Do Management Profiles Matter? An Analysis of Belgian Dairy Farmers

Mieke Vandermersch
E-mail : mieke.vandermersch@agr.kuleuven.ac.be

Erik Mathijs

Paper prepared for presentation at the Xth EAAE Congress
'Exploring Diversity in the European Agri-Food System',
Zaragoza (Spain), 28-31 August 2002

Do Management Profiles Matter? An Analysis of Belgian Dairy Farmers

Mieke Vandermersch and Erik Mathijs

Katholieke Universiteit Leuven

Abstract

To assess the performance of a farmer and to identify best practice among a group of farmers, the assumption is often made that all farmers maximize profits and thus share the same business goals. However, performance differs due to personal characteristics, objectives and strategies. A survey carried out among 73 Belgian dairy farmers revealed that for only 34% of the farmers 'profit maximization' is a primary objective. A regression analysis revealed that self-declared profit maximizers only obtained a higher farm income per liter, not per labour unit. Through cluster analysis, four main groups of farmers were found with similar objectives and management ideas: (A) risk-taking and progressive cow farmers, (B) risk-averse and progressive labour savers, (C) risk-neutral and relatively conservative profit maximizers and (D) risk-averse and conservative cow farmers. Gross margin per liter was highest for the labour savers. Other performance parameters were higher for cluster B only compared to cluster D. Scale economies were found for all performance parameters except for gross margin per liter.

Key words: farm management, farmers' objectives, farm performance, dairy, extension

Contact:
Department of Agricultural and Environmental Economics
Catholic University Leuven
Willem de Croylaan 42
3001 Leuven, Belgium
Telephone : +3216321450
Fax : +3216321996
E-mail : mieke.vandermersch@agr.kuleuven.ac.be

* The authors thank Leen Franchois and Lieve Meskens for research assistance and the Farmers Union in general and Eddy Leloup, Hugo Lismont and Lutgarde Liekens in particular for their support. The Belgian Ministry of Small Enterprises, Traders and Agriculture is gratefully acknowledged for financial support (S-6018).

Do Management Profiles Matter? An Analysis of Belgian Dairy Farms

Abstract

To assess the performance of a farmer and to identify best practice among a group of farmers, the assumption is often made that all farmers maximize profits and thus share the same business goals. However, performance differs due to personal characteristics, objectives and strategies. A survey carried out among 73 Belgian dairy farmers revealed that for only 34% of the farmers 'profit maximization' is a primary objective. A regression analysis revealed that self-declared profit maximizers only obtained a higher farm income per liter, not per labour unit. Through cluster analysis, four main groups of farmers were found with similar objectives and management ideas: (A) risk-taking and progressive cow farmers, (B) risk-averse and progressive labour savers, (C) risk-neutral and relatively conservative profit maximizers and (D) risk-averse and conservative cow farmers. Gross margin per liter was highest for the labour savers. Other performance parameters were higher for cluster B only compared to cluster D. Scale economies were found for all performance parameters except for gross margin per liter.

Key words: farm management, farmers' objectives, farm performance, dairy, extension

1. Introduction

To assess the performance of a farmer and to identify best practice among a group of farmers, usually farm management and extension researchers use an important (implicit) assumption, i.e., that all farmers maximize profits and thus share the same business goals. However, studies investigating the relative performance of a group of farmers contest this assumption. For example, Tauer (1995) showed that in 50 percent of the cases tested, a set of 49 New York dairy farms did not maximize profits. Using a panel of 289 Kansas farms, Featherstone et al. (1995) rejected the hypotheses of profit maximization for all farms.

How can these deviations from profit maximization be explained? Rougoor et al. (1998) attribute differences in farm performance to differences in management capacity, a term they define as "having the appropriate personal characteristics and skills to deal with the right problems and opportunities in the right moment and in the right way." Personal characteristics include drives and motivations, abilities and capabilities and biography. However, empirical studies that take into consideration differences in management capacity usually use age of the farm manager and his level of education as proxies for management capacity. Studies that go beyond this are scarce.[1]

The most comprehensive approach of identifying objective profiles has been by Solano et al. (2001). [2] They used a sample of 100 *Costa Rican* dairy farmers clustering farmers according to their objectives and then investigated the relationship between the profiles thus identified and farms'/farmers' characteristics. The study showed that economic goals were the most

[1] Usually aspects of human and social capital are being investigated in the context of attituted towards and implementation of new technologies and particularly sustainable farming practices. For example, Willock et al. (1999) studies the role of attitudes and objectives in business and environmentally-oriented behaviour in Scotland.

[2] An example of another, but rather limited, study is Öhlmér et al. (1998), who investigated the management capacity of 18 farmers.

important for the majority of the sampled farmers. Age, educational level, distance of the farm to population centers, level of dedication and pasture area were found to have the largest impact on the arrangements of objectives. However, these characteristics explained only a small proportion of the variation in the objective hierarchies. Objective profiles between clusters were very heterogeneous.

Finally, rural sociologists, and most notably J.D. Van der Ploeg, have defined so-called farming styles, albeit in a different context, i.e. in a context of (endogenous) rural development (e.g., Van der Ploeg, 1994, 2000). Different labels have been proposed such as 'dedicated producer', 'flexible strategist' and 'environmentalist' (Fearweather and Keating, 1994); 'yeomen' and 'entrepreneurial' (Austin et al., 1996); 'innovative sustainable', 'entrepreneurial imitators' and 'traditional routine' (Ferreira, 1997). However, the farming styles approach has been criticized recently by Howden and Vanclay (2000) who contend that farming styles are rather stereotypical images grounded in local farming discourse.

In this paper, we identify different management profiles as defined by farmers' objectives and we investigate whether these profiles have an impact on farm perfomance. We also look into the question whether farmers who think they are maximizing profits actually do so. For this, we carried out a survey among a group of Belgian dairy farmers. The remainder of the paper is organized as follows. In section 2, materials and methods are explained. Section 3 discusses the results of our analysis, while section 4 concludes the paper.

2. Method and materials

To identify and assess different management profiles, we carried out a survey in December 2001 among 73 dairy farmers using a structured questionnaire with mostly closed questions. The sample frame consisted of 700 dairy farmers who report their financial results to the services of the Farmers Union. The farmers were selected using a random sample stratified by quotum size to ensure that sufficient farmers with large quotum size would be selected. Table 1 shows that 67 percent of all Belgian dairy farmers have a quotum size of less than 200,000 litres, while only 4 percent have a quotum of more than 500,000 litres.

The questionnaire consisted out of seven main categories of questions. The first category was about the farmers' personal characteristics and about their family life. Age, education, experience, the probability of having a successor and related items were asked for. The second category contained questions about the farm characteristics: diversification rate, amount of labour, recent investments, most important constraints for the farm etc. Thirdly, farmers were asked to choose between seven management types the one that best corresponds with their way of farming. The types' descriptions were based on studies done by Kerkhove (1994), Van der Ploeg (1994) and Everaert and Lenders (1996). Questions about the farmer's objectives and strategies formed the fourth category of the questionnaire. The farmer has to answer first whether profit maximization is his main objective or whether he accepts a certain level of income. In the latter case, the farmer then has to state what their priorities are, such as: having enough spare time, producing with fewer risks and increasing the value of the farm. All farmers were further asked about their management strategies. Finally, 15 objectives were stated of which the farmers were asked to point out how important each of these objectives is in their management.

In the fifth category of the questionnaire, the farmers were given the possibility to 'completely or 'rather' 'agree' or 'disagree' with 21 statements about fertility management, roughage management, health management, feed management, environmental management, quality management, risk management and overall farm management. The use of management tools such as bull catalogues, soil samples, results of roughage samples etc., was explored in a sixth set of questions. The last category of questions mostly referred to the extent the farmer reads agricultural magazines, follows workshops or courses, uses a computer for the farm management, etc.

Amongst the sample of 73 interviewed farmers, a cluster analysis was done based on the last part of category number 4 (15 objectives stated) plus the categories number 5 and number 6 of the questionnaire. Ward's minimum-variance method was used. This is a hierarchical clustering method: it starts from the assumption that each observation is a cluster on its own. The distance between two clusters is measured by the ANOVA sum of squares between the two clusters added up over all the variables. At each generation, the within-cluster sum of squares is minimized over all partitions obtainable by merging two clusters from the previous generation. Ward's method joins clusters to maximize the likelihood at each level of the hierarchy under the assumptions of multivariate normal mixture, equal spherical covariance matrices and equal sampling probabilities.[3]

In a next step, a stepwise discrimination analysis was run in SAS (STEPDISC) to reveal the subset of quantitative variables that best indicate the differences between the clusters. In STEPDISC, variables are chosen to enter or leave the model according to one of two criteria: (1) the significance level of an F test from an analysis of covariance, where the variables already chosen act as covariates and the variable under consideration is the dependent variable; or (2) the squared partial correlation for predicting the variable under consideration from the CLASS variable, controlling for the effects of the variables already selected for the model.

The selection method begins with no variables in the model. At each step the model is examined. If the variable in the model that contributes least to the discriminatory power of the model as measured by Wilks' lambda fails to meet the criterion to stay, then that variable is removed. Otherwise, the variable not in the model that contributes most to the discriminatory power of the model is entered. When all variables in the model meet the criterion to stay and none of the other variables meets the criterion to enter, the stepwise selection process stops.

With the permission of the 73 farmers in the sample, the Farmers Union made data available about their 'gross margin for dairy per liter', their 'farm income for dairy per liter' and their 'quotum'. All figures are three-year averages (1998-2000). Using the data given by the farmers themselves for 'amount of labor for dairy', 'gross margin for dairy per FTE'[4] and 'farm income for dairy per FTE' were calculated. Each of these parameters was then used as a dependent variable in two regression analyses:

- The first regression was performed to test if farmers, having 'profit maximization' as main objective, effectively obtained better results than farmers who do not. Other independent variables taken into account next to profit maximization were: quotum,

[3] Ward's method tends to join clusters with a small number of observations and is strongly biased toward producing clusters with roughly the same number of observations. It is also very sensitive to outliers (Milligan, 1980).

[4] FTE = full-time equivalent labour unit

age, education level, education type, training abroad, succession and the use of a computer for the management.

- The second regression tested for differences in gross margin and farm income between the clusters. The independent variables next to the clusters were: quotum, age, education level, education type, training abroad, succession, the use of a computer for economical farm management and the use of a computer for technical farm management.

3. Results

3.1. Descriptive results of the survey

Table 2 summarizes some of the answers to the questionnaire by quotum size class. With respect to personal characteristics there seem to be no clear relationships with quotum size class. The most notable exception is that a successor is more likely to be present on farms large in dairy than on farms small in dairy. Farms with a larger quotum size might be more interesting to take over, because milk is one of the agricultural products where the price is (still) rather certain.

With respect to farm characteristics, farms larger in dairy are more likely to be co-operations or partnerships. Quotum size shows no clear correlation with the degree of specialization (multiple enterprises on the farm): in the middle quotum size class the percentage of farms having no other activities than dairy was highest. With respect to investment behavior, no clear-cut pattern emerges.

Quotum is particularly a constraint to improve the business for the middle class of farmers. This can be partly explained by the fact that this class has the largest number of specialized farms and that these may experience an overcapacity of labour due to quotum restrictions. In general, the farmers who are in a smaller quotum size class favor the quotum fund because they fear they will not be able to compete if quotum comes free or is abolished.

When asked to self-declare into a certain management style, about one third of the farmers considered himself a ‘grower’, another third a ‘fine-tuner’, while other styles are relatively scarce: diversifiers within agriculture (11%), labour savers (7%) and cost minimizers (4%).

34 percent of all farmers claim that profit maximization is their main objective. There is no clear-cut relationship with quotum size. Of the 66 percent of farmers claiming to have other priorities than profit maximization, most state leisure to be the most important. Larger dairy farmers are also likely to have long-run objectives, such as maximizing farm value. Minimizing risks is the third most important objective, stated primarily by smaller farmers. It is noteworthy that not a single farmer stated environmentally friendly production as their primary goal.

With respect to the strategies to reach their goal, the majority of the farmers (30%) indicate to do that by minimizing variable costs. It is interesting to see this is more likely to be the strategy of the larger quotum size classes. Minimizing fixed costs (21%) and maximizing milk production (18%) were secondly and thirdly most mentioned. Only 7% of the farmers

(particularly situating in quotum size class 2) indicated to have diversification as their major strategy.

Additional variables show a 84% of farmers having a PC, 64% of them also having access to the internet. However, only about half actually uses their PC and/or the internet for professional purposes. The number of farmers using computer programs for technical farm management increases from the lowest to the highest quotum size class. It might be more difficult to manage a larger herd without automation.

3.2. Results of the cluster analysis

The cluster analysis resulted in 4 main clusters, containing 93% of the farmers. The results of the STEPDISC procedure are summarized in table 3, where the most important variables in differentiating between the clusters are reported. A first results is that the correlation between these clusters and the self-declared styles is very low. This confirms Howden and Vanclay (2000) critique that farming styles are indeed stereotypical images and that in reality profiles may differ.

Farmers in cluster A are real cow farmers, who consider the quality of roughage as an important management aspect and make frequent use of feed ration calculation as management tool. They do not care much about reducing custom work and minimizing debts is not a real objective to them. Of all clusters, they are the least risk averse, are less reserved against changes and think it rather important to quickly react to technological changes. Moreover, they attach the highest importance to automation. We could describe these farmers are *risk-taking and progressive cow farmers*.

Farmers in cluster B have the most positive attitude towards finding solutions to environmental problems. They are relatively risk averse although progressive towards technological solutions and automation. Their attitude towards changes is neutral. Like cluster A, they are not striving for the reduction of custom work. However, they do not always consider themselves as real cow farmers. Debt minimization, but also leisure, is important for them. Most farmers declare leisure as their priority. These farmers could be described as *risk-averse and progressive labour savers*.

Farmers in cluster C are, like cluster A, keen to get a good result, no matter how much time needs to be spent on the farm. Their opinion towards risk is rather neutral and, in comparison to the previous mentioned clusters, they are less keen on technological innovations. They are the least prepared to find solutions to environmental problems. They do not think of soil samples as important management tools. Also the bull catalogue is used least frequent by this cluster. Reducing custom work is relatively important as is the attempt to keep veterinary costs low. They call the veterinarian only if no other possibilities are left. Rationing is not more than rather important and roughage is not always the most important attention point. These farmers are *risk-neutral and relatively conservative profit maximizers*.

Farmers in cluster D are the most risk averse and slowest in anticipating with new technologies. However, they are neutral to changes. Like the farmers in cluster A, they are real cow farmers, proud of their profession and using a steer catalogue as management tool as well as feed rationing tools. They score better in terms of mastitis prevention but are less inclined to spend all their time on the farm for a good result. For all of them, the quality of

roughage as well as the quality of milk is very important. These farmers can be labeled as *risk-averse and conservative cow farmers*.

3.3. Results of the regression analysis

The regression analyses were designed to answer two questions.

Question 1: Do farmers who claim to maximize profits achieve higher results than other farmers do?

Table 4 summarizes the results of the regressions testing whether those who claim to maximize profits actually reach better results. This hypothesis can only be confirmed for farm income per liter, in other words, self-declared profit maximizers focus on minimizing fixed costs and thus achieve higher farm income per liter. However, by doing so, do not achieve good results per labor unit. Further, scale economies can be observed for all performance except gross margin per liter. There seems to be a small age/experience effect on performance measures per labor unit, but the effects are not significant.

Question 2: Do management profiles matter for farm performance

Table 5 summarizes the results of the regressions that test whether there are differences in performance between different management styles, corrected for other variables, and particularly quotum size. Cluster B, the risk-averse and progressive independents, achieve the best results with respect to all measures. When gross margin per liter is concerned, they perform significantly better than the cow farmers of cluster A and D, but not than their more risk averse and conservative colleagues of cluster B. Looking at farm income per liter only reveals a significant difference between cluster B and D. Gross margin and farm income per labor unit yield the same results.

Quotum size matters, and thus scale effects, are present for all measures except gross margin per liter. Age and education effects and other human capital impacts are absent, which suggests that, at least for this group of farmers, farm size and objectives are more important to explain differences in income than other features of management capacity.

4. Conclusions

To assess the performance of a farmer and to identify best practice among a group of farmers, farm management and extension researchers implicitly assume that all farmers maximize profits and thus share the same business goals. However, performance is shown to differ due to personal characteristics, objectives and strategies. A survey was carried out among 73 Belgian dairy farmers. It revealed that for only 34% of the farmers ‘profit maximization’ is a primary objective. A regression analysis testing whether this objective was significant for farm performance, revealed that self-declared profit maximizers only obtained a higher farm income per liter, not per labour unit. Through cluster analysis, four main groups of farmers were found with similar objectives and management ideas: a group of risk-taking and progressive cow farmers, a group of risk-averse and progressive labour savers, a risk-neutral and relatively conservative profit maximizers-group and a risk-averse and conservative cow farmers-group. Gross margin per liter was highest for the labour savers. Other performance

parameters were higher for labour savers only compared to the risk-averse cow men. Scale economies were found for all performance parameters except for gross margin per liter.

References

Austin, E.J., Deary, I., Gibson, G., McGregor, M.J. & J.B. Dent, 1996, 'Attitudes and values among Scottish farmers: "Yeomen" and "Entrepreneurial" as factors, not distinct types', *Rural Sociology* 61: 464-474.

Barkema, H.W., J.D. Van der Ploeg, Y.H. Schukken, T.J.G.M. Lam, G. Benedictus & A. Brand, 1999, 'Management style and its association with bulk milk somatic cell count and incidence rate of clinical mastitis', *Journal of Dairy Science* 82: 1655-1663.

Everaert, H. and S. Lenders, 1996, 'En wat denkt de boer erover? Een sociologisch onderzoek naar de houding van de Belgische bedrijfsleiders tegenover hun beroepssituatie', L.E.I. publication nr. 586, Brussel, Landbouweconomisch Instituut, 257 p.

Fearweather, J.R. & K.C. Keating, 1994, 'Goals and management styles of New Zealand farmers', *Agricultural Systems* 44: 181-200.

Featherstone, A.M., Moghnieh, G.A. & B.K. Goodwin, 1995, 'Farm-level nonparametric analysis of cost-minimization and proft-maximization behavior', *Agricultural Economics* 13(2): 109-117.

Ferreira, G., 1997, *An evolutionary approach to farming decision-making on extensive* rangelands, PhD dissertation, University of Edinburgh.

Gasson, R., 1973, 'Goals and Values of Farmers', *Journal of Agricultural Economics* 24(3): 521-542

Gloy, B.A., H. Hyde & E.L. LaDue, 2001, 'Dairy farm management and long-term farm performance: evidence from panel data', selected paper AAEA annual meetings Chicago, IL.

Howden, P. & F. Vanclay, 2000, 'Mythologization of Farming Styles in Australian Broadacre Cropping', *Rural Sociology* 65(2): 295-310.

Just, R.E. & R.D. Pope (eds.) , 2002, *A Comprehensive Assessment of the Role of Risk in U.S. Agriculture*, Kluwer Academic Publishers.

Kerkhove, G., 1994, 'Sterk gemengd. Een socio-economische analyse van agrarische bedrijvigheid in het Hageland en Pajottenland, België', Wageningen, V.A.C./Circle for Rural European Studies.

Kumbhakar, S.C., S. Ghosh & J.T. McGuckin, 1991, 'A generalized production frontier approach for estimating determinants of inefficiency in U.S. dairy farms', *Journal of Business and Economic Statistics* 9(3): 279-286.

Milligan, G.W., 1980, An Examination of the Effect of Six Types of Error Perturbation on Fifteen Clustering Algorithms, *Psychometrika*, 45: 325-342.

Öhlmér, B., Olson, K. & B. Brehmer, 1998, Understanding farmers' decision making processes and improving managerial assistance', *Agricultural Economics* 18: 273-290.

Quiroga, R.E. & B.E. Bravo-Ureta, 1992, 'Short- and long-run adjustments in dairy production: a profit function analysis', *Applied Economics* 24: 607-616.

Rougoor, C.W., Trip, G., Huirne, R.B.M. & J.A. Renkema, 1998, 'How to define and study farmers' management capacity: theory and use in agricultural economics', *Agricultural Economics* 18: 261-272.

Solano, C., H. Leon, E. Perez & M. Herrero, 2001, 'Characterising objective profiles of Costa Rican dairy farmers', *Agricultural Systems* 67: 153-179.

Tauer, L.W., 1995, 'Do New-York Dairy Farmers Maximize Profits or Minimize Costs', *American Journal of Agricultural Economics* 77(2): 421-429.

Tauer, L. & Z. Stefanides, 1998, 'Success in maximizing profits and reasons for profit deviaton on dairy farms', *Applied Economics* 30: 151-156.

van der Ploeg, J.D., 1994, 'Styles of Farming: an introductory note on concepts and methodology' in van der Ploeg, J.D. & A. Long (eds.), *Born from within: practice and perspectives of endogenous rural development*, Assen, Van Gorcum, pp 7-30.

van der Ploeg, J.D., 2000, 'Revitalizing Agriculture: Farming Economically as Starting Ground for Rural Development', *Sociologia Ruralis* 40: 497-511.

Willock, J., Deary, I.J., Edwards-Jones, G., Gibson, G.J., McGregor, M.J., Sutherland, A., Dent, J.B., Morgan, O., Grieve, R., 1999, 'The role of attitudes and objectives in farmer decision making: Business and environmentally-oriented behaviour in Scotland', *Journal of Agricultural Economics* 50(2): 286-303.

Table 1: Number of dairy farmers, population and sample, by quotum size

	Population 1998	%	Sample 1998-2000
Q1 < 200,000	7276	67	12
Q2 200,001-300,000	1692	16	12
Q3 300,001-400,000	985	9	17
Q4 400,001-500,000	514	5	12
Q5 > 500,000	397	4	20
Total	10864	100	73

Table 2: Answers by quotum size class

	Q1	Q2	Q2	Q4	Q5	All
Personal characteristics						
Older than 40	58%	58%	53%	58%	55%	56%
Minimum educational level of technical college	50%	75%	65%	83%	75%	70%
Specific agricultural education	67%	75%	76%	58%	85%	74%
Foreign stage	17%	8%	6%	17%	25%	15%
Experience with dairy farming (years)	22	20	24	21	22	22
Experience as farm manager (years)	15	14	20	18	19	18
Successor present	8%	8%	6%	25%	15%	12%
Farm characteristics						
One person operation	33%	25%	35%	17%	15%	25%
Cooperation with partner	58%	75%	41%	58%	70%	60%
Parent-child partnership	8%	0%	18%	8%	15%	11%
Multiple enterprises on the farm	100%	83%	59%	75%	70%	75%
Family labor in FTE spent on dairy enterprise	0.8	1.1	1.3	1.3	1.5	1.2
Invested in land last 10 years	75%	75%	88%	83%	90%	84%
Invested in quotum	67%	83%	88%	58%	85%	78%
Invested in buildings last 10 years	83%	58%	94%	100%	100%	89%
Quotum is main constraint	50%	50%	82%	58%	55%	60%
Self-declared management style						
Fine-tuner	33%	42%	35%	42%	30%	36%
Cost minimizer	0%	0%	18%	0%	0%	4%
Grower	25%	17%	24%	50%	55%	36%
Labor saver	0%	8%	18%	0%	5%	7%
Diversifier within agriculture	33%	25%	0%	0%	5%	11%
Diversifier outside agriculture	0%	0%	0%	8%	5%	3%
End of career	8%	8%	6%	0%	0%	4%
Objectives (first choice)						
Profit maximization	33%	8%	41%	67%	25%	34%
To produce environmentally friendly	0%	0%	0%	0%	0%	0%
Low risk	17%	8%	6%	0%	5%	7%
Leisure	42%	33%	41%	8%	30%	32%
Farm value maximization	0%	17%	12%	17%	35%	18%
Debt minimization	8%	8%	0%	0%	0%	3%

Table 2, continued

Strategies to reach objectives (first choice)						
Minimize fixed costs	33%	17%	18%	17%	20%	21%
Minimize variable costs	25%	8%	29%	33%	45%	30%
Diversify	8%	25%	0%	0%	5%	7%
Quickly take advantage of new technologies	0%	0%	0%	0%	0%	0%
Co-operate with other farmers	0%	8%	0%	0%	0%	1%
Increase labor productivity	8%	0%	0%	0%	0%	1%
Concentrate on the herd to maximize milk production	25%	17%	24%	17%	10%	18%
Grow in cows and liters of milk	0%	8%	6%	17%	15%	10%
Increase milk quality	0%	17%	24%	17%	5%	12%
Additional variables						
Following agricultural lectures or workshop	8%	25%	29%	25%	30%	25%
Sometimes asking assistance from other farmers	58%	42%	53%	25%	35%	42%
Following courses concerning the farm	8%	17%	6%	8%	25%	14%
Having a computer	75%	83%	76%	92%	90%	84%
Using a computer for economic farm management	58%	42%	35%	42%	65%	49%
Using a computer for technical farm management	33%	33%	41%	58%	70%	49%
Having access to internet	58%	75%	47%	50%	85%	64%
Using internet for professional purpose	42%	50%	29%	33%	60%	44%
Being well informed about the EU dairy policy	33%	33%	41%	50%	80%	51%

Table 3: Most important variables characterizing the different clusters

		Cluster A	Cluster B	Cluster C	Cluster D
I am risk averse		-0.7	0.6	-0.1	1.4
I use feed ration calculation tools		2.0	1.2	1.5	1.9
I contribute to the solution of environmental problems, e.g. by minimizing N		1.2	1.5	0.1	1.2
I quickly react to technological changes		0.4	0.3	-0.4	-0.6
Reducing custom work is important		-1.3	-1.0	-0.2	-0.7
I do not want to change things quickly		-1.5	-0.1	-0.9	0.0
Quality is important		1.8	1.6	1.6	2.0
I am a real cow farmer		1.6	0.1	0.4	1.5
Keeping veterinary costs low is important		-0.6	0.5	1.1	-0.1
I use soil samples		1.8	1.2	0.9	1.6
The quality of roughage is one of the most important elements in my farm's management		1.9	1.7	1.6	2.0
It is important to automate farm management tasks		1.2	0.8	0.3	0.6
I am proud of my profession		2.0	1.8	1.7	2.0
Low rate of mastitis due to adequate prevention		0.5	1.5	0.6	1.1
If I have to, I spend all my time to get a good result		1.3	-0.1	1.3	0.8
To minimize debts is important		-0.8	0.8	0.1	-0.2
I use the steer catalogue as farm management instrument		1.6	0.8	0.5	1.7
Objectives					
Profit maximization		38%	0%	71%	32%
Prefers a satisfying income +	Environmentally friendly production	0%	0%	0%	0%
	Low Risk	0%	6%	0%	14%
	Leisure	15%	63%	18%	32%
	Farm value increase	38%	25%	0%	14%

Table 4: Regression results testing the hypothesis that those who state they maximize profits actually do so

	Gross margin per liter		Farm income per liter		Gross margin per FTE		Farm income per FTE	
	Par. Estimate	Prob>abs(T)	Par. Estimate	Prob>abs(T)	Par. Estimate	Prob>abs(T)	Par. Estimate	Prob>abs(T)
Intercept	0.245	*0.0001*	0.110	*0.0001*	32460	*0.0024*	12092	*0.0616*
Quotum	0.000	*0.8910*	0.000	*0.0001****	0	*0.0001****	0	*0.0001****
Age	-0.006	*0.5261*	0.000	*0.9667*	7406	*0.2999*	5139	*0.2466*
Education	0.002	*0.8380*	-0.007	*0.4841*	-5185	*0.4517*	-5668	*0.1867*
Agr. educ.	-0.004	*0.6786*	-0.002	*0.8631*	8626	*0.2377*	4035	*0.3719*
Training abr.	0.009	*0.4766*	0.002	*0.9027*	2555	*0.7649*	334	*0.9497*
Experience	0.010	*0.3050*	-0.001	*0.9203*	-3651	*0.5989*	-2226	*0.6049*
Succesion	-0.018	*0.1931*	-0.021	*0.1726*	-5241	*0.5905*	-5745	*0.3427*
Profitmax	0.000	*0.9741*	0.017	*0.0887**	-3603	*0.5709*	2851	*0.4700*
PCuse	-0.005	*0.5859*	-0.012	*0.2207*	2086	*0.7434*	-2897	*0.4643*
R2	0.0717		0.2939		0.3739		0.528	
Adj R2	-0.0610		0.1930		0.2845		0.4606	

Statistical significance is indicated at the 1***, 5** and 10* percent level.

Table 5: Regression results testing whether management profiles matter for farm income

	Gross margin per liter		Farm income per liter		Gross margin per FTE		Farm income per FTE	
	Par. Estimate	Prob>abs(T)	Par. Estimate	Prob>abs(T)	Par. Estimate	Prob>abs(T)	Par. Estimate	Prob>abs(T)
Intercept	0.285	0.0001	0.148	0.0001	44840	0.0010	22176	0.0088
Cluster A	-0.028	0.0452**	-0.014	0.3443	-2586	0.7949	-589	0.9255
Cluster C	-0.022	0.0841*	-0.023	0.1067	-8707	0.3373	-6899	0.2317
Cluster D	-0.038	0.0017***	-0.026	0.0468**	-14162	0.0962*	-9693	0.0732*
Quotum	0.000	0.7102	0.000	0.0013***	0	0.0001***	0	0.0001***
Age	-0.014	0.1701	-0.005	0.6534	7977	0.2731	5191	0.2609
Education	0.006	0.5274	-0.005	0.6228	-4862	0.5000	-5650	0.2187
Agr. Educ.	-0.010	0.3402	-0.005	0.6674	2215	0.7793	1209	0.8093
Training abroad	0.006	0.5846	-0.001	0.9434	2961	0.7271	65	0.9904
Experience	0.010	0.3202	0.002	0.8232	-498	0.9429	-77	0.9862
Succesion	-0.011	0.4642	-0.019	0.2391	-9868	0.3556	-8891	0.1911
PCuse ec. man.	-0.010	0.3242	-0.022	0.055*	5933	0.4294	-1304	0.7837
PCuse tech. man.	-0.006	0.5567	-0.005	0.6738	-5033	0.5064	-5077	0.2921
R2	0.2553		0.3324		0.4025		0.5442	
Adj R2	0.0928		0.1868		0.2721		0.4448	

Statistical significance is indicated at the 1***, 5** and 10* percent level.