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Farming Systems and Global Threats: Problems and Proposals Northern Portugal Cases

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ABSTRACT

In a context of growing global threats, from climate change, the depletion and degradation of natural resources, to the recent global economic crisis, consequences of short and long term are being witnessed, which undermine the agriculture sustainability. The systems vulnerability, their inability to resilience and the need for innovation is observed, emphasizing also the most capable systems (more sustainable), offering new opportunities and encouraging more environmentally friendly practices.

This work takes as starting point the evolution of economic, environmental and social parameters in farms, in recent years, in order to try to identify the difficulties and the solutions capable of sustaining agriculture in the context of multiple hazards at the farm level.

The main methodology focuses on inquiries to the responsible agents for developing the main agriculture activities held in Trás-os-Montes, including farmers and their associations.

The results confirm the dependence of production factors outside the farm, the limited availability and the high cost of manpower, the weakness of marketing channels and the poor organization of the sector as the main problems. Effective responses to these situations are the opportunities of the activities under study: (a) establishment of an organized marketing circuit, (b) strengthening of mutual help between farms, (c) collective use of inputs, (d) use of environmentally friendly production practices, (e) self-use of products produced on the farm, strengthening their autonomy.

This work proposes the society valuation for different levels of agriculture intensity, through discrete choices methodology, to identify the real importance that society attributes to the agrarian activity.

Keywords: Farming sustainability; swot analysis; proposals.

1. Introduction

In a time of increasing global threats, including pollution and climate change, the scarcity and degradation of natural resources and the unbalanced growth of world population, there are originated consequences of short and long term, which can undermine the sustainability of various sectors, including the agrarian sector. The most recent global economic crisis came to emphasize the lived reality, affecting all sectors of activity. The agrarian sector is not foreign, revealing the vulnerability of farming systems, their inability to resilience and the need for innovation, but also detaching the more capable systems (more sustainable), offering new opportunities and encouraging practices more environmentally friendly, as the reduced use of fossil fuels.

At the present global context, agriculture and food sector is facing an uncertain future. They have to confirm to be capable of dealing with sustainability in order to play a key role in ensuring food sufficiency and well-being of rural populations, present economic viability, prevent social exclusion and promote social equity, preserve natural resources by preventing environmental degradation.

Therefore it's time to question: Which farming systems survived? How have farmers adjusted the production systems to the new context in which we live?

This paper aims to detach the evolution of economic, environmental and social parameters in farms from the Northern of Portugal, in recent years, in order to try to identify the problems and difficulties found by the farmers in this period. In the final part some proposals capable to sustain agriculture in the context of multiple hazards at the farm level are enumerated.

2. Methodology

The main methodology focused on surveys, made in 2010, to farmers, institutions and agricultural associations related to the main agricultural activities developed in Trás-os-Montes, a region of Northern of Portugal.

A national statistical survey (INE, 2006, 2009) identified as main crop activities of Trás-os-Montes - the olive, chestnut production and the viticulture. The rearing of cattle and

small ruminants were distinguished as main livestock activities. In this situation the study of traditional systems with native breeds whose production area includes the region of Trás-os-Montes was adopted.

The surveys were done to small and large farms, and until now, at least four farms were studied for each activity. This stage of work is not yet complete, therefore are presented the achieved results only with the first group of surveys.

The collected information was used to evaluate the evolution of some important parameters of the sustainability of these farms, before and during the economic crisis, and carried out a SWOT analysis of the systems. The SWOT analysis identifies the strengths and weaknesses of the farms, in support of the identification to future actions, able to achieve the optimal use of the opportunities and the control of the threats.

3. Evolution of some sustainability indicators of studied farms

To assess some indicators aspects of their sustainability are presented in this point. The indicators are comparatively presented for two different realities - before the economic crisis and during the crisis context.

The figures presented for the selected indicators result from the mean values obtained for individual farms belonging to each activity. Then, these values are compared, resulting in a null (0), positive (+) or negative (-) evolution.

Other indicators, apart from those presented in this paper, are also fundamental to the analysis of farms sustainability. However, the absence of records by the producers turned its measurement impossible.

Table 1, 2 and 3 are respectively related to the evolution of economic, environmental and social parameters, for the period under consideration, for the main agricultural activities of Trás-os-Montes.

Table 1. Evolution of the economic indicators, for the main agricultural activities of Trás-os-Montes

	Olive	Chestnut	Vineyard	Cattle	Small ruminants
Income	-	-	0	-	0
Production	-	-	0	-	0
Production parameters	-	-	0	-*	0
Production flow	-	-	-	-	0
Total charges	-	0	-	+	0
Farms area	+	+	0	-*	0
Livestock Number	na	na	na	-	+
Cultural/manegeament practices	-	-	+	0	0
Indebtedness	+	+	0	+	0

Legend: «0» without alteration; «+» positive alteration; «-» negative alteration; «na» not applicable; «*» no changes to some respondents.

Table 2. Evolution of the environmental indicators, for the main agricultural activities of Trás-os-Montes

	Olive	Chestnut	Vineyard	Cattle	Small ruminants
Livestock density index	na	na	na	-	+
Animal welfare	na	na	na	0	0
Cattle feed	na	na	na	0	0
Application of sanitary products / LU	na	na	na	0	0
Application of plant protection products / AAU	0	0	0	0	0
Fertilizer application / AAU	0	0	-	0	0
Contribution to physical erosion of soil	+	+	+	+	+

Legend: «0» without alteration; «+» positive alteration; «-» negative alteration; «na» not applicable.

Table 3. Evolution of the social indicators, for the main agricultural activities of Trás-os-Montes

	Olive	Chestnut	Vineyard	Cattle	Small ruminants
Manpower on the farm	-	-	-	-	-
Agrarian structure	0	+	0	0	0
Motivation on dedication to activity	+	-	+	-	0
Perspectives for the activity	+	-	0	-	0
Sector general perception	+	-	-	-	0
Willingness to change	+	+	+	+	+
Alternative activities	0	0	0	0	-

Legend: «0» without alteration; «+» positive alteration; «-» negative alteration; «na» not applicable; «*» no changes to some respondents.

The main changes observed in tables 1, 2 and 3 are the following:

- Farms and livestock density changes, in order to try to improve the economic profitability of them;
- Tendency to lower consumption of fossil fuels, with positive environmental consequences;
- Diversification of farms activities in order to get more products for consumption;
- Willingness/availability to demand for training, in order to improve product quality and introduction of practices/innovations in production systems adopted;
- Agriculture viewed as an economic alternative to the unemployment.

Some cases reported null or reduced effects of these phenomena, particularly the economic crisis. It is the case of the small ruminants rearing. This situation could demonstrate the sustainability of farming systems, which may be due to the strong adaptability, resilience and autonomy that they systems have shown towards the weak soil, climatic and socio-economic conditions in mountainous areas of Trás -os-Montes, since ancient times.

4. Swot analysis of the studied farms

In this section are presented the Strengths (table 4), Weaknesses (table 5), Opportunities (table 6) and Threats (table 7) of the studied activities. These were based on the gathered information of the realized surveys, complemented with references from literature (Rota da Terra Fria Transmontana, 2006). The Strengths and Weaknesses are internal to the system. The Opportunities and Threats correspond to the external environment of the farms. The aim of this SWOT analysis is to identify the key internal and external factors that are important to achieving the sustainability of the goat farms.

Table 4. Strengths of the main agricultural activities of Trás-os-Montes

Economic	Environmental	Social
<ul style="list-style-type: none"> • Economic valuation of indigenous resources • Products are the main source of income of farm families • In other cases, agrarian products consist of an additional source of income • Some certified local products • Products with a unique flavour, benefiting of the combination of the characteristics of the crop/breed with the soil and climatic conditions, the flora and the production system • Low production costs • Low dependence on external inputs to the activity • High utilization of available resources by livestock 	<ul style="list-style-type: none"> • Environmental valuation of indigenous resources • Environmental and landscape diversity • Use of crop varieties and indigenous animal breeds • Activities adapted to the soil and climatic conditions • Reduced use of synthetic fertilizers, plant protection products and drugs in animals • Extraordinary hardiness and ability of local breeds animals • Control of weeds through grazing animal • Low animal stocking • Agro-forestry system is a carbon sink 	<ul style="list-style-type: none"> • Enables the creation of self-employment • High need for employed manpower originates source of employment • Allows to produce food for own consumption • Secondary activity for many individuals • Farmers motivated to continue with agricultural activity, even without financial support • Strong presence of institutions with expertise in monitoring, certifying and promoting local products • Demand for training by young farmers

Table 5. Weaknesses of the main agricultural activities of Trás-os-Montes

Economic	Environmental	Social
<ul style="list-style-type: none"> • Low profitability of the system • Low income/productivity/production efficiency • Production affected with climate change • Aged plantations • High mortality rate of small ruminants • Difficulty or non-regular out-flow of the products • High price of certified products induces low demand • High costs in manpower • High prices of inputs • System financial support - dependent • Absence of a fixed monthly salary • Lack of accounting records • Absence or low farmers entrepreneurial capacity • Absence or reduced willingness / ability of farmers' investment • Farms indebtedness 	<ul style="list-style-type: none"> • Steep slopes, thin soils, low soil quality • Temperature ranges and rainfall, frost and dry summer strongly determines the results of agricultural activities • Land use exceeds its potential, resulting in low productivity and degradation • Lack of soil analysis induce dysfunctional levels of fertilizer application • Many mills without effluent treatment • Villages soiled with animal droppings • No paths or inaccessible paths to the shepherd • Increasing mechanization use aggravate erosion soil problems • Poor conditions of animal welfare 	<ul style="list-style-type: none"> • Lack of association spirit / dynamic by farmers • Heavily fragmented associations, with negative consequences on regional competitiveness • Dominance of familiar agriculture • High degree of aging of farmers • Low levels of schooling • Poor land structure (small areas with high fragmentation and steep slopes) • Lack of manpower • Requirement of manpower everyday • Hard work as a result of steep slopes and the degraded or inaccessible paths

Table 6. Opportunities for the main agricultural activities of Trás-os-Montes

Economic	Environmental	Social
<ul style="list-style-type: none"> • Contributes to the maintenance and valorisation of abandoned areas • Low production costs compared to other breeds and animal species (food, manpower, veterinary ...) • Production area near to the border with Galicia, where the portuguese products are highly valued • Expand market potential • Production and / or activities diversification • Products (chestnuts, grapes, olives, meat, milk) with recent inclusion in urban gastronomy • Agritourism opportunity • Association of crops and cattle-raising activities could generate capital gains to the rural economy (e.g. chestnuts and smoked pork Bisaro) 	<ul style="list-style-type: none"> • Biodiversity, ecosystem and landscape conservation • Use of local varieties and breeds • Rational agricultural and livestock planning (better adaptation of activities to the soil and climate skills) • Natural clean of woods and fallow land by grazing animals, reducing fire risk • Less demanding in terms of energy (adapted to existing resources) • Contribution to the carbon market 	<ul style="list-style-type: none"> • Food for families self-consumption • Combating human depopulation • Increased consumer confidence in the final product • Lack of alternatives to agricultural activity • Healthy" way of life • High unemployment rate • Availability and accessibility of professional training courses

Table 7. Threats for the main agricultural activities of Trás-os-Montes

Economic	Environmental	Social
<ul style="list-style-type: none"> • Weak role of farmers associations • Farmers dependence of a cooperative whose operation is ineffective • Markets with much offer • Lack of competitiveness of products in the markets • Unfair competition (sale of products with non-specific production modes as being the products of the same) • Higher product price than competitors • Foreign products with lower price 	<ul style="list-style-type: none"> • Production systems intensification leading the depletion of natural resources and environmental pollution • Monoculture • Production systems abandonment • Livestock feed sources modification • Forest fire prevention ineffectiveness 	<ul style="list-style-type: none"> • Absence of descendants to the agricultural activity • Low social value of farming activity • Social discrimination of the farmer • High abandonment of the activity • Poor life quality conditions for farmers families • Negative perception of agricultural sector by farmers • Depopulation of rural areas • Social integration income reduces manpower available • Ageing population

5. Proposals

Based on the evolution of some parameters of sustainability and on the brief SWOT analysis previously exposed it is listed followed some actions that can be developed to improve the sustainability of crops production, livestock rearing and surveyed farms.

- *System diversification* – Crops, breeds and production activities diversity is an intrinsic characteristic of sustainability, for several reasons: i) it is a way to reduce the (economic) risk associated to each activity; ii) it is a way to complement the income; iii) it is a contribution for plant and animal biodiversity preservation; iv) it decreases the attack risk by pests, diseases and weeds infesting; v) it increases soil fertility and improves crop fertilization (CCE, 2006; Ferreira et al., 2002). Issues related to diversity are an integral part of sustainable development and underpins competitiveness, growth, employment and welfare in the European Union (CCE, 2006). In this sense, the agrarian systems must diversify its production and its economic activities. Tourism, at various levels, crafts and also food may have a leading role in the development of the systems under consideration.
- *Products quality* - The regional agri-food products are nowadays seen as a fundamental element in territory planning, landscape preservation, nature conservation and to avoid the process of rural areas abandonment. The promotion and valorization are pointed as a strategy for the increase farmers' incomes, of their welfare and in new valued dimensions of food quality (Cristovão et al., 2006; Rodrigo et al., 2010). However it isn't enough to be labeled as regional products. They have to be of high quality, related to its origin, and can be integrated in tourism activities.
- *Agro-ecology farming* – Agro-ecology is a set of techniques and concepts that arose in the nineties, targeting healthier and natural foods production. The use of natural resources and the absence of toxic products and soluble chemical fertilizers are the basic principles. It is a new approach of agriculture, integrating several agronomic, ecological and socio-economic aspects on food production, with capacity to answer to negative situations produced by modern agriculture (Altieri, 1994).

- *Activity organization* - For the sustainability of the agricultural activity to be effective, certain measures concerning the organization of activity and its relationship with the organization of farmers will have to be started up, for an effective technical support, an adequate flow of product, and availability of inputs at a good price.

With these strategically points it can be improved the farm products out-flow, with high quality, flavour and obeying to food safety parameters. Also the income to the farmer and his life conditions can be enhanced, the environment can be protected and the natural resources preserved. However we can ask: What is the effect of agriculture (its abandonment, its intensity) for the society? What is the real importance that society perceives from the agricultural activity?

To know these situation, to give emphasis to the farmer role in society and territory, and to made proposals in this way, it is necessary to quantify and to assess the relative importance of the various characteristics of the agrarian systems.

The Discrete Choice Experiments (DCE) technique, a member of the family of choice modelling methodology, founded upon the theory of characteristics (Lancaster, 1966) and the random utility theory (Mansky, 1977), can be used to assess the economic value of different levels of agriculture intensity for the general society. The usefulness of non-market valuation techniques, such as DCE, is the possibility of taking into account external benefits generated by agricultural activities that are not traded in the market, but have value to society.

The DCE use surveys to ask to the target population to select their preferred goods or services among a choice set of options. Each service is described by its relevant characteristics or attributes and respective levels. Examples of the relevant attributes could include: the environmental effects, the visual impact on landscape, local economic development, healthy, safe food, rural heritage preservation, and so on.

The conception of a DCE application requires the main phases: (1) the selection of the relevant attributes and levels based on exploratory research (pilot studies, focus groups, interviews) and on evidences of literature review; (2) the configuration of alternatives (agrarian systems) using experimental design strategies to combine the levels of the relevant attributes; (3) data collection using stated choice surveys; and (4) data analysis

through discrete choice models, including interactions with demographic or attitudinal questions (Louviere *et al.*, 2000; Bateman *et al.*, 2002).

The potentialities of DCE are: (1) to identify the most important attributes of agrarian systems and to assess the willingness to pay for its provision; (2) to detect groups or segments more willing to pay for the implementation of an agrarian system and the attributes that have more weight in the choice (heterogeneous preferences analysis); (3) to include hypothetical attributes that have not been offered in real-world markets.

6. Final considerations

This paper presents the evolution of some parameters of sustainability before and during the economic crisis. The analysis showed that it is reduced the evolution of the systems in this period. Nevertheless, it is worth to note the increase in the cultivated area and in stocking animal of farms towards the diversification of animal production, mainly for self-consumption. Also notable, is the inclusion of this activity on projects for the farmers' children, as answer to high unemployment that has been observed in several countries in general.

It was also developed, in this paper, a brief SWOT analysis of the systems under study, with the identification of its strengths and weaknesses and its opportunities and threats. Based on these aspects is listed some actions that can be developed to improve the sustainability of surveyed farms: system diversification; products quality; agro-ecology farming; and activity organization.

Also this work proposes the society valuation for different levels of agriculture intensity, through discrete choices methodology, to identify the real importance that society attributes to the agrarian activity.

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