EMPIRICAL STUDY ON COSTS AND INCOMES OF ORGANIC FARMING

Josep Mª. ARGILÉS BOSCH
Universitat de Barcelona
(Spain)

ABSTRACT

This paper conducts an empirical study on output, costs and incomes in organic farming.

Financial accounting offers biased information on the comparative economic situation of organic farming. A first approach reveals that partly organic farms, or those in transition to becoming organic, have significantly lower profits than conventional farming. This is because these organic farms incur in higher costs, and probably lower physical output that are not sufficiently balanced with higher output prices. Results point to similar conclusions for exclusively organic farming.

Costs were recalculated incorporating opportunity costs of family work and regression models rerun. Organic farming was a factor that significantly saved costs, and consequently improved results with respect to information offered by conventional accounting.

The article recalls for the necessity for accounting to broaden its scope and contents. There are crucial transactions that are not marketed, registered or valued but yield social profits and costs. Accounting should disclose social and environmental data in order to consider non-marketed outputs and costs.

1. Introduction.

Over the last decades worldwide agriculture has attained increasing levels of modernization and productivity. Key factors in this evolution have been intensive capital endowments, farming specialization, massive application of chemical fertilizers and nutrients and selection of high yield crops and livestock, including genetically modified organisms (GMO) in some countries.

In spite of these recent achievements, intensive farming systems entail some serious problems: decreasing effectiveness of land, pesticides and chemical fertilizers, ongoing loss of biodiversity, environmental and health damages, economic and social costs, as well as different kinds of unpredictable future risks (Matson et al., 1997; Altiery, 1998; Boschma, Joaris and Vidal, 2001; Tilman, 1998; Drinkwater, Wagoner y Sarrantonio, 1998). Dupraz (1997), Mishra, El-Osta and Steele (1999), Hornbaker, Dixon and Sonka (1989), Kurosaki (1997), Popp and Rudstrom (2000) and Omamo (1998) analyzed economic problems arising from specialization and monoculture. Melfou and Papanagioutou (2003) measured the effect of nitrate pollution in the growth rate of total factor productivity in Greek agriculture.

Growing concerns for environmentally friendly goods and services are being expressed together with those related with risks derived from intensive agriculture and broader environmental problems. This was, for example, a major issue at the World Summit on Sustainable Development held in Johannesburg in September 2002. In a recent survey (European Commission, 2005), citizens of the European Union answered that their main priorities in terms of agricultural policy were, listed in order of importance: ensuring stable and adequate incomes for farmers (36%), ensuring that agricultural products are healthy and safe (30%), promoting respect for the environment (28%), favouring and improving life in the countryside (26%) and favouring organic production (20%).

Organic agriculture is seen as the most environmentally friendly farming system. It favours renewable resources, recycles nutrients, uses the environment's own systems for controlling pests and diseases, sustains ecosystems, protects soil, reduces pollution, while at the same time promotes animal welfare, the use of natural foodstuffs, product diversity, avoidance of waste, etc (European Commission, 2002). In the frame of the European Union, environmental concerns play a vital role in the Common Agricultural Policy (CAP), which actively promotes organic agriculture. The development of organic agriculture will depend on its economic viability and CAP's determination to protect this type of farming.

However, there are almost no studies on economic viability of organic farming. Tzouvelekas, Pantzios and Fotopoulos (2001) found lower technical efficiency scores in organic cotton Greek farms *vis-a-vis* their conventional counterparts, while Lansink, Pietola and Bäckman (2001) found that organic farms are, on average, more efficient in relation to their own technology, but they use less production technology than conventional farms in Finland, thus resulting in approximately 40 per cent less productivity. Lansink and Jensma (2003) found larger variable profit in organic than in conventional Dutch farms, as well as interesting conclusions on trends of organic farming practises. Unfortunately,they do not offer information about the bottom line of profits. Descriptive statistics presented by Offermann and Nieberg (2000), usually drawn from small samples, do not offer tests and inferences applicable to the population of farms.

According to Mathews (1997), it is necessary to broaden the field covered by accounting to include social and environmental data. Environmental accounting has been developing a growing field of study since the last decade within accounting academics. According to Bebbington (1997), the latter has a role to play in a fairer and more equitable society. However, empirical studies on environmental accounting are scarce, and almost non-existent in environmental agricultural accounting.

This article contributes to the development of empirical environmental accounting and recalls for future research on this subject.

2. Research design.

2.1. Data collection.

The Farm Accountancy Data Network (FADN) was created in 1965 by Regulation (EEC) 79/65 of the Council in the context of the Common Agricultural Policy (CAP). Today, FADN collects accounting information at the level of individual farms, and every year it gathers data from a rotating sample of professional farms across all member states. FADN data is collected through a questionnaire, called the “Farm Return”, which is filled out by the farms with the assistance of specialised local accounting offices. The information obtained through the Farm Return is coded and transmitted to the European Commission. The information is summarised in reports similar to balance sheets and income statements and published by the European Commission at aggregated terms.

The European Commission (1997, 1998) provides detailed information about its procedures and methodology.

FADN was conceived as a complementary source of statistical information about farm income for policy makers, and the sample of farms from which is obtained, should be representative of different characteristics and types of farming of European agriculture. Since 2000 it has been collecting data on organic farming in the European Union. Every participating farm must fulfil information according to one of these three possibilities: partly organic or in transition to organic farming (code 3), exclusively organic farming (code 2) and non-organic framing (code 1). As can be seen, no distinction is made between farms in transition to organic and farms performing partly organic and conventional farming.

The Ministry for Spanish Agriculture (*Ministerio de Agricultura Pesca y Alimentación* [MAPA]) provided data from 8,700 farm records from its *Red Contable Agraria Nacional* (RECAN), the Spanish subsidiary of the FADN, corresponding to 2000, the first year in which data on organic farming was available. Of the total sample, 8,300 perform non-organic farming, 223 are partly organic or in transition to organic farming and only 25 farms perform exclusively organic farming, while 151 farms did not provide information on this issue. The tiny proportion of organic farms in the sample is even lower than its limited development in Spanish agriculture, a fact that reveals the scarce awareness of Spanish policymakers about the subject. Thus, results must be interpreted cautiously due to the small sample data for organic farming.

2.2. Model specification.

The following multiple regression model was used to analyse the influence of organic farming on farm costs, output and profits:

$$\ln Y = \beta_0 + \sum_{k=1}^{k} \beta_{Ok} \cdot O_k + \beta_S \cdot \ln S + \beta_A \cdot \ln A + \sum_{j=1}^{j} \beta_{Fj} \cdot F_j + \sum_{m=1}^{m} \beta_{Lm} \cdot L_m + \varepsilon \qquad (1)$$

The dependent variable *Y* symbolises farm performance with respect to costs, output and profits of firm *i* in year 2000 according to FADN methodology. The model intends to study the influence of organic farming (*O*) on farm performance, controlling also for farm characteristics, such as size (*S*), farmer experience (*E*), type of farming (*F*) and geographical location (*L*), which are likely to affect empirical results when a heterogeneous sample data of farms is used. Conclusions would not be properly drawn without controlling for these variables.

Three measures of performance are studied. Registered costs (*REGCOST*) represent those costs registered in FADN for farm *i*: specific costs (supply costs linked to specific lines of production: seeds and seedlings, fertilizers, crop protection products, feed for livestock, specific forestry costs, etc.), farming overheads (supply costs linked to production activity but not linked to specific lines of production), depreciation (calculated on current value) and external factors (wages and social security charges, rents and interests). *OUTPUT* represents the production yielded by farm *i*, while *INCOME* indicates the difference between output and registered costs for farm *i*.

Two dummy variables indicate whether a farm *i* performs organic farming (*ORGANIC*) and partly organic or in transition to organic (*ORGTRANS*), when its value equals one (and zero otherwise), while the default variable corresponds to conventional farms.

As conventional farming is more intensive and is not concerned with crop rotation and land rest, it is expected to be more productive in terms of physical production. However, organic farming tends to compensate it through increasing quality and its subsequent higher prices. Consequently, no prior hypothesis can be raised with respect to the relation between organic farming and monetary output. In the specific case of *ORGTRANS*, lower output is expected for farms in transition to organic farming, because, according to European regulations, farms must stop production during two to three years before being labelled as organic. However, the fact that this category includes transitional and partly organic farming does not allow for a definitive prior hypothesis.

Organic farming tends to avoid input waste and saturation. Indeed, it employs its own farm resources more frequently than conventional farming. However, it does not use resources intensively and higher costs would correspond to higher product quality. Controlling for other variables, and specifically size, no clear hypothesis can be formulated with respect to the influence of organic farming on costs. Consequently, no prior hypothesis for income can be formulated, though assumptions and existing research seem to point at lower incomes or profits for organic with respect to conventional farms. That is to say that transitional farms will likely present lower profits.

Size is an obvious control variable in the model, as it is expected that bigger farms will have higher output, costs and income. The European size unit (*ESU*) is an accepted and widespread used measure of size in the European Union agricultural statistics. *ESU* defines the economic size of an agricultural holding on the basis of its potential gross added value. It is calculated assigning predetermined values of gross value added to the different lines of production of the farms. Since 1995 one *ESU* equals 1,200 ECU of standard gross margin. This standardized measure of size is homogeneous for different types of farming.

The age of the farmer (*AGE*) is a proxy for farmer's experience. It is expected that more experienced farmers will have better skills, enabling them to make more effective decisions, thus reducing costs, improving farm output and increasing income. On the other hand, younger farmers may be more energetic, innovative and better educated, while farmers approaching retirement hardly invest in their farms. Consequently, no clear relationship between farmer's age and performance can be expected.

According to FADN methodology, seven dummy variables indicate that a farm operates the corresponding type of farming when these variables equal one and zero otherwise: *FIELD* for farms predominantly specialized in cereals, general field extensive or mixed crops, *HORTICULTURE* for farms specialized in horticulture, *PERMANENT* for farms predominantly specialized in fruits, citrus, olives, or combined permanent crops, *MILK* for farms specialized in dairying, GRAZING for farms specialized in rearing or fattening cattle, sheep, goats and other grazing livestock, *GRANIVORE* for farms predominantly specialized in pigs and poultry,, while mixed livestock type of farming (sometimes combined with various crops) is the default category. In the geographical context of our sample, where water shortages and dry weather are frequent, agricultural land is very scarce and livestock is usually produced in intensive capital endowed farms. Mixed livestock farms are expected to require higher costs (and production) than both, farms with predominantly field, wine and permanent crops and those with extensive grazing livestock, while they face lower costs (and production) than those specialized in more intensive agriculture such as horticulture, dairy and granivores.

Two dummy variables indicate the location in less-favored (*LESSFAZONE*) and mountain zones (*MOUNTZONE*) when its value equals one (and zero otherwise), while the default category applies to farms located in what we label "usual zones". The latter are usually far from consumption and purchasing markets and have lower technological, infrastructure and service endowments. We should expect higher monetary outputs and lower costs for this type of farming than for farms located in mountain and less-favored zones.

Equation (1) is expressed in the following full equation:

$$\begin{aligned} \ln Y = {} & \beta_0 + \beta_1 ORGANIC + \beta_2 ORGTRANS + \beta_3 \ln[ESU] + \beta_4 \ln[AGE] + \beta_5 FIELD + \\ & \beta_6 HORTICULTURE + \beta_7 WINE + \beta_8 PERMANENT + \beta_9 MILK + \beta_{10} GRAZING + \\ & \beta_{11} GRANIVOR + \beta_{12} MOUNTZONE + \beta_{13} LESSFAZONE + \varepsilon \end{aligned} \qquad (2)$$

3. Empirical results.

Different ordinary least squares regressions were performed for every dependent variable. The distributions of residuals appear to be normal, while scatter plots of studentized residuals versus the predicted values show that the equality of variance assumption does not seem to be violated. Factor inflation variables, all lower than 5, and condition indexes combined with proportions of variance suggest that multicollinearity is unlikely to affect estimations. Plots of logarithmized (and untransformed) dependent versus independent continuous variables reveal a better linear relation between independent and dependent variables when transformed into logarithms.

Table 1 displays results. Estimations of column A corresponding to farm output show significant expected coefficients for almost all control variables with $p<0.01$. Location in mountain zones is significant with $p<0.05$. Size is the variable that most influences farm output. Farms specialised in wine show a positive significant coefficient, contrary to expectations, because they mainly get high prices for their recognised quality wines. Organic and transition to (or partly) organic farming do not seem to significantly influence farm output. They did not obtain substantially different output to conventional farms. However, the small number of organic farms in the sample is an obstacle for obtaining significant results. Only provisional conclusions can be drawn considering the lack of data on organic farming.

Column B displays estimations for registered farm costs. All control variables present significant expected estimations with $p<0.01$. Again, size is the variable that most influences farm output. Results show that age is a significant factor influencing lower costs and farm output. Organic farming does not significantly influence cost, but no conclusive inferences can be drawn about it, as the sample of organic farms is very small. The question stands whether a wider sample would yield more significant results. Results show that partly, or in transition to, organic farming significantly increases costs.

Column C displays estimations on farm income. As negative values can not be transformed into logarithms, regressions were performed with untransformed variables. As expected, size is significantly associated with income, and the most influential variable. Farms specialised in extensive field crops, permanent crops and grazing livestock show significant lower incomes with $p<0.01$, while the contrary can be affirmed for intensive horticulture, wine and granivores. Farms located in mountain zones present significantly lower incomes with $p<0.01$. Farmer’s age do not present significant estimations with $p<0.05$, but it is significantly associated with higher incomes with $p<0.1$. Transitional and partly organic farming is significantly associated with lower incomes with $p<0.01$, but no significant estimation exists for organic farming, considering the small number of organic farms.

Column D offers estimations of income expressed in relative terms, as logarithm of output to registered costs. Adjusted R-square is very small: the model only explains 10% variability of relative income. However, estimations reaffirm and improve results from column C: almost all coefficients present significant expected values with $p<0.01$, or with $p<0.05$ for dairy farms. What is most important: partly (or transitional to) organic farming is again significantly associated with lower relative incomes with $p<0.01$, and organic farming is also significantly associated with lower relative incomes with $p<0.1$, thus confirming prior assumptions, supporting the main trends of existing research, and anticipating what could be more conclusively found with a wider sample of organic farms.

Results seem to provide evidence that registered incomes are lower for organic and transitional farms than for conventional farms. Given that European citizens are concerned with sustainable and environmental issues and that organic farming is the most environmentally friendly farming system, policymakers should play an active role supporting it. Evaluating non-marketed costs and benefits that do not usually appear in accounting records and statistics is an important task. However, subsidies are mainly influenced by geographical location and product specialization, while not significantly by organic farming, as can be seen in table 2. In terms of support to organic agriculture, European policies must be complementary shared by national Governments. Though CAP tries to promote organic agriculture, Spanish policies do not emphasize actions aiming to protect sustainable agriculture as other leading European Governments do.

This study attempts to incorporate non-marketed values to profit and loss statements. Costs and incomes were recalculated with the opportunity costs of family work. Results are displayed in table 3. Organic farming is a factor that induces lower costs of family work with $p<0.1$ (column A). Columns B and C show a change in signs for organic farming with respect to correspondent columns of table 1, though coefficients are not significant. Variable representing partly, or in transition to, organic farms show less significant signs than those of table 1, and it does not influence income, when family work is considered, with $p<0.05$. Column D also reveals influence of organic farming in relative profits, with a lower significance: with $p<0.1$.

Figures from table 1 did not properly reflect the complete economic situation of organic farming, since these farms usually employ a higher proportion of hired labour. They are usually ran by younger farmers, sometimes as a part-time job, whose wives are usually employed in alternative jobs. Contrary to what would be usually disclosed by conventional accounting, organic farming could be a sound viable alternative in agriculture. Similarly, influence of age on costs, output and profits is also biased by financial accounting information.

4. Conclusions.

This paper conducts an empirical study on output, costs and incomes in organic farming.

Financial accounting offers biased information about the relative economic situation of organic farming. A first approach reveals that partly, or in transition to, organic farming has significantly lower profits than conventional farming, as this type of farming incurs in higher costs and likely lower physical output, that are not sufficiently balanced with higher output prices. Results from the small sample of organic farming used in this study, point to similar conclusions for organic farming, but they are no conclusive. Results seem to indicate that farms in transition to organic farming significantly decrease income and must face higher costs for conditioning and preparing to organic.

When non-market information is considered, results differ substantially:
Costs were recalculated incorporating opportunity costs of family work and regression models reran. Organic farming significantly saved costs, and consequently improved results with respect to information offered by conventional accounting.
Other important data should be considered in empirical research, but it is neither available in agricultural statistics, nor in accounting information.
It is necessary for accounting to broaden its scope and contents. There are crucial transactions that are not marketed, registered and valued, but that yield social profits and costs. Accounting should disclose social and environmental data in order to consider non-marketed outputs and costs. In the specific case of agriculture, conventional farming is leading to a saturation point that brings many present and future environmental risks and problems, while organic farming favours sustainability, solution to environmental problems, biological diversity, etc. Accounting should provide appropriate information to compare fair costs and profits of alternative farming systems and assess optimal resource allocation between organic and conventional farming. Recent International Accounting Standard 41 on agriculture missed the opportunity to recall attention on such issues. European statistics and FADN should be concerned about their importance. Nitrate pollution, land rest, biodiversity, food safety, soil protection, etc. is important data to assess agricultural decisions. Citizens and policymakers should be aware of real costs and benefits of conventional and organic farming and calculate compensations, if necessary, that transition to organic farming deserve. Future research is needed with wider sample and data.

References.

Alfieri (1998), “Ecological impacts of industrial agriculture and the possibilities for truly sustainable farming”, *Mothly Labor Review*, Vol. 50, n. 3, pp. 60-72
Bebbington, J. (1997), “Engagement, education and sustainability: a review of environmental accounting”, *Accounting, Auditing and Accountability Journal*, Vol. 10, n. 3, pp. 365-381.
Boschma, M., Joaris, A. y Vidal, C. (2001), *Agriculture and Environment. Concentration of livestock production*. Comisión Europea. Bruselas.
Drinkwater, Wagoner y Sarrantonio (1998), “Legume-based cropping systems have reduced carbon and nitrogen losses”, Nature, num. 396, pp. 262-265.
Dupraz, P. (1997), “La spécialisation des exploitations agricoles: changements techniques et prix des facteurs”, *Cahiers d’Économie et Sociologie Rurales*, n. 45, pp. 93-122.
European Commission, 1997, ‘Data Definitions and Instructions for the FADN Farm Return’, *Community Committee for the Accountancy data Network*, RI/CC 1256 Prov.
European Commission, 1998, ‘Definition of Variables Used in FADN Standard Results’, *Community Committee for the Accountancy data Network*, RI/CC 882 Rev. 6.

European Commission (2002), “Analysis of the possibilities of a European Action plan for organic food and farming”, *Commission Staff Working Paper*, SEC1368.
European Commission (2005), “Europeans and the Common Agricultural Policy”, *Special Eurobarometer*, 221/Wave 622 – TNS Opinion and Social.
Hornbaker, R.H. Dixon, B.L. y Sonka, S.T. (1989), “Estimating production activity costs for multioutput firms with a random coefficient regression model”, American Journal of Agricultural Economics, vol. 71, n. 1, pp. 167-177.
Kurosaki, T. (1997), “Production risk and advantages of mixed farming in the Pakistan Punjab”, *The Developing Economics*, vol. XXXV, n. 1, marzo, pp. 28-47.
Lansink, A. O. and Jensma, K. (2003) “Analysing profits and economic behaviour of organic and conventional Dutch arable farms”, *Agricultural Economics Review*, 4(2), p. 19-31.
Lansink, A.O., Pietola, K. and Bäckman, S. (2002) “Efficiency and productivity of conventional and organic farms in Finland 19941997”, *European Review of agricultural economics*, 29(1), p. 51-65.
Mathews, M.R. (1997) “Twenty-five years of social and environmental accounting research. Is there a silver jubilee to celebrate?”, *Accouting, Auditing & Accountability Journal*, vol. 10, n. 4, p. 481-531.
Matson, P.A., Parton, W.J., Power, A.G. and Swift, M.J. (1997) “Agricultural intensification and ecosystems properties”, Science, 277, p. 504-509.
Melfou, K. and Papanagioutou, E. (2003) “Total factor productivity adjusted for a detrimental input”, *Agricultural Economics Review*, 4(2), p. 5-18.
Mishra, A.K, El-Osta, H.S. y Steele, Ch.J. (1999), “Factors affecting the profitability of limited resource and other small farms”, *Agricultural Finance Review*, vol. 59, n. 0, pp. 77-91.
Offermann, F. y Nieberg, H. (2000), *Economic perfromance of organic farms in Europe*. University of Hohenheim. Stuttgart.
Omamo, S.W. (1998), “Farm-to-market transaction costs and specialisation in small-scale agriculture: explorations with a non-separable household model”, *Journal of Development Studies*, Vol. 35, n. 2, diciembre, pp. 152-163.
Popp, M. y Rudstrom, M. (2000), “Crop enterprise diversification and specialty crops”, *Agricultural Finance Review*, Vol. 60, n. 0, pp. 85-98.
Tilman, D. (1998), “The greening of the green revolution”, Nature, n. 396, 19-noviembre, pp. 211-212.
Tzouvelekas, V. and Pantzios C. J. (2001)” Economic Efficiency in Organic Farming: Evidence From Cotton Farms in Viotia, Greece”, *Journal of Agricultural & Applied Economics*, 33(1), p. 35-48.

Table 1.
Estimations relating organic farming to output, costs and incomes (t-statistics in parentheses).

Variables	(A) ln[*OUTPUT*]		(B) ln[*REGCOST*]		(C)[1] *INCOME*		(D) ln[*OUTPUT/*(*T*]
Constant	7.145	***	6.638	***	1551.178	***	0.507
	(73.517)		(65.359)		(5.233)		(5.445)
ORGANIC	-0.022		0.167		-814.412		-0.189
	(-0.209)		(1.519)		(-0.972)		(-1.874)
ORGTRANS	0.011		0.284	***	-865.090	***	-0.273
	(0.272)		(6.664)		(-2.661)		(-6.981)
Control variables:							
ln[*ESU*]	0.681	***	0.764	***	85.131	***	-0.083
	(92.063)		(98.899)		(42.509)		(-11.768)
Ln[*AGE*]	-0.062	***	-0.149	***	6.914	*	0.087
	(-2.684)		(-6.197)		(1.677)		(3.956)
FIELD	-0.233	***	-0.227	***	-875.956	***	-0.006
	(-9.154)		(-8.542)		(-4.317)		(-0.239)
HORTICULTURE	0.516	***	0.260	***	2558.090	***	0.256
	(13.564)		(6.545)		(8.499)		(7.016)
WINE	0.290	***	-0.145	***	1221.402	***	0.435
	(7.730)		(-3.693)		(4.130)		(12.091)
PERMANENT	-0.274	***	-0.395	***	-720.092	***	0.121
	(-9.547)		(-13.153)		(-3.164)		(4.376)
MILK	0.191	***	0.249	***	353.685		-0.058
	(7.006)		(8.723)		(1.624)		(-2.201)
GRAZING	-0.165	***	-0.125	***	-774.342	***	-0.040
	(-5.803)		(-4.197)		(-3.420)		(-1.479)
GRANIVOR	0.541	***	0.678	***	1292.948	***	-0.137
	(14.162)		(16.992)		(4.231)		(-3.750)
MOUNTZONE	-0.042	**	0.061	***	-728.612	***	-0.103
	(-2.356)		(3.303)		(-5.173)		(-6.060)
LESSFAZONE	0.015		0.110	***	-170.245		-0.095
	(1.134)		(7.877)		(-1.590)		(-7.405)
R-squarre:	0.594	***	0.647	***	0.219	***	0.099

Notes:
Significance levels: *p<0.1, **p<0.05, ***p<0.01
1. Untransformed dependent and independent *ESU* and *AGE* variables, because logarithms can not be calculated for negative values of *INCOME*.

Table 2.
Estimations relating organic farming to subsidies (t-statistics in parentheses).

Variables	(A)[1] CURRENT SUBSIDIES		(B)[1] SUBIDIES ON INVESTMENTS	
Constant	388.912	***	21.253	
	(2.910)		(0.975)	
ORGANIC	306.137		-10.05	
	(0.810)		(-0.177)	
ORGTRANS	153.233		12.728	
	(1.045)		(0.533)	
Control variables:				
ESU	44.794	***	1.170	***
	(49.604)		(7.946)	
AGE	3.210	*	-0.753	**
	(1.726)		(-2.484)	
FIELD	267.139	***	-9.772	
	(2.920)		(-0.655)	
HORTICULTURE	-1469.741	***	-22.756	
	(-10.829)		(-1.028)	
WINE	-968.206	***	9.135	
	(-7.260)		(0.420)	
PERMANENT	-254.908	**	-0.730	
	(-2.484)		(-0.044)	
MILK	-1673.091	***	66.385	***
	(-17.037)		(4.147)	
GRAZING	67.510		7.779	
	(0.661)		(0.467)	
GRANIVOR	-2422.011	***	43.153	*
	(-17.598)		(1.921)	
MOUNTZONE	660.292	***	43.525	***
	(10.397)		(4.204)	
LESSFAZONE	101.179	**	4.374	
	(2.096)		(0556)	
R-squarre:	0.309	***	0.023	***

Notes:
Significance levels: *p<0.1, **p<0.05, ***p<0.01
1. Untransformed dependent and independent *ESU* and *AGE* variables, because logarithms can not be calculated when there are no subsidies.

Table 3.
Estimations relating organic farming to costs and incomes considering opportunity costs of family work (t-statistics in parentheses).

Variables	(A)[1] Opportunity costs of family work		(B)[2] ln[*TOTALCOST*]		(C)[1] *INCOMEREF*	
Constant	2286,228	***	7,199	***	-735,050	**
	(18,954)		(77,245)		(-2,289)	
ORGANIC	-899,137	***	-,082		84,716	
	(-2,636)		(-,809)		(,093)	
ORGTRANS	-196,534		,086	**	-668,556	*
	(-1,485)		(2,194)		(-1,898)	
Control variables:						
ln[*ESU*]	-,331		,473	***	85,463	***
	(-,407)		(66,741)		(39,389)	
Ln[*AGE*]	15,212	***	,082	***	-8,299	*
	(9,067)		(3,697)		(-1,858)	
FIELD	68,948		-,127	***	-944,903	***
	(,835)		(-5,202)		(-4,298)	
HORTICULTURE	260,827	**	,269	***	2297,263	***
	(2,129)		(7,383)		(7,045)	
WINE	-231,442	*	-,111	***	1452,844	***
	(-1,923)		(-3,085)		(4,534)	
PERMANENT	-21,935		-,198	***	-698,157	***
	(-,237)		(-7,192)		(-2,831)	
MILK	106,059		,164	***	247,626	
	(1,197)		(6,278)		(1,049)	
GRAZING	20,366		-,058	**	-794,708	***
	(,221)		(-2,134)		(-3,240)	
GRANIVOR	172,080		,554	***	1120,867	***
	(1,384)		(15,128)		(3,386)	
MOUNTZONE	-38,023		,018		-690,589	***
	(-,663)		(1,055)		(-4,526)	
LESSFAZONE	-4,859		,056	***	-165,386	
	(-,112)		(4,339)		(-1,426)	
R-squarre:	,011	***	,453	***	,193	***

Notes:
Significance levels: *p<0.1, **p<0.05, ***p<0.01
1. Untransformed dependent and independent *ESU* and *AGE* variables, because logarithms can not be calculated, neither for zero values of opportunity cost of family work, neither for negative values of *INCOMEREF*. *INCOMEREF* is farm income after subtracting the opportunity cost of family work
2. *TOTALCOST* is the sum of registered costs and opportunity cost of family work.