

Analysis of Changes on Farms Made Necessary by Constraints Concerning Protection of Water Quality

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Abstract

Farms are being increasingly requested to protect the environment. This leads to new constraints with respect to their production systems and, consequently, they are under pressure to modify their farming practices. This article presents an analysis of changes on cattle farms that have been participants in a programme for the protection of the quality of mineral water, in which considerable financial means are involved. The systems approach, by focusing on the notion of project and family context, constitutes a relevant conceptual framework for undertaking this analysis. Identification of the future projects of the farmers who have accepted to change their practices is a good way of understanding the reasons behind their strategy decisions. Given these projects, the farmers interviewed are satisfied with their participation in the programme for protection of the quality of mineral water. In view of the considerable external support involved, the technic-economic results of the changes, in the farms under study, can be considered positive.

Introduction

Management of natural resources and development of environment-friendly farming systems constitute a major challenge for agricultural research in developed countries. Farms that developed intensive production systems between the 1950s and 1980s ("les trente glorieuses"), are now confronted with demands for changes in farming practices coming from new actor-groups. These demands usually involve pressure to make major changes in production systems. In this context of change, or even of transformation, farms are ever more exposed to uncertainty concerning their evolution and their capacity to adapt to new situations. Hence, the question of change on farms has become a major aspect of research into farm management.

This article contains an analysis of the changes that have occurred on a number of cattle farms that have followed a policy for the protection of the quality of mineral water. As a general rule, the farmers in question have gradually participated in this operation. Currently, half of the farmers have signed the contract involving changes in farming practices. This analysis is in keeping with the systems approach trend that has generated the research work undertaken by Petit, 1981 and Brossier et al, 1991, of the Agrarian Systems and Development Department of INRA (French National Institute for Agricultural Research). The systems approach enables the farm to be placed in its context regarding family and other actor-groups in its environment, and enables its functioning logic to be understood given its past and projects for the future.

Case study: management of water quality

A private company marketing mineral water (henceforward referred to as MWC) expressed the desire to intervene in farming practices, with a view to preventing the increase of the nitrates content in groundwater. Farming is considered to be one of the main causes of the increase of the nitrates rate in the hydromineral catchment area. It is a fact that farming occupies practically the entire area. The recent intensification of production systems (fertiliser increase and turning-over of natural grassland) plus the extension of maize crops over the past decade confirm this observation. The MWC proposed a research contract to INRA in 1989 to study how changes could be made, in order to reduce the risks of nitrates pollution and also maintain a locally viable agriculture. The first stage of the research project furnished a diagnostic assessment of the system held responsible and proposed technical specifications¹.

Subsequently, MWC negotiated with the farmers by proposing a contract involving the obligatory application of the adopted technical specifications. These technical specifications, which cover the entire production system and farmland area of each farm, including land outside the perimeter, involve the following measures: (1) elimination of maize crops, (2) composting of all animal waste, (3) limit of 1 Livestock Unit/ha forage land reserved for animal feed supply, (4) non-use of plant health products, nitrogen fertilisation being ensured first and foremost by composted animal waste and (5) undertake new crop rotation based on lucerne.

In return, MWC committed considerable means in order to gain the participation of farmers in the process of change and to control the implementation of the new farming practices: (i) purchase of land: MWC proposed to buy the land at a very advantageous price (40,000 FF per hectare). In this way, MWC has become the owner of about 45% of the land in the perimeter. This land is turned over to the farmers free of charge on the condition that they sign the contract for 18 years. (ii) Revenue aid: MWC provides subsidies to these farmers of about 1500 FF/ha, for a period of 5 to 7 years. (iii) Investments: MWC has underwritten the investments made necessary on each farm by this change. The total investments come to about one million francs. (iv) Carrying out of certain tasks: MWC created a subsidiary in 1992, henceforward called AV, to manage farmer relations and carry out on the farms the tasks connected with animal waste management (stall emptying, composting and spreading on fields). The reactions of farmers to this package were varied. The motivations of those farmers who signed the contract can be understood in the light of their projects before the changes.

Presentation farmers' projects before the changes

The farms within the protection perimeter, 25 in all, are generally speaking dairy farms: animal turnover (milk and meat) from the dairy herd represents 80% of the total and milk alone more than 60%. They cover on average 120 ha and have 45 dairy cows. Currently, half of the farmers have signed a contract with MWC². Our study sample includes two categories of farmers: those who have undertaken radical changes by ceasing farming activity (farmers F, G and H) and those who have accepted to implement significant changes in their production systems (farmers A, B, C, D and E).

¹ For more detailed information concerning this research, see Deffontaines et al, 1993.

² MWC is continuing negotiations with the remaining farmers.

(1) **the three farms** having ceased farming activity are small dairy farms: on average 50 ha of usable farmland (Surface Agricole Utile, SAU) and 25 dairy cows with small milk quotas and low gross farm product. The common project of these farmers was retirement or preparing for retirement (Table 1). For these farmers, MWC's offer to purchase their farms and land was an opportunity not to be missed. When questioned about this change, they consider that they made a good decision.

(2) **the five farms** belonging to active farmers cover on average 150 ha of usable farmland with about 45 dairy cows, and a milk production per cow between 4200 and 5900 litres per year. Four of the farms are dairy farms; the fifth (E) specialises in beef production. The projects of these farmers are set out in Table 1. The three main objectives are: have done with economic difficulties, change the farm location to outside the village, and consolidate a production system compatible with the practices proposed. In view of these objectives, the five farmers were interested in the changes proposed.

Table 1: Farmers' projects before changes

Project	Farmer concerned
Farmers ceasing farming activity	
- Retirement or preparing retirement	F, G and H
Farmers continuing farming activity	
- Have done with economic difficulties and settle debts	B and E
- Changing farm location (leaving village)	A and D
- Simplification of production system and lessening of workload	C and D
- Consolidation of current production system with minimum change	A and C

Analysis of the changes on farms: some results

In order to analyse the changes and evaluate their consequences, interviews were carried out and data was collected over several years regarding the farms having signed the contract with MWC. Thus, the farms were monitored and supported during the changes. The evaluation of these changes aims to shed light on the consequences of the strategy choices made by these farmers.

Project fulfilment

Farmers A and D changed the location of their farms through recuperation of former farms (farms purchased by MWC) located outside the villages. Farmers B and E managed to settle their problem of high farm debts (see levels of debts in Table 3). Farmers C, D and E fulfilled their objectives of simplifying their production systems and diminishing work load through elimination of cereal crops, without compromising farm functioning and using the work support provided by AV which comes to about 28% of seasonal tasks (work carried out at

specific times of the year, for example cereal harvesting, haymaking, autumn and spring tillage, etc).

Evolution of technical results

As set down in the technical specifications, maize crops were eliminated from cropping patterns on three farms; the two remaining farms did not have maize crops anyway. MWC made compensation for this elimination of maize, which is a major change in the production system, by allocating its land free of charge to the farmers having signed the contract. This brought about a considerable increase of usable farmland for the farmers. Four farms out of five increased their usable farmland by 42% on average (Table 2). In the Department, the average increase is 12%. This increase led to a major change in land structuring on each farm. The four farms solved the problem of availability and/or size of cow pen in the vicinity of the farm. The proportion of cereals in cropping patterns diminished due to the increase of total land area. This decrease was equivalent to about 10%. Only the land under permanent grass benefited from the increase of usable farmland. This evolution confirms the trend towards a "grass-only" production system.

Table 2: Evolution of land structuring and technical results

Farm		B	E	A	C	D
Total usable farmland (ha)	1991	170	181	93	96.3	65
	1994	215	181	142	126	103
Usable farmland owned by MWC	1991	0	0	0	0	0
	1994	160	30	101	60	40
Cereals (ha)	1991	55	19	9	13	13
	1994	55	17	15	10	7
Maize (ha)	1991	0	6	10	0	7
	1994	0	0	0	0	0
N° of dairy cows	1991	36	72	36	42	35
	1994	46	80	44	54	40
Milk quota (1000 litres)	1991	270	-	240	250	140
	1994	300	-	320	300	200
Milk production/dairy cow/year	1991	2900	-	6500	5900	5000
	1994	4400	-	5900	5800	4200
Cereal yield (quintal)	1991	50	50	50	35	40
	1994	25	40	36	30	30

Application of technical specifications, particularly the elimination of maize silage from the cow diet, has led to a decrease in milk production per dairy cow and per year of about 10% in farms A and D (Table 2). The average amount of milk produced per cow and per year in the

Department is stable: around 6000 litres. Farm B, which was in a disastrous situation and suffered from bad technical control, increased milk production per cow and per year by 50%. In order to avoid a decrease in milk turnover, the farmers obtained new milk quotas with the help of MWC (about 30% increase in the four dairy farms) and increased the size of their dairy herds by 25% on average. As a result of the restrictive measures, set down in the technical specifications, concerning chemical fertilisation and plant health treatment, cereal yield decreased by 30% in the five farms studied. This yield corresponds to about 30 quintals under the new system. This would explain the lower proportion of cereals in the cropping pattern and the trend towards extensive dairy systems.

Encouraging economic results

All of the five farms studied increased their total production by about 35% on average. Monetary Surplus (roughly equivalent to farming revenue) considerably increased thanks to the major support that MWC subsidies to the farms represented (140,000 FF on average) and to EU subsidies (CAP) and support from the French government.

Table 3: Economic results before and after changes (in 000 FF)

Farms		B	E	A	C	D
Gross farm product	<i>1991</i>	<i>520</i>	<i>700</i>	<i>670</i>	<i>810</i>	<i>480</i>
	<i>1994</i>	<i>960</i>	<i>790</i>	<i>930</i>	<i>1010</i>	<i>540</i>
Monetary surplus	<i>1991</i>	<i>-70</i>	<i>-140</i>	<i>90</i>	<i>200</i>	<i>90</i>
	<i>1994</i>	<i>350</i>	<i>120</i>	<i>370</i>	<i>230</i>	<i>120</i>
MWC subsidy	<i>1991</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0</i>
	<i>1994</i>	<i>220</i>	<i>80</i>	<i>115</i>	<i>180</i>	<i>100</i>
Private expenditure	<i>1991</i>	<i>110</i>	<i>160</i>	<i>100</i>	<i>270</i>	<i>80</i>
	<i>1994</i>	<i>380</i>	<i>150</i>	<i>290</i>	<i>300</i>	<i>100</i>
Investments	<i>1991</i>	<i>190</i>	<i>15</i>	<i>110</i>	<i>15</i>	<i>-</i>
	<i>1994</i>	<i>300</i>	<i>3</i>	<i>930</i>	<i>550</i>	<i>-</i>
Medium/long-term debts	<i>1991</i>	<i>1390</i>	<i>970</i>	<i>210</i>	<i>670</i>	<i>220</i>
	<i>1994</i>	<i>170</i>	<i>420</i>	<i>300</i>	<i>830</i>	<i>180</i>

Farms B and E, which had heavy debts, put an end to their critical economic situations (negative monetary surplus), before the changes and obtained satisfactory results. Also farmer A considerably improved his monetary surplus. The increase in monetary surplus allowed the farmers to increase their private expenditure by 90% on average and to make major investments (Table 3). Also, thanks to the large investment made by MWC and to the investments made by the farmers, all those having signed the contract now command modern and well-equipped production systems, which is a great advantage for these farms.

Conclusions

This study shows that the farmers are generally satisfied regarding the fulfilment of their projects and the positive evolution of the technic-economic results of their farms. But this satisfaction also poses two kinds of problem to these farmers: (i) risk of external control of their farms and (ii) acquiring technical control of the new production system.

The farms having signed the contract with MWC opened up to the local dynamic which has made them more vulnerable to the possibility of external control exerted by MWC. Other research work (Gafsi and Brossier, 1995) focuses on this question and demonstrates that these farms are exposed to four types of external control. The first type is control by resources and concerns the control by MWC of the resources used by the farm, i.e. land ownership, work supply, investments and revenue support. The second type is control by functioning of the farms, concerning the control of technical processes and the production practices used by the farmers. Apart from the decrease in work load, due to the intervention of AV, MWC controls the sequence of operations for animal waste management and directly handles field fertilisation on the farms. The third and fourth type of control are control over activities and control over final objectives. These are both indirect and concern strategy choices given the activities and objectives of the farmers.

Regarding the perspectives of evolution on the farms studied, one of the essential aspects of the new production system is the technical control of production processes, especially management of ventilated hay. It is to be hoped that, after an initial familiarisation period of two to three years, the farmers will be able to produce high-quality hay which will replace maize silage in the animal diet. This will allow the initial level of dairy productivity per cow to be recovered. Regarding the future evolution, with the high increase of usable land and milk quotas, a great improvement can be expected concerning the technic-economic results on the farms when they have fully assimilated the changes. This perspective is reassuring because the temporary subsidies given by MWC over seven years can be replaced. However, the long-term viability of the new production systems remains an essential question for research.

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