

The determinants of product and process innovations in agriculture: the role of advisory work

Key-words: innovations, determinant factors, advisory services, agriculture.

1. Introduction

Objective of this paper is to analyse the determinants of product and process innovations by stressing the role of advisory services among the other determinants. The case study is the agriculture of an Italian region that is Piemonte, located in the North-Weast of the country.

The approach adopted is an ordered probit regression applied to the number of product and process innovations, the regressors variables are referred to: farmer's human capital, farm structure, territorial characteristics, subsidies for the adoption of environmentally-friendly techniques, relationships with public, private and semi-public advisory entities (cooperatives, farmer and inter-professional associations, specialty producing associations), communication canals used to receive information on innovations (contacts with other farmers, bulletins and journals, meetings, demonstration days, open days, ICT), motivations for and difficulties in the adoption of innovations.

The results of the two regressions show that the determinants of product innovations are different from those of process innovations, generally speaking the adoption of product innovations is more market-oriented while the adoption of process innovations is more subsidies-oriented.

The most effective advisory work for innovation adoption is the work supplied by Provincial Government, in the case of product innovations, and the work supplied by farmer and inter-professional associations, in the case of process innovations, for the Piemonte agriculture.

^{*} INEA

^{**} Università di Napoli Federico II and Centro per la Formazione in Economia e Politica dello Sviluppo Rurale

2. The data and the variables

The data used are available since the Piemonte Regional Government has commissioned a survey on whether and how farms had adopted the innovations produced by regional public centres; the survey was aimed at verify the effectiveness of the public activity in applied research and in innovation stimulation. This survey is quite unusual in the Italian context and shows a notable interest of an institutional body in the innovation's theme and in the methods for diffusion and acquisition of knowledge. The study has been realized by Piemonte region with the collaboration of National Institute of Agrarian Economy (INEA), by a survey activity implemented in the years 2004-2005. The present work analyzes the results of the questionnaires distributed to farmers by a private firm.

The sample is represented by 254 farms referred to five product orientations: cereals, fruits, horticulture, grapes and wine, toma (a specialty cheese from Piemonte). The provinces, where the farms are located, are differentiated according to their production. So Torino and Cuneo are specialized in cereal production; Cuneo, Torino and Biella in toma cheese production; Cuneo in fruits production; Alessandria, Asti, Cuneo, Torino in horticulture; Alessandria, Asti, Cuneo, Torino (Canavese's area) in grapes and wine production. Besides, the study has chosen research projects regarding main themes that are traditionally financed by the region (e.g. the exam of quantity and quality of cultural varieties, clones or local productions) and new thematic that are required investments for more years (e.g. analysis of environmental impact of cultural techniques)

The number of farms differentiated by product orientations is the following: 76 cereals farms; 65 grapes and wine farms (of which 5 produce Canavese wine); 45 fruit farms; 39 horticulture farms and 29 toma cheese farms.

The structure of the questionnaires was separated in two parts depending on whether the farmers had realized investments or shift in production process during the last five years. The responses of the two parts have been joined in a single format in order to carry out our analysis.

The dependent variables of our regressions are the number of product and the number of process innovations that farmers have adopted. The regressors variables refer to:

- farmer's human capital: the presence of young (less than 40 years old) or female farmers and the use of internet;

- farm age and structure, like the number of years of farm activity, farm size (in hectares and in number of employees) and specialization (in term of land utilisation);
- indicators of social and technological local capital, that is the demographic density of the municipality where the farm is located and the incidence of no profit employees and of research labs in natural sciences employees on the municipality population;
- territorial characteristics, like the farm altitude (mountain, hill and plain), the localization in an agro-food district and in the province of Torino, the distance from Torino;
- subsidies for the adoption of environmentally-friendly techniques;
- contacts with public, private and semi-public advisory entities (cooperatives, farmer and inter-professional associations, specialty producing associations, experimentation labs);
- motivations for the adoption of innovations, like increasing revenue, reducing costs, improving product quality, adjusting the production to consumer needs or to law requirements, obtaining regional funds, reducing environmental impact;
- communication canals used to receive information on innovations (bulletins and journals, meetings, demonstration days, open days, ICT);
- advisory services for the adoption of production and process techniques, like contacts with regional, provincial, inter-professional or producing association advisors, private advisors or contacts with other farmers, participation to demonstration days or to open days;
- investments necessary in order to adopt innovations, like purchase or rent of lands, purchase of machinery, improvement of building for production, change of production typologies;
- administrative, bureaucratic and technical difficulties, like production and delivery of documentation, obtaining certifications and financing projects, timing for documentation, adjustment to laws, lack of personal skills.

3. The results

The approach adopted is an ordered probit regression applied to the number of product and to the number of process innovations.

In table 1, the results of the first regression are reported. The fit of the regression is not bad taking into account that the values of the pseudo-R2 are never particularly high in this kind of regressions and that the variables are jointly significant, as the likelihood ratio (LR) test shows.

The determinants of product innovations, which are significant with a positive sign are: farm location in an agro-food product district, the presence of farm investments, the advisory work supplied by Provincial Government, the dummy for grapes and wine production and the membership to a inter-professional association. The necessity of adapting farm products mainly motivates the introduction of product innovations while inadequate personal skills represent the main difficulty.

Table 1. Ordered probit regression. Dependant variable: the number of product innovations

Variable	Coef.	z	P> z
District	0.54	3.0	0.00
Investment	0.33	6.0	0.00
Provincial Government's advisory work	0.82	3.0	0.00
Membership to inter-professional associations	0.30	1.7	0.09
Grape and wine dummy	0.64	3.3	0.00
Product adaptation motivation	1.21	2.7	0.01
Personal skill difficulties	1.36	3.0	0.00
N. obs.	252		
Log likelihood	-265.39		
Pseudo R2	0.14		
LR chi2(8)	87.31		
Prob > chi2	0.0000		

Table 2. Ordered probit regression. Dependant variable: the number of process innovations

Variables	Coef.	z	P> z
Product innovations	0.33	4.7	0.00
Farm age	0.02	3.3	0.00
Agro-environment measures	1.79	6.6	0.00
Machinery investments	1.19	6.3	0.00
Use of bulletins	-0.60	-2.8	0.00
Farmer associations' advisory work	0.89	3.2	0.00
Inter-professional associations' advisory work	0.60	2.6	0.01
Grape and wine dummy	0.89	4.1	0.00
Cereal dummy	-1.29	-5.2	0.00
Strict application's deadline	0.48	2.7	0.01
Cost reduction motivation	0.50	3.0	0.00
Pollution reduction motivation	0.51	2.9	0.00
Product adaptation motivation	0.79	4.0	0.00
Membership to a cooperative	0.37	2.3	0.02
Membership to a maintenance consortium	0.69	3.9	0.00
Number of obs	243		
Pseudo R2	0.32		
Log likelihood	-360.318		
LR chi2(15)	340.63		
Prob > chi2	0.0000		

Table 2 reports the results of the second regression. The fit of the regression is good since the value of the pseudo-R2 is 0.33 and the variables are jointly significant, according to the result of the likelihood ratio (LR) test.

The determinants of process innovations, which are significant with a positive sign are: the number of farm product innovations, the farm age, the presences of subsidies, the presence of machinery investments, the advisory work supplied by farmer and inter-professional associations, the dummy for grapes and wine production and the membership to a cooperative and to a maintenance consortium. Significant variables with

a negative sign are: the dummy for cereal production and the use of bulletins and of journals as communication canals. The adoption of process innovations is mainly motivated by cost and pollution reduction and product adaptation while too strict deadline for application represent the main difficulty.

4. Conclusions

Objective of the paper is to analyse the determinants of product and process innovations for the Piemonte agriculture by stressing the role of advisory services among the other determinants. The sample is represented by 254 farms referred to five product mixes: cereals, fruits, horticulture, grapes and wine, toma (a specialty cheese from Piemonte).

The approach adopted is an ordered probit applied to the number of product and process innovations, the regressors are variables referred to farm and territorial characteristics.

The determinants of product innovations, which are significant with a positive sign are: farm location in an agro-food product district, the presence of farm investments, the advisory work supplied by Provincial Government, the dummy for grapes and wine production and the membership to a farmer association. The necessity of adapting farm products mainly motivates the introduction of product innovations while inadequate personal skills represent the main difficulty met.

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The most effective advisory work for innovation adoption is the work supplied by Provincial Government, in the case of product innovations, and the work supplied by farmer and inter-professional associations, in the case of process innovations, for the agriculture in Piemonte.

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