FARM-LEVEL DETERMINANTS OF CONVERSION TO SUSTAINABLE FARMING PRACTICES IN THE NEW MEMBERS STATES

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ABSTRACT

A field survey carried out in 2005 in the Czech Republic and Lithuania to investigate the determinants of converting to organic farming reveals that farmer's own belief and the intrinsic characteristics of the farm increase the likelihood of conversion. If the process of certification as an organic farm implies important changes of the structure of the farm, it lowers the propensity of farmers to consider the conversion to organic. When considering the case of family farms, results of a logit model reveal that apart from farmers' own belief in the environmental or food quality benefits of organic farming, availability of information/own knowledge about the characteristics of technology to be adopted, availability of extra labour, and membership to farmers' associations increase the likelihood to convert.

Keywords: sustainability, organic, adoption, NMS, CAP.

1 INTRODUCTION

The increased interest of EU consumers for better quality food produced in an environmental-friendly way as well as the price premium of such produce are expected to act as incentives for farmers to seek and adopt more sustainable farming practices.

Conversion to sustainable farming practices has often been seen as an individual decision problem where the farmer decides to change the on-going farming practice and to adopt other farming standards. Motivations behind adopting sustainable farming practices are likely tied to recognising the complex impact conventional farming has on society and environment, and involve deeply held values, but which do not exclude profit-making motives (NOWAK 1987). Social, economic and environmental factors determined by local and regional milieu in which the farmer operates play a key role at the time of deciding to adopt new production practices. These factors include agronomic and market conditions, land tenure and infrastructure (FEDER and UMALI 1993; FRANZEL et al. 2001); farmers' skills or technical capacity (ROSENBERG 1972; HALL and KHAN 2003); environmental and institutional factors (HALL and KHAN 2003). Various authors investigated the determinants of adoption of new technology in general (HALL and KHAN 2003; WHITE et al. 2005) as well as the case of sustainable farming practices (RUTTAN 1998; DE SOUZA et al. 1999; SCHOON and TE GROTENHUIS, 2000; SIDIBÉ 2005).

The case of organic farming, one of the set of sustainable farming practices (LAMPKIN and PADEL 1994; PRETTY 1995; COBB et al. 1999; VAN ELSEN 2000; RIGBY and CÁCERES 2001; MADRE et al. 2002; HELANDER and DELIN 2004; MARINARI et al. 2005), is of interest for policymakers and stakeholders given the increasing demand for organic produce, the ascending curve of conversion to organic farming in the EU-15 since 1992 (when the Regulation EEC N° 2092/91 on organic farming entered into force)[1], availability of public subsidies for organic farming, and environment-related public concerns that call on farmers to re-consider the effects and the impact of their production systems in shaping the environment. A comprehensive framework for the organic production of crops and livestock now exists in the EU, including regulations to ensure the authenticity of organic production methods, for

[1] European Commission, 1991: Council Regulation (EEC) No. 2092 of 24 June 1991on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs. O.J. OJ L 198, 22.7.1991.

labelling, processing and marketing of organic products (Regulation EC N° 1804/1999)[2], and also governing the imports of organic products into the EU.
Still, in the EU-15 as well as in the new Member States (EU-N10), the observed rate of conversion to organic farming remains low. At the end of 2003 the highest number of registered organic farms in EU-15 was recorded in Italy (48,353 farms for a total organic area of 751,860 ha). In EU-N10, at the end of 2003 the highest values in terms of total area under organic farming and number of registered organic farms were reported in Hungary (70,514 ha of and 1,495 organic farms) and the Czech Republic (195,216 ha and 1,095 farms) (EUROSTAT, 2007).

This paper builds on the results of a larger study concerned with identification, characterisation and analysis of sustainable farming practices in selected EU-N10. The underlying assumption used to identify the determinants of adoption is that the structures of organic and non-organic farms within a given farming system are different. Moreover, it was assumed that the main (structural) characteristics of each farming system would not always favour the conversion to organic farming. The question this paper aims to answer is "what are the determinants of adopting sustainable farming practices in the NMSs context?", and considers the particular case of organic farming.

The remaining of the paper is organised as follows. Section 2 briefly looks at the situation of organic farming and associated policy context in the Czech Republic and Lithuania. Section 3 outlines of the methodological approach and data sources. The results of analysis are reported in section 4, and section 5 concludes.

2 CURRENT SITUATION OF THE ORGANIC FARMING IN THE CZECH REPUBLIC AND LITHUANIA

The main Czech law on organic farming is the Parliamentary Act No. 242/29 July 2000, and the amendment of the Act No. 368/1992 (on administrative fees). The law is implemented via two decrees of the Ministry of Agriculture (No. 53/2001 and No. 263/2003). From 2004, "Action Plan for the Development of Organic Farming by 2010" sets the main objectives and priorities for the Czech organic farming. The Czech organic inspection system is a mix of state and private sub-systems. The Ministry of Agriculture through the Department of Structural Policy and Rural Development represents the state sector, whereas KEZ (Control of Ecological Agriculture), a private inspection body founded in 1998, represents the private sector. From 1989, the land under organic farming in the Czech Republic followed an increased trend, in 2004 reaching to 263,299 ha. Organic agriculture started recently to expand also to mountainous and sub-mountainous areas where land is of lower quality (ZIVELOVÁ et al. 2003). The first financial funds to support the establishment of organic farms were released at the end of 1990, and by 1992 there were 15,000 ha under organic farming. State support to organic farming ceased over the 1993-1997 period and restarted in 1998 (Government Regulation Agricultural Act 252/1997), again inducing an increase of the number of organic farms. With the accession of the country to the EU, organic farming payments increased noticeably (in some cases, even by almost 300 %), as from 2004, the support for organic farming is co-financed via the common agricultural policy budget (Table 1).

Table 1 Evolution and structure of organic farming payments (CZ, 1998-2005)

[2] European Commission, 1999: Council Regulation (EC) No 1804 of 19 July 1999 supplementing Regulation (EEC) No 2092/91 on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs to include livestock production. O.J. L 222/1.

Year	Arable crops	Permanent crops(a)	Vegetables on arable land	Meadows/ pastures	Herbs on arable land
1998 (ECU/ha)*	62.82	62.82	62.82	62.82	62.82
1999 (€/ha)*	59.78	89.68	59.78	29.89	59.78
2000 (€/ha)*	61.56	92.33	61.56	30.78	61.56
2001 (€/ha)*	62.54	109.44	109.44	31.27	62.54
2002 (€/ha)*	63.29	110.76	110.76	31.65	63.29
2003 (€/ha)*	61.71	107.99	107.99	30.85	61.71
2004 (€/ha)*	22.81	79.27	71.60	7.13	71.60
2005 (€/ha)*	23.55	81.87	73.94	7.36	73.94
2004 (EU) (€/ha)**	91.23	317.09	286.38	28.51	286.38
2005 (EU) (€/ha)**	94.21	327.47	295.75	29.44	295.75
2004 Total (€/ha)***	114.03	396.37	357.98	35.64	357.98
2005 Total (€/ha)***	117.77	409.33	369.69	36.80	369.69

Notes: * national support; ** = amount of support from the EU budget; *** = total amount of payments received including national support. (a) = (e.g. orchards, vineyards, hops…). The annual exchange rates applied have been gathered from the Czech National Bank official data.
Source: Czech Ministry of Agriculture, 2005.

Lithuanian organic farming is regulated currently by the Law on agricultural and rural development and the Organic Agriculture Rules (harmonised with EU Regulations 2092/91 1804/99, 331/2000). The Rules were reviewed in 2000 (Order No. 375 of the Ministry of Agriculture, into force from 8 January 2001). Since 2004 four programmes under the Rural Development Plan "Agri-Environment" measure offer support for organic farming and animals of rare breed, and poultry farming.[3] Since 1993, the number of organic farms increased constantly. The increase was particularly noticeable in 2003-2004 when the annual growth reached 60 %. In 2004 there were 1,178 certified organic farms, of which 55 % were crops oriented and 41.3 % mixed farms (plant-growing, cattle-breeding, bee-keeping etc.). During 2004 the area of certified agricultural farming land increased by 20,000 ha reaching to a total of 42,961 ha (about 1.5 % of all farming land in the country); on average, a certified organic farm managed 36.47 ha. The payments for organic farming in Lithuania are higher during the conversion period (i.e. the first three years of farming organically the farmer receives the total amount of payments available for that year, while afterwards payments are halved). Eligibility to organic support scheme requires applicants to have a minimum five years in farming own or rented land (Table 2).

Table 2 Evolution and structure of organic farming payments (LT, 1997-2006)

Years €/ha	Cereals	Grassland	Vegetables, potatoes	Berry plantations	Orchards	Fallows	Herbs
1997*	n.a.	43.00	102.00	202.00	202.00	n.a.	n.a.
1998*	43.00	43.00	102.00	202.00	202.00	n.a.	n.a.

[3] Within the fixed period of 1 September–29 October 2004 (intended for the provision of applications for the support of development of organic farms) the National Payments Agency (NPA) of the Ministry of Agriculture received 738 applications from persons pursuing organic farming activities. Estimations of the Ministry indicated that the amounts from the EU budget for the farmers and companies implementing projects under these programmes would reach € 4,344,804 in 2004, € 5,851,002 in 2005, and € 7,820,647 in 2006.

Years €/ha	Cereals	Grassland	Vegetables, potatoes	Berry plantations	Orchards	Fallows	Herbs
1999*	43.00	29.00	102.00	202.00	202.00	n.a.	n.a.
2000*	25.78	23.06	61.05	120.75	120.75	n.a.	n.a.
2001*	33.55	23.76	75.48	125.80	125.80	22.36	n.a.
2002*	57.87	24.59	124.42	144.67	202.54	23.15	n.a.
2003*	86.90	26.07	144.83	173.79	202.76	86.90	n.a.
2004–2006*	83.20	23.60	110.20	146.80	150.4	n.a.	91.20
EU 2004-2006 **	**332.80**	**94.40**	**440.80**	**587.20**	**601.6**	**n.a**	**364.80**

Notes: *=national support; **=EU co-financing rate; ***=total payment amount received, including national support. n.a. = not available.

Source: "Ekoagros" data; Lithuanian Rural Development Plan 2004–2006.

3 METHODOLOGY

The investigation of the determinants of converting to organic farming is based here on two complementary approaches, namely (a) analysis of expressed attitude towards converting to organic farming, and (b) a binomial logit model that allows investigating the statistical significance of determinants identified. The expressed attitude is collected via face-to-face interviews with those farmers that converted to organic farming.

Under the assumption that the reasons that triggered the decision to convert vary among different farming systems, a farm typology is first defined upon a set of criteria that include: (a) farming system; (b) technology (i.e. organic and non-organic production)[4]; (c) legal form (family farms and agricultural companies); (d) main production enterprises in each farming system. The farm typology is associated to farming systems defined at homogeneous regional level (Local Administrative Unit, LAU1) based on available statistical information and applying a set of criteria (i.e. land use, agro-climatic aptitude, livestock, property and holding size, population characteristics) (for more details see CÁCERES et al. 2007). The determinants are selected based on an extensive literature review, supplemented with input from the national experts to grasp the local context specificities. They refer at characteristics of (a) organic farming; (b) farm; (c) farmer; (d) farming milieu; and (e) economic aspects. The determinants are then integrated in statements (e.g. 'Organic farming produces higher quality food'), and interviewees are required to indicate on a closed five-point Likert scale the importance they attached to such statements at the time of deciding to convert to organic farming (i.e. A=Very important; B=Rather important; C=Rather unimportant; D=Not important at all, E=Do not know/answer).

In a second step, the significance of the determinants identified via the field survey is explored through statistical methods under the assumption of a utility-maximising farmer that ponders whether to convert to organic farming or to continue farming with its current production technology (hence, as a non-organic farmer). The utility-maximising choice of the i^{th} farmer is assumed to depend on a set of physical and socio-economic factors (Xi) $U_{it} = d_i X_i + e_{it}$ where U_i is the indirect utility the farmer derives from continuing with its current farming practice or converting to the new one, t is the technology (taking value of 0 for the ongoing technology, and 1 for the new one), d_i is a vectors of coefficients corresponding to the associated physical and socio-economic factors (X_i), and e_i is the additive error term. The farmer will adopt organic farming if $U_{i1}>U_{i0}$, or will continue with as a non-

[4] Both partial-organic farms and farms in conversion were considered as organic farms.

organic farm if $U_{i0}>U_{i1}$. Defining the qualitative dependent variable for the adoption of the alternative technology as $y_i = 1$ if the farmer adopts organic farming, and $y_i = 0$ otherwise, a binomial logit model is specified as $prob[y=1] = \frac{e^{\beta x_i}}{1+e^{\beta x_i}}$ and prob(y=0) is 1-prob(y=1), where x_i is the set of variables influencing the decision. The probability of conversion (P_i) is

$$P_i = P(y_i = 1) = P(U_{i1} > PU_{i0}) = P(e_{i0} - e_{i1})$$
$$= P(u_i) < (B_i X_i) = F(B_i X_i)$$

where P(·) is a probability function, u_i = (e_{i0}-e_{i1}) is a random distribution term, and F is a distribution function for u_i. It follows that the probability of a farmer to convert to the new technology is the probability that the utility of the new practice (or the cumulative distribution function evaluated as B_iX_i) is higher than the utility of the old one. The exact distribution of F depends on the distribution of the random term u_i (and determines the type of model that reflects the adoption behaviour). A binary dependent variable (logit) model is preferred here, mainly owing to the characteristics of quantitative data available.[5] In this case, the underlying cumulative logistic probability function allows transforming the dependent variable to predict probabilities within the bound (0, 1), and the probability that a farmer will convert to organic farming is the probability that the utility of the current practice is lower than the utility of the organic one. The dependent variable becomes then the logarithm of the odds when a positive choice is made (i.e. conversion occurs) and the model is specified as $\ln[p_x / 1 - P_x)] = \sum B_i X_i$, where P_x = the probability of an event (adoption of the new technology, here, organic) occurs for an observed set of variables X_i; Bi are the coefficients to be estimated, and X_i is the set of explanatory variables.

In line with the theory of adoption, the model includes variables related to farmer's own belief in the benefits of farming organically, access to information, technology-specific knowledge, farm characteristics, and availability of labour. The selection of variables to be included in the model relied on both analyses of the results of the field survey as well as on the exploration of various alternative model specifications.[6] For an easier interpretation, dummy variables are defined for the attitudinal variables (i.e. those which implied a ranked preference and referring at farmers' expressed attitude towards organic farming). For example, for the "environmental or food concerns" determinant, which implied four alternative answers, A, B,

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[5] If u_i is normal, then F is a cumulative normal distribution function associated to a linear regression model. However, the linear model is not constrained between 0 and 1 and the binary decision generates a non-linear response (which violates the assumptions of a linear regression model). For both probit and logit models their underlying probability function (normal and logit) are bounded between 0 and 1 and exhibit an S-shaped curve, consistent with the theory of adoption. The cumulative logistic function is flatter at the tails compared to the cumulative normal one (that is associated with the probit model). In large samples, with many observations falling at the tails, this characteristic makes the results of the logit and probit models to differ. Results from both probit and logit models are interpreted as the logarithm of the odds in favour of adoption.

[6] At an earlier step, a model containing only the attitudinal variables was specified. The estimated coefficients for all but two variables were not statistically significant. Model correct specification was tested using a Wald test and the null hypothesis that the coefficients of the variables associated to profit, farm eligibility, market characteristics and machinery are equal zero to could not be rejected at 5 percent level of significance. Therefore, the associated variables were discarded and the analysis then proceeded with the remaining variables. A Cronbach's alpha test was also conducted for the attitudinal variables. The value for the overall sample is relatively low (0.401). When controlling for the farm location (i.e. country) and revealed behaviour (i.e. organic; non-organic), the test is above the 0.5 threshold, except for the Lithuanian organic farms (for which the small sample explains this outcome). The corresponding values are: Czech Republic (adopters; non-adopters) = (0.507; 0.520); Lithuania (adopters; non-adopters) = (0.336; -0.658). Consequently, the attitudinal variables considered here describe the same latent variable (i.e. conversion to organic farming) for each group of farmers and suggest the existence of other factors influencing the decision to convert besides farmers' own belief.

C or D, the A and B answers are coded as 1, while the C and D answers as 0). The variables and their definition are reported in Table 3.

Table 3 Definition of explanatory variables included in the logit regression regarding conversion to organic farming in the Czech Republic and Lithuania

FORGME	membership in farmers' organisation; 0=no; 1=yes
BETENVD	belief in better environmental or food quality of organic production/produce (0=limited or no belief; 1=strong and very strong belief)
KNOWHD	knowledge about specificities of organic farming production (0=no or very limited knowledge; 1=good or very good knowledge)
FARMAR	farmed area (own and rented) (ha)
ADDFFL	additional family labour working on-farm (number of persons)
ADDNFL	additional non-family labour working on-farm (number of persons)

4 RESULTS

Five regional farming systems are first identified in the Czech Republic and six in Lithuania (for details, see CÁCERES et al. 2007). At the time of drawing the sample, essential information such as number of organic farms associated to each farming system, was incomplete in both countries so statistical sampling procedures were not applied. For comparative reasons, in the desk research stage 12 interviews per farming system were envisaged (i.e. three organic family farms, three organic corporate farms, three non-organic family farms, and three non-organic corporate farms), the choice being influenced by the time and resources of the project. The statistical basis for identifying the profile of farms to be interviewed was then completed following the suggestions provided by national experts from the institutes for agricultural economics in the two countries (VUZE and LIAE). The initial design was finally adapted to the local situation, data availability, and access to farms during the implementation of the field survey in August 2005.

In the Czech Republic, 30 organic farms (of which 20 family farms) and 32 non-organic farms (of which 15 family farms) were interviewed.[7] In Lithuania, 23 organic farms (all family farms) and 66 non-organic farms (of which 54 family farms) were interviewed (Table 4). In Lithuania there are no organic corporate farms in the sample given the low presence of this type of farms in general in the country (only 20 certified organic corporate farms) and difficulties faced to contact them at the time of field survey.

Table 4 Characteristics of the organic family farms interviewed by farming system

Czech Republic	**Farm type**	**Crops-Oriented Sugar Beet**	**Crops-Oriented Maize**	**Mixed-Oriented Grassland**	**Livestock-Oriented**	**Mixed-Oriented Potatoes**
No. of farms	*organic*	*6*	*5*	*7*	*6*	*6*
	non-organic	*6*	*6*	*7*	*7*	*6*
Total farmed land (ha)	organic	2,365.0	515.9	4,479.0	333.9	597.5
	non-organic	7,040.0	7,955.1	5,637.8	7,808.0	3,363.0
Average size (ha)	organic	394.2	103.2	639.9	55.7	99.6
	non-organic	1,173.3	1,325.9	805.4	1,115.4	560.5

[7] It has to be mentioned that in some cases it was difficult to identify some types of organic farms to be interviewed (e.g. legal entities) given their reduced presence at the country level, or of some farms with a production profile suitable to the farming system (especially in the case of the Crops-Oriented Maize system).

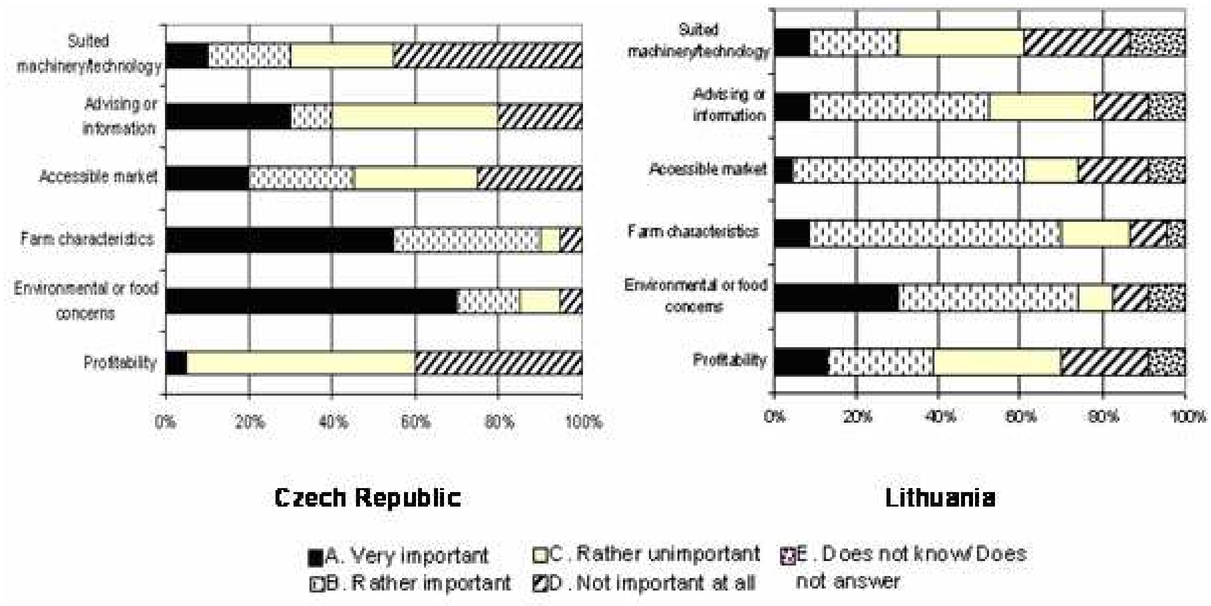
Lithuania	Farm type	Crops-Oriented	Crops-Marginal	Livestock-Marginal	Urban-Oriented	Interme-diate
No. of farms	*organic*	*6*	*8*	*3*	*3*	*3*
	non-organic	*10*	*8*	*9*	*12*	*10*
Total farm land (ha)	organic	146.7	622.0	274.3	15.4	265.9
	non-organic	6,487.5	267.2	641.4	4,222.6	994.1
Average size (ha)	organic	24.5	77.7	91.4	5.1	88.6
	non-organic	648.8	33.4	71.3	351.9	99.4

Note: No records for the organic farms in the Livestock-Oriented system (Lithuania).
Source: Compiled by the authors based on field surveys carried out in August 2005.

The average size of Czech organic farms interviewed varies from 55.7 ha (Livestock-Oriented system) to 639.9 ha (Mixed-Oriented Grassland system). The main land use categories vary among farming systems. Pastures and meadows have important share in Crops-Oriented Sugar beet system (81.4 %), Mixed-Oriented Grassland System (81.1 %), and Mixed-Oriented Potatoes System (69.0 %). Arable land has a higher share only in Crops-Oriented Maize system (97.4 %). In livestock production, organic beef cattle prevails (873.5 Livestock Units (LU) in Mixed-Oriented Grassland System to 59.5 LU in Livestock-Oriented system). In Lithuania, the average size of organic farms interviewed varies from 91.43 ha (Livestock-Marginal system) to 5.12 ha (Urban-Oriented system). In terms of land use in organic farms, pastures and meadows categories are more important in Crops Marginal System (59.7 %) and Livestock-Marginal system (57.2 %), while the share of arable land is higher in Intermediate system (66.0 %), Urban-Oriented system (64.7 %), and Crops-Oriented system (55.0 %). In livestock production, as in the Czech Republic, beef cattle is the most important species, the LU values ranging from 40.8 LU (Crops-Marginal system) to less than one in Urban-oriented system.

4.1 KEY DETERMINANTS OF CONVERTING TO ORGANIC FARMING

In the Czech Republic, the results extracted from the 30 organic farms interviewed indicate that the most important determinants of converting to organic relate to farmers' environmental and food concerns and to farm characteristics. Concerning the environmental and food concerns determinant, the main reason is farmers' own belief that organic produce are of higher quality than non-organic produce, and that organic farming is more respectful with the environment than non-organic farming. This determinant is closely followed by farm characteristics, 90 % of the farmers interviewed pointing on the importance of the fact that the production structure and size of the farm already fitted to the organic farming certification requirements at the time of deciding to convert. The existence of an accessible market for organic products did not emerge as important given that organic farmers were selling their produce to an already established network of clients. The existence of advisory organisations or access to information about organic farming, and the access to suited machinery and technology were evaluated as rather unimportant or not important at all (66.7 % of answers), mainly because farmers considered having sufficient information about organic farming requirements as well as suitable machinery at the time when decided to covert.



Graph 1 Main determinants of converting to organic (family farms)

Source: Compiled by the authors based on field surveys carried out in August 2005.

Table 5 reports the percentage of Czech organic farmers indicating as very or rather important determinants of adopting organic farming by farming system (A+B answers). The farm characteristics determinant is pointed out as having the highest importance in the case of Crops-Oriented Sugar Beet and Crops-Oriented Maize systems. Accessibility of organic products into the market emerged as crucial for organic farmers in Crops-Oriented Maize system (100 % of answers). In this system, the access to advice and information about organic farming was ranked higher than at the country level (60 % vs. 33.3%).

Table 5 Determinants of conversion to organic farming by farming systems (% of answers)

Czech Republic*	**Crops-Oriented Sugar Beet**	**Crops-Oriented Maize**	**Mixed-Oriented Grassland**	**Livestock-Oriented**	**Mixed-Oriented Potatoes**
1. Profitability	16.7	40	0	0	0
2. Env./ food concerns	83.3	80	71.4	83.3	100
3. Farm characteristics	100	100	85.7	66.7	66.7
4. Accessible market	33.3	100	28.6	33.3	16.7
5. Advising or information	33.3	60	28.6	16.7	33.3
6. Suited machinery	16.7	40	28.6	50	33.3
7. Other reasons	0	0	28.6	16.7	0
Number of organic farms	**6**	**5**	**7**	**6**	**6**
Lithuania*	**Crops-Oriented**	**Crops-Marginal**	**Livestock-Marginal**	**Urban-Oriented**	**Intermediate**
1. Profitability	33.3	37.5	100	33.3	0
2. Env./ food concerns	100	75	0	66.7	100
3. Farm characteristics	66.7	75	33.3	66.7	100

4. Accessible market	83.3	50	66.7	33.3	66.7
5. Advising or information	50	62.5	33.3	66.7	0
6. Suited machinery	16.7	37.5	0	33.3	66.7
7. Other reasons	0	0	0	0	0
Number of organic farms	**6**	**8**	**3**	**3**	**3**

Note: * Figures reported here include the A (very important) and B (rather important) answers.

Source: Compiled by the authors based on field surveys carried out in August 2005.

In Lithuania, farmers´ environmental and food concerns emerge as main determinants for conversion. Farmers indicated their own belief that organic farming produces higher quality products and solves environmental problems determined their decision to convert. Another important determinant is farm characteristics (farm size and structure of enterprises), indicated as very or rather important (69.6 % of answers) as the conversion did not require many changes of on-going farming practice. Market access was indicated as being rather important (A+B=60.9 % of answers) at country level, farmers indicated that the presence of middlemen buying their organic produce was a reason for not re-converting to non-organic production. Advice (mainly from the extension services) or information was reported as a very or rather important reason for adopting organic farming (52.2 % of answers). Those farmers who indicated it as an important determinant mentioned that they received training on organic farming management. Finally, profitability of organic farming (52.2 % of answers), and availability of adequate machinery (56.5 % of answers) were indicated as not crucial at the time of deciding to convert to organic. At the farming system level, the environmental or food concerns factor emerged as the most important for Crops-Oriented and Intermediate systems. The 'farm characteristics' was an important factor in Crops-Marginal system and Intermediate systems. Access to marketing channels was indicated as a key factor for adoption of organic farming in Crops-Oriented system.

The logit model relies on information only from family farms (owing to the inadequate data for legal entities). From own 2005 field survey database, information from 112 family farms was extracted (including organic and non-organic ones). Of the total sample available, three farms have been eliminated as outliers, and three for missing data so that the final sample utilised was of 106 records. Both fully organic and phasing-in farms are included in the "organic" farm category of the dependent variable, which take value of one if farm is organic, and nil if is non-organic. Estimations are carried out using the SYSTAT 11.0 statistical package. Table 6 reports the estimated coefficients, standard errors, t-test values and the odds ratio of the model specified.

Table 6 Estimated coefficients of the logit regression associated to adoption of organic farming of the Czech and Lithuanian family farms

Parameter	Estimate (b)	Standard error	t-ratio	p-value	odds-ratio
CONSTANT	-5.076	1.271	-3.994***	0.000	60.58
BETENVD	4.104	0.857	4.789***	0.000	22.801
KNOWHD	3.127	0.989	3.162***	0.002	1.955
ADDFFL	0.670	0.293	2.285**	0.022	2.691
ADDNFL	0.990	0.418	2.370***	0.018	0.992
FARMAR	-0.008	0.004	-1.996**	0.046	9.117
FORGME	2.210	1.129	1.957**	0.050	60.58

Log Likelihood of constants only model = LL(0) = -69.731
2*[LL(N)-LL(0)] = 82.948 with 6 df Chi-sq p-value = 0.000
McFadden's Rho-Squared = 0.595
Level of significance: 0.01***; 0.05**; 0.1*; n=106

Two tests for the goodness of fit of the model are performed. First, the test of significance of the coefficients of the logit model which relies on a chi-squared distribution, when the Maximum Likelihood (ML) estimation procedure is used (Table 6). The likelihood ratio (of the likelihood function) when all the parameters except the intercept are set equal to zero, follows a chi-square distribution and indicates whether the amount of variation explained by the model is significantly different from zero. Second, the correct classification power of the cases in various groups is checked. The procedure uses the explanatory variables for each farmer in the model estimated and predicts the probability that a farmer will convert to organic farming. A probability above 0.5 indicates a farmer that converted to organic farming. The logit model estimated here correctly predicts and classifies 83.6 percent of farmers. In what concerns the correlation among variables, no noticeable pair correlation was observed except for the one related to farm size and non-farm labour use.

The coefficients reported in Table 6 are the maximum likelihood estimators (i.e. they indicate the greatest probability giving the observed value). The coefficients indicate the direction of the effect of associated explanatory variable on the probability of conversion. The last column in reports the magnitude of the effect associated to a particular explanatory variable. The value is obtained by taking the exponential of the expected value of B at the power of the logistic regression coefficient. The resulting value is the odds of an event happening (here, convert to organic) as the explanatory variable increases by one unit.[8] A value of exp(Bi) above one indicate that the odds increase, below one indicates decreasing odds, while a value of one indicates no change in the odds.

The results confirm that the decision to adopt organic farming is strongly influenced by farmer's own belief in the environmental and/or food quality benefits organic farming brings. The effect of own belief on the adoption of organic farming is positive and significant (4.104; odds-ratio=22.801). The positive odds-ratio indicates that those farmers who believe in the environmental and/or better food quality benefits of organic farming are 22.8 times more likely to adopt such farming practice. Membership to farmers' association increases substantially the odds of adoption, most probably because farmers gain additional information on the characteristics and requirements of organic farming. The sign of the estimated coefficients for labour availability are also positive, indicating that the odds of adopting organic farming increase where additional (family and non-family) labour is available. Such outcome is in line with the characteristics of organic farming technology that is more labour-intensive. The odds-ratio is higher for the family labour (2.691) compared to that for non-family labour variable (0.992), suggesting that where family labour is not a constraint, it is more likely that adoption of organic farming will take place. The only inverse relationship related to adoption of organic farming is observed for the farm size variable. The sign of the coefficient is negative, and the odds ratio indicates that when the farm is large, there is a 9.11 times lower chance that adoption of organic farming occurs, probably owing to the labour-intensive specificity of the organic production technology.

[8] As exp(0)=1 this can be used as a benchmark against with Bis can be compared to grasp the magnitude of the estimated coefficient. For positive coefficients, as Bi increases, the exp(Bi) increases faster than one and vice versa for the negative coefficients.

5 CONCLUSIONS

An investigation on the key determinants of adopting sustainable farming practices, using the organic farming as a case study was carried out. The key determinants here refer at those elements that influence directly the decision of the farmer to adopt organic farming. The results are based on information collected through direct interviews carried out in the summer of 2005 in the Czech Republic and Lithuania at the farming systems level.

Overall, the results for both countries indicate differences among the farming systems in terms of the main determinants of conversion. Farmer's own belief about environmental benefits and better quality of organic produce, characteristics of the farm in terms of enterprises structure and institutional aspects related to criteria applied during the organic certification procedure, the availability and accessibility to marketing channels for organic produce, and profitability emerge as prevailing factors influencing the decision to convert to organic. The diversity of factors identified reflects the particular challenges faced at the farming system level, an insight that is blurred when the analysis is carried out at aggregated country level. As organic production is more labour-intensive, where labour availability is not a constraint, the propensity to decide to convert to organic is potentially high. Most often such change will be observed among family farms that rely on own family labour than among large corporate companies that would face increase in labour search and supervision costs. Further research is needed into whether the benefits of organic farming will exceed the associated costs of converting from a capital-intensive technology to a labour-intensive one.

DISCLAIMER

This paper reports the results of a larger study commissioned to Empresa Pública Desarrollo Agrario y Pesquero S.A. (Spain) under the coordination of the Institute for Prospective Technological Studies (IPTS), and does not represent the official position of the European Commission. Usual disclaimers apply.

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