1st Mediterranean Forum for PhD Students and Young Researchers :Designing Sustainable Agricultural and Food Production Systems under Global Changes in the Mediterranean,18-19 July, 2016_Montpellier, France

Operational framework to characterize the diversity and the efficiency of farming systems in dryland areas : the case of Saïs, Morocco

El Ansari L [1,2 *], Belhouchette H [1,3], Chenoune R [3], Yigezu Y. Atnafe [4], C. Gary [2]
[1] CIHEAM-IAMM-UMR System, [2] INRA-UMR System, [3] CIHEAM-IAMM, [4] ICARDA
* Elansari@iamm.fr

Introduction

The challenge of food security is becoming of utmost importance, as the world's population is set to reach 9.7 billion by 2050 (United Nations, 2015).The main solution promoted by agricultural policies is to intensify agricultural production in order to satisfy populations food needs.

However, this intensification ought to be moderate and carried out without increasing the pressure on natural resources, especially in dryland areas where the environmental capital is already overexploited (Robinson et al., 2015). It is therefore for policy makers to find trade-offs between these two aspects which will imply a better use of existing resources (Garnett et al. 2013). Hence the interest of this study which aims **to assess and characterize the diversity of the farmers' strategies in the Saïs plain in Morocco,** in order **to identify the most developed agricultural systems in the use of natural resources.**

Materials and Method

- The plain of Saïs spreads over an area of 2 200 km^2.
- It is located in northern Morocco. known for the richness and diversity of its agriculture (crop systems and livestock).
- Data were collected from 287 farmers during the 2013/2014 cropping season. The analysis is focused on six crops: Wheat, Barley, Faba bean, Chickpea, Onion and Potato.

➔ **The study involves two key steps**

Step 1: Characterization of farming systems based on farm clustering

- **Data collection for farm household composed of three components : structural, economic, and consumption data**
- **Farm typology based on clustering analysis : Principal Component Analysis (PCA) & Hierarchical Ascendant Classification (HAC)**

Step 2: Cross analysis based on farm efficiency analysis

- **Technical efficiency at farm scale, based on the Data Envelopment Analysis**
- **Cross analysis depending on Farm income inputs, energy, total inputs cost**

Results and discussion

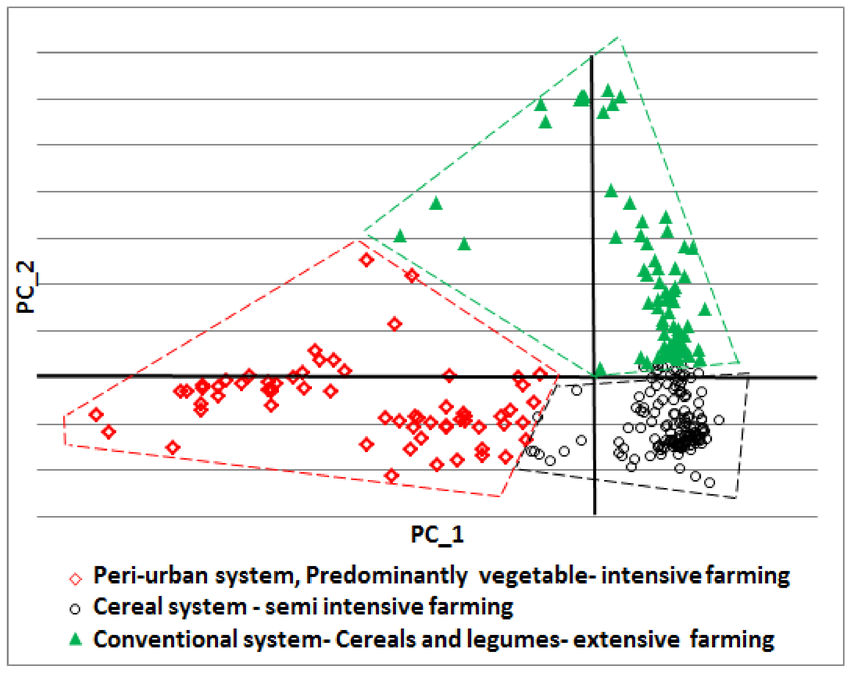

Fig.1: Distribution of farms surveyed (n = 287) by classes of farms as a function of PC1 and PC2.

Table 1: Typical Farms according to the typology criteria, based on the clustering analysis

Class-typology	Quantity-Nitrogen (kg/ha)	Quantity-irrigation water (m3/ha)	Farm income (dh/ha)	Labor (person-day/ha)	Total Mechanic labor (dh/ha)	Technical orientation _Cereals (%)	Technical orientation _Legumes (%)	Technical orientation _Vegetables (%)	Off Farm income (dh)
Peri-urban system, predominantly vegetable-intensive farming	142.89	583.94	19985	56	671	11	2	87	3697
Cereal system - semi intensive farming	83.36	41.44	7379	15	768	95	2	3	3628
Conventional system- Cereals &legumes- extensive farming	60.96	6.93	6492	11	585	47	56	1	2458

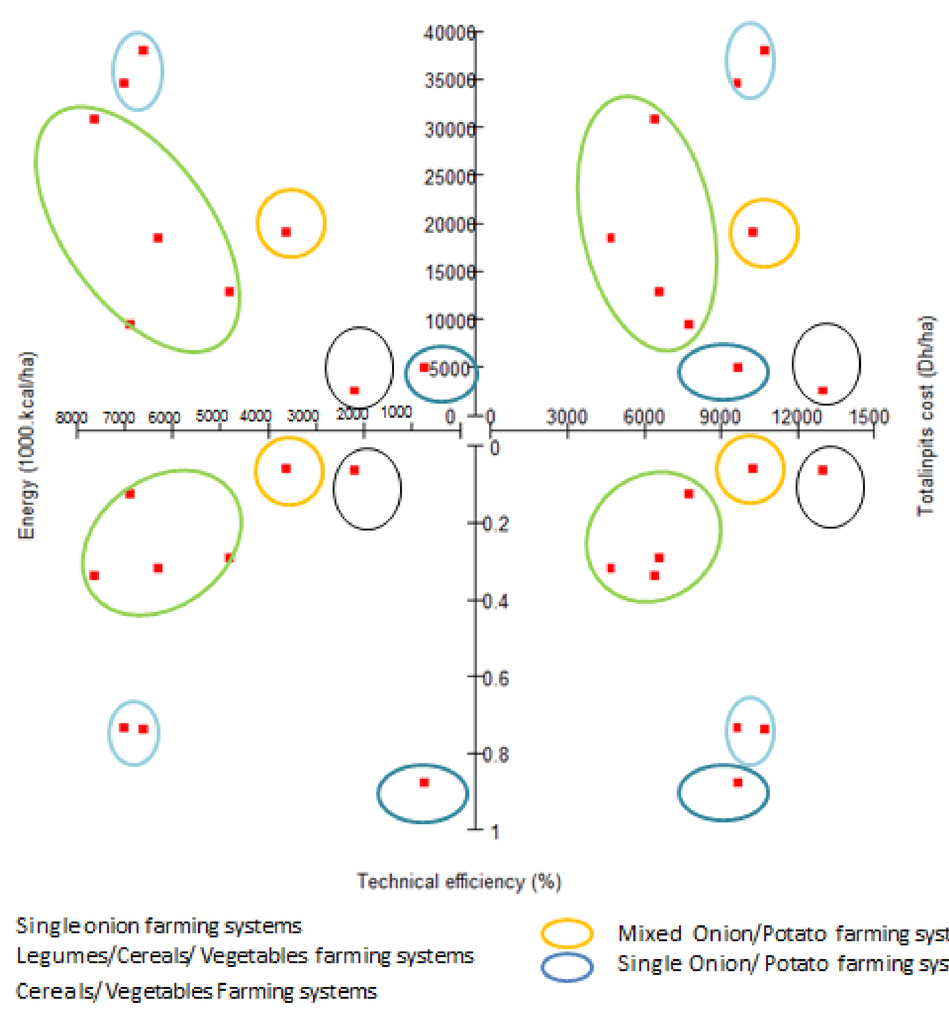

Fig.2: Cross analysis of farming systems, based on farm efficiency analysis- Peri-urban system, Predominantly vegetable- intensive farming

Step1 : **Characterization of farming systems based on farm clustering**

The clustering analysis based on 12 variables (structural , economic and consumption variables) enabled us to identify 3 classes of farms as illustrated in fig.1:

- Peri-urban system, Predominantly vegetable- intensive farming;
- Cereal system - semi intensive farming;
- Conventional system- Cereals and legumes- extensive farming.

Step2: **Cross analysis based on farm efficiency analysis – Peri-urban system, Predominantly vegetable- intensive farming**

- The mixed cereals/ vegetables farming systems are the most efficient in term of farm income, inputs use, and energy,
- The single vegetables farming systems are the least efficient and performing systems
- The mixed cereals/ legumes/ vegetables farming systems are the intermediate systems which can improve efficiencies and farm income,

References:

- Garnett T., Appleby M. C., Balmford A., I. J. Bateman, Benton T. G., Bloomer P., B. Burlingame, Dawkins M., Dolan L., Fraser, Herrero M., Hoffmann I., Smith P., Thornton P. K., Toulmin C., Vermeulen S. J., Godfray H. C. J. (2013). Sustainable Intensification in Agriculture: Premises and Policies. *Policy Forum*. SCIENCE VOL 341.
- Robinson L.W., Ericksen P.J., S. Chesterman, Jeffrey S. Worden.(2015). Sustainable intensification in drylands: What resilience and vulnerability can tell us. *Agricultural Systems* .135, 133–140.
- United Nations.(2015). World Population Prospects: the 2015 Revision, Key findings and Advance Tables . United Nations, New York.