

# PRODUCTIVE SYSTEMS AND THE DECISION-MAKING PROCESS: A CASE STUDY OF FAMILY FARMING IN MOUNTAIN GREECE

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The productive evolution of a farming area is influenced by a whole range of factors linked to physical environment and relevant social and economic conditions.

Through focusing attention on the productive system of a relatively homogenous region, useful findings can be obtained bearing on the complexity of the factors which shape this system, the categorization/classification of those factors and the manner in which they exert their influence.

This also facilitates a more adequate understanding on the exceptionally pertinent issues to do with both the process of transformation of the system and its chances of survival when conditions change. The decision-making procedure employed by farmers is undoubtedly closely bound up with such issues. Its investigation in the light of the manifold interconnections created between any farming householding and its social and economic milieu in the course of its normal productive functioning naturally facilitates understanding of rationales motivating the behaviour of farmers and ultimately the actual implementation of the indicated policies (Schmitt, 1989).

## THE RESEARCH SETTING

The Feneos district in the region of the Peloponnese was chosen for the study of the abovementioned ques-

## ABSTRACT

The present study focuses on the basic factors influencing the productive system of a relatively homogeneous region of the countryside by means of factor analysis applied to the data of a sample of 87 farms. The main target of the study is to gain a more adequate comprehension of the farmer's decision making procedures. The methodology adopted enabled us to examine the above mentioned issue in the light of the manifold interconnections created between any farming householding and its social and economic milieu under current conditions. The analysis investigates the attitudes and modes of thinking characterizing farmer's decisions and the way in which these decisions are interrelated with the ongoing process of transformation of the system.

## RÉSUMÉ

*Cette étude est concentrée sur les facteurs de base exerçant une influence sur le système productive d'une région relativement homogène de l'espace rural en utilisant d'analyse factorielle appliquée aux données issues d'un échantillon de 87 exploitations.*

*L'objectif principal de l'étude est de permettre une compréhension plus adéquate de processus de décision des agriculteurs.*

*La méthodologie adoptée nous offre la possibilité d'examiner la question ci-dessus à la lumière des interconnexions créées entre chaque exploitation agricole et son milieu économie et social sous les conditions courantes.*

*L'analyse recherche les comportements et les modes de pensée caractérisant les décisions des agriculteurs et la façon que ces décisions sont liées avec le processus en cours de transformation du système.*

tions. The Feneos district is a plateau at an altitude of approximately 750 metres, including nine communities which together constitute a homogeneous whole both geomorphologically and climatologically. It is a purely agricultural area in which, over the last decades as in all the farming districts of the country, the population has been in continuous decline. From a figure of 5,443 inhabitants in 1936, by the time of the 1991 census this had fallen to only 2,197. Productive activity in the district includes cultivation of the 4,000 hectares of the tableland and grazing, mainly of the transhumant type, of approximately 33,000 sheep and goats, making use of the 10,000 hectares of pasturelands to be found in the surrounding

mountains. Stockbreeding is one of the district's traditional occupations. Plant production, however, also plays a significant role in productive activity, particularly since the completion of irrigation works in the 80s, which made possible the irrigation of over one third of the land area in the plain<sup>(1)</sup>.

The geomorphological conditions and the co-existence of animal and plant production give the area a productive profile which is to be encountered in numerous agricultural districts in Greece, where the two activities coexist in relative equilibrium. In this sense the district is representative of a much wider whole.

However, over the last decade the modernization which has been carried out of the country's productive processes (Maniatea, 1986, Martinos, 1987) appears to operate much more in favour of cash crops, where it is simpler to introduce advanced technology, with the related substitution of capital for labour. The main crop in the Feneos district today is hard wheat, which takes up approximately 45 percent of the area under cultiva-

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(1) For the detailed study of the historical development of the productive system and of the region generally in the pre-war period see Aivaliotakis (1941).

tion<sup>(2)</sup>. Invested farm capital is channeled mainly into mechanical equipment serving the needs of plant production (mechanization of cultivation) and amounts to 1,127 thousand drachmas per farm. By contrast the mean capital expenditure on buildings serving the needs of stockbreeding is negligible, amounting to only 0.5 thousand drachmas per farm<sup>(3)</sup>.

Farming activity in the district embraces as indicated both animal breeding and plant cultivation. However, as emerges from figures derived from random sampling of 20 percent of the farms of the district, 64 percent have oriented themselves towards the cultivation of cash crops with a view to commercial marketing (the main commodity being hard wheat). By contrast, only 15 percent of farms specialize exclusively in stockbreeding, in the sense that the plant production carried out in parallel with stockbreeding is chiefly oriented to servicing the stockbreeding unit's need for animal feeds. The stockbreeding sector predominates in another 18 percent of the farms but plant production is aimed chiefly at the production of cash crops<sup>(4)</sup>.

Thus it is worthwhile investigating the rationale informing farmers' decision-making procedures in the light of the transformation carried out in existing systems of production.

#### DATA AND METHODS

From each of the nine communities constituting the district of Feneos a random sample was taken of approximately 20 percent of the farms. This sampling yielded a total number of 87 farms. Compilation of statistical materials was effected through the use of a questionnaire addressed to farm heads and supplemented by a personal interview.

<sup>(2)</sup> Feed plants (barley, oats, tare, alfalfa, maize) cover 35 percent of the area under cultivation, meeting stockbreeders' requirements for unprocessed stockfeed and only partly for concentrated (data from own research findings and Ministry of Agriculture annual statistical research bulletins).

<sup>(3)</sup> Own research estimates. This is due to the fact that most stable facilities are constructed from makeshift materials. Thus they are either of negligible value or have been written off years ago because of their age.

<sup>(4)</sup> To divide the farms into categories the following quantifiers were employed: "gross value of animal production", "gross value of plant production" and "gross value of animal feed produced", on the basis of which for each farm there were derived the ratios:

$$a = \frac{\text{gross value of animal production}}{\text{gross value of plant production} - \text{value of animal feed produced}}$$

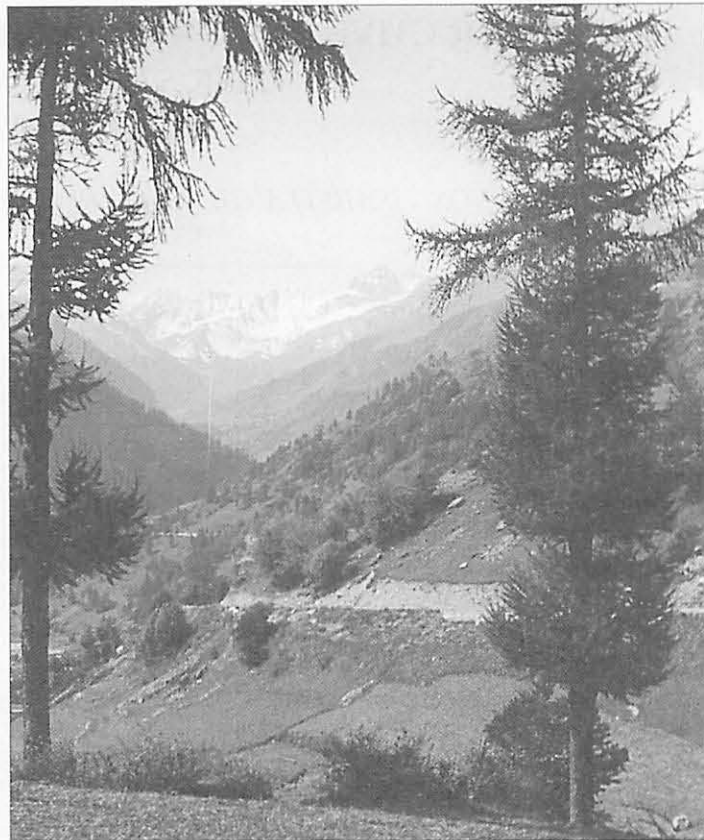
$$b = \frac{\text{gross value of animal feed produced}}{\text{gross value of plant production}}$$

Farms with  $a < 1$  and  $b < 0.5$  were characterized as mixed farming/stockbreeding holdings catering predominantly for the production of "cash crops".

Farms with  $a > 1$  and  $b > 0.5$  were characterized as pure stockbreeding holdings.

Farms with  $a > 1$  and  $b < 0.5$  were characterized as mixed farming/stockbreeding holdings catering with stockbreeding production predominant.

Finally, in 3 percent of the farms the ratios were constructed as follows:  $a < 1$  and  $b > 0.5$ , which means that there was a small fourth category of farms orientated towards plant production and engaged in the production of stock feed for the local market.



For the purposes of the study 20 variables were defined related to:

- The structural characteristics of the farms (hectarage of land in use, magnitude of productive activities, number of animal units per farm, etc.);
- the characteristics embodied in techno-economic organization of production (degree of mechanization, farm income, productive outlay, subsidies, etc.) and
- the social characteristics of the farm head (age, level of education).

To trace the dimensions of the productive system and analyze the relationships entailed in them, recourse was had to the principal axis factoring (PAF) method of factor analysis. The factors that emerged were identified through varimax rotation of the axes and the computations were carried out on the basis of the SPSS/PC\* programme.

#### RESULTS

In **table 1** it appears that six factors account for 61 percent of the total variation. The first two factors, i.e. stockbreeding production and wheat production are the chief components of the system, pointing to the main orientation of production. They account for 40 percent of total variation. More specifically, the first factor is identified from the high loadings for the ASU, VFG, SAP and TOMEA variables in relation to the techno-economic organization serving animal production,

Table 1 Varimax rotated factor matrix.

Variables	Designation	Fact f <sub>1</sub>	Fact f <sub>2</sub>	Fact f <sub>3</sub>	Fact f <sub>4</sub>	Fact f <sub>5</sub>	Fact f <sub>6</sub>	Com. h <sup>2</sup>
CA Cultivated Area	stremmas (0.1 ha)/farm	0.085	0.771	-0.203	0.224	0.478	0.228	0.974
POL Privately Owned Land	% of the total cultivated area	0.026	-0.173	0.014	-0.100	-0.100	-0.761	-0.630
WHEAT Area covered with wheat	stremmas/farm	0.088	0.865	-0.149	-0.080	0.060	0.206	0.831
FG Area covered with Feedgrains	Stremmas/farm	0.156	0.141	-0.124	-0.020	0.904	0.142	0.897
VFG Value of Feedgrains and Fodder produced in the farm	% of total value of feeding stuff	-0.738	-0.042	0.232	0.039	0.238	-0.014	0.659
OCA Own Consumption of Animal products	% of the net family farm income	-0.001	-0.021	0.802	-0.045	0.051	-0.245	0.709
OCP Own Consumption of Plant products	% of the net family farm income	-0.215	-0.227	0.593	-0.088	-0.123	0.155	0.496
ASU Animal Stock	animal units/farm	0.638	0.044	-0.210	0.039	0.291	0.058	0.534
MECHA Mechanisation	available HP/stremmas of arable land	0.133	0.164	-0.179	0.648	-0.011	0.099	0.507
AGE Age of the headfarmer	No. of years	-0.042	-0.071	-0.029	-0.589	-0.053	-0.212	0.402
EDUC Education level of the headfarmer	No. of years of schooling	-0.121	0.339	0.094	0.669	-0.020	-0.286	0.668
APAL Area of the Pasture Land	stremmas/farm	0.381	0.147	-0.203	0.074	0.315	0.010	0.313
SAP Subsidies of Animal Production	% of net family farm income	0.724	-0.205	-0.428	-0.026	0.223	0.029	0.620
SPP Subsidies of Plant Production	% of net family farm income	-0.097	-0.348	0.256	0.228	-0.061	-0.019	0.617
TOMEA Total Money Expenses of Animal production	in drachmas	0.903	-0.027	-0.086	0.109	0.016	-0.007	0.835
TOMEPL Total Money Expenses of Plant production	in drachmas	0.072	0.662	-0.219	0.422	0.045	0.144	0.692
RENT Rent paid	in drachmas	0.337	0.291	-0.104	0.201	0.130	0.395	0.422
WAGE Wages paid	in drachmas	-0.181	0.554	0.030	0.137	0.017	-0.017	0.360
NFFI Net Family Farm Income	in drachmas	0.266	0.333	-0.642	0.069	0.131	0.047	0.618
OFI Off-farm Income	% of the total family income	-0.248	-0.184	0.519	-0.156	-0.147	0.068	0.416
% of total variance		25.1	14.6	7.4	6.2	4.2	3.6	
Cumul. % of total variance		25.1	39.8	47.2	53.3	57.5	61.0	

KMO Measure of sampling adequacy = 0.752. Bartlett test of sphericity = 867.118 signif. = .00000 64 (16.8%) off-diagonal elements of AJC Matrix > 0.09.

while the second factor is identified from the high loadings for the CA, WHEAT, TOMEA and WAGE variables. The "own consumption", "social characteristics" of farm heads, "conditions of self-provisioning" of the stockbreeding system and "size of holding" (proportion of land owned), constitute the remaining secondary dimensions of the productive system. These factors account for proportions of total variation ranging from 7.4 percent to 3.6 percent respectively.

From the examination of the structures of the first two factors it emerges that two relatively unrelated productive orientations coexist in the district: the orientation towards stockbreeding production and the orientation towards cashcrops. Despite the fact that the district is traditionally a stockbreeding area, it can be seen from the emerging tendencies that the available land in the plain, which is also the district's chief natural resource, is used predominantly for the production of cash crops (hard wheat) and to a much lesser extent for the needs of animal production (feedgrains and fodder), which however remains the most significant dimension in the productive system. In particular, from the examination of the structure of the factor of "stockbreeding production" it emerges that the system functions poorly in respect of its possibilities for self-provisioning in feedgrains and fodder, since increases in animal units on the farms are accompanied by reductions in production of feedgrains, as is characteristically shown in the high negative loading for the VFG variable. The level of financial outlay for animal production (TOMEA) is the most significant variable determining this factor and points to the degree of dependence of stockbreeding activity on the market. The weight of the VFG and TOMEA variables in the factor underlines the essential

role played by feed costs in animal production (see also Zioganas, 1990). As expected, there was a very high correlation coefficient for VFG with the TOMEA variable (see table 2).

The extent of the land area reserved for the production of animal feedgrains (FG) correlates positively with the total area of cultivated land (CA) (table 1 fact. 5 and table 2). However the orientation towards cultivation of wheat (as emerges from the second factor and the correlation coefficient of the CA and WHEAT variables) does not allow of a stable level of self-provisioning when there is an increase in animal stock. In fact coverage of feedgrain needs (VFG) introduces a significant negative loading into the factor.

Subsidization of animal production is an important factor in stockbreeding activity. By contrast subsidies to plant production are not deemed to play any substantial role in encouraging the proliferation of cash crops (hard wheat).

Any increase in stockbreeding capital (expressed in terms of animal units) presupposes an increase in the area of pastureland, as typically suggested by the loading for the APAL variable in this first factor. This is in line with the system of animal breeding based exclusively on grazing animal for approximately six months (spring to summer) in mountain districts.

It is worth noticing the fact that in a stockbreeding district par excellence the area of land under cultivation is related in the first instance to a choice on the part of farmers to opt for cultivation of wheat, as emerges from the second factor. The high loading for the WAGES variable suggests that an orientation to cash crops necessitates employment of wage labour. The loading for EDUC in the factor, and likewise the structure of the

Table 2 Correlation coefficients.

	CA	POL	WHEAT	FG	VFG	OCA	OCP	ASU	MECHA	AGE
POL	-0.369**									
WHEAT	0.803**	-0.301*								
FG	0.609**	-0.222	0.213							
VFG	-0.033	-0.037	-0.130	0.060						
OCA	-0.215	0.205	-0.182	-0.103	0.225					
OCP	-0.358**	-0.072	-0.276*	-0.215	0.263*	0.495**				
ASU	0.300*	-0.118	0.139	0.403*	-0.431**	-0.151	-0.298*			
MECHA	0.347**	-0.151	-0.252*	0.030	-0.083	-0.189	-0.189	0.180		
AGE	-0.260*	-0.215	-0.182	-0.079	0.020	0.111	0.025	-0.043	-0.430**	
EDUC	0.304*	0.075	0.241	-0.036	0.108	0.131	-0.103	-0.081	0.395**	-0.365**
APAL	0.369**	0.005	0.261*	0.407**	-0.262*	-0.180	-0.271*	0.334**	0.132	-0.196
SAP	-0.003	-0.002	-0.090	0.289*	-0.487**	-0.018	-0.207	0.569**	0.070	-0.017
SPP	0.146	-0.045	0.182	-0.100	-0.181	0.510**	0.261*	-0.171	0.071	-0.189
TOMEA	0.096	0.026	0.064	0.161	-0.685**	-0.85	-0.220	0.620**	0.207	-0.074
TOMEPE	0.698**	-0.297*	0.658**	0.200	-0.125	-0.245	-0.288*	0.199	0.448*	-0.298*
RENT	0.484**	-0.406**	0.430**	0.271*	-0.239	-0.147	-0.222	0.231	0.288*	-0.237
WAGE	0.431**	-0.132	0.507**	0.037	0.189	-0.020	-0.109	-0.103	0.164	-0.087
NFFI	0.509*	-0.095	0.403**	0.303*	-0.352*	-0.545**	-0.488**	0.438**	0.248	-0.061
OFI	-0.342*	0.048	-0.292*	-0.239	-0.250	0.323*	0.505**	-0.309*	-0.308*	0.020
	EDUC	APAL	SAP	SPP	TOMEA	TOMEPE	RENT	WAGEI	NFR	
APAL	-0.023									
SAP	-0.214	0.325*								
SPP	0.344*	-0.140	-0.196							
TOMEA	-0.033	0.401**	0.640**	-0.150						
TOMEPE	0.474**	0.195	-0.079	0.177	0.103					
RENT	0.057	0.255*	0.231	0.043	0.352**	0.358**				
WAGE	0.300*	0.036	-0.190	0.280*	-0.133	0.411**	0.062			
NFFI	0.041	0.331**	0.103	-0.311*	0.290*	0.496**	0.281*	0.068		
OFI	-0.149	-0.242	-0.224	0.360**	-0.267*	-0.264*	-0.293*	-0.102	-0.462**	

N of cases: 87 1-tailed Signif. \* - 0.01 \*\* - 0.001.

fourth factor, "social characteristics", indicates that the option of mechanized cultivation of cash crops is more commonly favoured by younger and better educated farm heads.

The factor of incurred financial expenses (TOMEPE) is also a basic element informing this tendency in the productive system. The magnitude of such expenses is determined mainly by the costs of employing wage labour and paying rents, since modernization in the sense of mechanization of production entails increasing the area under cultivation, which is usually accomplished through resort to renting land. Moreover, incurred financial expenses are undoubtedly a basic component of both dimensions (animal and plant) in the system, at the same time underlining emerging tendencies within the system as a whole.

In the first dimension, increases in expenditure coincide with an emergent incapacity to modernize animal production, which although still predominant is clearly in a state of decline. The traditional type of stockbreeding appears unable in the prevailing conditions to sustain the necessary changes which would permit the introduction of modern technology into flock management as well as the infrastructure necessary for productive exploitation of pastureland. The result is low labour productivity and declining competitiveness in the whole sector, which has no other option but to depend more and more on the external stockfeeds market in or-

der to maintain a subsistence level of farm income.

Consequently the previously ascertained tendency to decline in the system's self-provisioning capacities in feedgrains testifies much more to inability to modernize animal production than it does to the low cost of acquiring stockfeed from other districts. It also reflects the lack of appropriate institutions and of an organizational framework for more rational exploitation resources.

Despite the fact that the tendency towards plant production for cash crops (hard wheat) shows a closer correlation between the level of farm income as opposed to that of stockbreeding, only a small part of the overall variation in farm income is accounted for by that factor. This comes of course as no surprise, since as already noted, as far as animal production is concerned there are in the present conditions only very limited prospects of moving the sector towards more modernized high labour-productivity structures, while for plant production the significant increase in income obtained through expansion of the areas under cultivation has come up against the limits of availability of land for rent or for sale. Thus the absence of more definite specialization in one or the other branch of production to a large extent reflects the absence of the necessary prerequisites for more rationalized farm organization.

From structural analysis of the third factor it emerges that the value of items for self-consumption by producers is declining as a proportion of farm income. The



products concerned are moreover normally animal products. Total commercialization of production has become a reality chiefly in larger households engaged in plant production, whereas in those tending towards animal production self-consumption remains at much higher levels. This is due both to the fact that stockbreeding households tend much more to adhere to traditional consumption patterns and to the much higher proportion of total food costs occupied by animal products. Moreover the high loading for the OFI variable in the factor indicates that it is the households with lower overall incomes that register higher shares for non-farm revenue sources in such overall incomes and are thus capable at present of securing their livelihood. As a labour-intensive occupation, stockbreeding does not leave much opportunity for off-farm employment. In this particular case non-farm income is chiefly a matter of flows from farmers' pensions and to a much lesser extent from employment sources in other sectors of the economy.

This same fact is in itself an indication that the practice of this type of stockbreeding is partially dependent on the employment of elderly members of the nuclear and joint families of stockbreeding holdings, with all this implies for modernization of production as well as for the poor prospects of generational renewal of the farm (Gidarakou and Apostolopoulos, 1995).

With all due reservations as to the capacity of quantitative analytical methods to provide an in depth account of psychosocial processes, it was ascertained in the course of the present study that the social characteristics of producers constitute the fourth interpretative factor in the overall fluctuation of variables. It emerges from the structure of the factor that the more highly educated and the younger farm heads are those who apply mechanized farming techniques. However, the absence of any essential connection between the individ-

ual characteristics of producers and the main dimensions of the productive system, and in particular with the variable of net farm income, indicates that both the choice of orientation and the productivity of the system in the district are to a great extent independent of the psychological characteristics of farm heads.

#### FINAL REMARKS

In the preceding text an attempt was made to identify the basic factors characterizing the productive system of a relatively homogeneous mountain region. At the same time an investigation was carried out into the influence exerted by these factors as the system underwent transformation through adaptation to a greater or lesser extent to the new realities of the market. An attempt was also made to examine the decision-making processes of farmers in the framework of the transformations undergone by the productive system.

It is understood that the quantitative dimension of the complex phenomenon whose dynamic we have attempted to capture here represents only one side of the reality, which undoubtedly has more to it than can be depicted through the variables we have employed.

From the preceding analysis it emerges that orientation towards animal production remains predominant, albeit in decline in what has always been a stockbreeding district. Taking into account other technical data and characteristics of the methods of animal husbandry (quality of stabling installations and genetic materials, breeding conditions, etc.) and the value system of the stockbreeders, there are grounds for concluding that the stockbreeding orientation corresponds for the most part to a traditional mode of production and in fact of life in general, which in the concrete conditions of the areas linkage to the wider market is finding it increasingly difficult to sustain itself. Given that the required many-sided external intervention on the level of technical in-

frastructures and provision of specialized services is inadequate and also late in coming, the vicious circle is perpetuated of low productivity of both animals and labour<sup>(5)</sup>.

The fact that the amount of investment undertaken in the district in livestock production at the farm level is so limited should be attributed to factors having to do with various social and organizational parameters as well as to the low farm income levels. In the conditions which have been created, where successors are not being groomed because of rejection by the young of stockbreeding as an occupation, the decision-making processes of the largely elderly stockbreeders are conditioned by criteria and practices aiming at no more than bare subsistence. On the other hand, in cases where parallel occupation with cash crops is to be observed on farms predominantly oriented towards stockbreeding, decisions are geared to choosing options towards substituting capital for labour techniques exclusively in plant production<sup>(6)</sup>.

There is therefore nothing coincidental about the way that the incapacity of the local community to exploit the existing opportunities for funding and spontaneously to promote measures of a structural character through rational utilization of natural resources leads the existing traditional stockbreeding system to adaptations and/or distortions which increasingly jeopardize its chances of survival. Nor should it be considered surprising that in conditions of continued deterioration of pasturelands, factor analysis should point to the need for there to be an increase in the area of land available for that purpose, in the interests of increasing animal production. The implication is that without the income support provided by E.U. subsidisation<sup>(7)</sup> of problematic mountain regions the productive system before long will have collapsed. Accordingly, under the prevailing conditions the abovementioned weaknesses of stockbreeding production as a system point to a tendency towards evolution into systems of plant production, when and where available natural resources so permit.

The analysis identified production of cash crops as the second basic element in the system, with wheat predominating, given that it provides a satisfactory income (above min.subsistence level) for only 46 percent of farming households. Despite the fact that this is an option that was taken on the basis of satisfactory techno-

logical prerequisites, having been preceded by extensive drainage and irrigation works, and with cultivation having been completely mechanized, it runs up against the shortage of adequate land on the plain. Thus the failure to effect a satisfactory increase in the area under cultivation, whether through purchasing or renting land, has meant keeping the mean fixed costs at very high levels for the many farms which possess their own machinery. In short, as is suggested by the negative correlation between animal capital and self-produced stockfeed (0.432 signif. 0.01), the modernization which has been adopted represents a type of rationalization which notwithstanding its minimizing the requirement for human labour and liberating the population from labour-consuming production, at the same time jeopardizes the continuing survival of most farms. Thus, given the existing limitations, the margin of decision left to farmers is circumscribed by a framework of partial rationality — rationality in the narrow economic sense of the term — whose predominant feature is the logic of achieving a given minimum subsistence income level while at the same time minimizing the labour input but also perpetuating a relative waste of capital as suggested by the high degree of existing mechanization.

Last but not least, as far as social characteristics are concerned, it appears that those who relate most readily to the modernization process which has been put into effect are the younger and more educated farmers. Moreover, plant production is the sector which has been virtually the exclusive beneficiary of this modernization. Of course it is not without significance that the passage of time has brought with it the ever stronger influence of the urban centres and their characteristic consumption models and way of life generally.

The decisions farmers take may thus indeed be shaped within specifiable parameters from the economic and environmental viewpoint but they are undoubtedly influenced by more general social and ideological factors which have no immediate connection with the district as such. ●

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(5) On the basis of our own research estimates the average yield per year was approximately 80 kg milk per sheep.

(6) These farms exhibited the same degree of mechanization (0.4 HP/strema) with those oriented towards the production of cash crops. Mechanization, however, refers exclusively to technology suitable for the cultivation of land.

(7) The degree of subsidization of farms specializing exclusively to stockbreeding was found to account for approximately 40% of the net farm income. The degree of subsidization in the mixed farming/stockbreeding holdings was 29%, whereas in the predominantly cash crops farms it was only 7% of the net farm income.