knowledge institute	Ali Daoudi
12	Goldenhouse	Supplier / Producer	Mohamed Benazrine
13	Groupe Ziani Mohamed	Investor group	Ziani Mohamed
14	Technical Institute for the Development of Saharan Agronomy (ITIDAS)	Government	Fouad Bendjeddou
15	Technical Institute of Horticulture and Industrial Crops (ITCMI)	Government	Raouf Guezaz
16	ZZPM	Supplier, producer, nursery	Naga Abdel Kader