L1.5_kraiem.pdf

Kraiem.khemais@iresa.agrinet.tn

ASSESSMENT OF DAIRY PRODUCTION SUSTAINABILITY: CASE OF DAIRY FARMS IN THE DISTRICT OF NABEUL IN THE NORTH OF TUNISIA.

N. M'hamdi[1], R. Aloulou[1], M. Ben Hamouda[2] et K. Kraiem[1].*

[1]Ecole Supérieure d'Horticulture et d'Elevage de Chott Mariem, 4042 Sousse Tunisie

[2]Ecole Supérieure d'Agriculture de Mateur, 7040 Bizerte Tunisie

ABSTRACT

By using IDEA diagnostic method, the sustainability of 30 dairy farms, from the district of Nabeul, has been evaluated. Based on statistical methods (PCA, AHC), each scale of durability (agro ecology, socio territorial, and economic) has been characterized for the enquired farms and has allowed to build groups. "Production system" typology is relevant for describing farms by agro ecological and economic scales. The socio territorial scale gives the limiting sustainability value for most of the enquired dairy farms. Inside this scale, the main way of progress relies on employment and services improvement (services, contribution to employment and collective work). Economically, durability is determined by the level of efficiency and it depends on financial independence. Socio territorial scale was the only one which is not linked to production system and it was based on the farmers' way of life. On the other hand, global durability evaluation of farms, as well as creating collective references means, to be able to analyze links between the three sustainability scales.

Key Words: Durability, Assessment, IDEA method, Dairy production.

Introduction

Since 1992, the concept of sustainable development defined as a "development which meets the needs for present without compromising the capacity of future generations to meet their own needs" is proposed to try to answer the increasing environmental problems, but also waitings of the company as regards social and economic development, (WCED, 1987).

The application concept of sustainable agriculture tries to take into account three scales (economic, social and environmental) and to define a comprehensive framework (Landais, 1998).

Applied on the level of farm, durability requires the development of methods permiting to evaluate it. One of them the IDEA method which permits to evaluate farms durability by using indicators. (Vilain, 2000; 2003).

Material and Methods

This study has concerned 30 dairy producers selected from Tuniso-Luxembourg cooperation Project (OEP, 2005).The area of study (Nabeul) is localised in the North-East of Tunisia. The collection of information was carried mainly on agro ecological scale which implements the

relationship between agriculture and the environment. This scale contains several indicators such as diversity, space organization and agricultural practices, socio territorial scale which is evaluated by indicators that support a whole of objectives (the human development, the quality of life, ethics, employment and local development, citizenship, coherence…). It is divided into three large components: the quality of the products and the territory, employment and services, ethics and the human development. Economic durability scale is divided into four components; economic viability, economic and financial independence, transmissibility and the efficiency of the productive process.

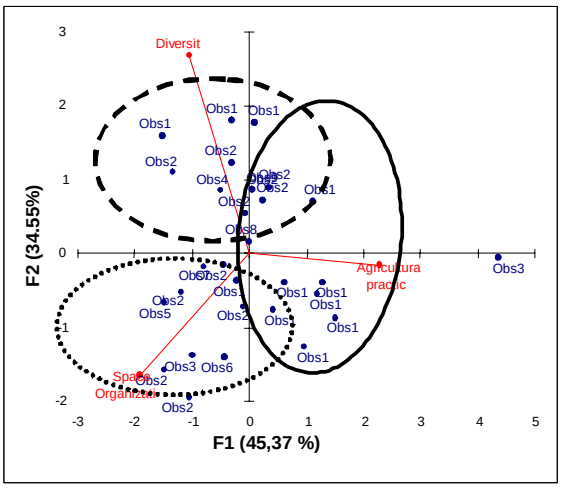
Statistical analysis

Data were analysed by several statistical method such as Ascending Hierarchical Clustering (AHC) and Principal Components Analysis (PCA) using SAS software (version 6.1) and XLSTAT.

RESULTS

a- Agro ecological scale

Principal Components Analysis permits to distinguish 3 groups as shown on figure 1. The table of contributions shows that indicator " agricultural practices " is well represented on axis 1 (F1), it participates with a proportion which exceeds 52.26 %, whereas component "Diversity" is represented the least on this same axis with a percentage of 10.91%, and it contributes with the highest proportion on axis 2 (F2) (72.51 %) what is confirmed by Pradel and Del' Homme (2005).



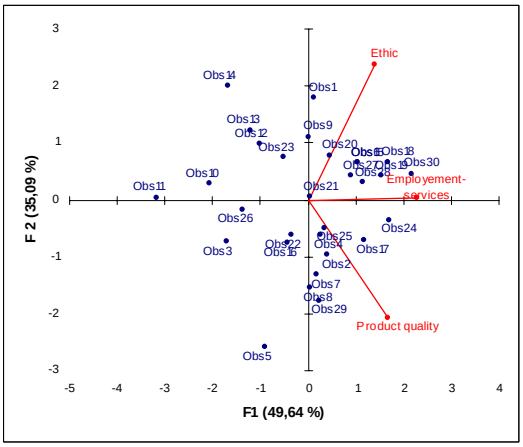
	F1 (45.37 %)	F2 (34.55 %)
Diversity	10.91	72.51
Space organization	36.81	27.24
Agricultural practices	52.26	0.24

Table of contribution of variables

Figure 1: PCA on agro ecological scale

c- PCA on socio territorial scale

Principal Component Analysis on socio territorial scale did not permit to identify groups in a precise way. Basing on the table of contributions, Employment is well represented on axis 1 (F1) (52.54 %) and Ethic on axis 2 (F2) (65.71 %).



	F1 (49.64 %)	F2 (35.09 %)
Product quality	27.60	43.26
Employment	52.54	0.02
Ethic	19.85	65.71

Table of contribution of variables

Figure 2: PCA on socio territorial scale

Ascending Hierarchical Clustering (AHC) permits to obtain a dendrogramme (figure 3) to determine 4 homogeneous classes. Class 1 gathers individuals located above axis 1(F1) of PCA on socio territorial scale. In this class we find farmers having a good quality of life and are not considered insulated. Class 2 gathers a small number of farmers above axis 1 (F1) and on right axis 2 (F2). These farmers do not privilege employment and services. On the other hand, they stress quality products and territory. Class 3 mixes farms with various activities which have a relatively low sustainability for socio territorial scale. Indeed, they are located practically all in opposition with the axis of three components. Finally, class 4 contains farmers having bad marks for the three components of the socio territorial scale.

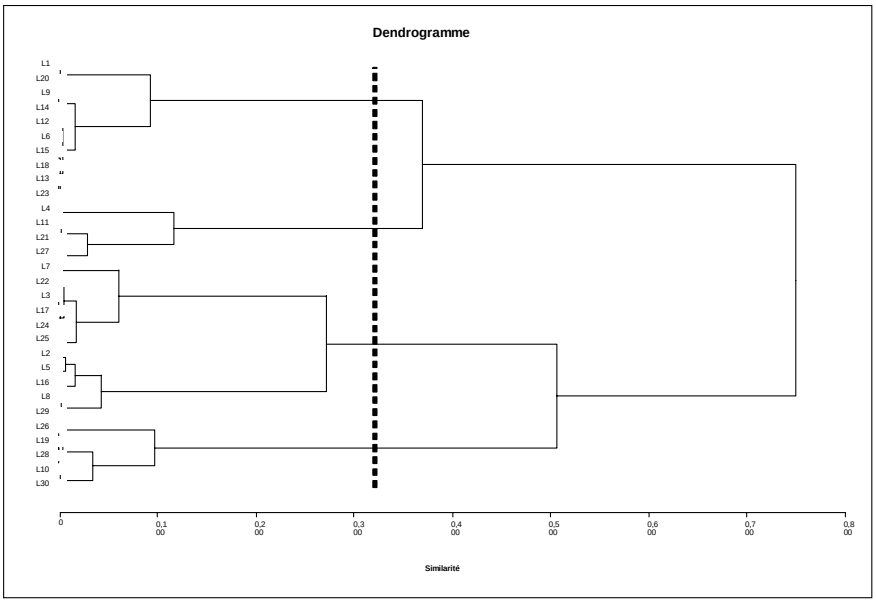
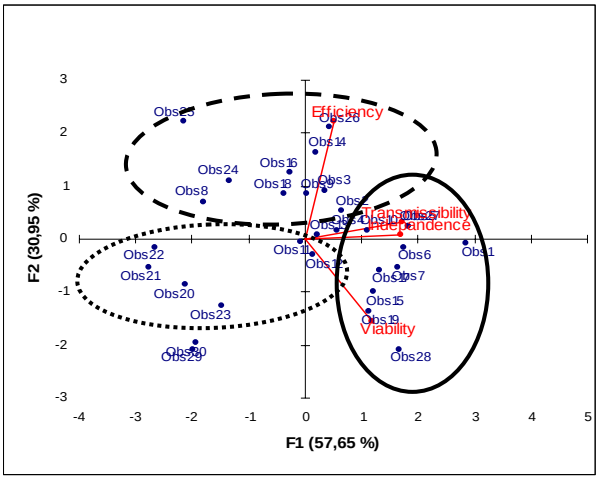


Figure 3: AHC on socio territorial scale

d- PCA on economic scale

Among the 30 studied farms, two (29 and 30) present a particular economic situation: We did not take into account farms presenting a particular economic situation for latter PCA in order to free itself according to Del'Homme (2005) from the extreme values which they constitute. Figure 4 shows the positions of the 4 components of durability economic scale and the coordinates of 28 observations.



	F1 (57.65 %)	F2 (30.95 %)
Viability	18.45	32.73
Independence	38.18	0.08
Transmissibility	39.71	1.34
Efficiency	3.64	65.84

Table of contribution of variables

Figure 4: PCA on economic scale

Basing on figure 7, 3 groups were identified; group 1 is located above axis 1 (F1) with a number of individuals relatively dispersed. It is characterized by farms autonomous on financial level, efficient, fairly viable but having low rates of specialization. The two others are located below the same axis: one rather located towards left with a low number of individuals relatively dispersed (group 2). The second directed towards right (group 3). Analysis of contributions shows that component "efficiency" is strongly represented on axis 2 (F2) (65.84%) whereas its contribution on axis 1 (F1) is very weak (3.64%). It is also shown that the component “independence” has the lowest value on axis 2 (F2) (0.08%).

Global results

Scales of durability

The mark of durability is the lowest value of the three scales. Figure5 shows that the socio territorial scale is the limiting scale (52, 5).

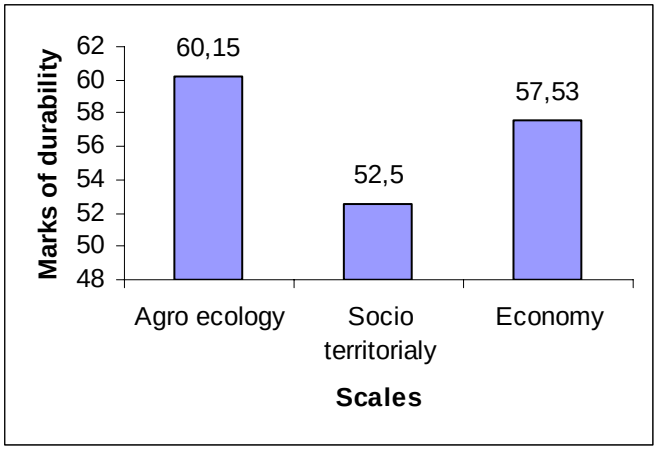


Figure 5: the durability of the farms

According to Figure 6 the components; transmissibility, employment and services and organization of space have the lowest values which are11.95, 11.98 and 13.05 respectively. These results agree with those of Van Bol (2000).

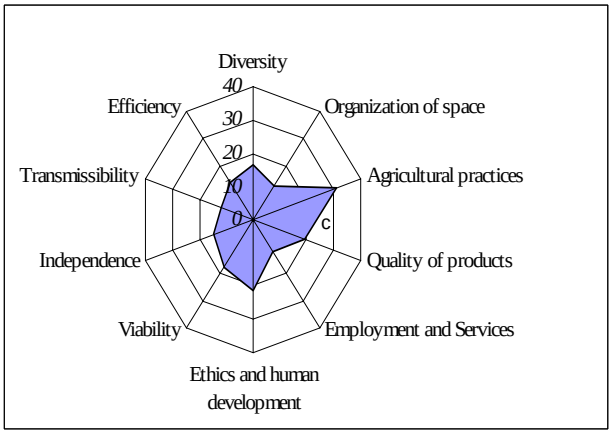


Figure6: Charts of the components of durability

DISCUSSIONS

1-Agro ecological durability analysis

The results obtained for agro ecological scale are relatively high and consolidated compared to other durability scales, but our investigation showed that for component "Diversity" presence of leguminous plants is not very significant and permanent or temporary meadows of more than 5 years are often very reduced or absent because of hard climatic conditions (repeated drought) and lack of water resources and technical and financial material for irrigation, which are confirmed by Van Bol (2000). Whereas rotation is characterized by a quaternary distribution of surfaces (corn, barley, oats, vegetable crops). For indicator "pieces dimension ": we noted a very great variability. The area of ecological regulation is often lower than 5% of useful agricultural surface. For fodder stock management, investigation revealed many failures such as absence of silage (except 5 farms), scarcity of permanent meadows and the use of stable and straw as feeds for animals during the summer periods. As regards to cultural practices, we noted a predominance of organic fertilization (manure) because, according to farmers, the best yields are obtained with the use of manure rather than with mineral fertilizers what is confirmed by Rossier and Gaillard (2001).

On the other hand, farmers use few mineral fertilizers because water is a limiting factor. We also noted the absence of liquid manure except in one case, the non use of compost and the excessive use of pests. For animal welfare, pastures are not protected, production is in semi-full air and zero - grazing is used under unfavourable climatic conditions (heat, rain, cold...), feeding and reproduction management and building conditions are considered bad to average in more than 50 % of farms. Irrigation is dependent on farm size, availability of water resources and the nature of crops. Therefore there are farms which do not irrigate and whose yields are random. Other farms irrigate when precipitations are limited. For this indicator, Damjan and Glavic (2005) announced that it is essential to integrate the factor “water availability”. So farms are divided into three classes; farms which have external water resources will have a maximum mark, farms which have wells or not very deep drillings will have an average mark and farms which have drillings or deep borings will have a minimal mark.

2-Socio territorial durability analysis

The major difficulty of this evaluation holds in fact that considerable criteria are qualitative and subjective and that list of relevant criteria makes debate. The results obtained for socio territorial scale are weak, because of the weak mark of component "Employment and services", giving in fact a weak mark of durability, which is confirmed by Gamborg and Sandøe (2003). These latter indicated that the need for formation for farmers can be a sustainable solution. Lack or technical training insufficiency is sometimes at the origin of non observance of technical recommendations. The ignorance of reasons which underlie recommendations does not permit to develop provided work. Many things were known as in connection with these discordances: irrational logic, incapacity of adaptation and adoption. However, farmers are able to innovate and to adapt to new situations. Producers adapted techniques to their socio economic conditions by selecting appropriate elements for their conditions. Indeed, decisions which farmers take are related to theirs preferences, their knowledge and resources. Agricultural services, a long time based their step on fact that, to improve agricultural production, there were modern techniques whose effectiveness was shown by agronomic research. The interest of research to study production systems and implication of producers to methods of participative diagnosis allow the emergence of the effective needs for support and assistance. The farmers’ way of life, on average, is appreciably improved by possibility of more often releasing itself is daily obligation (weekend and holidays).

3-Economic durability analysis

Dispersion for economic results differs from that of other scales. This can be explained by the number of different names found in our sample and marketing strategies, which does not permit to develop milk to same value, but also by different debt positions. At the economic level, producers are subjected at risks raised because of plants and animal diseases, with a pressure with downstream on selling price and production costs, in a context of strong competition and weak purchasing power of consumers. The perishable and seasonal character of productions reinforces commercial risks. Technical innovations to make outputs more stable must be adapted to the low producer’s financial capacities. In this group, economic viability is most variable. The note of specialization rate is overall weak what highlights the fragility of farms.

Conclusion

This study carried out on durability of dairy farms in the area of Nabeul, enabled us to show that it acts of a concept which starts to have its place in dairy farming. IDEA makes the

farmers sensitive to the concept of durability and the need for the better taking into account natural environments protection by improving husbandries (mainly by limiting pests). It also allows to dairy producers to include/understand that to be sustainable, is to take into account the three pillars of sustainable agriculture (environmental protection, insertion in its economic and social territory and economic performance). This study allowed us to highlight the following points:

1) – Limited value of durability was given for socioterritorial scale in whitch the margin of progress is mainly on formation, employment and services.

2) - For two of the three scales, we can evaluate durability by the dairy system of production. Analysis on the components level makes it possible to explain durability level of each scale.

3) - To train the farmers as regards durability, we must take into account the three scales of durability and not only limiting value because it is the balance of 3 scales which counts and not performance on a scale.

4) - Validity of results also rests:

* On calculation of indicators (mark attributed according to value intervals)

* On method itself (weighting indicators coefficient, compensation within components and scales indicators) in order to answer questions of investigation and to set up references of durability, new studies will have to be started on a higher number of farms.

References

Damjan K., Glavic P., 2005. A model for integrated assessment of Sustainable development. Resources, Conservation and Recycling 43, pp.189–208.

Gamborg Ch., Sandøe P., 2003. Breeding and biotechnology in farm animals—ethical issues. In: Levinson, R., Reiss, M. (Eds.), Key Issues in Bioethics. Routledge Falmer, London, pp. 133– 142.

Landais E., 1998. *Agriculture durable*: Les fondements d'un nouveau contrat social? Le Courrier de l'environnement de l'INRA, avril 1998, n°33, 11 pages.

Ministère De L'Agriculture : Commissariat Régional du Développement Agricole (CRDA), 2004. Annuaire des statistiques agricoles 2003.

Ministère De L'Agriculture : Office de l'Elevage et des Pâturages (OEP), 2005. Rapport annuel 2004.

Pradel M et Del'homme B., 2005. Evaluation de la durabilité des exploitations viticoles dans le vignoble bordelais – Méthode et résultats. *OENOMETRIE XII – 27-28 mai 2005 – MACERATA (Italie).*

Rossier D., Gaillard G., 2001. Bilan écologique de l'exploitation agricole. Méthode et application à 50 entreprises. Station fédérale de recherches en agro écologie et agriculture, Zurich-Reckenholz.

Van Bol V., 2000. Azote et agriculture durable, approche systémique en fermes pilotes. Laboratoire d'Ecologie des Prairies (UCL), thèse: 153 pages.

Viaux Ph., 2004. Le point sur l'agriculture durable – Mesurer la durabilité des exploitations. Perspectives agricoles, juillet - août 2004, n°303, pp 27-28.

Vilain L., 2000. La méthode IDEA - Guide d'utilisation, educagri Ed., Dijon, 1ère édition 100 pages.

Vilain L., 2003. La méthode IDEA - Guide d'utilisation. educagri Ed., Dijon, 2ème édition 151 pages.

World Commission On Environment And Development: WCED, 1987. Our common future-Oxford University Press; Oxford, United kingdom. (Traduit en français: CMED-Commission Mondiale sur l'Environnement et le Développement (1998). Notre avenir à tous. Les éditions du fleuve; Montréal, Canada).