



Study of the Sustainability of Potato Farms in the Region of Oued Souf (Southern Algeria)[#]

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ABSTRACT

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The objective of this study is to diagnose the potato sector in the El Oued region by highlighting the technical and environmental situation of this sector. For this purpose, a field survey was carried out at the level of 75 farms in the El Oued region. The Oued Souf region's Farm Sustainability Indicator (IDEA) is important. The assessment of agro-ecological, socio-territorial and economic indicators indicates that the agro-ecological indicator is the most represented by (the indicator of fertilizer and agricultural practices) by 98 out of 100. The results of this study show that this crop presents a good adaptation to the conditions of the region. This sector is undergoing significant development and is of great importance because this agricultural activity represents an economic potential at the local, regional and national levels. However, this sector remains fragile in relation to various constraints of a technical nature (unreasonable irrigation and fertilization and high seed prices), economic (price fluctuations and disorganized markets) and environmental (diseases, weeds) which directly influence the functioning of farms and therefore their profitability. This is why it is necessary to face the problems encountered and fight against the factors that can hinder the sustainability of this sector and give a competitive value.

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Introduction

The agricultural space in the Algerian Sahara has been experiencing an unusual dynamic for several decades, particularly since the promulgation of Law 83/18 APFA (Accession à la Propriété Fancier Agricultural) (Chaouch, 2018).

Since the 2000s, the region of Souf (El Oued) has experienced impressive agricultural development. This agricultural dynamic is linked to the development of open field vegetable crops, potato with the beginning of the tomato boom, mainly focused on land for agricultural development formally under the private domain of the State (Ouendeno, 2019). Le Souf is the leading supplier of potatoes to the national market, accounting for 40% of the national market (M.A.D.R, 2017).

Since the 2000s, potato cultivation in the El Oued region has experienced a meteoric expansion that has resulted in a significant increase in cultivated areas and improved yields. Today, this crop is highly integrated into

agricultural production systems because of its profitability, increased demand for this food material, population growth and changing eating habits.

In fact, the total area devoted to potato cultivation in the El Oued region did not exceed 822 ha in 2000, and has evolved rapidly to reach 36.200 ha in 2018.

In the same way, potato production has also multiplied for the same period, increasing from 131308 quintals in 2000 to 11360000 quintals in 2018 (D.S.A, 2019).

Despite the success of potato cultivation in the El Oued region, which is mainly due to its better adaptation to agricultural regions on the one hand, and the important place it occupies in the population's diet on the other hand, this sector remains fragile due to certain constraints that negatively influence the sustainability of this crop. It is from this perspective that we thought it would be interesting to conduct a diagnostic study of the current situation of the potato sector in the El Oued region.

The objective of this study is to carry out an environmental analysis of this sector and to identify new mechanisms that can promote potato cultivation. The aim of this study is to determine the major natural constraints that interrupt potato production in the El Oued region.

Materials and Methods

Survey Methodology

In spite of the great development of the potato crop in Souf, in this paper we will try to analyze the development factors and sustainability constraints of this crop, illustrating by the case of Guemar and Reguiba regions in different farms. The data used came from surveys at the level of 75 farms and data from different agricultural services.

We will therefore constitute a reasoned sampling, which aims to discover the operating diversity of production systems and we will choose production units in each of the previously identified categories and also in relation to the presence of the farmer.

Surveys at the farm level of development: A survey was carried out at the farm level, it enabled us to have essential information on the identification of the activities and the mode of operation of the farm, as well as aspects related to the socioeconomic and environmental environment.

Calculating the Sustainability Indicator

Like IDEA, IDPM is an ecosystem and quantitative approach method that was developed in a multidisciplinary group. This grid makes it possible to quantitatively evaluate, for a plot of land or a vegetable farm, practices likely to go in the direction of sustainable development. For this purpose, 40 indicators have been developed. The

evaluation is made on three scales of sustainability of equal weight and varying from 0 to 100: scale of agro-ecological sustainability (environmental impact of the farm's activities on the territory and natural environments); scale of socio-territorial sustainability (insertion of the farm in its territory) and scale of economic sustainability (economic functioning of the farm). Each scale of sustainability is subdivided into three or four components that most characterize a sustainable agricultural system. The scale of agro-ecological sustainability analyzes the propensity of the technical system to combine efficient use of the environment's resources, ecological cost and technical-economic viability (M'Hamdi et al., 2009). The scale of socio-territorial sustainability is analyzed by means of indicators that promote the objectives of human development, quality of life, employment and local development, ethics and citizenship. (Vilain et al., 2008). The economic sustainability scale analyzes the performance of the production system in the medium and long term through the viability, transferability, independence and efficiency of the system. All ten sustainability components are subdivided into indicators. A total of 40 indicators are obtained, which are themselves composed of several items.

Description of the Study Area

The Souf is located in the south-eastern part of Algeria (see figure 1). It is characterized by a hyper-arid climate. The oases of Souf extend over an area of 11738.4 km² (Khezzani and Bouchemal, 2018). The Souf was named the country of Ghouts (Côte, 2006). In recent decades Souf has seen the development of open field vegetable crops, mainly potatoes.

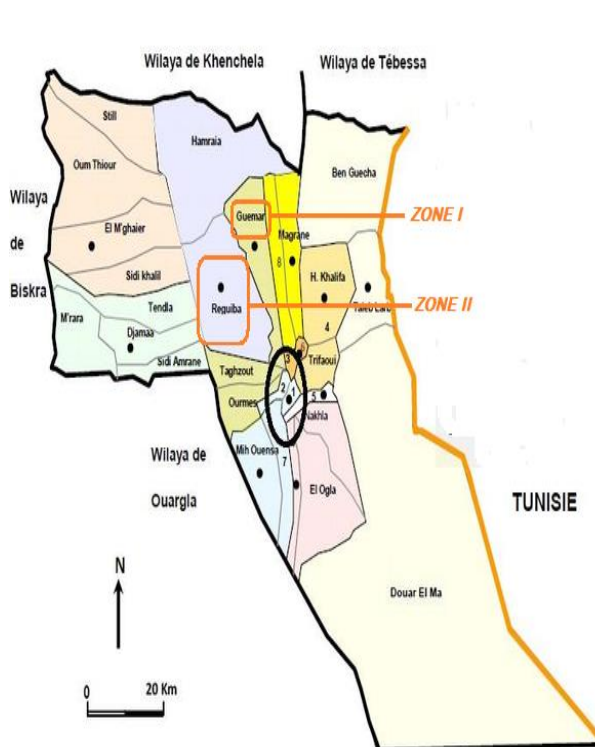
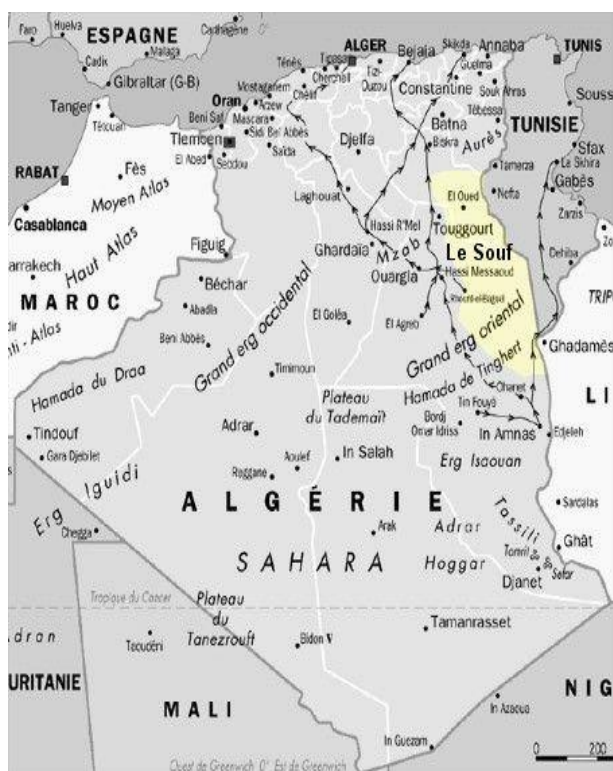


Figure 1. Geographic location of the Wilaya study areas of EL OUED.
Source www.google.com/search?q=El+Oued,+Algérie+carte&tbm=isch&hl=fr&chips

The territory of the commune of Guemar is located in the center and north-east of the wilaya. It has an area of 1.264 km². The territory of the municipality of Reguiba is located to the north-west of the wilaya. It has an area of 1.966 km².

Results and discussions

The potato: a cash crop

Potato development began in the 90s with the launch of the APFA's potato development programs. It has been in full swing since the last decade, thanks to the support given to farmers by the PNDA and the rural renewal in the mid-2000s and also due to the strong demand in the national market which has stimulated production (Ouendeno, 2019). Potatoes are grown twice a year (in season and off-season). The first season (commonly called "Saba") starts from September to December. The manure used is a mixture of beef, turkey and poultry wastes (makes the

mixture since poultry waste is more concentrated for potatoes). The potato is produced in the soil for 5 years. The origin of the seeds: Ain Defla, Holland

The farmer plants the potato seeds and replants the small potatoes from the previous season. He carries out phytosanitary treatments against the disease (the yellow patches of the potato), and against weeds. These problems are caused by the importation of seeds and manure.

In recent years, potato production in the El Oued region has grown steadily, making it one of the richest agricultural regions in the country. It counts for more than a third of national production (40%), which makes it the first place among the states producing this crop (CAW, 2018). The new agricultural dynamics in the region of El Oued is essentially linked to the implementation of agricultural development programs, the availability of natural resources and the commitment and willingness of farmers. All these factors have launched and made the potato cultivation in the El Oued region efficient.

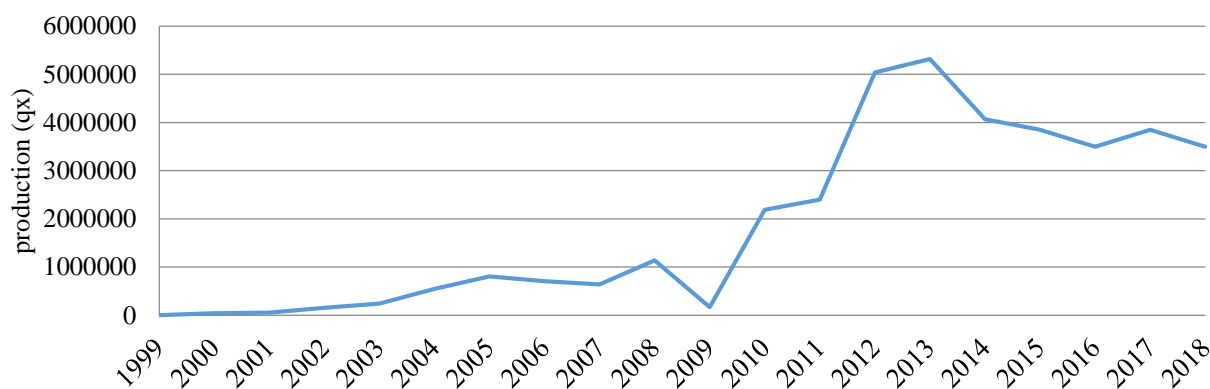


Figure 2. Evolution of potato production in the study region .Source: DSA, 2018



Figure 3. Potato farming and coolin

Table 1. Distribution of agro-ecological, socio-territorial and economic sustainability score

	Obtained Score	Maximum	Rule of 3 to reduce all max to 100	
			Obtained Score	Maximum
Diversity	6	33	18	100
Organisation of the space	9	33	27	100
Agricultural practices	18	34	53	100
Quality of products and territories				
Employment and Services		33	18	100
Ethics and human development	5	34	15	100
Viability	0	30	0	100
Independence	15	25	60	100
Transmissibility	15	20	75	100
Efficiency	3	25	12	100

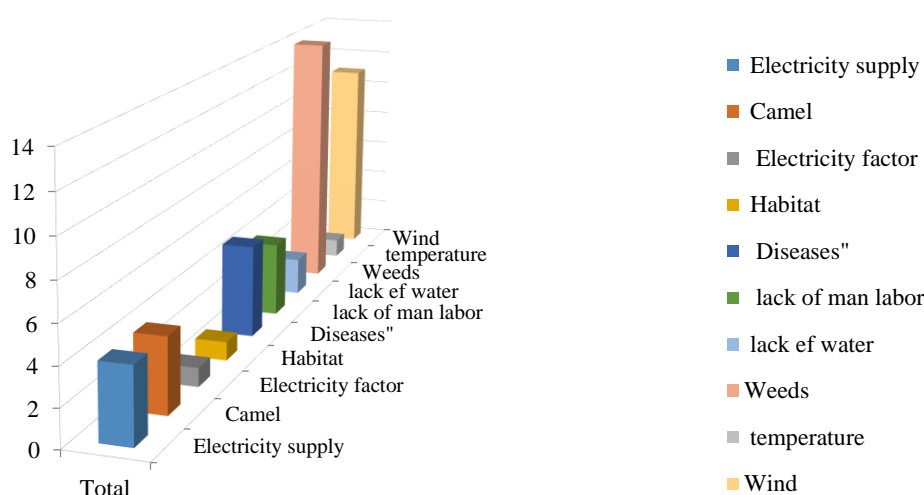


Figure 4. The main constraints of agriculture in the zone of Guemar.

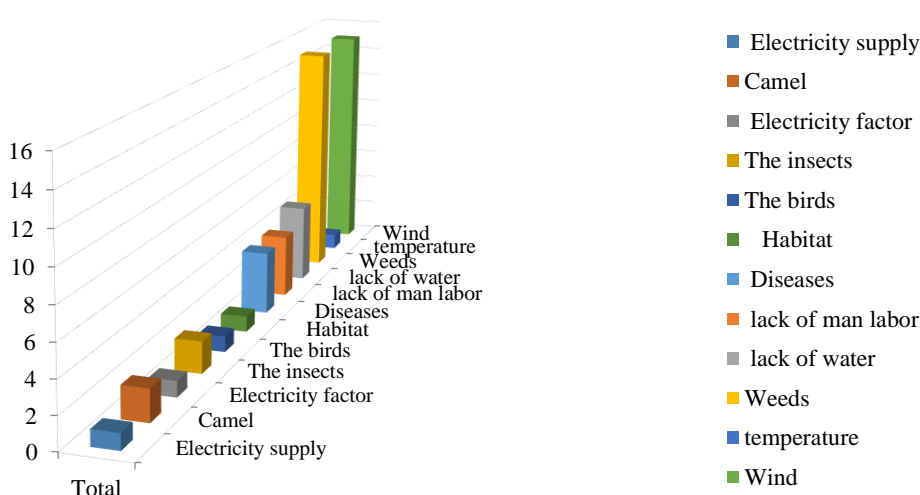


Figure 5. The main constraints of agriculture in the "Reguiba" area

There are several indicators to evaluate the sustainability of farms in the El Oued zone among them:

Indicators of farm sustainability

As IDEA is an ecosystem and quantitative approach method that was developed in a multidisciplinary working group. This grid makes it possible to quantitatively evaluate, for a plot or a vegetable farm, practices likely to go in the direction of sustainable development (Ahouangninou, 2013).

Agro-ecological sustainability

The average for agro-ecological sustainability was 98 points out of 100. This pillar of sustainability encompasses ecological diversity, spatial organization and agricultural practices. Ecological diversity had an average of 11.38 points out of 30 with a maximum of 24 points. The average represents 37.93% of the theoretical maximum. Figure 3 shows the high gap between the average of this component and its theoretical maximum. Farms are less diversified in terms of production and the activity as carried out does not favor the maintenance of the specific diversity of the soils. Among the indicators of this component, only that of "Valorization and conservation of the genetic heritage".

Socio-territorial sustainability

The average of this dimension of sustainability was 45 points out of 100. This pillar of sustainability has three components: human development, management and quality of production, and employment and local development. The human development component had an average of 18 points with a maximum of 33 points. This indicator is less represented in the farms in this region.

Economic sustainability

This scale of sustainability has four components: viability, transferability, independence and efficiency. The transferability component had an average of 75 out of 100 points. Vegetable farms are not economically viable. These findings are related to the small acreages that are farmed, which do not allow producers to reap high profits.

The main socio-economic and environmental constraints of agriculture in the zone of Guemar and Reguiba.

The main problems of the developed agricultural system (phoeniculture and market gardening) in the farms of Guemar can be summarized in the problem of weeds present in 30% of the farms, and the problem of wind in 23%.

The main problems of the developed agricultural system (phoeniculture and market gardening) in Reguiba's farms can be summed up by the two main weed problems and the wind problem by 29%.

Conclusion

The state of Oued Souf has become a very important agricultural hub in recent years, indeed, the diversity of its productions (dates, potatoes, tomatoes ...) and its contribution to self-sufficiency in agricultural products in Algeria.

The potato is a promising crop that offers many advantages; it has a very high yield potential, it is nutritious with a high energy content, it is a profitable crop for Algerian farmers because it is highly consumed by the population.

Despite the important dynamics of potato production, there are constraints that inhibit this evolution, of which weeds are the first reported problem.

The Indicator of Farm Sustainability (IDEA) of the El Oued region is important.

The evaluation of the agro-ecological, socio-territorial and economic indicators indicates that the agro-ecological indicator is most represented by (the fertilizer indicator and agricultural practices).

The two zones of el Oued (Guemar and Reguiba) have experienced an evolution of market gardening, especially potatoes and tomatoes.

The results of the study show that vegetable production in Oued Souf is limited by its agro-ecological dimension. Producers have no objective to reduce the health and environmental risks related to the use of pesticides, they generally use the pesticides they have on hand as long as they manage to eliminate crop pests and diseases. The different factors determining the phytosanitary practices of market gardeners (especially potatoes). An improvement in the agro-ecological dimension of sustainability will increase the overall sustainability of production.



Cyperus rotund



Sonchus oleraceus



Chenopodium album



Figure 6. Among the main weeds that cause major problems to the potato crop

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