

# Agricultural diversity and food security in the South of Algeria

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## ABSTRACT

In this article, we try to introduce the different agriculture forms adapted in the province of Ghardaïa southern Algeria and to identify their development perspectives in the purpose of reaching food security. The research work was based on a survey at the agricultural area of the region let us know four agriculture forms. First, old palm for subsistence, new palm agriculture for business vocation, then pre-oasis agriculture known by its market garden and livestock farming, and the fourth one is extra-oasis featured by large-scale farming. In addition to their different way of exploitation, the agricultural form presents different potentialities in the development and food security.

**KEY WORDS:** Agriculture, development, food security, oasis, palmary

## INTRODUCTION

Algeria is living food insecurity situation due to the shortage of local agro-food production and it is depending on the food international markets (Chabane, 2010). The alimentary needs of the population are more and more covered by the importation, especially cereals, milk, sugar, and alimentary oils (Bouazouni, 2008). In fact, the proportion of starvation is <5% of the total population (FAO, 2015) and the alimentary availability is evaluated more than 3600 kcal (kilocalories)/inhabitant/day (Ferroukhi, 2009), however, the rate of auto supply of alimentary products remains weak.

Algeria imports 75% of its need of cereals, 60% of its need of milk (CENEAP, 2010), and 30% of its need of livestock alimentary (CNA, 2008), in addition to the total consumed sugar and alimentary oils. Then, an important part of the availability is imputed to the importation, the fact that makes the food security of the country vulnerable. Besides, the large consumable products whose price are more and more volatile, whereas the capacity of the country in terms of importation is uncertain because of the fragility of its economy based on the hydrocarbons sales (Mouhoubi, 2008).

Many factors have been contributing in that situation, such as weak agricultural productivity, development programs

failure, hard natural conditions, water shortage, and the limited land resources (Bessaoud and Montaigne, 2009). Some regions are a disadvantage in terms of resources, in particular the South of the country where most agriculture and cattle farming are affected by the Saharan climate, moreover, the lands are infertile, and the hydraulic resources are often not renewable (Bouammar, 2010).

The agriculture in the province of Ghardaïa is suffering from this kind of constraints. The practical agricultural area is too small, evaluated by 32, 745 ha (hectares) (MARD, 2015), with a ratio of 0.07 ha/inhabitant, against a national average of 0.23 ha/inhabitant. In fact, Ghardaïa is located in the vast arid area of the Algerian Sahara, with a surface area of 86, 560 km<sup>2</sup> and host a population estimated to 430, 563 inhabitants (MILC, 2015).

The agriculture in this region is distinguish by the date palm framing, rustic, and adapted trees to serve climatic conditions such as aridity and heat, those agriculture was in the pass time the major source of subsistence for the old population (Khene, 2013). Starting from 1960s, new agricultural area was created near to the old oasis. Other developments were being set at exterior of oasis by the 1980s. The question that should be asked, in that way, is in which level this different agricultural forms could reply to local demand in terms of food security. The aim of this

article is to examine the diversity of this agriculture and to identify the development opportunities in terms of food security.

**METHODS**

The work method is based on a survey of a representative sample of farms in the study area. We started by drawing up the inventory of agricultural perimeters in the district. In total, 56 areas were defined and classified, especially in terms of localization, surface, number of farmer, the period of development, irrigation water source, distance regarding the nearest oasis or urban area, and land tenure. The follow-up process needs the previous zoning of the area subject of the studies and reasoned sampling (Jouve and Tallec, 1996; Bedu *et al.*, 1987). The previous zoning is carried out based on criteria that looked a priori determining for cultivation mode. The homogenous zones which are the result allow to set stratification of the region and to establish reasoned sampling of the sites to be surveyed.

We have chosen two criteria which are likely to have determined impact on the farming mode, as the period of development and the situation regarding the nearest oasis. For the first criteria, we had two variants, whether the development is achieved before or starting from 1960s, the period that coincided with decolonization of the country and liberation of development initiatives. For the second criteria, three variants are being identified: Oasis zone, near oasis, and extra-oasis, in terms of nearest location to the oasis.

The combination of the two criteria gives us theoretically six homogeneous situations as it is shown in Table 1. In fact, the situation (2) and (3) does not exist because the old agriculture was practiced executively in the oasis. Hence, the study area can be subdivided into four (04) homogenous zones, represent four mode of exploitation of the environment. Based on this stratification, we classed all the agricultural perimeter of the area. The selected sample contains 6 perimeters among 56, to represent 10.7%.

To carry out the survey, we set a questionnaire to identify existing agricultural systems. The used questionnaire

aims to learn the specifications of the environment and the population that farms it, the history, perspectives of development, organization of the area, and using means and systems of production. At the end, 60 surveys have been carried out at the rate of 10 for each perimeter. The statistical examination of the collected data was achieved by multiple correspondence analysis and completed by ascending hierarchical classification.

**RESULTS**

The graphic of observation obtained by multiple correspondence analysis feature for four homogeneous groups of farming (Figure 1). This result is confirmed by the ascending hierarchical classification (Figure 2).

**DISCUSSION**

The analysis of the results of the survey shows the existence of 4 homogenous groups. This shows that farming area subject of studies is organized in 4 different agrarians systems. The first group represents old oasis farming, the second one is for new oasis, the third one is about suburban oasis, and the fourth is related to the extra-oasis agriculture. The main characteristics of the identified agrarian systems are presented in Table 2. Otherwise, this result indicates also that the criteria distinction is considered a priori pertinent and can be used in the characterization of the agrarian system for the studied region.

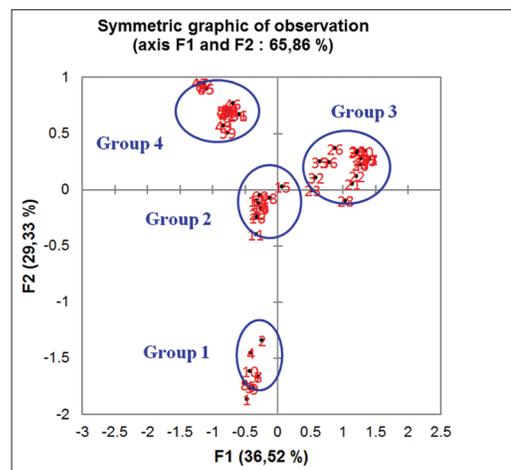


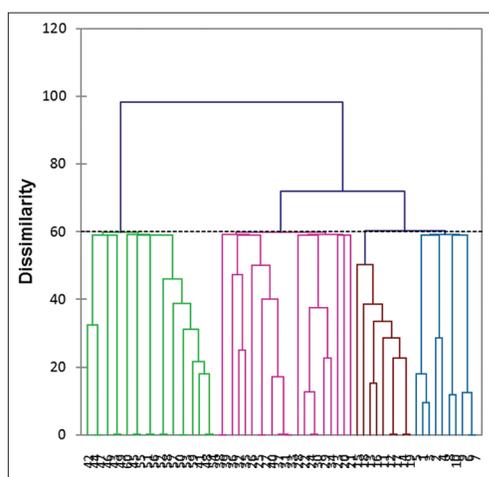
Figure 1: Symmetric graphic of multiple correspondence analysis

Table 1: Homogenous zones of the study area

Criteria 2	Criteria 1		
	Oasis perimeter (inside the oasis)	Suburban oasis perimeter (extension of the oasis)	Extra-oasis perimeter (out of the oasis)
Old (before 1960)	(1)	(2)	(3)
New (starting from 1960)	(4)	(5)	(6)

**Table 2: Majors identified characteristics of the Agrarian system**

	Old oasis	News oasis	Suburban oasis	Extra-oasis agriculture
Importance/total agricultural area (%)	8	3	33	56
Development	Before 1960	1960-1980	1960-1980	Starting from 1980
Land tenure	Private	Possession	Agricultural possession	Concession
Farms	≤1 hectare	≤1 hectare	1-3 hectare	≥2 hectare
Labor	Familial	Familial	Familial+workers	Workers
Intensification	No	No	±	High
Crops	Subsistence date palm	Commercial date palm	Commercial date palm Market gardening Fodder	Commercial date palm Field crops Shifting cultivation
Livestock	No	Sheep, goat	Cattle, poultry	No
Problems	Urbanization	Management, land tenure	Water, workforce	Workforce, spare part, know-how
Tendencies	Abandonment	Stagnation	Extension	Diversification



**Figure 2:** Dendrogram ascending hierarchical classification

### Palm Grove in the Old Oasis

In the old oasis, we found auto subsistence palm grove destined for date’s production with weak market value. After being insured the vitality of oasis for centuries, this kind of palms is likely to reach its terms. Nowadays, the subsistence has evaluated, and dates are no longer basic alimentary. In fact, this palm grove is in abandonment situation and is victims of anarchic urbanization that are growing more and more, with further prejudice in terms of partition and the pollution of the lands and underground water layers. The old oasis palm grove represents nearly 8% of the agriculture area of the Province.

In the other hand, the conditions of layout are restrictive in the old oasis palm grove. The farmed lands are at risk of flooding, and the plantations are dense with difficult access. The old oasis farming has series of structural constraints and its threatened by the urbanization spread, so it reduces their possibilities in the development and their contribution in the food security.

### Palm Grove of New Oasis

These new oases are being developed by the public authorities during the sixties of the past century. Where

the aim was to encourage the settlement of the old poor nomads and boosting the hydraulic resources discovered in that period (continental layer intercalary). The new oasis contains gathered habitation area and new style of palm grove with spaced, regular plantation, dominated by large varieties of dates destined for commercial purposes similar to former colonial palm grove in the region Oued Rhir (South-east Algeria).

The problem of this new oasis is located in their production systems, not much diversified, and mostly based on market dates production. On the other hand, our survey has shown bad collective managements of the hydraulics that insure the irrigation. Often, the mismanagement has an impact on water availability and tree’s productivity, from where the lack of interest of the diversification and the farming intensification is being confirmed. The development of this agriculture goes definitely through an improvement of the practice of managements. From other side, the farmers of this kind of agriculture have often an second incomes (salary, small business, or service), from this we find out how difficult to integrate new farming, whereas the livestock farming can be developed in that case and can improve the local production and the benefice of the agriculture.

### Suburban Oasis Farming

This kind of farming back to 1960 and it developed on suburban of old oasis, where the lands and hydraulic resources still spared from anarchic urbanization and pollutions. This area is characterized by its dynamic agriculture, structured farms with an easy access. Their proximity to urban market is an asset that allows them to ameliorate the production systems based on market garden and livestock products. The suburban oasis farming covers nearly 33% of the global farming surface.

In a perspective of development and food security, it’s a must that the suburban agriculture continues their booms.

It can be interesting to ameliorate their access conditions to factors of productions. Fruit agriculture can also be developed in that area and can be associated with market garden. Moreover, it is possible to boost the livestock activities besides that agriculture to increase the supply of milk and meat which are in shortage.

### Extra-oasis Farming

This agriculture is related to new farming perimeters created far from the agglomerations. This mode of farming is the most recent and the most widespread. Developed since 1980s and covering 56% of the farming area of the circumscription. In terms of surfaces, we can distinguish two farming categories. Small-scale agriculture around 2 hectares, generally created by the public authorities through collective perimeters and distributed by concession way. The second category represents large-scale agriculture with a surface from 10 to 1000 hectares.

Considering the constraint of remoteness, small farming is mostly based on perennials crops not demanding much work (date palm and other fruit trees). Whereas large-scale farming has enough material and means, most of them develop the cereals farming under center-pivot irrigation with require large surface and important materials. The extra-oasis farming has a good developing prospective due to huge resources and prospecting possibilities. It is remaining a potential for improving the food security in the region.

### CONCLUSION

This study shows that the agriculture in the region of Ghardaia, southern Algeria, has known many evolution stages, which has allowed a different mode of farming to be developed and promoted. Those evolutions are likely forced by the growing need of the population, however, other economic and environmental factors are involved in that.

The old oasis farming was created and maintained during a long period of time by the old population to insure their own subsistence. At the beginning of 1960s, the public authority tried to establish new palm grove farming with market vocation to improve the life conditions of the population and create new resources of incomes. This period coincided with the independence of the country, the gradual progress of the life conditions, and starting growth of the population, so new needs have been immersed. As well new farming process has been created at the periphery of the old oasis and destined for

supplying the oasis which are gradually transforming to anarchic urbanization zones.

Later, the rarefaction of the proximate land has forced the farming developer to create a new remote land form the oasis. This initiative was encouraged by the State at the beginning of 1980s. In terms of development, the old oasis palm grove presents critical situation due to anarchical urbanization, whereas the new developed area is characterized by dynamic and productive farming that contributes with great efficiency to the food security in the region.

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