Typology of farms in the region of Ouargla "bowl of Oued Mya" by using the MCA

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Abstract- The region of Ouargla "bowl of Oued Mya" characterized for centuries by phoenicicoles farms knows strong socio-economic and cultural mutations that have strongly affected the agricultural sector since several decades. The introduction of new production systems by pioneer fronts resulted in various forms of organization and farm management. In order to understand this diversity and define the characteristics of the farms, we based on a structural typology. Treatment data by MCA under SPSS, thereafter hierarchical ascendant clustering followed by K-means analysis allowed us to determine the number of classes corresponding to the types of agricultural farms. Based on the most discriminating variables, we cleared the characteristics of each farm type. From this study we determined the most discriminating variables including the professional identity of the farmer, the importance of farms, seniority, location, size of the farm and the dominant culture. Clustering indicate five types of farms, namely: ancient irrigated farms, "bours" farms, the improved farms, small new farms and at last the medium and large farms.

Keywords: Farm, Typology, Structure, Ouargla, Oued Mya

I. NTRODUCTION

The region of Ouargla, also called bowl of Oued Mya has, for centuries been characterized by a unique production system, commonly known as "oasis system", "creates the price of self-abnegation, this system is common in traditional palm groves in family farms of small size " « crée au prix d'abnégations, ce système est répandu dans les palmeraies traditionnelles en exploitations familiales de petites tailles » [1].

The increase of agricultural land has been at a modest rhythm "for a century, the map of Oasis has not changed, it is only densified" « pendant un siècle, la carte des oasis n'a guère changé, elle s'est seulement densifiée» [2], it was the extension of the oasis areas by the farmers, goshawks ksour[1]. However the development of agricultural land began dice, 1983, as part of the law relating APFA[2] 83-18 and executive Decree 97-483 concerning the concession of agricultural land, encouraged by the availability of huge water resources and soils suitable for development has created a spectacular agricultural dynamic. This new policy resulted many news form of farms, some of which are of the order of hundreds and even thousands hectares for the development of strategic cultures including cereals, others of a few dozen hectare intended for vegetable crops and also, allotted perimeters versatile of 2 or 4 ha.

The beneficiaries of these agricultural lands are not necessarily farmers, because entrepreneurs, potential traders, pensioners and even the unemployed are part of the list of neo-farmers, encouraged by incentive measures that the state has set up. "Is this social category which, in Algeria, was encouraged by the government to invest at important surfaces, and sophisticated technical means to develop an Saharan cereal production. This form of capitalist development has taken some boom in the country of Ouargla, Mzab and Touat "(M. Côte, 1999). « C'est cette catégorie sociale qui, en Algérie, a été encouragée par les pouvoirs publics à investir sur des superficies importantes, et dans des moyens techniques sophistiqués, afin de développer une céréaliculture saharienne productiviste. Cette forme de mise en valeur capitaliste a pris un certain essor dans le pays de Ouargla, le Mzab, le Touat » [3].

As result, we have several category of farms which differences can be attributed to several criteria whose the main structural indicators can be used to construct a typology of farms.

In this article, we will present the study area, the approach for building typology including the variables used for conducting surveys. Finally, we present the results of the statistical analysis through the identification and characterization of the different types of farms.

II. MATERIAL AND METHODS

A. The region of Ouargla

The region of Ouargla, also called the bowl of Oued Mya "is in fact the lower valley of the Oued Mya that flows with the Oued Mzab and Oued Nsa at sebkha Safioun. We can

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[1] Plural of Ksar which refers to a type of fortified village
[2] Homeownership Agricultural Land by the law 83-18 of August 18, 1983

consider that the "country of Ouargla" begins at the south with the ruins of Sedrata and ends at the entrance of sebkha Safioun, 40 km at north." «est en fait la basse vallée de l'Oued M'ya qui se jette avec l'oued Mzab et l'oued Nsa dans la sebkha Safioun. On peut considérer que le « pays de Ouargla » commence au sud avec les ruines de Sédrata et se termine à l'entrée de la sebkha Safioun 40 km plus au nord.» [4].

It covers 19,000 km² [5] and is administratively composed of six cities; Ouargla, Rouissat, Ain El Beida, Hassi Ben Abdellah, Sidi Khouiled and N'Goussa. The resident population is estimated at 266,314 habitants [5].
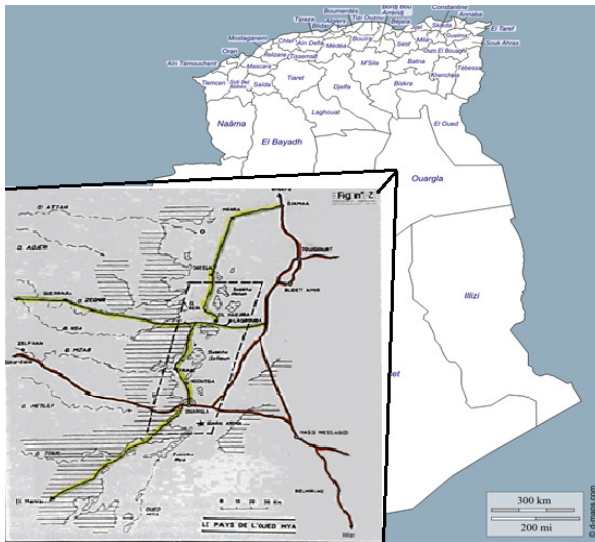

Fig.1: Situation of the region of Ouargla (Oued Mya).
Source of the map of Oued Mya, Côte M, 2016 [6].

Farming which occupied formerly, with nomadic, the whole population, occupies currently just 16% [5] of the working population but remains the basis and reason of being of local people.

B. Choice of typology
Knowing that, "the elaboration of typologies consist to identify the groups of rather similar farms between them for presented the same operating characteristics and, thereby, be indebted for the same modes of development." «l'élaboration de typologies consiste à identifier des groupes d'exploitations assez semblables entre elles pour présenter les mêmes caractéristiques de fonctionnement et, par là, être redevables des mêmes modes d'action de développement. » [7], for the Saharan regions "Two methods are suggested, the first method built the typology of production systems starting situations and farmer's projects (Brossier J. & M. Petit 1977). The second method, built the typology on based on classification variables called of structure ". « Deux méthodes sont suggérées, la première, bâtir la typologie des systèmes productifs en partant des situations et des projets des agriculteurs (Brossier J. & Petit M. 1977). La deuxième méthode construit la typologie sur la base de variables de classification dites de structure»[8].

According Sebillotte "In agricultural practice, engineering judgment is always coupled with a socio-economic judgment because the objective is to optimize a set of activities, of a farm, a region or a country." «Dans la pratique agricole, le jugement technique est toujours doublé d'un jugement socio-économique car l'objectif est d'optimiser un ensemble d'activités, qu'il s'agisse d'une exploitation agricole, d'une région ou d'un pays » [9].

So we retained as goal to make a structural typology of farms in the Ouargla region in the order to understand the first level de characterization of the diversity of farms.

It is the descriptive typology based on a set of qualitative and quantitative variables that can be used for qualitative purposes. "Typologies that we call" structural ", that is, essentially based on the nature and modalities of organizing and combination of means of production. "« Les typologies que nous appellerons « structurelles », c'est-à-dire basées essentiellement sur la nature et les modalités d'organisation et de combinaison des moyens de production.» [10].

Our approach is as follows:
- Determining the region of study;
- Pre-investigation in order to select our sampling;
- Investigations;
- Statistical treatment.

C. Pre-investigations and investigations
Our approach is based on surveys. The survey unit is "the farm." The questionnaire is semi-open type.
Pre-surveys were conducted in the various agricultural areas of the region where we have identified nine categories of farms for which, we attributed, to start, the names the most commonly used. Then we have: Irrigated traditional farms, farms called "bours[3]", those SAR[4] (of colonial period), farms of agrarian revolution, small APFA, concession, medium sized farms, large sized farms and agricultural enterprises. These different categories have already been the object of identification (Chaouch 2006) [11].
For investigations, we selected a sample of 219 farms, 18 variables and 65 items. The variables used are; seniority, location and legal status of the farm, age, level and professional identity of the farmer, importance of agriculture, manpower, farm size, dominant culture, variety, alignment and age of palms, second culture, breeding, income, irrigation and drainage.

D. Treatment of data
Treatment of data was carried out by SPSS, a matrix 219 farms x 18 variables (with 65 items) was submitted to the Multiples Correspondence Analysis (MCA) for a first analysis data. The most discriminating variables were the basis for a classification by the method of Ascendant Hierarchical Clustering (AHC) which, through dendogram, determining the number of classes. Finally, the k-means

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[3] Farms based on direct water supply from groundwater
[4] Rural Agricultural Sector

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analysis, allowed synthesized all the surveys elements to characterize each type of farm.

III. RESULTS AND DISCUSSION

The examination of Table 1 shows that Cronbach's alpha near to 1, indicates a reliability of the model, which the summary and the eigenvalues diagram (fig. 02) show that all the factors that we have entered, identified two axis where the first represents 63.71% of the variance and the second 35.75% totaling together 99.46% which is very satisfying for our study.

Table 1: Model Summary

Dimension	Cronbach's Alpha	Variance Accounted For		
		Total (Eigenvalue)	Inertia	% of Variance
1	,966	11,427	,635	63,485
2	,891	6,300	,350	35,003
Total		17,728	,985	
Mean	,939	8,864	,492	49,244

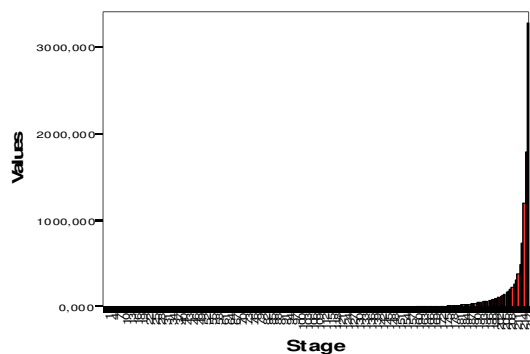**Agglomeration Schedule**

Statistics : Coefficients

Fig. 2: Diagram of the eigenvalues

Knowing that for the same axis, more the discrimination measure of a variable is great, more it contributes to the formation of this axis and its meaning; the results of our MCA are as follows:
- For the first axis, we notice a strong contribution of the variables related to the identification of farms; the legal status (0.983), seniority and location of farm (0.970), followed by the dominant culture (0.837). The contribution of the variables related to the human component including the professional identity of farmer and manpower (0.832). On the same axis also appears the contribution of variables; size of farm (0.821), the second culture (0.813), place of farm.
- About the second axis, the strong discriminating variables are the professional identity of the farmer (0.945) and the place of farm (0.805).
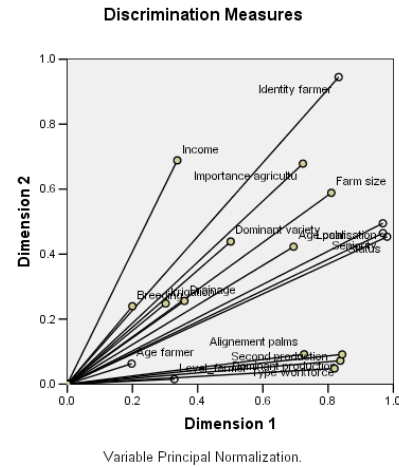
Discrimination Measures

Variable Principal Normalization.

Fig. 3: Discrimination measures

The fig. 03 confirm the importance of descriminants variables on the first axis and that, the variables "professional identity of the farmer" and "place of agriculture" are variables that discriminate on the two axis.

It is noteworthy that the variables related to the farmer such as age and level does not contribute in the formation of axis and, only professional identity of the farmer can discriminate. Indeed, regardless of age and level of the farmer, experience, knowledge, practices acquired from generation to another and the importance he accorded of farm, which dictate the success or failure of agriculture.

Whether he is farmer, nomad, or investor recently poured in agriculture, the farmer is the fundamental key to the success or failure of farming, confirmed by Bouammar "Obviously it would be futile to inject funds into the agricultural sphere if in parallel we do not act on the development of man. Any agricultural development action must deal with the main actor who is the farmer (...).».« Il est évident qu'il serait vain d'injecter des fonds dans la sphère agricole si en parallèle on n'agit pas sur le développement de l'Homme. Toute action de développement agricole doit composer avec l'acteur principal qui est l'agriculteur (…) » [12].

Regarding the studied items, the graph below under the parabolic shape known as "Guttman effect" confirm the existence of multiple links between the answers of farmers particularly for the strong discriminating variables "This kind of configuration occurs when precisely there has multiple links between answers". « Ce genre de configuration se produit quand précisément il y a des liens multiples entre les réponses.» [13].
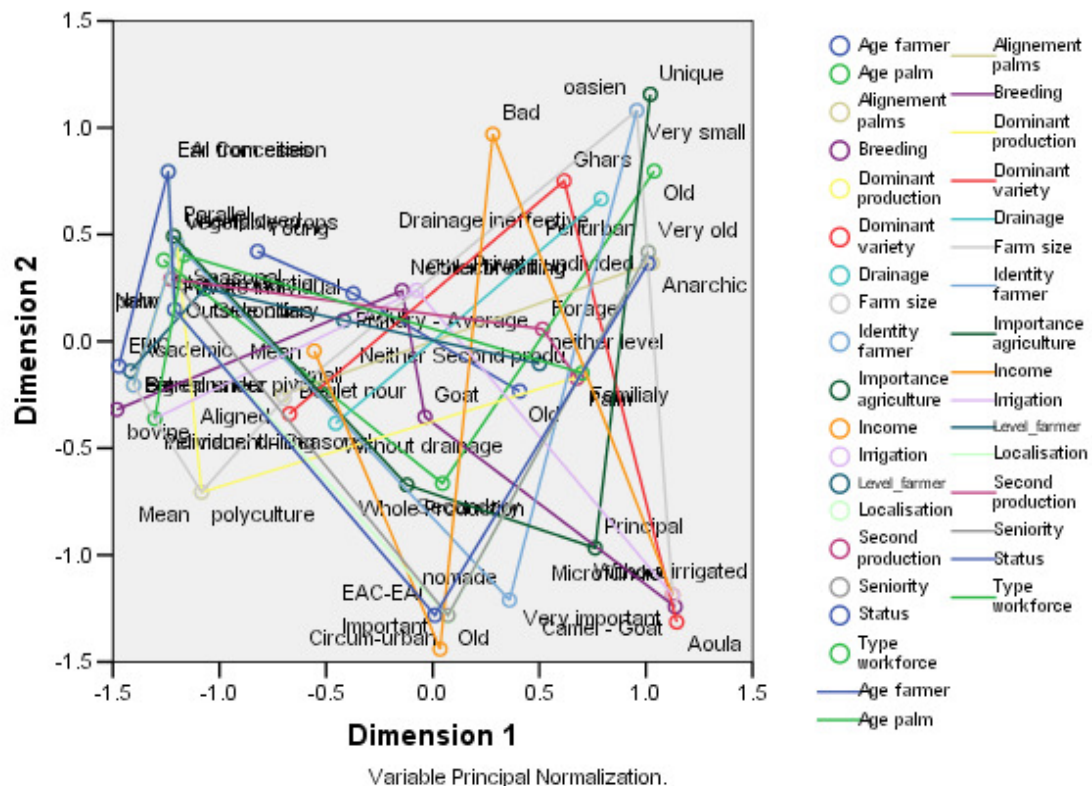
Fig. 4: Joint plot of category points

The fig. 4, oppose clearly the farms of very small sizes and microfundio to large farms compared to the first axis. Compared to the second axis, the extreme sizes farms opposed to medium-sized one. The same configuration appears for the variable "located of farms", the peri-urban and circum-urban farms are clearly opposed to farms outside and far from the cities to the first axis. These extreme cases are opposite to the circum-urban farms that we consider medium to the second axis.

For the variable, "importance of farm", the graphic opposes the farmers for whom farming is the only activity to those having another functions in parallel. Compared to the second axis, both these cases are opposed to farmers having agriculture as a secondary activity where the farmer is trying to take advantage but risk of neglect, sell or just give up his farm. All these relations will be taken up for the characterization of each farm type. All these relations will be taken up for the characterization of each farm type.

A. Determination of the number of farm types by clustering
Following this first analysis and on the basis of the variables retained we carried out an analysis Ascendant Hierarchical Clustering (AHC) based on the method of "Ward Linkage" that promotes the formation of

homogeneous groups in the aim of determining the number of classes in our study.


Fig. 5: Hierarchical tree or dendrogram

The dendogram or the hierarchical tree in the fig. 05 above shows that the length of the branches represents the distance between clusters and the best cut for the representation of this "clustering" is that at five clusters or types of farms.

B. Characteristics of farm types

Following this hierarchical classification we applied the method of classification k-means where the table "Cluster Membership" determines the allocation of individuals by cluster and shows that the five types include the following categories:

- The type concerning the only category of ancient irrigated farms, called also the traditional farms;
- The type of farms named "Bours", where are ranged only the farms "Bours",

- The type of improved farms, comprising the farms SAR (of colonial period) and the agrarian revolution farms;
- The type of the new small farms comprising all the small farms attributed by APFA and Concession.
- The type of medium and large farms where are regrouped the medium sized, the large farms and agricultural enterprises.
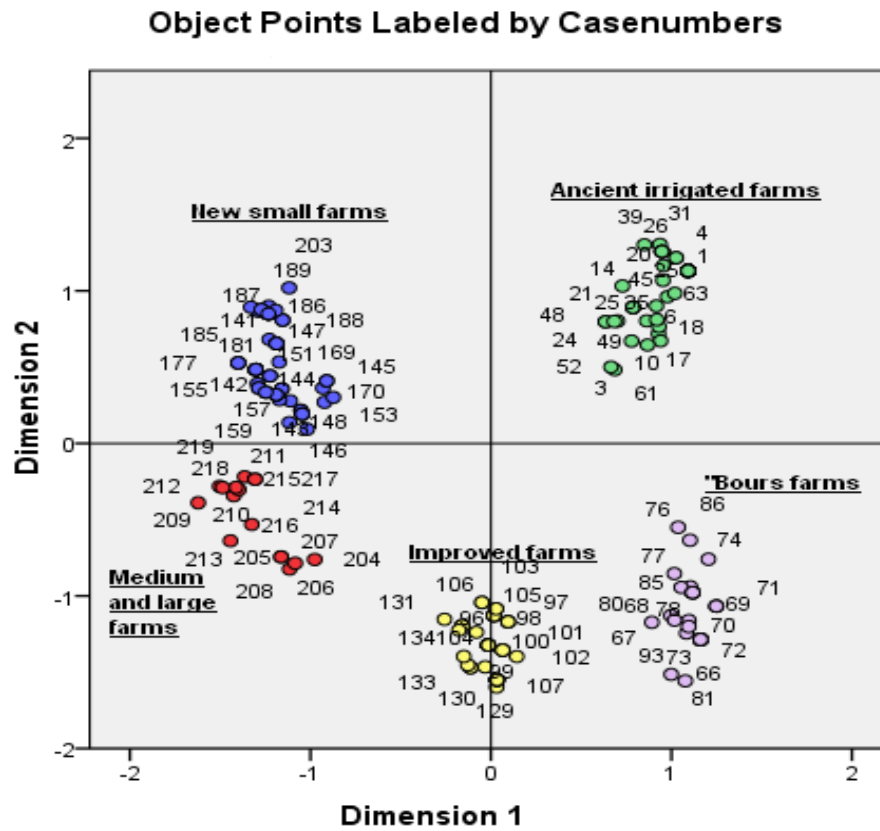
Fig. 6: Types of farms in the region of Ouargla

The descriptive study of all the variables through ANOVA based on F test shows that, overall, the most useful variables for identifying different clusters and most significantly discriminating between groups are: the irrigation followed by the seniority of the farms and their size, dominant and secondary culture.

The final cluster centers can give meaning to each type, then we present in the following the five types of farm, the most significant variable and the fundamental characteristics of each type.

1)   *The type of ancient irrigated farms:* this type concerns the category of traditional irrigated farms where the most discriminating variable is "the importance of

farm". The legal status is the customary private undivided usually obtained by inheritance.

These ancient farms dating back centuries are situated in the heart of the bowl of Oued Mya. They have heterogeneous and very small sizes (0.1 ha) on average, however, The farmers do not attach importance to the concept "surface", it is the tour of water and the number of palm trees that counts.

This type is based on date palms at dominance of the variety "Ghars" very adapted to local conditions, with little underlying cultures increasingly scarce, as well as goat breeding that which is consistent with the almost total lack of any construction then the income is generally very low.

Irrigation is assured from collective drillings, but with very poor drainage deteriorated following the abandonment of farming and also the extension of the city at the expense of the drainage network.

Farmers of filiations are older in their majority and agriculture is the only activity and they rely, therefore, on other family members for family expenses. The younger prefer other activities and class farm as a secondary activity.

The family labor is limited in most cases, only one person to pollinate palm trees and harvest dates.

2)   *The type of farms named "Bours"*: this type of farms is highly discriminated by the variable irrigation. Indeed the water supply is ensured by the capillary rise of the groundwater. Farms are form of cells where are planted thirties or fifties date palm. Here the notion of "surface" is insane and the farmers talk about the number of palms.

This type is characterized by the local varieties called Aoula and also Ghars. The breeding is essential and it is consists, average, of about twenty goats and some camels, unfortunately, in continuous decline.

The complementarities between crop production and livestock imposed a housing system and zeribas[5] very close, making it more manageable agricultural and livestock activities for these peri-urban farms, private and undivided.

Farmers are nomads settled for several decades, generally older. The younger one, prefer other activities, particularly in the oil sector. Manpower is familial and usually limited to the manager himself. The income of these farms Bours is better due to yield of palms average 140 kg/palm with peaks up to 200 kg/palm, probably the highest of all farms phoenicicoles[6] in Algeria.

3)   *The type of improved farms:* This type includes the categories of farms at status legal EAC and EAI. They are the farms (SAR) of the colonial period and the farms of the agrarian revolution (1970). The discriminate variable is the dominant culture; date palm through Deglet Noor variety.

These circum-urban farms are the first created by authorities and called "improved". They are homogeneous, of 1 - 1,5 ha, the alignment of palm trees, the distance between palms trees and the exclusivity of the Deglet Noor variety, differentiates significantly this type. Irrigation is done from drillings collective. Rare are the farms having breeding and when they exist, they are limited at a few goats.

The farmers, nomads, become sedentary since a few decades are over 70 years old and the manpower is family to an average of only one person.

4)   *The type of the new small farms:* This type includes small farms created by the Law APFA (1983) and those of the concession (1997) as a small farm of 2 ha and

which are clearly discriminated by the "localization" variable. This is the first experience of farms outside cities and far from cities.

These farms are based on the production of vegetable crops with high added value, such as watermelon preseason at the concession farms at Khchem Rih which has become a pole of this culture in the Sahara and even nationally.

The remoteness, lack of housing and the predominance of seasonal cultures are causing the lack of permanent workers and the predominance of seasonal. Young palm trees of the variety Deglet Nour and increasingly Ghars, are conditioned by the availability of water, production of date is still in its infancy with low yields.

It's not a question here of "real farmers", beneficiaries whose professional identity is multiple, pensioners, civil servants and especially the unemployed have benefited from the incentives granted by the State in the aim to promoting the agricultural sector. The result is not always satisfactory; only 1/3 of the assigned area that is really cultivated.

5)   *The type of medium and large farms:* they include medium, large farms and agricultural enterprises. They are very significantly discriminated by the professional identity of the farmer, these entrepreneurs, potential traders; and even executives and doctors have seized the opportunity of investment in the sector and benefiting thus the support of the state.

They located outside urban centers, private status legal these farms have one or two drilling individual and are dominated by permanent and seasonal manpower.

The farms of medium size (30 ha) are located at Hassi El Khefif and based on the production of market gardening and fruit growing that gave good results with date palms. The constructions serving as housing for workers, and zeribas for livestock; usually of twenty goats are characteristic of these farms.

The farms of large sizes (64 to 200 ha) with the enterprise farms (1600 ha) are located in Hassi Ben Abdellah and Ain El Beida. They were created in order to produce cereals under pivots but the continual drop in yields (40 to 45 quintals/ha, farms today produce only 20 quintals / ha) (Chaouch 2006) [11] obligate the farmers to opting towards the forage crops and date palm giving, for the moment, the modest yields. Housing for workers, sheds and barns for certain farms having a bovine breeding 10 to 30 heads.

CONCLUSION

The region of Ouargla is one of the Saharan regions, the most influenced by the socio-cultural and economic mutations that have generated several categories of farms known by the different characteristics both physical and human.

The typology of these agricultural farms is based on the structural variables and the initial investigations revealed nine categories of farms in this region across its agricultural areas.

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[5] palm-based livestock shelters
[6] On the date palm (date palm cultivation)

The MCA shows that the most discriminating variables related to the human component in particular the professional identity of the farmer and the importance which he grant to agriculture, followed by the legal status, seniority and location of the farm, the dominant culture, the second one, the size of the farm and the manpower. Clustering followed by K-means analysis allowed to distinguish and characterizing five farms types named; irrigated ancient farms, "bours" farms, the improved farms, the type of the small new farms and the medium and large farms types.

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