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A Survey on the Production Potential of Bread Wheat in Public Agricultural Establishments in the Province of Setif-Algeria

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Abstract – The present survey was carried out at seven public agricultural establishments spread over the territory of Setif province. This investigation has brought out a more detailed diagnosis of the unsatisfactory reality of bread wheat production in relation to the natural, human and financial available capabilities. Results revealed that PCA analysis explained 64% of total variance including for 37% of the variation explaining variables related to agricultural land occupation namely SHD1220 and SBT being the major factors, the hierarchical ascendant classification allows to subdivide the public agricultural establishments into two distinct groups, dominated by the largest agricultural establishment *Makhloufi Aissa* characterized by a large sown area averaging 777.6 ha/growing season and a modest average yield of about 11.6 q over the five growing seasons, while the rest of establishments were characterized by a small sown area as well as a much lower yield.

Keywords –Triticum Aestivum L., Cultivated Area, Yield Production, Public Agricultural Establishments, Setif Province.

I. INTRODUCTION

Algeria covers 238 million hectares total area of which 191 million are occupied by the Sahara. The agricultural area represents 3% of this total, the useful agricultural area is around 7.14 million hectares, of which almost half is left fallow each agricultural season [1].

Cereal cultivation is an important economic sector. Indeed, it is a staple food of a very large part of the world's population. Producing more cereals has become a deal of concern for Algeria, whose needs, for a growing population, are estimated at more than 111 million quintals around 2020 [2].

Herbaceous crops cover 3.8 million hectares, although wheat cultivation is the main activity, especially in arid and semi-arid areas. The land sown annually represents 3.6 million hectares or 50% of the plowed land [3].

This survey aims to look into the reality of bread wheat production in the province of Setif by its position in the national cereal production being an important product for bread-making. In this context,

the present survey was carried out on the seven existing public agricultural establishments over Setif province in order to highlight the real capabilities and the disadvantages of bread wheat production.

II. MATERIALS AND METHOD

A. Survey Location

The survey of the present study was carried out at seven public agricultural establishments existing over the province of Setif, as geographical distribution is illustrated on Figure 1.

Fig.1. Locations of the public agricultural establishments over the Province of Setif.

B. Data Collection

During this investigation, recorded data for each public agricultural establishment, focused on detailed bread wheat situation during five years from 2015 to 2020 including the cultivated area, the irrigated area, the cultivated varieties, the annual production and corresponding yield. The data collected at the level of the seven public agricultural establishments were tabulated and organized into groups, as shown in table 1.

C. Statistical Analysis

Statistical analysis was made using a principal component analysis (PCA) and then a hierarchical ascendant classification (cluster analysis) tests.

Serial	Agricultural establishments	Administrative Location	Cultivated area (ha)	Cultivated Variety	Irrigated area (ha)	Gross Production (q)	Yield (q/ha)
1	*Cheikh El-Aifa*	Bougaa Ain Aroua	124.33	HD1220	0	1399.2	10.6
2	*Sersour Salah*	Ain Azel- Bir Haddada	145.0	HD1220 Anapo	0 25	1449.0 400.0	12.4 16.0
3	*Lagmara Rabeh*	Ain-Arnet Ain-Arnet	102.33	HD1220	0	1861.36	17.68
4	*Makhloufi Aissa*	El-Eulma Djarmene	777.6	HD1220	20	9097.0	11.6
5	*Khababa Abdelouaheb*	Ain-Arnet Mezloug	179.33	HD1220 Anapo	100 0	2184.6 300.0	13.6 15.0
6	*Chakhchoukh Messaoud*	Djemila Beni foudha	150.0	HD1220	0	2370	16.2
7	*Bouteraa Mahmoud*	El-Oueldja Bir El-Areche	124.33	HD1220 Enforta	0	943.98 600.0	9.92 10.0
Total	#######	###########	1602.92	######	145	20605.14	12.85

III. RESULTS AND DİSCUSSİON

A. PCA Analysis

Data set was studied through PCA to get outline of relationship among the tested parameters. The loading plot (Fig. 2) depicted the liaison of these parameters with each other.

On the scatter plot, two dimensions are listed along the X-axis (Cultivated area, ha) and Y-axis (Grain yield, q/ha). As following, these axes explain 64% of the cumulative variance.
Principal component 1 (PC1) accounted for 37% of the variation and explained much more the variables related to agricultural land occupation which are the area sown by Hidhab variety (SHD 1220) and the

total area sown by bread wheat varieties (SBT) being the major factors.

Note that SHD1220 and SBT were closely located on the same side of the loading plot indicating major contributors of agricultural land occupation, while areas sown by Enforeta (SENFORETA) and Anapo (SANAPO) were located closely on the other side of the loading plot.

Principal component 2 (PC2) accounted for 27% of the variation and explained much more the variables related to agricultural land production with grain yield performances; which are the grain yield produced by Hidhab variety (RHD1220) and average yield of all bread wheat varieties (RBT) representing the major contributors.

It was clear from Fig. 1 that wheat varieties with high value of SBT would produce poor yield RBT.

The parameters; average area sown with Enforeta variety (SEFORETA), irrigated area (SI), area sown by Anapo variety (SANAPO), yield of Anapo variety (RANAPO) are placed almost juxtaposed in the center of the plan and appear without any effect on the discrimination of agricultural establishment groups.
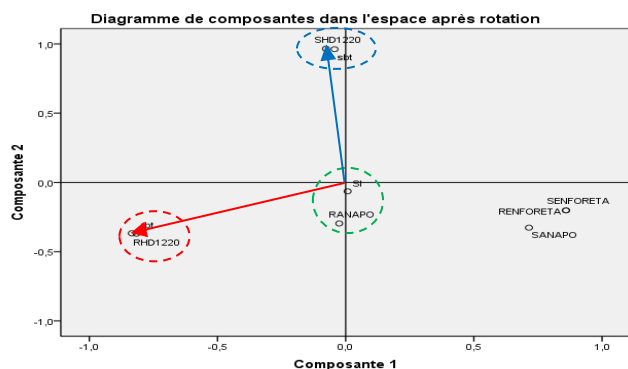

Fig.2. Biplot graphical display of the studied parameters

B. *Hierarchical Ascendant Classification*

Based on a principal component analysis of these five variables belonging to the seven public agricultural establishments and by using only the discriminating variables extracted by the PCA which are: area sown with Hidhab variety (SHD1220), total area sown by bread wheat (SBT),
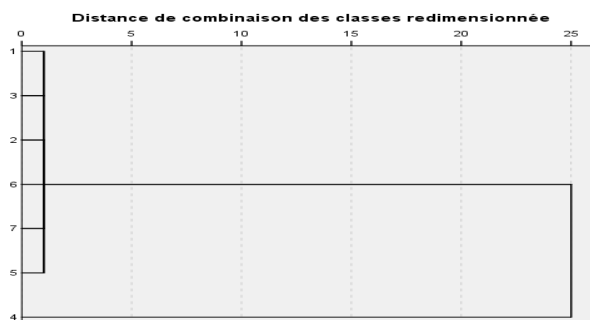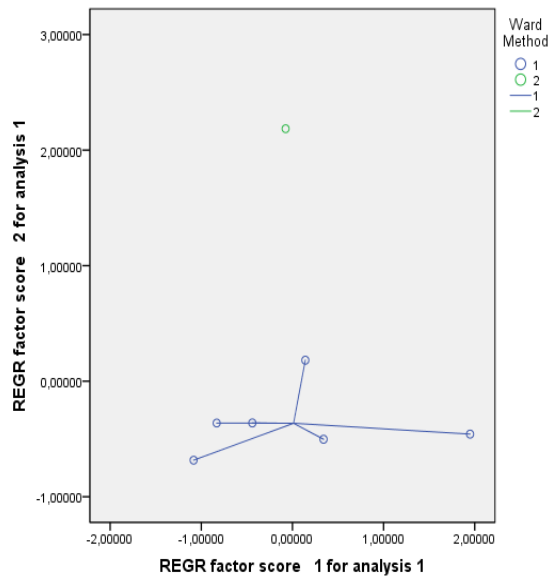

Fig.3. Identification of public establishments groups

average yield of overall bread wheat varieties (RBT) and yield of Hidhab variety (RHD1220), the Hierarchical ascendant classification was represented by a dendrogram that subdivide the public agricultural establishments into two very distinct groups, as shown on figure 3, via the Hierarchical tree using Ward Distance:

- Group 1: was represented by *Makhloufi Aissa* establishment and characterized by a large sown area with Hidhab variety (SHD1220)with 777.6 ha per growing season and a modest average yield (RBT) of about 11.6qx
- Group 2: was formed by the rest of establishments: *Sersour Salah, Lagmaraa Rabah, Chakhchoukh Messaoud, Cheikh-El-Aifa, Khababa A/ouahab* and *Boutaraa Mahmoud* which characterized by a small sown area with bread wheat (SBT) of about 20 ha, namely the two varieties Enforeta and Anapo, a good yield for the Enforeta variety (RENFORETA) but a much lower average yield (RBT) grouped together as illustrated on figure 3.

To obtain a more aggregated partition, Ward's method, which is an algorithm for grouping two classes of a partition, was used as shown on figure 4.

Fig.4. Bread wheat aggregated groups using Ward's method

III. CONCLUSION

Based on the present survey, carried out in the seven public agricultural establishments differently in terms of natural, human and financial conditions, it appears that, although the broad extent of the sown area intended for the production of bread wheat, this strategic crop suffers from multiple production constraints, in particular low performance, which puts these establishments in a disadvantageous situation compared to their actual potential. Solid efforts must be made to establish a very strong and more effective relationship between existing research institutions and the productive sector, in order to support this sensitive strategic crop which is exposed to many drawbacks, including appropriate management tools, to deal with the current wheat crisis.

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