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Is organic farming a chance for family farms to survive?

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ABSTRACT

The paper investigates the choice between conventional and organic production technologies for individual farmers in Hungarian agriculture. We employ sequential logit model on a cross-section data set of Hungarian farmers for the period 2007. Our estimations reveal that age of farmers has negative, whilst being full time farmers and having more diversified production structure have positive impact on the intention for being organic farmers. Furthermore, it appears that education, being full time farmers and more diversified production structure positively influence the final decision between conventional and organic farming.

Keywords: innovation, attitudes, organic production, diffusion

1. INTRODUCTION

The organic agriculture represents a promising alternative for the future of European agriculture. It is consistent with the notion of sustainable development set forth already in the 1992 CAP Reform. Despite of increasing importance of organic farming in European agriculture, the research on organic farming is rather limited. The recent papers analyse the situation and motivations of organic farms only in some European countries: for example in UK (Burton et al. 1997, 1999; and Rigby et al (2001), in Spain (Albisu and Laajimi 1998) in Portugal (Costa et al 2005) and in Netherlands (Gardebroek 2002). This scarcity of the research is especially true for New Member States of the enlarged EU. Our contributions to related literature are twofold. First, this paper investigates the choice between conventional and organic production technologies for individual farmers in a New Member State, namely in Hungarian agriculture. Second, contrary to previous research which usually apply simple binary (logit or probit) model for investigation of farmers' motivations. we employ sequential logit model allowing us to get more insights for farmers' intentions.

The rest of the paper is organized as follows. Section 2 provides a brief literature review on the differences between organic and conventional farms as well as on the motivations to adopt organic farming techniques. The next section describes the survey design and the variables. The results are presented in section 4. The last section summarizes and offers some conclusions on the implications for the development of organic farms in Hungary.

2. LITERATURE REVIEW

The increasing interest in organic farming techniques has produced a number of scholarly articles that assess the differences between organic and conventional farms, as well as the decision to adopt. A number of these studies have collected farm-level data by surveying agricultural holdings and have qualitatively analyzed these data (Lampkin 1994; Freyer, Rantzau, and Vogtmann 1994; Fairweather and Campbell 1996; Fairweather 1999). There have also been a number of statistical approaches to address the issue of adoption of new technologies. These analyses can be classified into two main groups. A first group is composed of bivariate analyses measuring adoption at a certain point in time.

Burton et al (1999) analyse the determinants of the decision to adopt organic production techniques are examined applying binomial and multinomial logit techniques to a sample of 237 horticultural producers from the UK. The analysis indicates that organic horticultural producers are more likely to be young, run smaller enterpises and be female than their conventional counterparts, and that there are significant non-economic aspects to the decision to adopt organic techniques which may be missed in comparative profitability studies. In addition, results suggest that the registered and unregistered organic producers should not be regarded as a homogenous group, with significant differences in terms of the influence of gender and information sources observed.

Genius et al (2006) investigate organic land conversion in Crete using trivariate ordered probit model. Findings suggest that the decisions of information acquisition and organic land conversion are indeed correlated, and different farming information sources play a complementary role. Structural policies improving the farmer's allocative ability are found to play an important role in encouraging organic farming adoption.

The second group of studies comprises of duration analyses that explain how long it takes a farmer to adopt a particular technology. Burton, Rigby, and Young (2003) study the influence of a range of economic and non-economic determinants on the adoption of organic horticultural technology using discrete time models in UK. The empirical results highlight the importance of gender, attitudes to the environment and information networks, as well as systematic effects that influence the adoption decision over the lifetime of the producer and over the survey period.

Läpple and Donnellan (2009) investigate the adoption and abandonment decisions of organic farms in Ireland. They find that organic support payments emerge as important driving factor of adoption over time. The empirical results also highlight the importance of environmental and risk attitudes, farming experience as well as influence of other organic farmers on the probability to adopt organic farming; whereas decisions to abandon organic farming appear to be mainly driven by economic and structural factors. Farmers who have an off-farm job are more likely to abandon organic farming and a more 'intensive' farm system has a positive effect on staying organic.

Previous research has identified several relevant characteristics that influence adoption including both noneconomic and economic factors (Serra et al. 2007). Most important noneconomic factors are the farmers' personal characteristics (education, age), personal attitudes, lifestyle choices, concerns about health and the environment, access to technical and financial information on organic farming, geographical issues, and farm structural characteristics e.g. size of farms. Economic factors such as the availability of sales outlets, public subsidies, transition costs, or organic produce price premiums are also crucial to understand adoption processes.

3. SURVEY DESIGN AND VARIABLES

In Hungary focusing on organic produce started in early eighties of the last century by founding a Club of Organic Producers in 1983. The successor of the Club, the Hungarian Federation of Organic Producers (Biokultura Egyesület) (HFOP) was founded in 1987. HFOP has 13 members of legal entity covering organic production across the country. Its profile covers wide range of activities from diffusing philosophy of organic farming through representing the interests of stakeholders up to supporting related research. Meanwhile HFOP has established Biokultura Hungary Ltd and the latter was authorized to register new applicants, controlling them at least once in every year and, releasing certificate if the producer met the requirements. 95 per cent of released certificates of organic farming come from Biokultura Hungary Ltd.

Looking at main tasks of HAOP the following can be mentioned: Communicating organic produce to the public; representing the philosophy of organic production to authorities; supporting organic programs; making the administrative requirements of organic production clear to producers; receiving new applicants; collecting, processing and spreading information on organic produce; protecting to establish new local units for a network of organic producers; helping to develop rural tourism.

Table 1. Diffusion of organic production in Hungary (1995-2005)

Year	Number of organic farms	Total area covered by organic produce
1995	108	8232
1996	127	11937
1997	161	15772
1998	330	21565
1999	327	32609
2000	471	47221
2001	764	79178
2002	995	103672
2003	1255	113816
2004	1420	128690
2005	1353	122615

Source: http://www.biokontroll.hu/biokontroll.php

Legal basis for organic productions is provided by Council directive of 2092/91/EGK and two more national directives as 140/1999 released by the government and one, 74/2004 of Ministry of Agriculture and Rural Development (MoARD). HFOP keeps record of all organic producers in this country and provides producers with information related to production, quality, market and, technology issues. Producers can put data and information on the website of NFOP after having the permission of Biokultura Hungaria Ltd.

Organic production has had an upswing in the late 80s and 90s of the last century and early this decade in Hungary, however, the dynamic was slowed down during last years (Table 1).

As accessing individual data of organic and conventional producers is very limited and such data cannot be found in published statistics, finally, two databases were used for sampling. First, a nationwide database of HAOP covering all counties and keeping records on organic producers on a voluntary basis. Second, concerning conventional producers we use the database of Agricultural Chamber of Pest county.

Concerning conventional farms the target was to have 99 farms in the sample with more or less equal distribution between sub-groups of ESU 1.00-1.99, ESU 2.00-5.99 and ESU 6.00-49.99. As no data on farm size by ESU was available in the database an iterative approach in sampling was required to be applied. In the Agricultural Chamber's database 677 conventional farms were recorded with ESU mostly above one. Farms with less than one ESU (not market oriented) were dropped. Only during the interviews it was turned out which size category the farm belongs to. In the first run 99 conventional farms out of those with ESU above were selected. However, to find the right number of farms for the sample in each category additional runs of sampling were needed. In the second, the third, and the fourth run further 35, 30, and 30 farms were selected. In number of cases it also turned out that the farms did not exist any more. In the four runs we have randomly selected total 194 farms. 127 out of 194 were interviewed. Among them there were 31 farms with 1.00-1.99 ESU and 31 with 2.00-5.99 ESU, and 35 farms with 6.00-49.99 ESU. In addition, interviews with further 30 farms with 50 ESU and above were done. Data on the latter farms were not dropped, but used in the analysis. Table 2 shows the definitions and descriptive statistics of the main variables.

Table 2 Variable definitions

	Definitions	Mean	Std. Dev.	Min	Max
Adopter	1= if a farm is organic farm, otherwise zero	0.290	0.455	0	1
Education	1= primary school 2= lower secondary school 3=Upper secondary school (general) 4=Upper second. (pre-voc., techn.) 5=College or university degree	3.703	1.347	1	5
ESU	Number of European Size Unit	53.181	126.614	0.6	906
Total land	Size of the total land in hectares				

Rented	Size of the rented land in hectares	121.513	315.390	0	1970
Age	Age in years of the farmer	52.296	11.589	26	80
Fulltime	1= if a farm is full-time, otherwise zero	0.659	0.475	0	1
Diversified	1= if a farm produce more type of products, otherwise zero	0.569	0.496	0	1

4. RESULTS

We analyse the farmers' intentions in two steps. First, we compare the characteristics of farmers using univariate statistics. Second, we analyse the potential determinants of the adoption decision using sequential logit analysis).

4.1. Univariate comparison

Comparison of Adopters with Nonadopters

Table 3 Comparison of Characteristics between Adopters and Nonadopters of Organic Farming

	Mean		t Test
	Non adopters	Adopters	
Number of farms	127	52	
education	3.59	3.96	-1.7608*
ESU	61.18	33.64	1.6927*
Age	52.6	51.04	0.5713
Full time	0.62	0.75	-1.7187*
Rented land (hectares)	147.6	57.68	2.4658**
Diversified	0.47	0.80	-4.7300***
Total land (hectares)	181.04	103.81	1.6807*

Source: own estimations based on the survey

Legend: * p<0.1; ** p<0.05; *** p<0.01

Note: t Test calculated assuming unequal variance

Producers who adopted organic farming were more educated reported less farm size both in terms of the ESU and total land and less rented land (Table 3). Interestingly, the age was not different significantly between organic and traditional farmers. Approximately 75 per cent of the organic producers have worked as a full time farms compared to non adopters (62 per cent). Organic producers, on average, farmed fewer hectares (103.8) than non organic farms (181.4). On avarege, organic farms have been more diversified (80 per cent) compared to traditional producers.

Comparison of Adopters with Nonadopters who consider being organic farmers

As observed in Table 4, there were still more differences than similarities between adopters and non adopters who consider to being organic producers. We have not found significant differences between two groups in terms of education, age and being full time farms. Nonadopters used and rented more land and they have been less diversified compared to organic producers.

Table 4 Comparison of Characteristics between Adopters and NonAdopters who consider being Organic Farmers

	Mean		t Test
	Non adopters with considerations	Adopters	
Number of farms	81	52	
education	3.72	3.96	-1.0219
ESU	77.2	33.6	1.863*
Age	51.27	51.46	-0.0921
Full time	0.68	0.75	-0.8734
Rented land (hectares)	203.93	57.68	2.3904**
Diversified	0.47	0.80	-4.1028***
Hectares	239.44	103.81	2.0970**

Source: own estimations based on the survey

Legend: * $p<0.1$; ** $p<0.05$; *** $p<0.01$

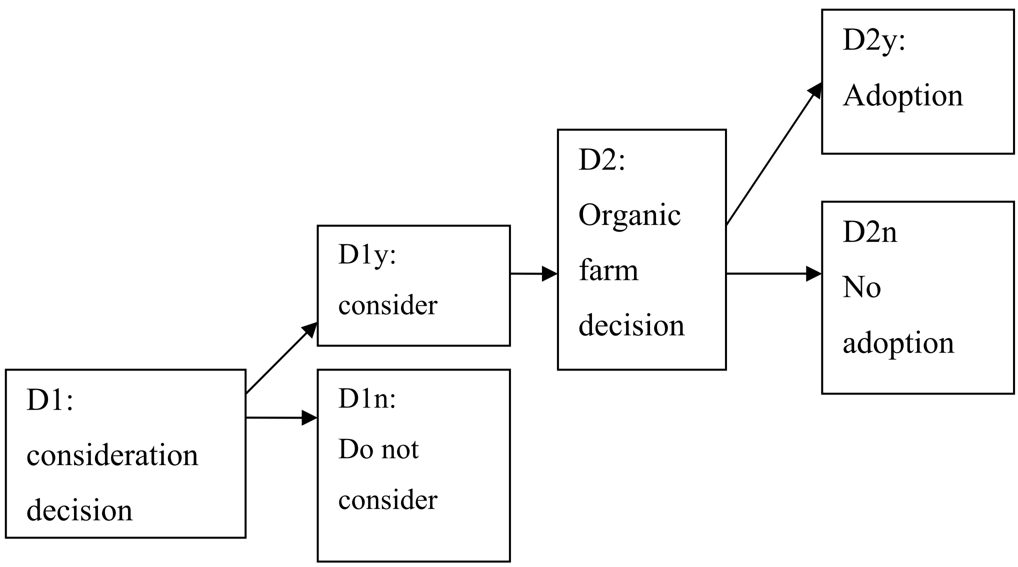
Note: t Test calculated assuming unequal variance

4.2. Adoption of Organic Agriculture

If the adoption of the organic farming is conceptualized as a sequential decision problem it can be estimated as a sequential logit model based on separate logistic regressions for each step, decision or transition (see Khanna 2001, Buis 2009, Sauer and Zilberman 2009).

The decision to consider being organic farmers or not (*D1*) is followed by the decision to adopt organic technology or not (*D2*). If the farmer decides not to consider at all being organic farmers (*D1n*) then the adoption decision on organic technology (*D2*) is not relevant (see Figure 1).

Figure 1



A rational farmer would consider on organic farming if the expected benefits U_{D1*} are greater than zero where

(1) U_{D1*}= U(D1y)−U(D1n)>0 and correspondingly would adopt the organic technology if the expected benefits) U_{D2*} are greater than zero with

(2) U_{D2*}= U(D2y)−U(D2n)>0

The net benefits U_{D1*} and U_{D2*} are latent variables, assumed to be random functions of vectors of observed exogenous variables *Z1* and *Z2*

(3) $U_{D1*}= Z_1\gamma_1+\varepsilon_1$ and $U_{D2*}= Z_2\gamma_2+\varepsilon_2$

where ε_1 and ε_2 are random error terms and γ_1 and γ_2 are vectors of unknown coefficients. The observable choices of the farmer are

(4) $U_{D1}= U_{D1y}$ if $U_{D1*}>0$; $D_1= D_{1n}$ otherwise and

(5) $U_{D2}= U_{D2y}$ if $U_{D2*}>0$; $D_1= D_{1y}$; $D_2= D_{2n}$ otherwise.

However, the selection equation (5) is defined only over the subsample where $D_1= D_{1y}$ (since $D_1= D_{1n}$ and $D_2= D_{2y}$ not observed). This three-way grouping leads to a bivariate sequential model with the probabilities of the three outcomes

(6) $P_{rD1y,D2y}=Pr(D_1= D_{1y},D_2= D_{2y})=\Phi_2(Z_1\gamma_1,Z_2\gamma_2,\rho)$

(7) $P_{rD1y,D2n}=Pr(D_1= D_{1y},D_2= D_{2n})=\Phi(Z_1\gamma_{1,}\rho)-P_{rD1y,D2y}$

(8) $P_{rD1n,D2n}=Pr(D_1= D_{1n})=1-\Phi(Z_1\gamma_{1,})$

where Φ and Φ2 are the cumulative distribution functions of the standard normal distribution and the standard bivariate normal distribution with correlation coefficient ρ, respectively.

We apply a model that explicitly accounts for the effects of farm-specific variables like age and education, size of farms, share of rented land. We focus on the following hypotheses based on previous empirical literature (Padel and Lampkin, 1994; Burton et al., 1999).

Age. It is often stated that organic farmers are younger on average than conventional farmers. The hypothesis for this observed difference in age is that organic farms' practices are often implemented with a change of farm ownership (e.g. farmer's child taking over farm control from parents). An additional hypothesis is that older farmers are more conservative than younger farmers are and therefore more resistant to organic farming.

Education. Another often stated difference between organic and conventional farmers is the education level. Explanations are given those organic farmers that are new entrants to organic farming are usually high-educated and idealistic. However, it could also be that higher educated farmers expect to cope with difficulties in organic farming better than conventional farmers.

Size of farm. The relation between organic farming and farm size differs by country. However, the hypothesis is that there exists a positive relation between organic farming and number of hectares. Organic farms are more extensive than conventional farms requiring more land for pasture. Moreover, organic farms use more roughage than concentrated feed and this roughage may be produced on the farm, requiring more land.

Rent. If the major part of the farm is rented, deciding to farm organically may raise objections from the landlord. This conflict may also have an impact on the decision process.

Table 5 Sequential Logit Results for Adoption of Organic Agriculture

	Logit 1	Logit 2
education	0.184	**0.354****
esu	-0.001	-0.002
rented	0.002	-0.002
age	**-0.027***	0.007
full	**0.764****	**0.710***
diversif	**0.602***	**1.518*****
constant	0.166	-4.085***
N	179	133
Log pseudolikelihood	-169.089	-75.421
McFadden's R^2:	0.082	0.153
McKelvey & Zavoina's R^2:	0.158	0.315
Count R^2:	0.754	0.654
Correctly classified	75.42%	65.41%

Source:Own estimations based on the survey

legend: * p<0.1; ** p<0.05; *** p<0.01

In addition, we consider two additional control variables, namely being full time farmers and family farms, and diversification of production.

We consider various specification estimating two farm size proxies separately. In addition, we check whether does nonlinear relationship exist between the size of farm and the adoption of organic farm, thus we apply squared size variables. In addition, we introduced the squared age variable due to same reasons. However, preliminary analyses show that we can reject the non linear relationships between the size of farms/the age of farmers and adoption of organic technology. Our estimations reveal that being full time farmers, and having more diversified production structure have positive impact on the adoption organic farmers at the both stages of decisions. The age of farmers has negative influence on the consideration for being farmers, whilst the higher education has positive impact on the adoption decision.

5. CONCLUSIONS

Although organic production represents a promising alternative for the future of European agriculture, but organic farming is in still infancy in Hungary, its dynamics was slowed down during last years. The study investigates the adoption of organic technology in Hungarian agriculture using a survey among organic and conventional farmers. We focus both on farmers demographic and farms characteristics to explain the adoption behaviour. The results highlight that there are significant differences between adopters and nonadopters farms regarding to the size of farms, the education of farmers, being full-time farmers and the diversification of production. We apply sequential logit model to explain farms decisions of adopting organic technology. Estimations show that being full time farmers, and having more diversified production structure have positive impact on the adoption organic farmers' decisions. The age of farmers has negative influence on the consideration for being farmers, whilst the higher education has positive impact on the adoption decision. This paper is only the first step to analyse the behaviour of Hungarian farmers on adoption of organic farming Further research is needed to better understand why organic production is developing slowly in Hungary.

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