Social opportunities and private convenience of choices at farm level: an approach to the links between farm income and sustainable GDP.

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1. Introduction

The present work is a suggested approach for assessing the social effects of choices made at farm level. These choices often responses to institutional indications which encourage the farms to adopt objectives which are in the public interest. One of these is, for example, farming which has low environmental impact. It is essential in each case to examine the links between the results of farm management and sustainable GDP, in order to identify the margins of private convenience and social utility of the particular choices made.

2.Objectives and contents

The work has three related objectives.

The main aim is to identify a practical method of approach which can link micro and macro economic aspects in order to evaluate the social repercussions of the choices made at farm level, using existing evaluation tools.

Another objective is to evaluate which farm management systems best meets the collective needs.

Last objective is to find a methodology which does not involve statistical processing of the farm data, and thus for small samples also can be used.

The identified method is based on certain indicators, chosen from among those obtained from analysis of the farm accounts, suitable for representing socially desirable objectives. An

MADM method of quantitative MCDM analysis was used to make a joint evaluation of various objective indicators in different types of farm management.

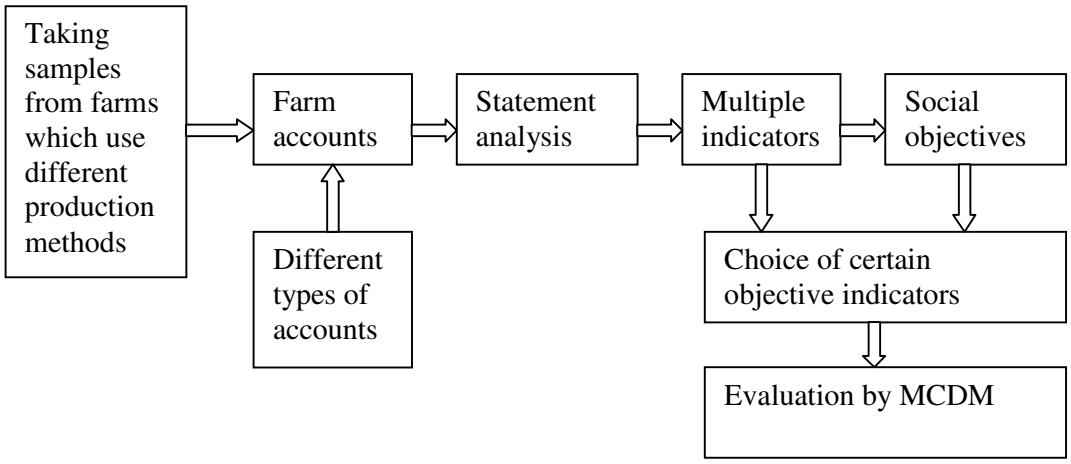
This evaluation method was applied to case studies of organic farms. A small sample of farms were evaluated, some of them organic and some using conventional farming methods, so that the results of the two production methods could be compared.

However what will be discussed here is not the results of this small sample. These were conditioned by the particular physical and geographical locations and the productive structure of the factors of the farms in the specific micro-area where the research took place and are thus only partially transferable to other contexts. Rather than this, the method used to obtain these results will be examined to see how it is valid or in some way useful for similar analogous evaluations. Indeed it might be interesting to perceive if (changing someone of the chosen objective indicators and/or weightings given to there in the carried evaluation) it could be applied to other situations or, in any case, improved.

3. The method used

The pattern that was used in the evaluation process is shown in the following figure 1.

Figure 1: The sequence of the evaluation process



3.1 The farm accounts

The first step was to prepare the farm accounts of the farms which were examined.

Three different types of farm accounts were used: the accounting financial statement, which is the most well known and widely used; the so-called *serpierian*[1] farm accounts, which has been traditionally used by Italian agrarian economists; and the materials-energy balance, used to evaluate -at least in part- environmental sustainability. The results of the first two types of accounts are expressed in monetary terms and the latter in physical ones. The economic and environmental efficiency in the productive process was evaluated by comparing the income and costs of the two groups of farms in physical and monetary terms.

The three different types of farm accounts could have been put together into a single integrated accounts system[2] but it was considered more suitable and easier to treat them separately and then to integrate the most significant results later.

Figure 2 shows the characteristics of the three types of farm accounts that were used.

[1] Given this name because it was developed by Serpieri A. (1948,1950) to evaluate the value of the land but was also used to evaluate the farm management. It was then elaborated by Di Cocco and Tassinari, then by De Benedictis (1976) and over the years has been discussed by many other authors (including Panattoni and Campus, 1983; Di Sandro,1984; Marenco, 1995; Gallerani, 2001).

[2] There are many examples in the literature of integrated environmental and economic accounts at national as well as at farm level. It has been preferred in this case to draw up a simple materials and energy balance in phyisical terms (Ciani,1992, Gallerani., et.al., 2001) without entering into a real *integrated environmental and economic accounts* (Poppe, 1994; Merlo, 1996; Bartolomeo, 1997; Gatta, 2002, Gray, 1996), with different levels of analysis.

3.2 Synthetic evaluation of the results of the management systems from a social point of view

The results of the three types of farm accounts were analysed separately using different indices. These were useful for expressing both the individual business objectives of the private farmer (in terms of economic efficiency of the farm and net income) and those socially desirable, defined as optimal allocation of resources and general wellbeing (in terms of farm net social product or rather globally distributed income and environmental sustainability).

Certain indicators were than identified which were suitable for representing socially desirable objectives. These were chosen from those obtained from analyses of different types of farm accounts.

Lastly the synthesis of the evaluation was carried out using quantitative multi-criteria analyses. This, by reemploying certain of the parameters from the above accounts, made it possible to compare in a joint evaluation certain economic and environmental indicators. These were previously weighed from a social and not purely private point of view.

The evaluation was carried out using various instruments connected as shown in fig.3.

3.3 The choice of the multi-criteria instruments

Multi-criteria analysis was used for the final evaluation of the results because of the above mentioned need to evaluate a series of objectives at the same time, and also to employ different units of measurement, both monetary and physical, in the analysis. These express the objective parameters to maximise or minimise, derived from the farm accounts.

Figure 2 Particular characteristics of the various types of farm accounts used

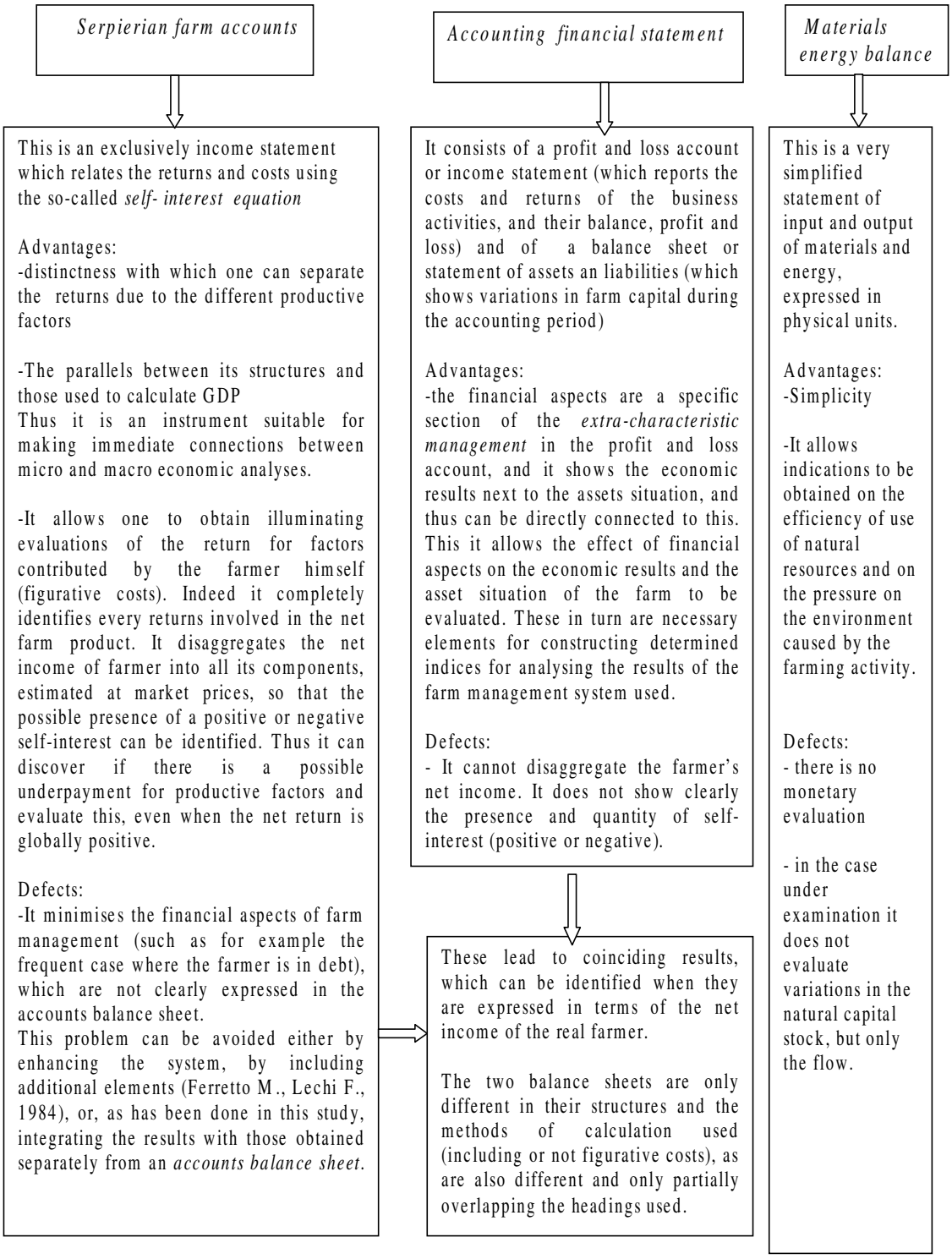
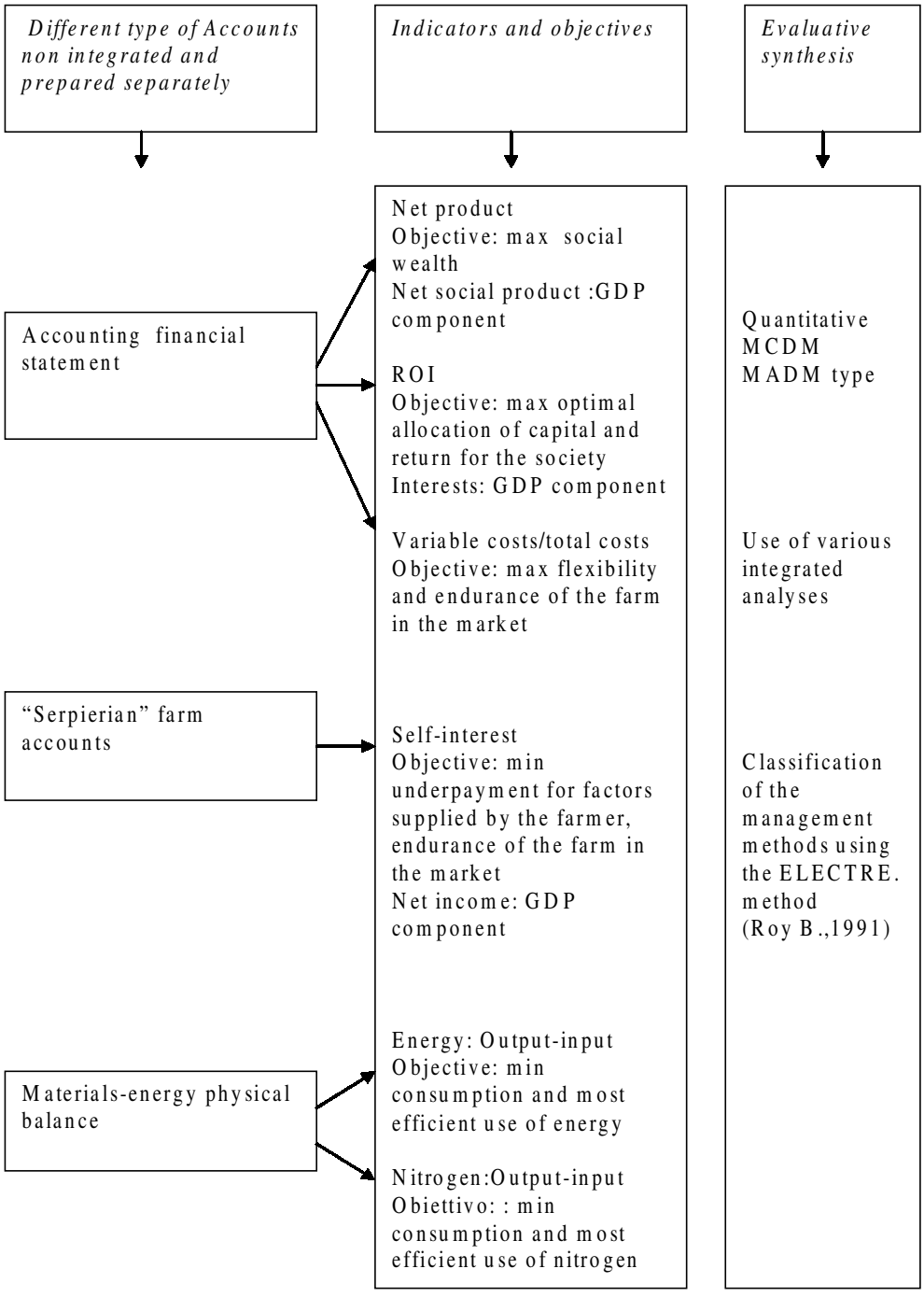


Figure 3: The evaluation instruments used



MADM was used from the MCDM. This choice was made because of the aims of this specific case study, which made an instrument such as MADM more suitable, because it is able to deal with discrete and non-continuous choices (MADM and MODM applications: Marangon F.1992; Gomez-Limon et.al., 2004). Given that precise quantitative data was available, quantitative analytical methods could be used in MADM. Thus it was decided to use an integrated quantitative analysis method which included more multi-criteria evaluation instruments (see figure 5).

It was possible to evaluate the different farm performances using the single analyses in figure 4 separately, based on:

Either the general behaviour of each farm with respect to all the objectives and also with respect to the importance attributed to them (through application of the *weighted sum*);

Or the best behaviour of the farm in the worst case, to minimise the risks involved in minimum achievement of a given objective (through the use of *max-min analysis*);

Or the satisfaction which could confirm the choice a certain type of management system for the achieved objectives (through *concordance analysis*);

Or the bitterness which accompanied choices which involved abandonment of other systems of management, with reference to the best results for determined objectives obtained from use of those systems (identified by *discordance analysis*).

Using more complex *weak dominance* screening, in particular, one can construct a league table of more or less efficient alternatives, even though these are not dominant in a paretian sense, which are able to take into consideration the good global behaviour, and reduction of risks, connected to weak points, of each farm management alternative simultaneously. Good

global behaviour is confirmed by the satisfaction implicit in each choice while risk reduction is connected to the minimum bitterness from having abandoned other types of farm management.

3.4 The social objectives to pursue and the indicators which are suitable for representing them

The criteria used in the analysis represent the public interest. Thus from among the indicators in the farm accounts those have been chosen which are suitable for representing global social objectives rather than, but also including, private ones.

From a public point of view one objective to pursue is economic growth and this concerns more the results of the farm rather than the net income of the individual farmer. This means that it is important to maximise other differentiated income such as added value, which form part of the national GDP, or the net farm private product, or, better, the net farm social product, which represents the new wealth created by the farm. The social income is distributed among the factors which have contributed to creating it. This, as global income, effects the collective wellbeing. *NET SOCIAL PRODUCT* has been chosen from among the cited indicators.

Wellbeing, does not, however, depend solely on the increase in material wealth connected to economic growth but also on other intangible elements, such as the conservation of the environment, in terms of long term sustainable development. The present corrections to GDP also take into consideration consumption of environmental capital, which also presupposes an improvement in how efficiently this is used (Friedrich Shmidt-Bleek ,1994).

Another socially desirable objective is thus the establishment of league tables of environmental efficiency for the farms, based on their use of natural resources as factors in the production process. *ENERGY CONSUMPTION* and *NITROGEN RELEASE* have been chosen to represent this.

Other social objectives linked to the simple economic efficiency of the farm are the financial return on capital (land and working capital and assets) invested globally (and thus not only that of the farmer but also of outside investors) as well as the flexibility of the farm to variations in market prices, which allow it to survive as a vital income producing entity. RETURN ON INVESTMENT was used as an indicator of financial return on capital and *VARIABLE COSTS ON TOTAL COSTS RATIO,* as an indicator of flexibility.

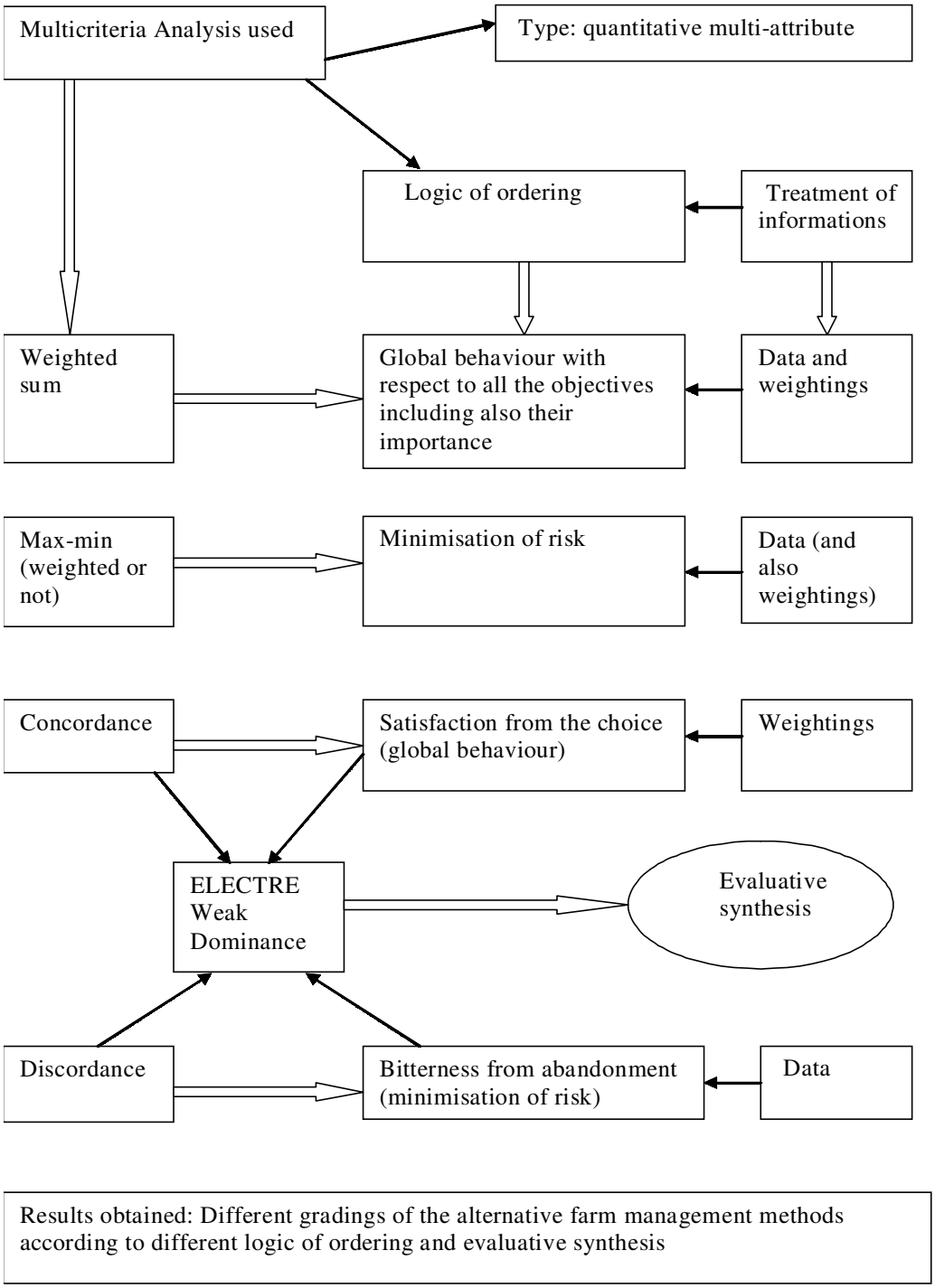
Another social objective is the minimisation of possible underpayment (with respect to market prices) of factors provided by the farmer himself (at the same time figurative costs and income). Indeed, while the maximisation of net income and profit is a private objective, the minimisation of losses is not, given that the farmer is part of society like anyone else, and that his net income forms part of the total national income. The objective is private when farm self-interest is positive, not when one wishes to guarantee that the farmer is paid at market prices for his input. Otherwise long-term underpayment could result in a reduction in productive activity with resulting damage to the whole economy, even though, in the short term, it is those farms which are less dependent on external production factors which are more resistant to market instability. *THE NEGATIVE SELF-INTEREST* was chosen as an indicator of this underpayment.

In all there are six indicators. These represent objectives which are partly economic and partly environmental, some of which must be maximised and some minimised, and are only partly in conflict with one another. For example reducing emissions of material and energy consumption in the productive process may be in conflict with the quantitative increase in total production, but not necessarily with the monetary value of the product or with the net product, which is effected, unlike total production, by the purchase costs of the factors mentioned above and which benefits from a reduction in these.

Figure 4: Matrices for multi-criteria evaluation of the different farm management systems

	Alternatives												*Weightings*
Criteria	Alt1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9	Alt. 10	Alt. 11	Alt. 12	
Farm Net product													34,0%
Return on Investment													10,0%
Variable Total costs													6,0 %
Negative Self interest													10,0%
Energy consumption													20,5%
Release of nitrogen													20,5%

Figure 5: Characteristics of the multi-criteria analysis used and the results obtainable



3.5 Weightings given to the chosen indicators

The different indicators of social satisfaction in farm management which have been identified have different importance, and thus have given different weightings in the multi-criteria analysis (weighted sum, concordance, max-min weighting).

The *pair comparison* system was chosen from among the various methods which can be used to weight the indicators (Saaty, 1990; Nijkamp P., et al., 1990).

4. Conclusive discussion on the results obtained from the evaluation method used

It is noteworthy that the method used stimulated interesting considerations, which might be further examined from both a micro and macro economic point of view, on the opportunity of choosing determined indicators of social wellbeing which are also connected to private convenience, on the links which exist, not always unequivocally, between economic and environmental performance of farm management, and on the weights which can be attributed to the indicators themselves in different public contexts.

The method also allowed the greater analytical possibilities offered, in a technical applicative sense, by independent separate compilation of the different accounting systems to be highlighted. Each of these made it possible to analyse different aspects of farm management. Above all it demonstrated that evaluative synthesis of the results could be obtained in a valid way even when following methods different from those already used for drawing up integrated farm accounts.

By contrast, it highlighted that using integrated multi-criteria instruments to evaluate the indicators was advantageous. It gave a wider and more complete view of the situation for the final judgment, because of the different logic of ordering of the alternatives of the different analyses, and of the possibility of synthesising it by using weak dominance.

The results from applying this method consist of a league table of the relative efficiency of the farms which adopt different farm management systems, from which various aspects of the social repercussions of the different systems can be examined. This league table identifies the most efficient farms according to different ordering logic, which correspond to the cited different multi-criteria analysis adopted in the overall evaluation process. In reality more league tables are created, which refer to the different multi-criteria analyses adopted, and a final league table which is the final synthesis, from using the *weak dominance* method.

This instrument for classifying the alternatives, which can be used together with others for integrating multi-criteria evaluations, was shown to be the best suitable one for *closing the circle* in the final evaluative synthesis.

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