Incorporating social and environmental indicators in technical and economic advisory programmes in livestock farming

Arandia A., Intxaurrandieta J.M., Mangado J.M., Santamaría P., Icaran C., Lopez E., Del Hierro O., Pinto M., Ruiz R., Nafarrate L.

in

Bernués A. (ed.), Boutonnet J.P. (ed.), Casasús I. (ed.), Chentouf M. (ed.), Gabiña D. (ed.), Joy M. (ed.), López-Francos A. (ed.), Morand-Fehr P. (ed.), Pacheco F. (ed.). Economic, social and environmental sustainability in sheep and goat production systems

Zaragoza : CIHEAM / FAO / CITA-DGA
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 100

2011
pages 9-15

Incorporating social and environmental indicators in technical and economic advisory programmes in livestock farming

A. Arandia*, J.M. Intxaurrandieta, J.M. Mangado**, P. Santamaria***, C. Icaran***, E. Lopez***, O. del Hierro****, M. Pinto****,R. Ruiz**** and L. Nafarrate*****

*Dpto. de Gestión de Empresas, UPNA, Campus Arrosadia, 31014 Pamplona (Spain)
**ITG Ganadero, Avda. Serapio Huici, 22 Edif. Peritos, 31610 Villava, Navarra (Spain)
***IKT, Granja Modelo s/n, 01192 Arkaute, Vitoria-Gasteiz (Spain)
****NEIKER-Tecnalia, Berreaga 1, 8160 Derio, Bizkaia (Spain)
*****SERGAL, Granja Modelo s/n, 01192 Arkaute, Vitoria-Gasteiz (Spain)

Abstract. The impact that agricultural policies exert on the sustainability and multifunctional nature of farming systems, together with the huge amount of scientific references available, has been central to the implementation of this work. The main objectives of the project were: (i) to broaden the scope of the existing farmers' advisory programmes from a technical and economic perspective to social and environmental issues; and (ii) to develop a decision support tool able to cope with the three pillars of sustainability within the framework of the holistic analysis of livestock farming systems. For this purpose, a set of economic, environmental and social indicators has been proposed and a computer tool developed to manage the database, to calculate the value of every indicator, to assess each livestock farm, and to generate graphic outputs.

Keywords. Sustainability – Indicators – Livestock farming systems – Computer tool – Holistic approach.

Incorporation d'indicateurs sociaux et environnementaux dans les programmes d'appui technique et économique en production animale

Résumé. *L'impact que les politiques agricoles exercent sur la durabilité et les aspects multifonctionnels des systèmes d'élevage, y compris de nombreuses références scientifiques disponibles, ont été au centre de la mise en œuvre de ce travail. Les principaux objectifs du projet ont été : (i) élargir la portée des programmes existants de conseil aux éleveurs du point de vue technique et économique également aux questions sociales et de l'environnement ; et (ii) développer un outil d'aide à la décision capable de faire face aux trois piliers de la durabilité dans le cadre de l'analyse holistique des systèmes d'élevage. Donc, une collection d'indicateurs dans les domaines d'étude, économique, social, et de l'environnement, a été proposée, et un logiciel a été développé pour gérer la base de données et leur analyse, qui fournisse une sortie graphique permettant l'analyse et l'évaluation du fonctionnement de tels systèmes, et permettant aussi de calculer la valeur de chaque indicateur.*

Mots-clés. *Durabilité – Indicateurs – Systèmes d'élevage – Logiciel – Analyse holistique*.

I – Introduction

The integration of agriculture, the environment and the social context in which it has developed has gained relevance in the successive revisions and modifications of the agricultural policy, defining certain lines of work in livestock farms, as well as support schemes focused on strengthening actions oriented towards payments for agro-environmental improvements and support plans for areas with geographical limitations.

Therefore, it is becoming more and more important to develop tools to analyse the production systems from a triple perspective: economic, social and environmental. With the tool developed through a research project funded by the Spanish National Institute for Agricultural and Food Research and Technology (INIA) the aim was to be able to conduct an analysis of the different livestock farming systems, and thus obtain more exhaustive information on the sustainability of the systems analysed.

Initially the project was intended for ruminant livestock farms, due to the importance that these production systems have for the environment through the supply of a large part of their feed and the forage systems management, and due to the fact that these production systems are firmly rooted in the rural environment.

The main objective of this project is to develop a tool to analyse and diagnose farming systems from an economic, social and environmental perspective.

II – Materials and methods

In this study a number of partial objectives have been typified in order to design a diagnostic methodology for the farming systems. The following objectives have been set:

(i) Typification of agricultural systems. This typification is linked to the main productive orientation (herbivore livestock production), type of livestock management (feeding systems depending on forage production) and marketing system (direct sales, short distribution channels).

(ii) Study of existing methodologies (selection of OCDE indicators, MESMIS methodology, Solagro method (2004, 2007), DIALECTE, MEAScope project, etc.) and associated tools, which, through an exhaustive analysis may enhance the development of an adaptable wide-scope tool of feasible use.

(iii) Development of indicators, carried out in several phases, first through the bibliographical search and valuation of existing indicators, a second phase consisting of drafting an initial series of specific indicators adapted to the context of this study, a third stage in which experts of different fields related to this project pool and valuate information, through a Delphi survey and finally going on to a validation, valuation and weighting phase.

The selection criteria used were: ease in obtaining data, significance of the results obtained and coherence of the system. The indicators proposed are described below.

1. Economic indicators

Traditionally the valuation of the livestock farming systems has been conducted from the technical and economic perspective, assessing on-farm the production capacity of raw materials and feeds, with the objective of adapting the production systems to the best productive techniques and with the best economic results.

The indicators were chosen in such a way that the economic analysis of the indicators proposed would revise the topics examined of the basic production resources, valuation of the production growth and movements with regard to the position of the products on the market, the positioning of the farm as regards its production diversity, the stability of the production system in relation to the fluctuations of agricultural policies and markets as well as the existing level of productivity and technology in the systems analysed.

Profitability is the first dimension to be analysed using three purely economic indicators.

In the second dimension the chosen indicators are used to valuate the farm's capacity for self-sufficiency in relation to four factors: subsidies, financing or debt capacity, (degree of

dependence on inputs (feed) and on manpower, and finally the degree of self-management of the farm surface area.

The objective of the diversification dimension is to analyse the potential of putting the diversification proposal into practice; valuating the number of different marketable products in the first indicator, the number of customers for each product in the second indicator, the production with the greatest weight within the system in the third indicator and the impact that extra-farm income would have in certain systems in the last indicator.

In all indicators the production dimension valuates the weight of the economic value of the product in comparison to the total farm income.

The stability coefficient dimension aims to measure the medium-long term trend of the systems as a function of the activity they develop and the product they sell, with prediction capacity, according to historic data, of the trend of the production analysed (milk, meat, etc.) on the one hand and possible price trends (stable, rising, zigzag, etc.) on the other.

The last dimension is the cost structure, that allows production cost distribution to be valued in relation to the parameters of the production system dimension, ESU (European size unit), total income or total expenditure.

Table 1. Economic indicators

Dimensions	Indicators
Profitability	Availability of entrepeneur/ manpower unit/year
	Net margin per unit of economic size (ESU†)
	Capital returns
Self-sufficiency	Autonomy without subsidies
	Financial autonomy
	Feed autonomy
	Manpower autonomy
	Surface area autonomy
Diversification	Production variability
	Number of customers per type of production
	Importance of the production with the largest share
	Off-farm income / total income
Production	Net margin / total income
	Net margin / sales
	Gross margin / total income
	Gross margin / sales
Stability	Price and production prediction capacity
	General price and production trend
Cost structure	Variable costs / ESU†
	Variable costs / total cost
	Feed / total cost
	Structural costs / total cost
	Structural costs / ESU†
	Interest + amortisations / total income

†ESU: European size units. ESU is a measure of the economic size of farms in terms of gross margin (1 ESU = 1200 € of gross margin).

2. Environmental indicators

There is a large number and wide diversity of environmental indicators which refer to the livestock production systems. Following selection and analysing the experience acquired in the

use of Dialecte agro-environmental diagnostics in different farms in the Basque Autonomous Community, 35 indicators were chosen and classified in 7 items, many of which coincided with those of the Dialecte programme, but calculations, parameters, score ranges and information structure were adapted.

Table 2. Environmental indicators

Theme	Dimensions	Indicator†
I	Livestock census and land base	LSU/UAA
		kg organic N /UAA
		LSU/forage surface area
		% use of own forage
		Use of commons
II	Uses and Management of land	% UAA of permanent pasture
		% UAA temporary meadow
		% UAA annually sown
		% UAA under irrigation
		% UAA treated with pesticides
		% UAA receiving organic matter
III	Nutrient balance	N "surplus"/ha
		N "surplus"/1000 l (milk)
		N "surplus"/100 K (meat)
		N efficiency
		P_2O_5 "surplus"/ha
		P_2O_5 "surplus"/1000 l (milk)
		P_2O_5 efficiency
	Soil balance	kg N/Ha of UAA
		kg organic N /ha/y
		kg mineral N /ha/y
		N balance (kg N/ha)
		P_2O_5 balance (kg P_2O_5/ha)
		Supply of P_2O_5 to the soil (kg P_2O_5/ha)
IV	Waste management	Rainfall collection
		Wastewater collection after cleaning
V	Natural elements and biodiversity	Hedge length /ha UAA
		Length of forest borders /ha UAA
		% length of river with riparian vegetation
		No. of crop species
VI	Energy balance	Total energy consumption /ha
		Total energy consumption /manpower unit per year
		Total energy consumption /maintenance energy
VII	GHG emissions	Equivalent t CO_2 /ha
		Equivalent t CO_2 /AWU
		Equivalent t CO_2 /Net margin

†LSU: Livestock unit; UAA: Utilized agricultural area; AWU: Annual workforce unit.

All the information has been plotted on a diagram to enable a rapid assessment of the environmental situation of the farms. The dimensions chosen have been marked by several

causes: choice of indicators providing significant, non-redundant and not very complex information, and the wish to take advantage of the work experience gathered in the Solagro DIALECTE programme and conducted in ruminant farms of the Basque Country. The indicators have not been categorised under headings of a given environmental topic due to the fact that the implications for each indicator are at times very numerous and varied.

3. Social indicators

The choice of social indicators is particularly problematic due to the difficulty in reaching a consensus on socially desirable aspects in agricultural systems, both because of the ideological weight of this type of indicator and because of the difficulty in making these indicators objective and quantifiable. Many other studies underline how difficult it is to analyse and valuate these indicators and less work has been carried out on them.

Following proposals by Van Calker *et al.* (2005) the social dimension of sustainability is divided into two categories: (i) an internal category that encloses themes related to on-farm work; and (ii) an external category that includes what society perceives of agricultural activity.

Table 3. Social indicators

Internal Dimensions	Indicators	External dimensions	Indicators
Ownership	Professionality Sex / youth Social economy Continuity Family farming	Animal welfare	Frequency of visits Grazing Housing Livestock movement Animal health
Job creation	Land occupation Tangible assets Intangible assets Socioeconomic viability Remuneration	Landscape and tradition	Natural elements Unique elements Valuation of surroundings Breeds
Quality of life	Time availability Social activities Training, travel Free time Holidays Personal assessment	Quality of products and nearness to consumers	Microbiological requisites DO / PGI Other certifications Ecological production Absence of GMOs Agrotourism Form of marketing
Quality of work / amount of work	Independent decision-making Ergonomic and psycho-sociological quality Personal assessment Hours worked Level of concentration No of days >12 hours		

The internal dimension assesses the capacity of arable and livestock systems to: (i) maintain family agriculture; (ii) enhance associationism and facilitate the access of women and young people to farm ownership as a main source of income; (iii) generate employment with a decent salary and with less capital investment, CAP rights and lands; (iv) permit quality of life with free time, participation in social activities, training and travel, as well as a personal appreciation of the item; and (iv) generate work quality, ability to make their own decisions, to minimise work hazards and number of hours worked, besides a qualitative and quantitative self assessment.

In the external dimension consideration is given to what society values both in terms of animal welfare and in the maintenance of traditions and unique landscapes, as well as quality, local, farm products.

In the internal dimension of ownership, the indicator of professionality refers to the titleholder of a farm that requires a volume of employment of at least one Annual Work Unit and at least 25% of their income should come from agricultural activities. Furthermore, a positive valuation is given to the participation of women and young people. The socio-economic indicator valuates the associative systems in relation to the individuals. The continuity indicator valuates succession as a fundamental question in social sustainability. Finally the family farming indicator valuates the possibility of managing the system with family labour.

The dimension of job creation aims, in spite of recognising the difficulty of the agricultural sector to generate employment, to valuate the capacity to grow. This capacity of generating employment in the sector is important mainly in certain regions with few alternatives in other sectors. The indicator of territorial occupation valuates the factor pertaining to limitation of land as a generator of resources (crops, livestock feed, etc.) and a guarantee of economic viability. The indicators valuation of material and immaterial assets are considered from the perspective that neither should be too high, as they are necessary to develop the activity and can be amortised with the yield obtained by the activity developed, which would indicate that the investments in machinery, buildings, facilities and quotas and rights are adjusted to the dimension of the production system. Finally, the work remuneration indicator initially proposes knowledge of the hours worked in the activity, hours of rest and holidays, in order to calculate and valuate the yields obtained from hourly remuneration.

The dimension quality of life, considered as one of the main pending questions, valuates as indicators the availability of time, as a sum of days off, and the possibility of dedicating time to participating in social activities or training activities and travel. Furthermore, the farmer is asked how many free days he has a week and how many days' holiday. Finally he includes a personal valuation of the farmer of his quality of life.

The dimension quality and quantity of work includes, among others, an indicator of personal valuation in which the farm owner valuates his perception of the quality and quantity of work carried out.

The external dimension of the valuation of animal welfare is linked to the indicators of visits to animals, pasture and duration, freedom of movement of animals when stabled and animal health as an expenditure or drug management and need for replacement.

In the dimension of landscape and tradition, agricultural activity is a very important element of influence on the configuration of the territory and hence on the landscape which, among other things is the main use of land.

The dimension quality of produce and approximation to the consumer is measured with various indicators, some of which are totally objective such as those which valuate the physical and chemical quality of the product, membership of a designation of origin or other type of certification. Furthermore, there is a subjective valuation such as for example the perception of society of the obtention of quality food as an important aspect of agriculture.

III – Results and discussion

The agricultural sector has historically been an economic sector entrusted with the production of food for society. At present this vision is changing, and apart from the productive functions social and environmental functions are recognised as increasingly valued by society.

The management centres of the Basque Autonomous Community and Navarre have developed for more than 25 years programmes of economic and technical management to analyse the strengths and weaknesses of their management on the farms.

The new rules of the CAP within which the farm advisory service is framed, means that the management centres have to adapt the advisory environment to the new situation.

The centres described previously have multiple technical and economic data of a very relevant sample of farms whose main production orientation is ruminant livestock. The challenge that has arisen in this article is that of defining the type of information necessary so that once processed, there will be enough indicators both in quality and in quality terms to advise integrally on the farms involved.

In 2009, in order to validate the tool and following a series of previous trials with sheep and cattle farms, this tool has been applied on dairy farms.

One of the main conclusions that has been drawn from this project has been precisely the need to use a large amount of data for the diagnostics of the sustainability of the farms, in such a way that no indicator, item or field, however important it may seem, can determine this trait per se.

The difficulty detected in the article does not lie so much in obtaining data and integrating it in determining these indicators, but in the weighting of the data in the three pillars of analysis; economic, social and environmental, in such a way that these indicators, being comprehensive and showing the reality of the systems, show the key points of the system and may be interrelated and serve as reference and comparison, in a global analysis of the system.

The work pending for the forthcoming years is to extend the software application to a larger number of farms with different and diverse activities.

Furthermore, the results obtained in this way can set guidelines for drafting policies to promote productive models, that is, an exclusively technical and economic analysis could have been considered not to be viable but when the analysis of positive externalities generated in the environmental and social fields is incorporated they may be taken into account as viable systems.

Acknowledgements

"Diagnosis of the sustainability of livestock farming systems. Incorporation of social and environmental indicators to technical and economic management programmes", INIA project RTA2005-00174-C02.

References

Diez B., Beltrán de Heredia I., Villalva D., Bernués A. and Ruiz R., 2009. Aplicación de la metodología MESMIS para la evaluación de la sostenibilidad del sistema ovino de raza latxa. In: *XIII Jornadas AIDA sobre producción animal*, Tomo II, pp. 379-381.

OECD, 1999. *Environmental indicators for agriculture*. Vol. 1. Concepts and farmework and Vol. 2. Issues and design. Paris: OECD.

OECD, 2001. *Indicadores medioambientales para la agricultura. Métodos y resultados*. Vol. III. Paris: OECD.

Solagro, 2004. *Dialecte. Diagnostic agri-environnemental d`explotiation*. Versión 4.0. Toulouse: Solagro.

Solagro, 2007. *DIALECTE. Diagnostic agri-environmental d'explotation*. Manuel d'utilisation.

Solagro, 2007. *Planete. Pour l'analyse énergetique de l'explotation agricole*. Version Juillet 2007. Toulouse: Solagro.

Van Calker K., Berentsen G., Giesen G. and Huirne R., 2005. Identifying and ranking attributes that determine sustainability in Dutch dairy farming. In: *Agriculture and Human Values*, 22, pp. 53-63.

Waarts, Y. 2005. 'Indicators for the quantification of multifunctionality impacts'. Series of Research Reports of the FP6 Research Project MEAScoope, Vol.4.