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**Fifth Joint Conference on
Agriculture, Food, and the Environment**

Proceedings of a Conference Sponsored by
University of Minnesota
Center for International Food and Agricultural Policy

Università degli Studi di Padova
Dipartimento Territorio e Sistemi Agro-forestali

Agricultural Development Agency - Veneto Region

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**SESSION III: AGRICULTURAL SYSTEMS WITH LOW
ENVIRONMENTAL IMPACT**

**PAPER 2: FARMING OBJECTIVES AND ENVIRONMENTAL ISSUES IN
THE VENICE LAGOON WATER BASIN**

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FOREWORD

This volume contains the papers presented at the Fifth Joint Minnesota/Padova Conference on Food, Agriculture, and the Environment held at Abano Terme, near Padova in Italy, June 17-18, 1996. This conference was organized by the Center for International Food and Agricultural Policy at the University of Minnesota and the Dipartimento Territorio e Sistemi Agro-forestali at the Università degli Studi di Padova (University of Padova) under their international collaborative agreement, along with the Agricultural Development Agency - Veneto Region, the University of Perugia, and the University of Bologna - CNR. The first Joint Conference was held in Motta di Livenza, Italy in June 1989, the second in Lake Itasca, Minnesota in September 1990, and the third in Motta di Livenza in June 1992. The Fourth Joint Conference was held in September 1994 at the Spring Hill Center in Minnesota.

This conference focused on topics of mutual interest in the areas of (1) agricultural and resource policy, (2) land markets, (3) the food and agricultural industry, (4) agriculture and the environment, and (5) agricultural production and environmental quality and sustainability. Although the conference was not intended to provide a comprehensive coverage of all the issues, this volume hopefully represents a useful contribution to current understanding and debate in the areas of food, agriculture, and the environment.

Judy Berdahl, secretary for the Center for International Food and Agricultural Policy at the University of Minnesota, assisted with these Proceedings.

Benjamin Senauer
University of Minnesota

Danilo Agostini
University of Padova

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FARMING OBJECTIVES AND ENVIRONMENTAL ISSUES IN THE VENICE LAGOON WATER BASIN

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Introduction

The problem of agricultural pollution of the Venice lagoon has for some time been at the center of a lively debate involving the farmers, environmental associations and local, national and international authorities. A part of the problems of the lagoon, and in particular the eutrophication processes, can be traced back to the agriculture present in its water basin that, as well as being very widespread, is amongst the most intensive in Italy and the world. The topic under discussion is therefore how to intervene to substantially reduce the negative effects of the agricultural practices on the water resources and numerous studies have been done and proposals put forward. Some of these proposals have been realized in adequately financed intervention plans. Unfortunately, the practical implementation of these measures clash with problems which are difficult to define and solve. The basic question seems to be whether to favour direct regulatory measures or indirect incentives. The former collide on the one side with political resistance from the farming sector and on the other with the profound weakness of the institutional structures which would implement them. The latter are of uncertain efficiency because of the strategic behavior of the farms that react to agro-environmental policy measures in a way not foreseen by the lawmaker (Giupponi and Rosato, 1995). This has all pointed to the suitability of flanking the study of policies at economic and institutional level by analysis of the farmers' decision-making process to identify strategies at a farm level. The strong links between the success of agro-environmental policies and the characteristics of the different types of farms call for the microeconomic reality to be studied in depth, with the aim of setting up intervention methods adapted to the desired objectives. This research project investigates the willingness and effective capacity of the farm managers to react positively to proposals of environmental protection. The question has been tackled by means of a survey of a representative sample of farms operating in the Venice lagoon water basin.

The approach should not be considered alternative but complementary to the neo-classical one and aims at re-evaluating the role of the institutions, cultural heritage and social behavior in the integration process between traditional agriculture and protection of the natural resources from the viewpoint of integrated rural development.

1. The limits of profit maximization approach

The attempt to explain how farmers make decisions has traditionally been entrusted to neo-classical economic theory. According to this, the only objective of a rational farmer is the maximization of profits, that the individuals operate in an environment in which no uncertainties exist and that they possess a perfect knowledge of all the available alternatives and their implications. This basis has repeatedly been the object of strong criticism and many efforts have been made to overcome the limitations. Among the most significant contributions are the theory of decisions and the work of Von Neumann, Morgenstern and Savage, which introduced utility functions (Von

¹ Paolo Rosato and Manuela Bombana collaborated on the work. P. Rosato set up the research project, M. Bombana processed the data and set up the questionnaire, the paper was written by both. The authors thank C. Poli for his contribution towards setting up the questionnaire and A. Fumagalli for the farm surveys.

Neumann, Morgesten, 1947), modified by introducing the concept of limited rationality, according to which there are situations of imperfect knowledge of the alternatives (Simon, 1957). More recent psychological (Kahneman, Tversky, 1992) and economic theories (Quiggin, 1982; Yaari 1987) suggest further elements that influence the decisional process and the way in which the context influences the perception of the results. In particular, the importance that individuals place on an event could depend on its position on the scale of priorities of the possible results, as suggested by the RDU theory (Rank Dependent Utility Evaluation) (Weber, 1994).

Psychology has provided new starting points for a better understanding of decisional processes by offering a radically different point of view: the attention moves from the search for general models to analysis of the factors that determine individual behavior (tab. 1.1).

Tab. 1.1. The decisional process from the economic and psychological point of view

Characteristic elements	Approach	
	Economic	Psychological
Focus on:	predicting outcomes aggregated behavior equilibrium solutions theories	explaining the processes individual behavior learning phenomena
Anomalies studied	market inefficiencies	deviations from normative behavior
Proxy for importance:	can anybody make money with it	can it lead preferences reversal?

Source: Weber E.U. (1994).

This approach can give economic models wider descriptive power, recognizing both the subjective nature of the perception of objectives and results and the dependence of individual behavior on intrinsic incentives such as personal satisfaction.

Naturally, acceptance of the basis outlined here implies a substantial change from the traditional approach to the study of decisional processes. In the first place, the farmer is taken to be the main expert on the subject (Fairweather, Keating 1994, p. 182). It is also assumed that the farmer's decisions will be "rational", adopting a non-traditional definition of the term. It can be hypothesized that a decision is rational when there is coherence between behavior and objectives, in other words a rational decision implies a choice coherent with a set of criteria (Jacobson, 1994, p. 79). This broadening of the concept of rationality, combined with identifying the criteria of choice and motivations of the farmers, gives a better understanding of their attitudes towards farm management (Olsson, 1988).

The specialist literature separates the farmers motivations into objectives and values. The objectives are situations in which the individual wishes to find himself; some objectives can be ends in themselves, others can be instruments for obtaining different results. Take, for example, the action of a farmer who buys land. The purchase can be made in order to: a) satisfy the desire to own more land, b) increase the capital value of his property, c) enlarge the business to give his son work, d) increase output and earnings, e) improve access to other parts of the property, f) embark upon new activities such as re-forestation. The same action can therefore be a response to different motivations. To possess more land can be an end in itself or else a means for pursuing future objectives such as maximizing profits, family stability or improving ease of access, cropping etc.

The values are intrinsically linked to the individual and appear to be more stable over time and under differing circumstances. They concern what is desirable in every situation; they are justified by reason, moral judgment or aesthetics. Typical values are honesty, humanity, progress, liberty, democracy. These form a cultural product, have an end in themselves and generate a certain regularity in behavior. The values are shared by all members of a given system. The hierarchy that

forms amongst these determines, together with the objectives, the farmers' choices (Gasson, 1973, p. 524).

Empirical research projects undertaken to identify objectives and values have, however, furnished conflicting results. Some authors indicate maximization of profits as the main, or even only, objective of the farmers (Flora, 1986); others, instead, firmly state that the economic objectives are not sufficient to adequately describe the decisional process and that unsuccessful maximization of profits cannot be explained by the concept of "market inefficiency", but can be justified by the factors that regard the personal sphere. Another criticism of the traditional models regards the superficiality with which the earnings objectives are treated, leading back to the simple maximization of profits. Economic objectives can be extremely diverse, they could be maximization of the following: a) profits; b) global family earnings; c) long-term net farm income; d) the inter-annual stability of the net farm income; or, e) the conservation of the farming heritage. These objectives can also be pursued jointly, in which case the element differentiating the farms becomes the priority they are given (Mantino, 1990, p. 43). The different facets of the earnings objectives are also confirmed by the fact that the various authors give them different valence. To some they signify enlarging the volume of business (Pomeroy, 1987), for others they consist in achieving financial security (Gasson, 1973).

In any case it seems to be generally accepted that the objective of maximizing income can show very different facets and is not enough to explain the entire decisional process. Mantino (1990), Thompson (1986), Brown and Larson (1979), Weber (1994), Jacobson (1994) and many others take this line. These authors draw attention to many non-economic factors affecting the farmers' choices: a) the social context, i.e. recognition, prestige, the continuation of family tradition, working with other family members; or else b) the objectives and values relating to self expression, like the possibility of being creative and original, of pursuing personal development; c) the objectives concerning values intrinsic to the type of work, like the pleasure of performing the typical duties, the preference for a healthy open-air life, the value of hard work, independence, freedom from supervision and organizing a timetable (Gasson, 1973). The importance of the factors concerning the psychological and social sphere was also demonstrated by Smith and Capstick (1976) who, using techniques of direct comparison, ascertained that they were always ranked first (tab. 1.2.).

Tab. 1.2. The ranking of the farmers' objectives

1°	Continue working
2°	Stabilize earnings
3°	Increase efficiency
4°	Provide an education for offspring
5°	Improve standard of life
6°	Reduce need to ask for loans
7°	Maximize profits
8°	Have more free time
9°	Increase net value
10°	Increase farm size

Source: Smith and Capstick, 1976

The second placing of "stabilize earnings" should also be noted that, while being a fundamentally economic objective, has a valence very different from maximization of profits that only appears in seventh place. The search for economic stability reveals another important factor in determining the choices: the level of aversion to risk. The study has also demonstrated that the importance given to the different objectives modifies over a lifetime and changes considerably with the varying of personal and job characteristics.

Table 3.1 reports the main contributions to the study of farmers' decisional processes with information on the techniques used and results obtained.

Tab. 1.3. A review of the models

Author, year of publ.	Technique used	Aim of the study	Results
Gasson, 1973	Questionnaires	Objectives & values	Maximization of profits is not the only objective
Smith & Capstick, 1976	Questionnaires (paired comparison)	Priority objectives	Maximization of profits is not the main objective
Brink & Mc Carl, 1978	Linear programming model	Variables that influence the objectives	Age influences attitude towards risk
Harper & Eastman, 1980	Questionnaires (paired comparison)	Farm size	Small farms are more orientated towards intrinsic values of farm work
Olsson, 1988	Questionnaires	Risk	Management styles
Mantino, 1990	Qualitative research	Family strategies	Management styles
Stellin, 1992	Qualitative research	Family strategies	Links between choices & family environment
Fairweather & Keating, 1994	Questionnaires (factorial analysis)	Interactions between objectives & lifestyle	Management styles
Olson, 1994	LISREL simultaneous equations model	Spread of information	Description of decisional process
Jacobsen, 1994	Repeated questionnaires	Time horizon of choices	Differentiated behavior in the short and long-term
Schoorlemmer et al., 1994	Questionnaires	Risk	Attitude towards risk
Weber, 1994	Gambling decision	Risk	Attitude towards risk
Brown & Larson, 1979	Questionnaires	Racial groups & management	The value of owning the land is greater than that of the production factor
Cary & Holmes, 1982	Questionnaires	Influence of the past	Past history influences management style

2. The objectives and values of the farmers of the Venice lagoon water basin

2.1. Study method

The decisional strategies of the farmers were analyzed by means of a questionnaire laid out in different sections. The first is geared to surveying the structural characteristics of the farm and current and past management methods, with particular reference to land use, use of manual labor, recourse to contractors², etc. The second part includes questions on the motivations of the management and farming choices, as well as farming as a profession. The third section regards the environment and has the aim of sounding out the farmer's awareness of the environmental impact of his activities, of the services he offers to the community and his willingness to do more. The fourth part investigates the use of fertilizers, pesticides and deep plowing and the knowledge of and willingness to adhere to the agro-environmental measures proposed by the new CAP. The questionnaire was given out to a representative sample of 200 farms located in the Venice lagoon water basin (BSLV).

The following sections summarize the results with particular reference to the characteristics of the BSLV, management methods, motivations underlying the farming practices and the relationships between these practices and the producing environment.

² The term contractor denotes a firm that sells mechanized services (plowing, harrowing, harvesting, etc.) to farms.

2.2. The characteristics of the study area

The BSLV extends over an area of about 1,840 km², including three provinces (Padova, Treviso and Venice) and 95 communes. It has a population of 950,000 at a density of 516 inhabitants/km². The total farming surface area is about 1,450 km² (79% of the total). The surface area actually cultivated amounts to 1,170 km² and is mainly used for arable crops (92% of the UAS), such as cereals, soybean, tobacco, sugarbeet, forage crops and horticultural products. Permanent cropping occupies around 8% of the UAS and is mainly vines (7% of the UAS).

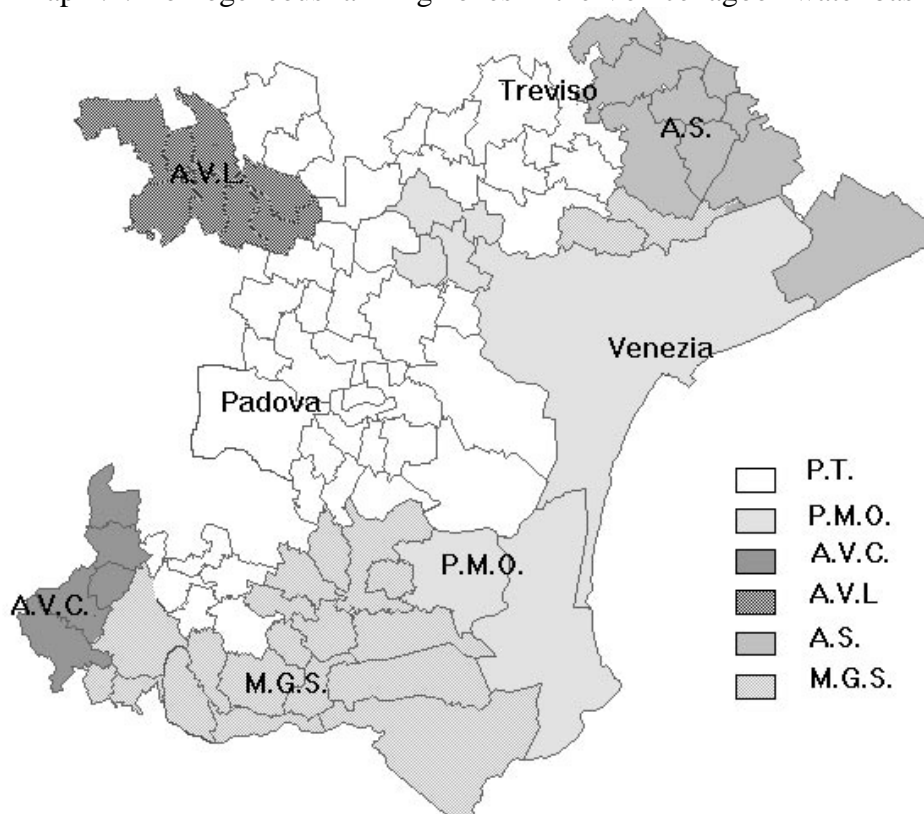
Around 41,000 farms operate in the BSLV, 24,500 of which rear livestock. The average farm size is fairly small, being 3.5 ha. 95% of the farms are family-run, 68% of these being full-time. Management by individuals whose main employment is in other sectors is widespread (29%). There are many livestock, with 179,000 cattle (17% dairy cows) and 82,000 pigs.

Agriculture in the BSLV is diversified enough to allow the identification of truly homogeneous agricultural zones, clearly distinct from one another on both a structural and territorial level¹.

The homogeneous agricultural zones identified are:

- a) the zone managed by part-time farms cultivating arable crops (P.T.);
- b) the area managed by small and medium-sized market gardens (P.M.O.);
- c) the zone managed by hill vineyards (A.V.C.);
- d) the area with a significant number of dairy farms (A.V.L.);
- e) the zone of medium-big farms cultivating tree and arable crops (A.S.);
- f) the area managed by medium-big arable farms (M.G.S.).

Map 2.1. Homogeneous farming zones in the Venice lagoon water basin



³ Identification was done using Cluster Analysis on the data at commune level, utilising the following indicators: horticultural UAS percentage, tree crops UAS percentage, number of cows per hectare of UAS, percentage of farms managed mainly part-time, average UAS per farm, percentage of young people between 14 and 29 years old active in the primary sector.

The areas managed mainly by part-time farms with arable crops (P.T.) are situated in the central part of the BSLV (map 2.1), they include 47 communes, 44% of the UAS and 58% of the farms in the basin (tab. 2.1). This is the largest area, and is characterized, obviously, by a large percentage of small (2.3 ha), mainly part-time farms (31%), growing the typical crops of the area and with few young people occupied in farming. Another distinctive element is the widespread use of contractors.

The area dominated by market gardens (P.M.O.) is situated next to the coast and has very sandy soils and a good water supply. It covers 5 communes, 13% of farms and 14% of the UAS and is characterized by the low percentage of part-time farms and of UAS under tree crops, while horticulture covers 15% of the UAS. There are a good number of big farms, especially in the southern part, and percentage of young people employed in farming. The work load per unit surface area is also relevant. The zone, therefore, has a reasonable number of professional farms that compete well with the other economic sectors in the area in terms of profitability.

The zone mainly managed by hill vineyards (A.V.C.) is clearly defined by the south-eastern buttresses of the Euganean Hills and represents only 2% of farms and UAS. The main identifying elements are the absence of horticulture crops and dairy farms, while part-time farms and vine growing are widespread. These characteristics make it similar to the P.T. areas but it differs by the presence of vines and, consequently, a higher employment capacity.

Table 2.1. Characteristics of the homogeneous agricultural zones

Indicators	Homogeneous agricultural zone					
	P.T.	P.M.O.	A.V.C.	A.V.L.	A.S.	M.G.S.
Number communes	47	5	6	8	9	20
Number of farms	24074	5355	851	3355	1465	6107
%	58	13	2	8	4	16
UAS (ha)	52193	16391	1769	6884	7387	32683
%	44	14	2	6	6	28
Farms prev. part-time (%)	31	22	31	30	29	25
UAS horticultural (%)	2	15	1	1	0	2
UAS tree crops (%)	9	4	32	3	17	7
Aver. farm size. (ha)	2,3	3,2	3,0	2,2	4,8	5,8
Farms < 2 ha (%)	23	15	16	25	9	10
Farms > 50 ha (%)	5	19	9	2	28	20
Rurality index	2,1	5,8	2,9	2,1	3,0	3,7
Working days/UAS	48	67	52	63	30	28
Cows/UAS	0,34	0,18	0,07	0,80	0,19	0,09
Tractors/UAS	0,25	0,21	0,23	0,32	0,17	0,14

The areas with a significant presence of dairy farms (A.V.L.) are in the north-western part of the BSLV where the springs and permanent meadows provide valuable forage crops. This zone extends over 6% of the UAS and includes 8% of farms. The A.V.L. area is very similar to the P.T. one in the diffusion of part-time farms, farm sizes and youth employment. It differs by the large number of dairy cattle, scarcity of typical local crops and high level of mechanization and of farm work-load.

The zone managed by the medium-big farms dedicated to tree and arable crops (A.S.) occupies the north-eastern part of the BSLV, 6% of the UAS and 4% of farms. Characteristic elements are the diffusion of tree crops (vines inland and orchards on the coast), the absence of market gardens and limited mechanization. It is an area of strong agricultural systems where, alongside the decent farm sizes, are high-earning crops and a careful use of farm capital, especially machinery.

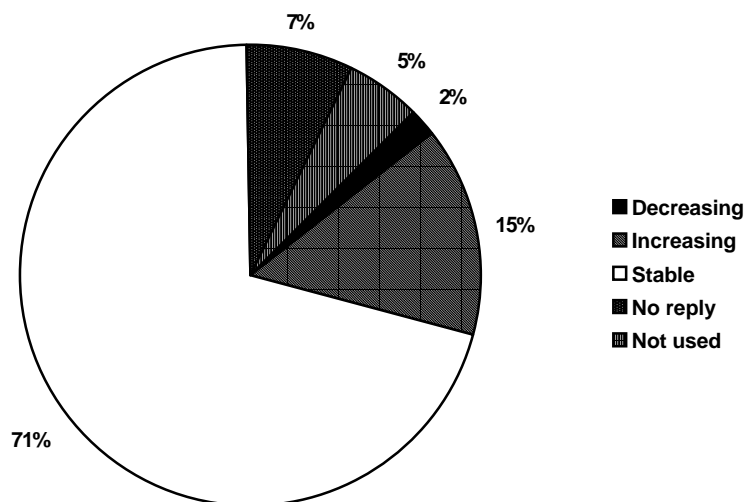
The area managed by the medium-big arable farms (M.G.S.) is the second in size (28% of the UAS) and number of farms (16%). It encompasses 20 communes, mainly situated in the southern

part of the BSLV. The characteristic element is definitely the combination between the spread of arable crops and the large average farm size, along with the scarcity of typical local crops and dairy farms. The area has a strong agriculture where the elements of success can be found in the farm size and limiting of production costs, especially those relating to labor and machinery.

2.3. Farm management

The surveyed farms are run by a limited number of people: in 70% by just one or two and in 20% by three or more. The main type of management is family-run and only a tiny percentage (around 1%) - constituted of very big farms with tree and arable crops - employ paid labor. In all other cases the work is done by members of the family. This confirms the results from other research projects, in which family ties play a determining role in management and farming choices (Mantino, 1990; Stellin, 1992). Notwithstanding this family collaboration, the cropping operations are often not carried out using farm resources (labor and machinery), but are entrusted to external firms. Recourse to contractors appears in fact common and regards all operations with peaks at harvesting (87%) and sowing (71%). The expansion process of contracting is stable in 72% of the farms surveyed, increasing in 15% (fig. 2.1). Hiring shows different patterns in the identified homogeneous areas. In particular, detailed analysis using the logistic regression model shows growth in the big arable farms and stability or decline in all the others, particularly the market gardens. Management re-structuring has in fact already largely taken place in the areas dominated by part-time farms and is now involving the full-time medium sized or big farms. This signifies that this solution, in terms of excellent timing of the work, is also becoming worthwhile in the professional arable farms.

Figure 2.1. Pattern of recourse to contractors (%)



Recourse to extension services appears fairly consistent, to the query "Do you make use of advisors?", two-thirds of those interviewed gave a positive reply. The logistic regression analysis displayed that the response to this question is affected by the homogeneous farming area. The probability of turning to advisers is high, particularly in the area with farms run part-time. Advisers from the agronomic advisory groups are questioned by 40% of interviewees, free-lance consultants and commercial advisers in around 20% of cases. The advisers from the farming co-operatives are only called by 11.5%. The principal declared needs are agronomic advice (79.5%), followed by fiscal matters (39.7%) and queries concerning livestock (35.9%).

It therefore seems that management methods are firmly anchored to the family dimension but with an increasing use of external cropping and management services. This trend appears to belinked

to two main motivations. The first, typical of the areas where part-time farming is most widespread, can be traced back to the decline of available intellectual and material resources for the agricultural production processes. The second, mainly in the areas with medium-sized and big arable farms, is connected with the constant attempt to reduce production costs, especially fixed ones.

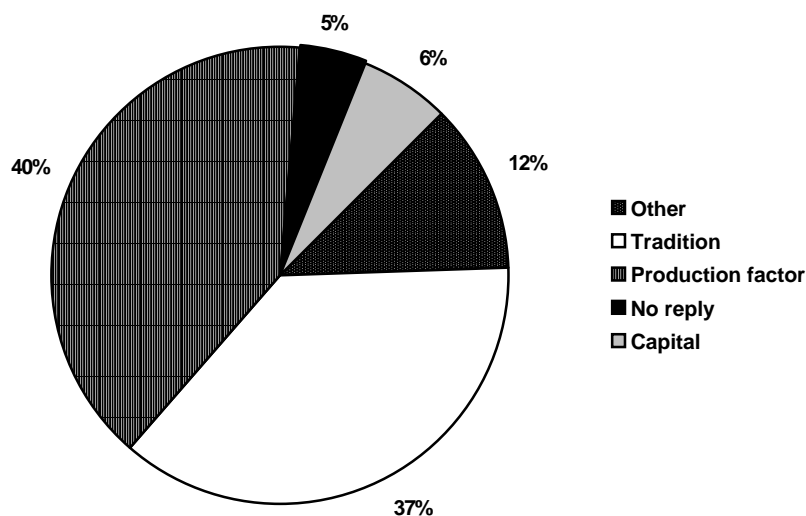
2.4. The motivations of land management

The motivations in land management have been analyzed under various points of view. In particular it was wished to investigate three fundamental topics: 1) the type of bond the farmers have with the land; 2) why farming is practiced; 3) what determines the choice of current crops. These three aspects demonstrate different motivations that interlace in various ways with the management. In fact, those interviewed react in different ways to the questions set. In the first place they display a very deep bond with the land that certainly goes beyond income needs and when the motivations of practicing farming are gone into in greater detail, tradition emerges as the main factor. Taking, instead, the reasons for crop choice, earnings are clearly uppermost.

2.4.1. The bond with the land

To the question "What is the land to you?", 34.2% of interviewees replied "a production factor", 31.6% "a tradition" and 19.7% "capital". It should also be noted that the type of reply is not dependent on homogeneous area, confirming the assumption that the bond with the land transcends the specificity of the agricultural production organization⁴.

Figure 2.2. The bond with the land



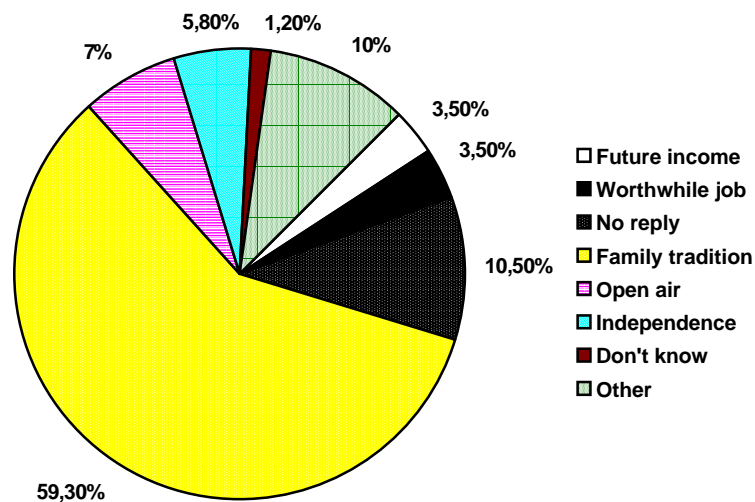
Analysis of the group who replied "other" to the query in figure 2.2. highlighted some elements that regard the way in which the farmer sees himself in relation to the land. In fact, the replies are: "the land is my life"; "the land is everything"; "the land is like a son". Deep attachment to the land was confirmed by the responses of the farmers to the question on the circumstances under which they would agree to sell the land. 57% of those interviewed declared that they would not agree under any circumstance. Money was not sufficient (for 81%) nor a better-paid job (95%), nor better qualified socially (97%). The interviewees who declared themselves absolutely against selling the land spend a great deal of time on farming activities and are of above-average age.

⁴ Analysis of the index χ^2 of dependence between the replies to the question and type of homogeneous area demonstrated independence between the two variables.

2.4.2. The motivations for farming and crop choices

To the questions on the reasons for farming, the major part of interviewees (59%) stated that the main motivation is family tradition followed, at intervals of around 5%, by future income, dignity of the occupation, the fact that it is work in the open-air or independent (figure 2.3).

Figure 2.3. Motivations for farming



The earnings incentive is therefore totally inadequate to justify a practice of farming that appears to be a cultural inheritance, more so even than professional. Farming is founded on a sort of life condition, for those who do it professionally, and a life style for those who, while working in other sectors, own land. This is confirmed by the fact that, although earnings can be very modest, the giving up of professional farming happens with the arrival of inability to work and almost never when pensionable age is reached or as a change of job. It is a different matter where agricultural practices are carried out part-time. Although there are strong cultural motivations, the practice of part-time agriculture has spread only where recourse to contractors has allowed the setting up of production models with minimal labor requirements and of low earnings ability. Where this has not happened the disappearance of the professional farmer has led to abandonment, occasionally mitigated by maintenance in a mainly hobby-like way. In the BSLV the good arable soils and the impressive growth of contracting has allowed farming to be maintained on all the available land, and has limited the abandonment to small plots within the urban centers or in the brackish coastal areas of the lagoon.

Instead, the main objective in the choice of specific crops is the maximization of income: to the question "Why did you choose the current crops?", 59% of interviewees declare that the decisions are strongly affected by earnings. In second place, the farmers say that crop choices are made on the basis of soil suitability and the climate. There is a tendency to deny being influenced by people from outside the farm, either contractors or advisers, or by neighboring farms. Motivations connected with marketing and those of an environmental nature are considered of little importance (tab. 2.2).

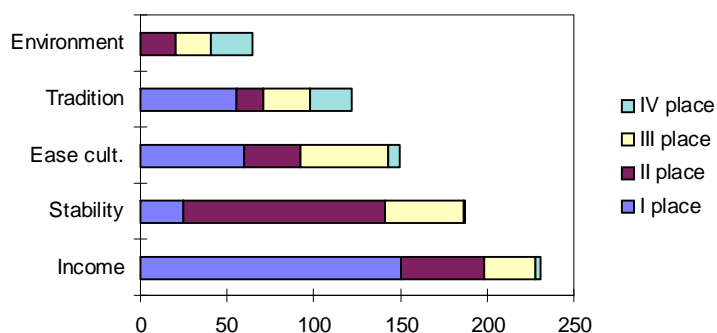
As has already emerged from other analyses (Gasson 1973), the farmers demonstrate a certain pride due partly to the awareness of doing work of use to society (more than 60% say they cultivate the land so as not to leave it fallow) and partly to the fact of doing an independent job, free of external influences. This freedom appears to be over-rated as, notwithstanding the absence of effective environmental policies and widespread services to agriculture leaving the farmer fairly free in the choice of crops, the evolving of the systems and current policies of income-support severely limit the possible options.

Table 2.2. Motivations in crop choices (%)

Motivations	Level of agreement				Total
	Disagree	More or less agree	Definitely agree	No reply	
Tradition	59.0	17.1	21.4	2.5	100
Earnings	19.7	18.8	59.0	2.5	100
Ease of cultivation	54.7	20.5	22.2	2.6	100
Advice from contractor	96.6	0.0	0.9	2.6	100
Advice from adviser	88.9	1.7	6.8	2.6	100
Imitation neighbors/friends	90.6	2.6	4.3	2.6	100
Ease of sale of produce	67.5	16.2	12.8	3.5	100
Suitable climate	24.8	40.2	33.3	1.7	100
Suitable soils	20.5	39.3	37.6	2.6	100
Require little time	62.4	18.8	15.4	3.4	100
Nearness of markets	69.2	19.7	8.5	2.6	100
Not ruin the landscape	60.7	26.5	10.3	2.6	100
Not leave the land fallow	36.8	20.5	40.2	2.5	100
Not pollute	53.0	28.2	16.2	2.6	100

The farmers of the BSLV, anyway, are not homogeneous in respect to the factors influencing crop choices. For example, farms with dairy cows and those that are part-time are firmly bound to tradition and less interested in earnings. For the livestock farms, this attitude is justified by the fact that the farmer is strongly orientated towards cowshed management and often maintains fields of low-earning forage crops. The part-time farms, instead, see cropping as the principal means for preserving land capital and not necessarily as a source of income. Teaching influences the farmers' behavior; a good level of education diminishes both the probability of agreeing with the statement that the choice of type of crop depends on the climate, and that it depends on the time required for the cultivation. Moreover, the less well-educated farmers show a deeper attachment to the land and declare that they cultivate it so that the land is not abandoned.

Figure 2.4. Ranking of the main motivations for the current crops



To establish which of the motivations listed in table 2.2 would take priority it was asked to rank them. As can be seen in figure 2.4⁵, in first place is the objective of earning as much as possible, in second the guarantee and stability of income, in third "ease of cultivation", in fourth "tradition" and in fifth "environment". The classification doesn't vary much when the results are analyzed by system, in fact the first two motivations (earnings and stability) remain in first and second place and

⁵ Only 50% of the sample replied to this question, which was more difficult than the average.

environment is always last. There are marginal modifications for tradition and ease of cultivation, that swap positions⁶ on some farms.

Cultivating the land and, to a lesser extent, the crops chosen, also seem to have marked influences on the value of the property. As is shown in table 2.3, the main valorizing crops are arable crops and vines and only 11.1% of interviewees consider that the crops do not influence the value. Analysis by system highlights a tendency to favor the effect of crops grown on the value; in fact, the farmers who cultivate arable crops attribute a higher economic value to the land used for this and the same happens for the vine growers.

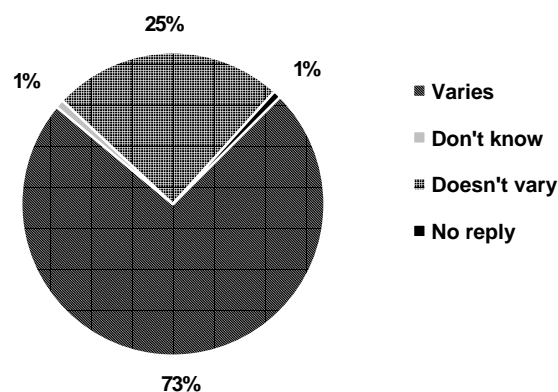
Table 2.3. Land use and land value

Most valorizing use	Frequency	%
Meadow	4	3.4
Arable crop	41	35.0
Vines	33	28.1
Independent of the crop	14	11.1
Don't know	11	9.4
No reply	7	6.0
Other	7	6.0
Total	117	100.0

2.4.3. Farmers' perception of risk

One of the aims of the research was to establish the farmers' perception of risk. In fact, the copious literature on farmers' decision-making processes attributes a very important role to risk in farm management in general, and crop choice in particular. It was therefore attempted to investigate the perceptions of variations in earnings ability and the reasons that determine them. From the replies obtained, risk appears to really effect the management of the farm. To the question "Do you have the sensation that the earnings capacity of your land varies over time?", 73.5% responded positively (fig. 2.5). The replies do not vary significantly analyzing the different types of homogeneous area and do not depend, in the studied sample, on age.

Figure 2.5. Perception of earnings variability over time



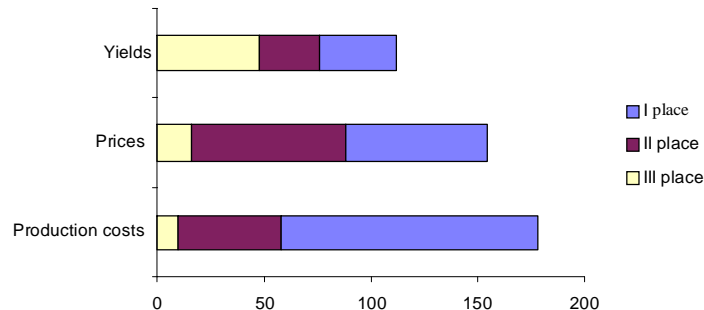
To analyze perception of the main causes of this variation, it was asked to rank the factors that determine earnings capacity on the basis of importance (fig. 2.6)⁷. Production costs resulted as being

⁶ The result supplied by the indexes of correlation and bivariate tables is confirmed by logistic regression analysis, in which no variable results as significant.

⁷ Only 74 individuals (63% of the sample) responded to this question, which was more difficult than the average.

the most important factor, followed by prices and in last place, yields. In fact, for 54.1% of interviewees cost of production appears in first place, while for 32.4% it is in second. The prices are in first place for 29.7% of interviewees and in second for 48.6%.

Figure 2.6. Factors influencing earnings capacity



The priority assigned to production costs as the determining factor of earnings capacity shows the importance attached to real outgoings even if these are revealed as fairly uniform over time, as demonstrated by the very standardized production technique adopted for the main arable crops by most farmers in the BSLV. Production costs are therefore perceived as influencing the earnings capacity, but not its variability. Instead, variations in prices and yields appear to be much more important.

To the question "What makes prices vary?", the way that has been registered most often is the EU agricultural policies (41.3%), most certainly because of the recent reform (fig. 2.7). World (16.6%) and local market (11.9%) trends follow. The percentage of farmers who state that they ignore the causes of these variations and/or who didn't reply is very high (5.5%). It is worth noting the absence of motivations connected to farming strategy. This confirms the hypothesis of Noell (1994), according to which the farm manager retains that his decision-making power is greatly limited by both political and meteorological external factors.⁸

What is illustrated for prices is also confirmed for production. As can be seen in figure 2.8, rain and hailstones are considered the most important factors of variation, uniting 73.1% of those interviewed. Scarce importance is attributed to the variables that depend on the farmer's professionalism, such as cropping operations (3.4%). The classification varies little considering the different types of farms⁹.

The responses to the above questions identify a farmer well aware of the variability of agricultural earnings but fairly fatalistic about management and the attainable economic results; he places importance on variables that are not directly under the control of the farm, such as economic policies or the weather. Therefore, control over earnings variability is mainly through cropping choices. In fact, growing cereals has become widespread recently, well tested in the BSLV, providing stable yields and good returns. This has been to the cost of soybean, the price of which oscillates, and sugarbeet, which has very variable yields.

⁸ The frustration due to this situation appears to have been tempered by the recent evolution in earnings capacity. The abandoning of the policy of price support and the introduction of compensations (EC regulation 1765/92) has had a doubly positive effect for farm managers: variability in farming earnings has notably reduced and there has been a clear increase in average earnings, especially on arable farms.

⁹ The significance of the χ^2 test on the dependence between the response to this question and the type of farm equals 0.26.

Figure 2.7. The factors that influence prices

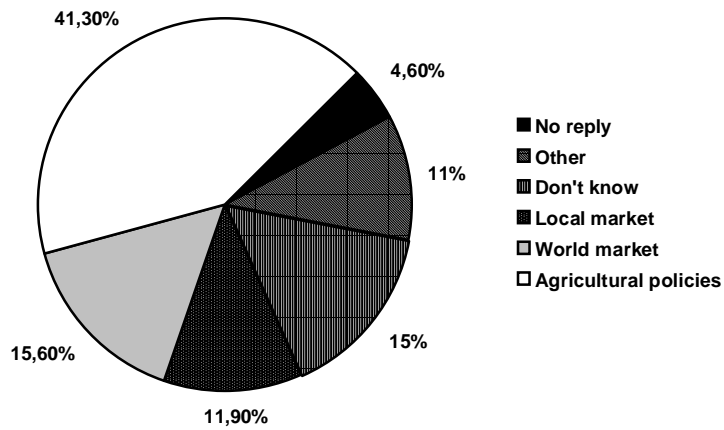
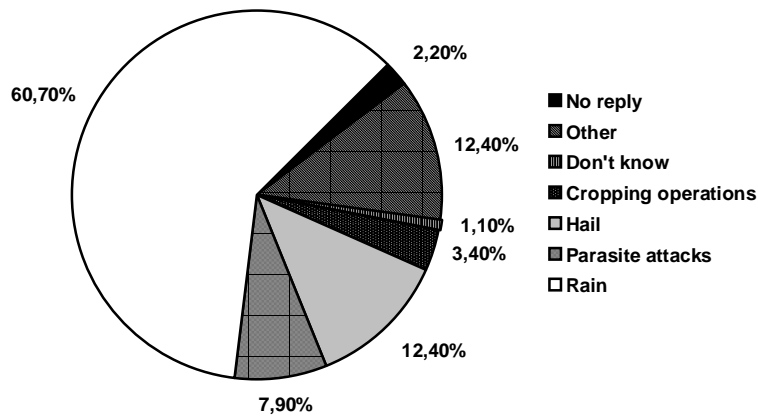


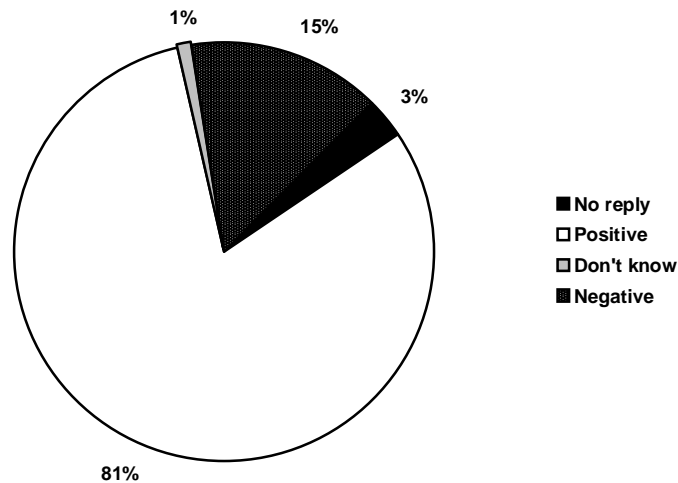
Figure 2.8. The factors that influence yields



2.5. Farming practices and the environmental question

An important part of the study of farmers' decisional processes concerns the perception of the farmer's role in the environment. It was attempted to evaluate how the farmers consider the effect of their activities on the landscape. The vast majority of farmers (81.2%) stated with force that cultivating the land contributes to the beauty of the landscape (fig. 2.9) and the responses do not differentiate by varying the type of system.

Figure 2.9. Farming practices and landscape quality: the role of agriculture



The elements that make the countryside more attractive, for the majority of those interviewed, are crops (33.3%), followed by trees (29.6%). Scarce importance is attributed to meadows (2.5%) and natural elements such as hedges and wooded scrub (3.7-1.3%). This attitude contrasts strongly with the aesthetic perception of society as a whole, which appears to appreciate the more "natural" elements, as has emerged from specific studies (Tempesta, 1992). This dichotomy determines a clear conflict between the farmers who consider attractive that which is cared for, ordered and productive and the non-farmers who, instead, appreciate elements that usually detract from productivity and/or ease of cultivation. This problem is well recognized at a political level and has been translated into specific regulations to rectify it (EC Reg. 2078/92).

Table 2.5. Elements qualifying the agricultural landscape

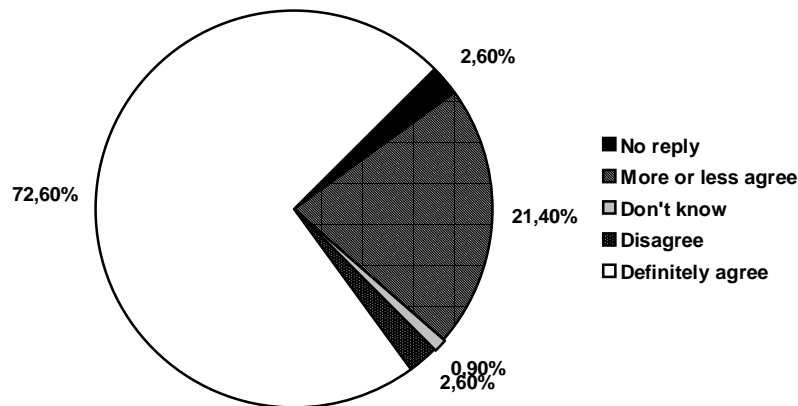
	Frequency	%
Trees	24	29.6
Hedges	3	3.7
Woods	1	1.3
Meadows	2	2.5
Crops	27	33.3
Embankments and field edges	9	11.1
No reply	2	2.5
Other	13	16.0
Total	81	100.0

Another important question is on the use of fertilizers and pesticides. To understand if the farmers consider pesticides and fertilizers a danger to health, they were asked if they eat their own produce and, in the affirmative, if the amounts of chemical inputs differ between produce destined for the market and those for home consumption. Almost all those interviewed (88%) consume their own produce: 95% consume horticultural produce, 56.3% from the vine and 68.9%, fruit. There was evident preoccupation for health risks; in fact, on 75.6% of the farms interviewed the amounts of fertilizers and pesticides used on produce for home consumption are lower than those used on produce destined for the market, relating obviously to the same crop.

The interviewees seem to be fairly preoccupied by the effects of fertilizers and pesticides on their health, with 72.6% considering them potentially damaging (fig. 2.10) and desegregating the analysis by farm type doesn't demonstrate clear variations in responses. However, the reaction to the

problem differs clearly by type of farm. The market gardens seem to be most sensitive, as the toxicity of the products used has been a motive for choice in 88% of the farms, while for part-time farms and big farms with tree and arable crops the percentage is around 50%. This is due to the different crops practiced, with the producers of crops destined for direct consumption being more sensitive.

Figure 2.10. Fertilizer and pesticide use in farming and health: Do you consider that the use of pesticides and fertilizers damages your health?



After having ascertained the perception of the potential risk of chemical inputs, the ways in which farmers acquire information on their use were analyzed. The responses have been particularly worrying as a strong dependence on the marketing systems of the chemical inputs has emerged (tab. 2.6).

Table 2.6. Sources of information on fertilizer and pesticide use

Source	%
Contractor	9.0
Retailer	42.0
Extension officer	27.0
Adviser	8.0
Books and journals	3.0
Other	11.0
Total	100.0

42% of interviewees declared that they rely on the retailer, 27% on the regional extension services, 8.9% on private advisers and only 3% on the specialist literature. The replies to this question seem to be influenced by the type of homogeneous farming area¹⁰. The area with more part-time farms gains information from the retailer in 46% of cases and from the contractor in 21.9%, while in the zone with big farms growing tree and arable crops, from both the retailer and the adviser. Instead, the area with dairy farms and big farms is mainly informed by the extension services.

¹⁰ The observed α of the χ^2 equals 0.17.

The greater dependence on the marketing systems is therefore confirmed in the areas where farms are run with the aid of contractors as they lack equipment.

The following results have been acquired on the predisposition of farmers to adopt production techniques with low environmental impact (tab. 2.7).

Table 2.7. Willingness to reduce the use of techniques with high environmental impact

Conditions	Reduction		
	Fertilizers	Pesticides	Deep tillage
Everyone must do it	28.2	28.2	3.4
Be recompensed	27.4	27.3	19.7
No condition	23.1	21.4	37.6
Don't know	0.0	0.9	2.6
No reply	0.9	0.0	10.3
Other	20.4	22.2	26.4
Total	100.0	100.0	100.0

First of all, the farmers are in favor of reducing the quantity of fertilizers and pesticides, even if only within given limits. The condition stated most often is "...everyone does it", and shows the free rider problem that is typical of environmental policies. In fact, someone who uses pesticides in a zone where the other farms don't use them because of an environmental policy, is not only favored but causes notable disadvantages to the adjacent crops. The second condition reflects another fundamental problem in agro-environmental policies: who must bear the cost of the cleaning up? 27% of the farmers consider that society must accept this burden, not the primary sector. Table 2.8 also shows that, in contrast to pesticide and fertilizer use, the farmers are not very willing to reduce deep tillage. This could indicate a lack of awareness on the origins of pollution phenomena and conserving soil fertility. The high percentage of "other responses" is due to farmers who retain that they do not cause damage to the environment and that it would be impossible to be even less polluting.

Desegregating the analysis by type of farming area doesn't show variations in the replies regarding pesticides and fertilizers, while there are some differences on the subject of reducing deep tillage. In fact, the dairy farms have demonstrated greater willingness with 27% being willing to reduce deep tillage under some kind of compensation scheme. Market gardens are much less keen, with 68% stating that they would be unwilling under any circumstances. Logistic regression analysis on the reduction of fertilizer use demonstrates that higher levels of education increase willingness. Moreover, if the use in farming practice is declining the probability increases of not being keen to accept agricultural policies for the environment. Lastly, the farmers willing to accept policies of pesticide reduction grow a small percentage of arable crops and those disposed to reduce deep tillage work mainly on the farm.

A confirmation of what has been said above is given by analyzing the preferences expressed for some environmental policies (tab. 2.8).

Most farmers would appreciate incentives to reduce the amount of pesticides and fertilizers used, while few would be interested in incentives to reduce deep cultivation. Only 23.9% say they are disposed to abandon plowing. This confirms a profound bond with the land, which is considered improved when cultivated. Desegregating the replies by type of farming area does not display any noteworthy variations. On the contrary, level of education is an important variable for determining the willingness to adhere to environmental protection policies and age diminishes the probability of accepting a reduction in deep plowing and allowing access onto the land for recreational purposes. Moreover, the size of the farm increases the willingness to cede part of the land for access to the public for recreational activities and no increase in contracting increases the willingness to use

environmentally-friendly methods. Lastly, those who are cutting down on work in farming practices are less willing to adhere to agro-environmental policies.

Table 2.8. Preferred agro-environmental policy measures

Incentived production techniques	Interviewed %		
	Yes	No	Total
Reduction of chemical fertilizers	54.7	45,3	100,0
Reduction of pesticide doses	63.2	36,8	100,0
Reduction of deep tillage	31.6	68,4	100,0
Set-aside	23.9	76,1	100,0
Recreational use of farmland	43.6	56,4	100,0

These results, useful for a predictive evaluation of agro-environmental protection policies, are also affected by level of information. Only 50% of those interviewed were aware that the EU subsidizes methods with low environmental impact. The situation is not uniform, part-time farms in particular have been revealed as sensitive to methods with low environmental impact.

Conclusions

Analysis of the data has clarified the farmers' objectives and values both as regards management methods, such as part-time and the use of contractors, and the importance of the strictly income-related motivations in relation to family, social or cultural ones. It is worth noting that the current socio-economic system, deriving from economic development over the whole territory, has characteristics entirely peculiar to the area being examined. In fact, notwithstanding the considerable draining of intellectual and material resources, farming has remained a worthwhile exercise. The development has preserved agricultural practices but transformed them: the changes have involved management methods but not motivations and traditional values.

In other words the transformation of the territory has favored some variations in short-term objectives, causing a substantial modification in the day-to-day running of the farm, but it appears to have perfectly preserved the long-term objectives, such as the importance attached to traditional values and the land, seen as a reserve of capital and especially as a fundamental point of reference during the lifetime.

A net separation emerges clearly from the elaborations between the motivations adopted in agricultural practices and crop choices. While the agricultural practices are due mainly to the desire to continue a family tradition, the crop choices are fundamentally affected by economic needs (earnings level and stability). Consequently the land is seen, even within a strictly farm context, as a multi-purpose resource involving production factors, reserve of capital and traditional values. In any case the tendency emerges of many farmers assuming a fatalistic attitude towards management and the attainable economic results; they give importance to variables that do not fall directly under the control of the farm, such as economic policies or weather factors.

Regarding attitude towards the environmental question, the farmers demonstrate themselves as being extremely cautious: although manifesting some awareness of the environmental problems caused by their cultivations they seem to be fairly averse to accepting earnings reductions connected with the adoption of eco-compatible agricultural practices. This rigidity can be ascribed to four main reasons: the modest level of current farming income, the lack of credible alternatives in cropping techniques, the limited freedom of action imposed by massive recourse to contractors and skepticism over the success of environmental policies because of free-rider attitudes. In any case, the need seems to be confirmed for specifically aimed measures that respect the farmers' desire to cultivate

and that, given the evolution in the organization of agricultural production processes, fully involve the contracting firms.

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