

Estimate the compound growth rate (CGR) of area, production & productivity of Potato in El Oued Souf Algeria

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Abstract

Agriculture in the Algerian Sahara has undergone spectacular changes since the introduction of new technologies such as electric pumps and the law on access to land ownership. According to various sources, potato consumption, which was estimated at 21.7 kg in 1966-67 (FAO), rose to around 34 kg/inhabitant/year in 1979-80 (ONS survey), and was estimated at 113 kg/inhabitant/year in 2015). The Willaya d'El Oued has become an agricultural hub in south-east Algeria. It is an area of great agricultural, economic and research importance. The purpose of this study is to analyse growth trends in potato area, production and yield in the Willaya of El Oued. Data were collected from the Ministry of Agriculture and Rural Development, for a period from 1990-00 to 2018-19, using simple descriptive statistics: growth rates, compound annual growth and extent of crop diversification as well as Instability Index. The results show that in the region there is a positive and significant growth in cultivation. In addition, the expansion of the area does the specialization of cultivation in the region and the index of instability of area (5.45), production (4) and yield (7) was high, indicating that the area devoted to cultivation has increased. This is evidenced by the tendency to grow crops in the region increases considerably on the agricultural it provides more than 24% of national production.

1. Introduction

Since independence, Algeria's agricultural policy has been to ensure food security, but given that the northern regions of the country, with their changing climate (rainfall deficit), are unable to meet the demand of the growing population, the State has turned to the southern regions, which are endowed with water resources (underground water), large areas and a population that is already farming. In the south of the country, the agro-climatic conditions are hostile to agriculture, but thanks to the various support programmes and the courage of the farmers, this has led to high production. The willaya of Eloued, in south-eastern Algeria, is an agricultural hub. During the 2018/2019 marketing year, it produced 17.4 3 million tonnes of market garden produce, representing around 12% of national production, from a surface area of 39,917 hectares.

Potato cultivation is strategic in Algeria, with consumption rising from 34 kg/inhabitant/year in 1979-80 to 113 kg/inhabitant/year in 2015 (Bessaoud et al., 2019). 37,000 ha of land are devoted to potatoes in the willaya, with production of 1.214 million tonnes (MDR 2019). According to agricultural statistics, the willaya accounts for more than 24% of national production (MDR 2019). The Willaya d'Eloued has a specific composition of the southern regions of the country, with a very wide diversification of crops, and a growth that permits high levels of agriculture at national level. The aim of our study was to analyse the growth and trends in potato area, production and yield in the Willaya of El Oued. Data were collected from the Ministry of Agriculture and Rural Development, for a period ranging from 1990-00 to 2018-19, using simple descriptive statistics to estimate the trend in the evolution of potato cultivation by ca area, production and yield.

2. Material and methods

2.1. Presentation of the region

The study area, which comprises 18 municipalities, covers an area of 11738 km².

It is characterised by a hyper-arid climate, with an average annual temperature of around 22°C and average annual rainfall of 78 mm (ONM, 2012). El-Oued is the region of the low Sahara, its geomorphology making up the Great Eastern Erg, a vast expanse of sand. (Fig N°1).

Geographically, the town of El Oued is bounded by the following coordinates:

Longitudes X1 = 05°30' and X2 = 07°00' East.

Latitudes Y1 = 35°30' and Y2 = 37°00' North.

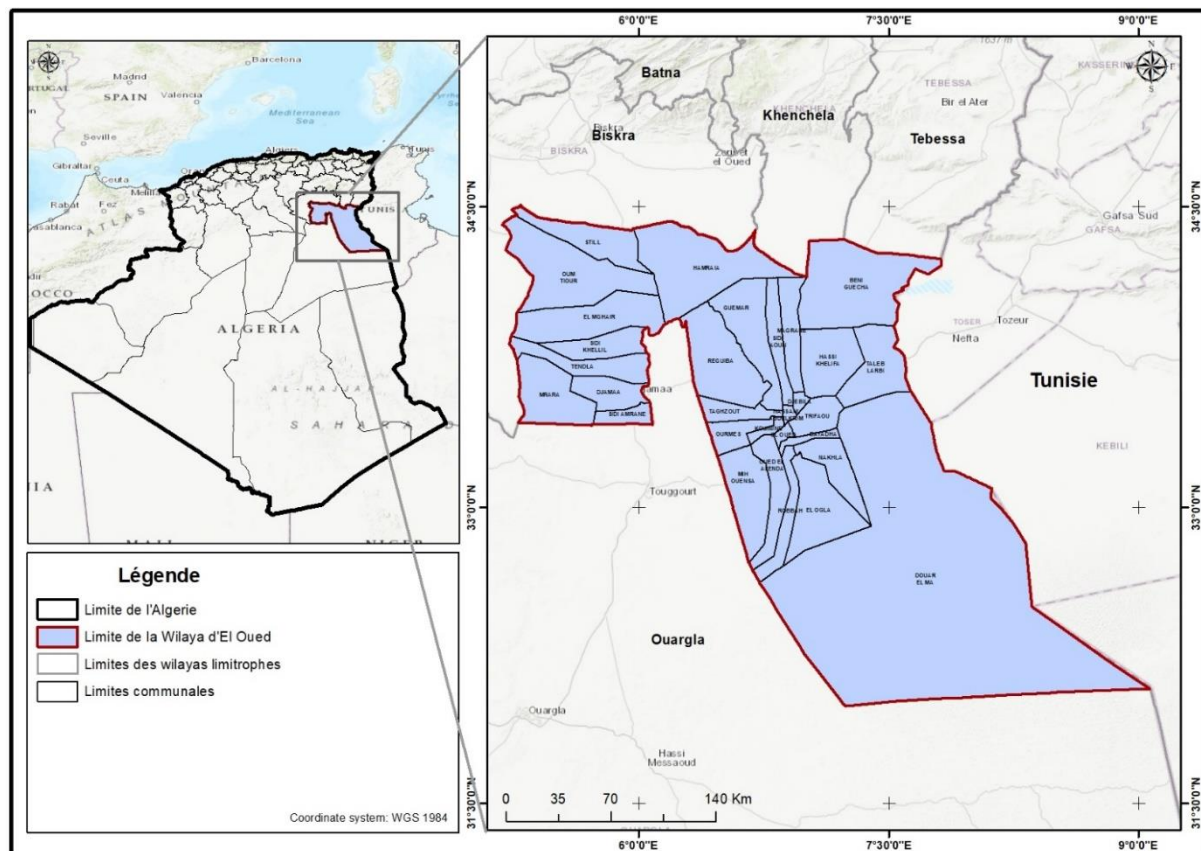


Fig N°1

2.2. Methods of analysis

Time series data on potato area, production and yield were collected from 1999-2000 to 2018-2019 (20 years). Simple descriptive statistics are used to measure trends in potato cultivation area, production and productivity.

2.2.1. Growth rate analyses

The growth rate is calculated according to the following equation

$$Tx = [(Current\ V - V_{pas}) / V_{pas}] / 100 \text{ Equation N}^{\circ}1.$$

With

V: current value. Area (Ha), production (Qx) and yield (Qx/Ha).

V : past Past value. Area(Ha), production(Qx) and yield (Qx/Ha).

2.2.2. Compound growth rate analysis

The compound annual growth rates of potato area, production and yield in Willaya El oued were obtained by fitting an exponential function of the following equation

$$\text{Log } Y = \text{Log } \alpha + \text{Log } \beta \text{ Equation N}^{\circ}2.$$

With

Y=Area(Ha), production(Qx) and yield (Qx/Ha).

Where,

Y = Area / Yield / Production.

α = constant.

t= time variable of the year (1, 2,...n)

β = regression coefficient which indicates the rate of change or growth of a series.

2.2.3. The Simpson diversification index

Used to calculate crop diversity in the region and in the state as a whole

The index is used to inform us about the diversification of agricultural production.

. A value of zero (0) indicates specialisation and when its value approaches one (1) shows an increase in the extent of diversification. This allows analysis of temporal changes in the position of crops in agricultural production.

$$SID = 1 - \sum (A_i / GCA)$$

Where A_i is the annual area devoted to a particular crop. GCA is the total annual area cultivated and n is the number of crops.

2.2.4 Instability index

The coefficient of variation or instability index. The coefficient of variation was used to study the variability of area, production and productivity using the following formula

$$CV = \delta x / \text{Moy}(x)$$

CV: Coefficient of variation

Where, σx = Standard deviation of x

Moy (x) = mean of x

x = area, production, yield

Instability index

IS = Standard deviation δx / Avg(x).

The instability index was classified into two groups, namely Low < 25% and High > 25%. (Devi, & Zala, 2016).

3. Results

3.1. Growth rate analyses

Potato cultivation has expanded superficially in The region. There has been a more than forty-fold increase in area, from 822 ha in 1999-2000 to 37,000 ha in 2018-19, a growth of 98%. Production has also increased compared with the 1999-2000 season, when it was 0.13 million tonnes, rising to 12.14 million tonnes in 2018-2019 - an increase of 99%. Yields rose considerably over the period as a whole, by 51%.

Table N°1. Growth rate analyses

Region	Growth rate analysis		
ElOued	Area (ha)	Production (million tonne)	Productivity Qx/Ha
	822	0,131	159,8
	37000	12,14	328
Tx %	98	99	51

3.2. Analysis of compound growth rate

The table N°2 shows that area, production and productivity recorded a positive and significant growth rate. The variability of area, production and yield was high at 22.95. 26,25. 2.67 and 24.83 per cent respectively. This is due to the increase in area, irrigation facilities and organic amendments resulting in increased production and yields.

Table N°2. Compound Growth Rate of area, production and productivity of Potato.

Region	Compound Growth Rate(%)		
ElOued	Area	Production	Productivity
	22,95	26,25	2,67

Note **Significant at 1% level of significance.

3.3. Simpson diversification index

The results showed a significant diversification of crops, the variability of crops planted over twenty years the index rose from 0.8 in 1999/00 to 0.03 in 2018/2019 .table which shows a decrease in diversification which was close to 1 and the orientation of farmers towards specialization in pivot.

Table N°3. Simpson diversification index

Year	irrigated land (ha)	potato area (ha)	SID
1999/2000	20720	822	0,8
2018/2019	39917	37000	0,03

3.4. Instability index

the instability present in potato area, production and productivity during the study period are 5.45 4.18 7.27 .the crop showed low instability throughout the period (1999-00 to 2018-19). The instability index showed an instability of 5.45%, the variation being more or less similar to the production index which is 4.18% but lower, for the yield the variation is quite high which is 7.27%, this index variation can be explained by the improvement of the soil by organic amendments but also the use of irrigation. According to Rebai et al2017 The emergence and spread of potatoes in the El Oued region is closely associated with the spread of pivot irrigation.

Conclusion

The study revealed a positive growth rate in the area (98%) and production (99%) of the crop in the region. The yield growth rate shows (51%) that there has been a high rate of change. The increase in potato area has contributed most to this development. However, the variability of area and yield is quite high for growth rates, 22.9.2, 67percent quite high, which affects the volume of production 26.25 percent. State intervention to store surplus produce. In addition, the Simpson indices calculated show The successively decreasing value of the Simpson index indicates a level of increasing specialisation. The instability results reveal that for the whole period recorded low growth rates, the yield instability index was 7.27%, while production and cultivated area had instability indices of 4.13% and 4.18%, respectively. The study revealed a significant level of security in potato production in the region, due to irrigation provided by numerous irrigation schemes combined with government investment, maintaining sustainable production and a constant supply must be the focus of researchers and policy makers.

Bibliographical reference

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