

PRELIMINARY TYPOLOGY OF AGROBIOLOGICAL FARMS IN THE SEMI-ARID REGION OF ALGERIA

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Abstract

Algeria has shown a delay in terms of organic agriculture, although this latter covers diverse agricultural practices and structural potential that have shown to be advantageous to the development of this sector. However, the aim of this Paper is to elaborate a typology of organic agriculture in the semi-arid regions of Algeria, for the purpose of presenting a reading grid so as to be acquainted with the size, distribution and diversity of the organic crops within the study area; in virtue of which, a survey was conducted on the conduct and the structure of organic farm. Visits had also been made to eighty plots of land. Consequently, the results of this survey allowed us to group organic agriculture into three types on the basis of structural and operational criteria: the first type is certified, often modern, small in number, following international specifications, and frequently located in the East; the second one is mixed, respecting the standards of organic agriculture, not certified but large in size; as for the third type, it is traditional, in other words natural, and more widespread. Subsequently, organic agriculture in Algeria is limited in terms of space and number, whilst the majority of practices have shown to be of traditional nature, poorly supervised and controlled due to the technical, socio-economic and agricultural policy constraints.

Keywords: Algeria, organic agriculture, state of affairs, typology.

1. INTRODUCTION

According to FAO (2010), organic agriculture has access to many market opportunities at national and international levels. As a matter of fact, the demand for organic agricultural products is growing and being closely linked to the increasing awareness of the impact of food on human health and well-being. Additionally, organic agriculture is alike determined by technical specifications in the majority of developed countries, as their compliance is monitored by a certification institution. In other contexts, mainly in Africa, practices of farmers (due to lack of means or access to inputs) may be carried out, by default, in organic agriculture situations that are not certified by a third-party institution (Caplat, 2010).

In the Mediterranean, organic agriculture had been covering nearly 4.5 million hectares and 150,000 producers in 2013 (Agence Bio, 2015). In reality, it regroups a diversity of production types that vary according to geographical contexts (Bayiha et al., 2019). Furthermore, it has had different faces from one region to another and from one era to another. Nonetheless, as it often originated from marginal

environments, it has gradually gained legitimacy in most countries, with the exhaustion of the production-oriented agricultural model (Sylvander, 2005).

Indeed, Algeria has ultimately fallen behind the schedules in the development of organic agriculture. Since 2000, a very small area has been converted (Hadjou et al., 2013), 59 certified organic farms; in other words, more than 1,118 ha, were actually distributed in the four provinces of Biskra, Mascara, Mila and Relizane (Abdellaoui, 2012), the availability of a natural and diversified potential all the way through the national territory, édapho-climatic conditions favourable to organic agriculture and the will of the public authorities to develop organic agriculture (Benziouche, 2017), along with the existence of a large number of agricultural products being produced under extensive conditions which can be assimilated to organic products, so that their production process fulfils almost all the conditions required by organic agriculture (Agroligne, 2015).

In light of the facts outlined above, we propose, through this Paper to characterise organic farms and to elaborate a typology of organic agriculture in semi-arid regions; hence, we aim to identify both groups of observations with similar characteristics but which differ from one type to another, and groups which stand out in a significant way, based on a modelling action aiming to:

- Locate and quantify the different organic crops;
- Clarify diversity in order to make it easier to represent;
- Obtain a reading grid for a clear knowledge of the organic agriculture in the area;
- Build a classification to represent a complex reality (Bélières et al., 2017).
- Properly identify the constraints that prevent the development of organic agriculture.

2. EQUIPMENT AND METHOD

Presentation of the study region

The case of the semi-arid regions has been chosen as a study area, as being representative of the dominant agrarian realities in Algeria, characterised by a structural increase of the rural population and a dominant mode of production in extensive family farming. Besides, this choice has alike been dictated by the importance of the diversity of agricultural production systems in the region. The semi-arid climate corresponds to a Mediterranean climate, along with a rainfall varying between 300-500 mm/year, with drought no longer limited to the summer season but to a significant part of the year (Emberger, 1971).

Sampling and conducting the survey

The methods used to conduct the typologies depend on the intended objectives and the selected discriminating indicators (Hervé et al., 2021).

The first step constitutes the identification of the study region with a reasoned choice based on typology and characterisation studies (Ndiaye, 2018).

As for the second step, it involves the realization of the survey conducted from March 2020 until May 2021, with eighty certified and non-certified organic producers through a questionnaire (86 questions: quantitative and qualitative). Thus, in order to collect the necessary information, we identified a questioning pertaining both on the individual producer at the level of their farm and supplemented by direct observations (Eponon et al., 2017).

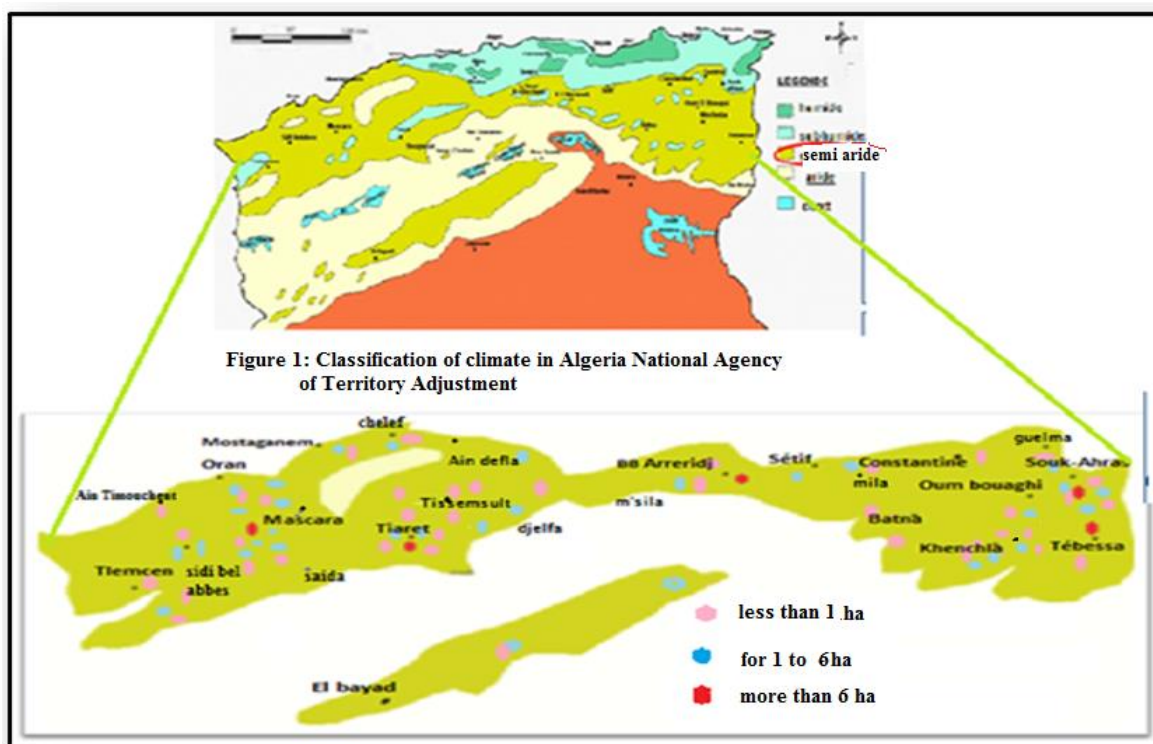


Figure 2. Presentation of organic farms subject to survey according to the surface in the semi-arid zones in Algeria (ANAT, 2004, modified)

Table 1. Distribution of farms in semi-arid regions

REGION	Organic surface Ha	Number of farms	Non-certified farm	Certified farm	Dominant crops
WEST	113	39	35	5	Olive tree, onion, Hard wheat
EAST	69	27	22	4	Saffron, prickly pear
CENTRE	35	14	14	0	Olive tree, medicinal plants
TOTAL	217	80	71	9	

Collected information and statistical analysis

The collected information includes farm size and age, organic crops, surface of the organic crops, certification and cultural patterns of conduct.

The data input was conducted through Excel and the database was then transferred to SPSS for statistical analysis purposes.

Descriptive statistical analysis was carried out to describe the series of values, alongside presenting them in the form of graphs and whisker boxes. Moreover, we adopted the Turkish comparison method

of averages (ANOVA). Subsequently, a classification to group the individuals (the surface) into classes was also performed (Eponon *et al.*, 2017).

The recourse to use the quantitative and qualitative analysis methods will lead us to provide explanations based on the opinions of the interviewed actors and the situations that took part of the environment (Ndiaye, 2018).

3. RESULTS

1. Characterisation of organic farms

Size of organic plots of land

The surface distribution of organic plots of lands is asymmetric (+ve) right-side asymmetry. Known from the line representing the second quartile (median =1.6 ha). The median is close to the first quartile (1.4), which explains the reason why most observations were made in small surfaces. Notwithstanding, there exists aberrant values with high values (represented by the circles above the box) (fig.3)

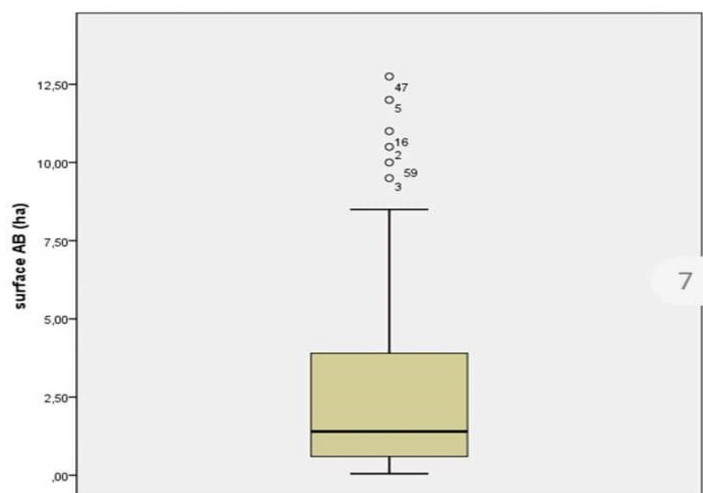


Figure 3. Box plot of the surface of the organic plots of land

Surface of the farms by region

The total organic cultivated area is about 217 ha. The analysis of variance revealed non-significant differences ($F= 0.14$ $p<0.05$) between the 03 regions (East, West, Centre) for the average size of the farms.

The greatest availabilities of land are observed in the Western region (especially in the province of Mascara, Relizane and Tiaret), which have a surface area of 113 ha, i.e. 52% of the surface area studied, whilst the Centre region (Bordj Bou Arreridj) extends over smaller surface areas of 34 ha approximately, i.e. 16%. The Eastern region (mainly Khenchla and Souk Ahras), occupies a surface area of 69 ha, i.e. 32% (fig. 2).

Among the organic farmers subject to our survey, 13% had immediately exploited all of their land surfaces, 74% had exploited between 20% and 99% of their land surfaces, and 13% had exploited less than 20% thereof (fig. 5).

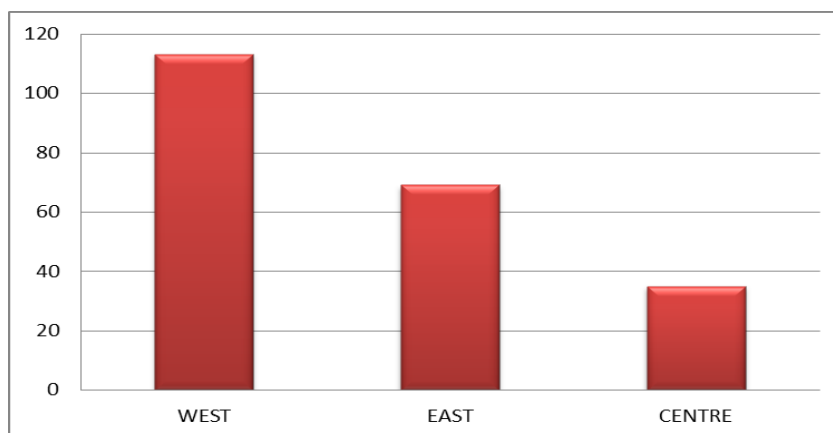


Figure 4. Distribution of surface areas by region (ha)

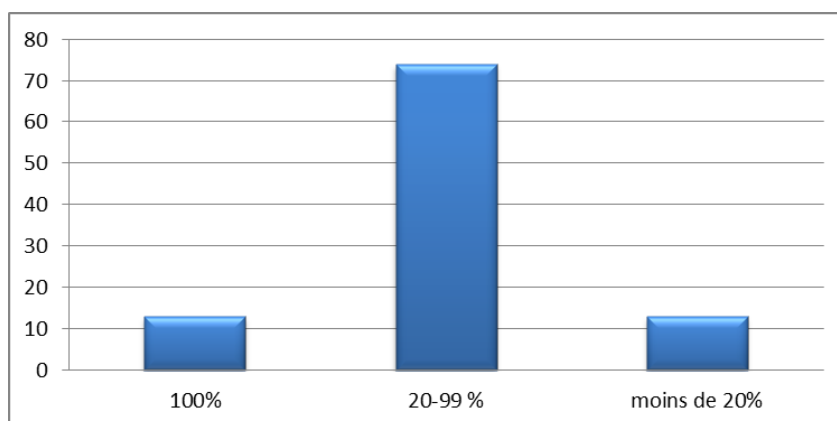


Figure 5. Part of the organic surface area under exploitation

Cultural pattern

The results pertaining to the cultural pattern show that more than half (66%) of the surveyed farmers adopt old techniques potentially adapted to family farming, pattern on small surface areas with a large workforce, diversified, based on the use of local resources, 25% based on the semi-modern mode and 9% on modern mode (Figure 11) .These last two modes are more mechanized than the previous case, with patterns on large surface areas, responding to different opportunities.

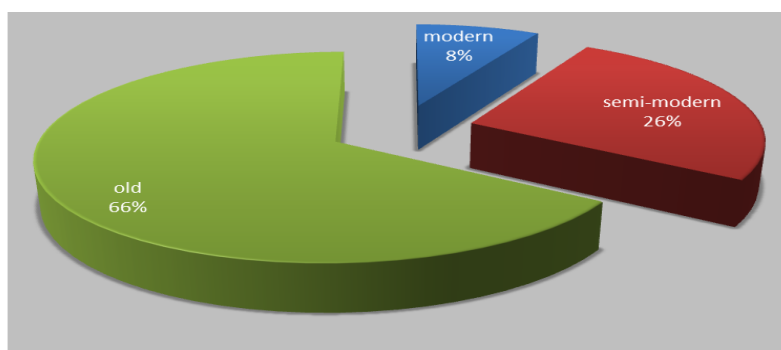
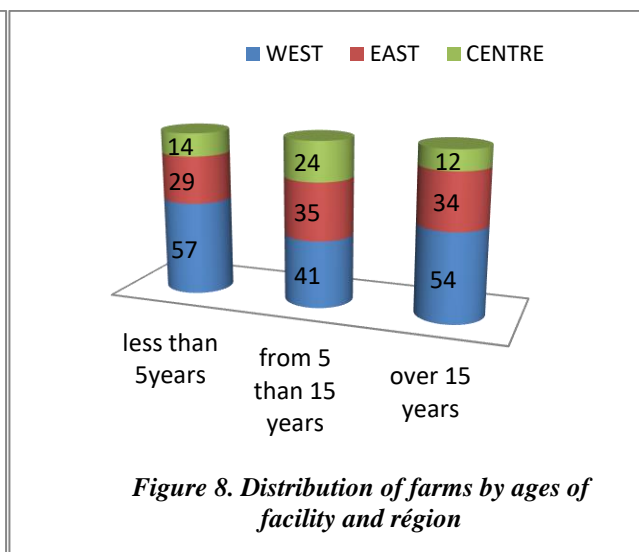
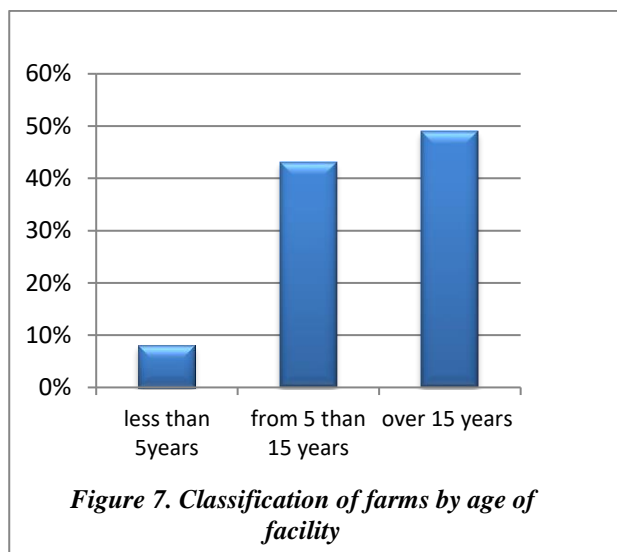


Figure 6. Distribution of cultural modes

Age of the organic farms

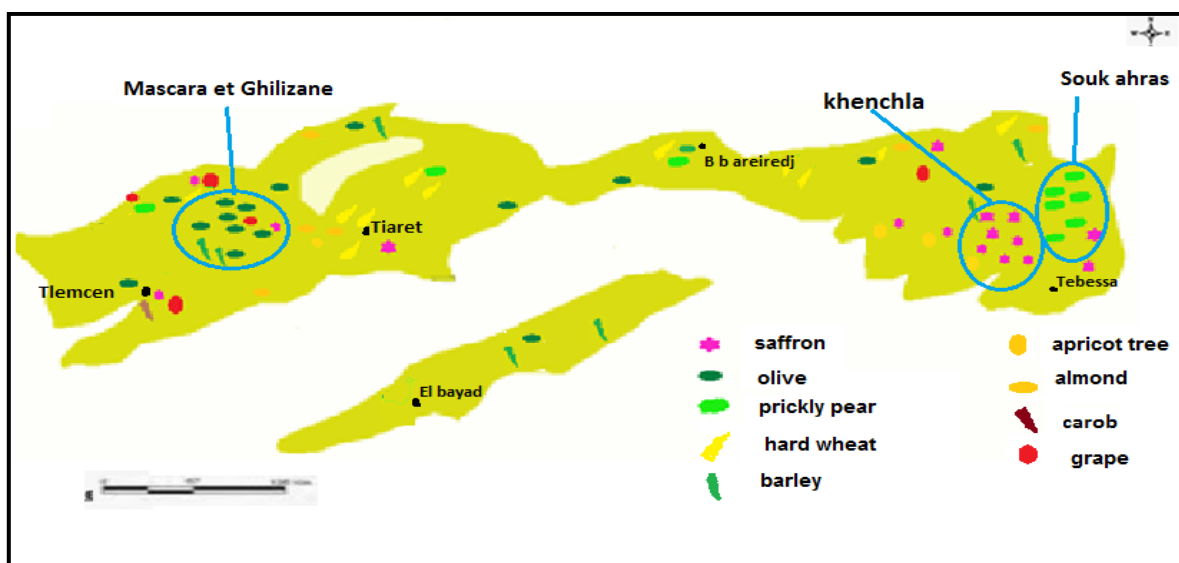
The average age of the organic farmers' facilities is 15 years.

The distribution of the visited organic farms into three age groups of facilities (less than 6 years, 6 to 15 years and more than 15 years), showed that farms older than 15 years represent more than 49% of the organic farms whose majority (54%) are located in the Western region (Fig. 7). Whilst 43% of the farms are between 6 and 15 years old with a more or less homogeneous geographical distribution and only 8% are less than 5 years old with the majority located in the West (57%) and East (29%) (Fig.8).



Distribution of organic crops

In the population subject to our study, crops are significantly variable according to farms, and from a region to another.



Indeed, cereal crops represent about 38% or 84 ha, of which hard wheat is the dominant crop, thus representing 56% of the cereal crop surface area distributed over different provinces. Besides, arboriculture activities of 39% or 82.5 ha are dominated by four crops as follows : 22.5 ha or 63% of olive production generally concentrated in the western region, in particular the province of Mascara and Relizane, 35 ha of prickly pear which is frequently located in the province of Souk Ahras (East), representing 75% of the surface area of the crop subject to survey, 3.5 ha of almond trees and 8 ha of carob, market gardening representing 12% i.e. 23 ha, whereat onion cultivation is dominant with 4.7 ha, medicinal and aromatic plants of 10% i.e. 20.6 ha based on saffron with a surface area of 15 ha from which 86% is concentrated in the province of Khenchla (East), leguminous plants of 0.8% i.e. 1.8 ha and 0.7 ha of viticulture (fig 9).

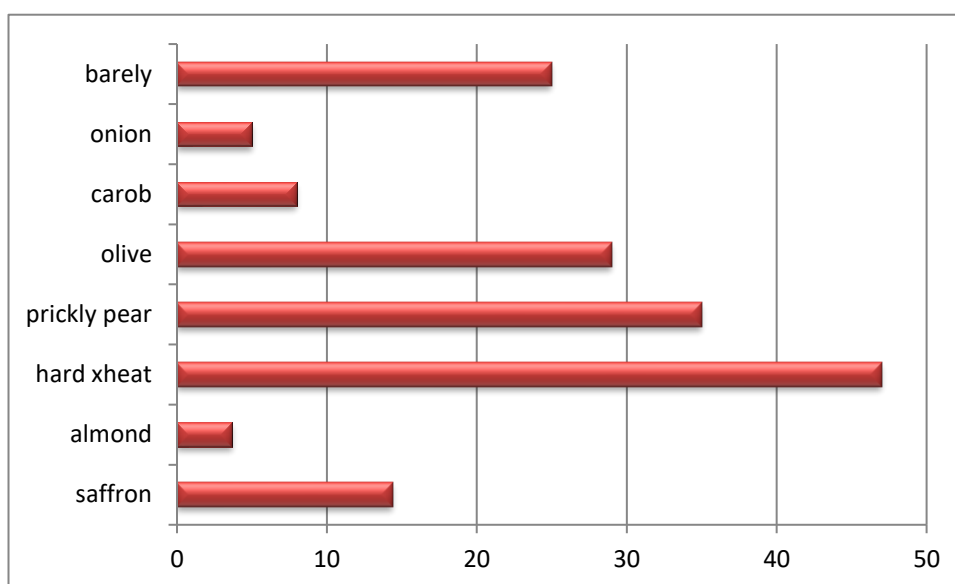


Figure 10. Surface areas of dominant organic crops (ha)

Certification process

In light of results obtained, we have classified organic crops into two categories: the first one is not certified, representing 89%, planted under extensive conditions; which production process meets almost all the requirements of the organic agriculture standards. The second category, consisting of other certified organic crops, depends on an embryonic stage and represents 11%, as it complies with the Specifications (Figure 11).

2. The typology of organic agriculture

Our surveys have revealed three types of organic agriculture in the studied regions:

Type I Certified organic agriculture

This type of organic agriculture covers 11% of the producers subject to our survey, whereat the analysis shows a positive correlation ($r = 0.678^{**}$) significant at the level of 0.01 between certification and cultural pattern. The production techniques used in this type have shown to be somewhat more modern. The certified agricultural products are intended for international markets.

Besides, farms of this type are more important in the eastern region (Khenchla, Souk Ahras and Mila), as it records 67%, compared to 33% in the western region (Ghilizane, Tlemcen, Tiaret and Mascara), whilst this type is not existing in the centre region (Figure 9).

Type II Non-certified mixed organic agriculture

It represents an entrepreneurial type of farming that is mainly intended for the local market. This type covers 23% of the producers subject to our interviews (Figure 12).

The agricultural practices associated with this type have shown to be modern and semi-modern, respecting the standards of the organic agriculture, without requiring any certification in the previous case, distributed more or less homogeneous across the provinces subject to our survey, with 41% in the West, 25% in the Centre and 34% in the East (Figure 9).



Figure 11. More important organic crops

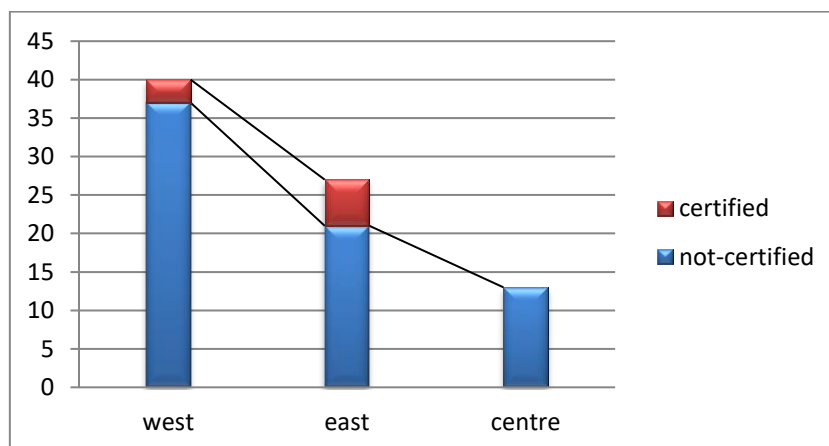


Figure 12. Presentation of farms according to their certification

Type III Traditional non-certified organic agriculture

The last type consists of the traditional organic culture based on the farmer’s knowledge or described as “natural”, where neglected farmers still use old techniques inherited from their parents, without recourse to synthetic inputs, in order to obtain a healthy and inexpensive production. This form of agricultural production of a unlikely mechanised food-producing is the most widespread production model representing about 66% of the organic farmers subject to our survey (Figure 12), and corresponding in fact to small-scale producers, generally practised in all the visited regions, namely, the rural and mountainous areas (Mascara, Batna, Tiaret and Setif) (Figure 9).

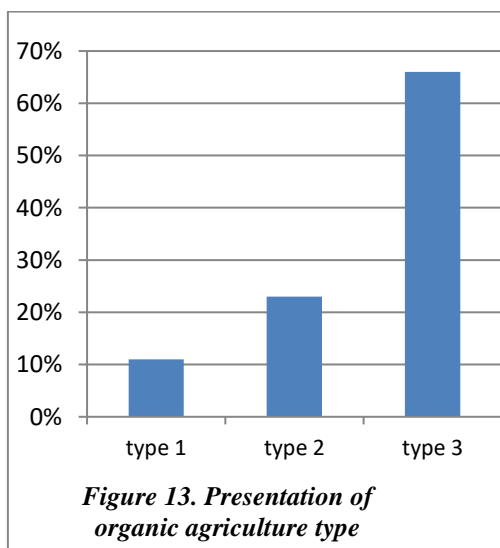


Figure 13. Presentation of organic agriculture type

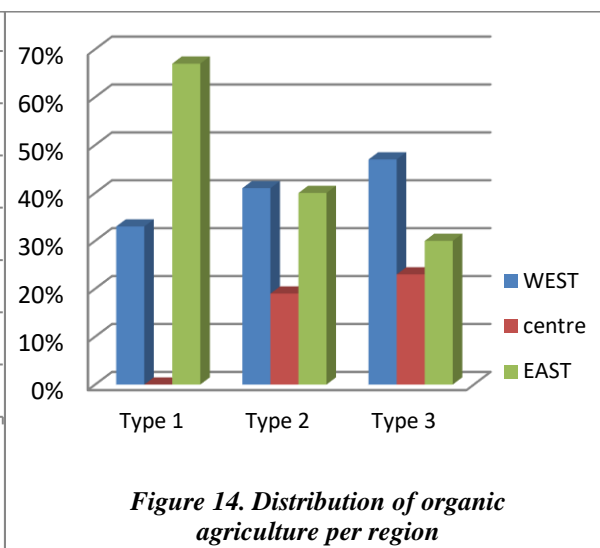


Figure 14. Distribution of organic agriculture per region

Table 2: Main characteristics of organic agriculture types

Variables	Modalities	Type I		Type II		Type III	
		Effective	%	Effective	%	Effective	%
The farming surface area	0 --- 2	4	44%	2	11%	38	73%
	2 --- 6	3	33%	15	78%	6	12%
	6 --- 13	2	23%	2	11%	8	15%
The region	West	3	33%	8	41%	24	47%
	Centre	0	0	5	25%	12	23%
	East	6	67%	6	34%	16	30%
The cultural pattern	Modern	5	55%	9	47%	0	0
	Semi modern	4	45%	10	53%	0	0
	Traditional	0	0	0	0	52	100%
The age of facilities	Less than 5 years	3	34%	3	19%	4	8%
	From 5 to 15 years	6	66%	11	55%	8	16%
	Over 15 years	0	0	5	26%	40	76%
Part of organic agriculture in the farming	100%	6	67%	1	5%	8	15%
	99 -20%	2	23%	8	42%	16	30%
	Less than 20%	1	10%	10	53%	28	55%
The certification	Yes	9	100%	0	0	0	0
	No	0	0	19	100%	52	100%

3. DISCUSSION

Analysis of the characteristics of three types of organic agriculture

The average surface area of the farms subject to our survey is assessed to approximately 2.7 ha. Besides, Type II farms occupy the largest area with an average of 5.7 ha, followed by Type I farms with 5.1 ha and Type III farms with 1.2 ha. These results confirm those obtained in some previous studies carried out in Algeria. Hence, the results attained in these studies (Bessaoude et al., 2019) showed that the preponderance of small farmers is a general characteristic of agriculture in Algeria. Only a small number of Types II and III farmers have converted only a part of their total area to organic farming, as they are still in a trial stage and they have yet to be ready to convert to organic farming. Thereafter, the means to achieve and succeed in this conversion must be accessible to them, and several obstacles can hinder the ability of producers to make the conversion; for instance, additional costs that are difficult to cover for most of small farmers (Journeau, 2013). In return, most farmers of Type I have immediately exploited their entire area to increase production and profits. The agricultural techniques practiced in Types I and II farms are more or less intensive and technological than those in the following case for the purpose of obtaining quality products. Type III

producers use old customary technical routines that are occasionally referred to as traditional, due to several reasons including the unavailability of resources (high costs of fertilisers and pesticides).

The analysis of the age of facility of the types of organic agriculture has shown that most of the non-certified farms (Types II and III) are old, which confirms the heritage of ancestral agricultural practices, and all of the certified farms are recently installed (less than 15 years), but remains low after efforts have been granted by the public authorities (National Agricultural Development Plan 2008) for the development and promotion of organic agriculture on the organizational and legal level in Algeria (Hadjou et al., 2013). More to the point, certified organic agriculture is based on exported and transformed agricultural products (prickly pear, saffron, olive oil, carob and geranium...). On the other hand, the dominant products in mixed organic agriculture are often cash crops, in respect such as olives, saffron, dried fruits, mushrooms and sage. Above and beyond, Type III is for the most part devoted to self-consumed food crops and technically easy crops (hard wheat, onions, barley, almonds and pomegranates).

Nevertheless, certified producers (type), adhere to either the European or the Tunisian certification (ECOCERT, QUALITEFRANCE...) and is known to be the closest and the most used certification in Algeria. Type II and III producers (89%) are unable to certify their production, due to the fact that the main constraint identified by these farmers is the high costs of organic certification. Indeed, a one-day inspection by a foreign certification entity, certification in Africa can cost between 500 US \$ and 3000 US \$ (Journeau, 2013), Besides, the farmers suffer from the obstacle of selling organic production and getting the premium price, which is behind the decreased number of registered certified farms in recent times, thus confirming the lack of investment in the creation of new certified organic farms.

As a matter of fact, certified organic agriculture has yet to be stable, as it involves a very small number of producers and has yet to have the institutional framework necessary for the desired development thereof. Likewise, it suffers from the remoteness of the certifying entities and the lack of exports of such organic products to solvent markets.

Mixed organic farmers, representing 23% of the organic farmers subject to our survey, are not moving forward and still remain at this entrepreneurial stage. In virtue of which, this type of farmers face difficulties to attain the total conversion of their surface area because of their incapacity to cover the costs during the conversion period.

In traditional organic farming, 73% of the organic farmers record a small surface area because the majority of the farmers face land problems, dominated by peasant practices due to the absence of technical support along with the lack of training of producers.

These last two types of organic farming face alike the difficulty of certification due to the absence of governmental support and financial assistance.

Other general obstacles that prevent the evolution of organic agriculture involve the low local and national demand for organic products. 80% of organic products are sold at prices similar to conventional products due to the absence of marketing procedures and consumer awareness campaigns dedicated for the promotion of organic products.

4. CONCLUSION

The results of our interviews with organic farmers in farms have allowed us to determine a classification of their farms, based on variables of structure and functioning, which brings out three

groups. Type I consists of certified organic farming, Type II implies non-certified mixed organic farming and Type III represents traditional non-certified organic farming.

This typology shows that the environment is generally not very favourable for the development of organic farming in Algeria.

From the beginning to the end of the analysis of the characteristics of the above-mentioned three types of organic farming, we conclude that organic farming in semi-arid regions has shown to be an old production system, at present dominated by peasant practices, with a very small surface area, poorly exploited, with limited supervision, except for some recent provisions, after going through a difficult start.

Indeed, this better understanding of the organic agriculture sector helps to predict solutions for the evolution of the organic agriculture situation in Algeria, and in the semi-arid regions in particular, namely throughout permanent control and training of small farmers as well as achievement of fair trade.

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