# Determinants of on-farm diversification: The case of farmers in Catalonia

Lluís Butinyà (*)

Jackeline Velazco (**)

Ricard Rigall-I-Torrent (***)

## INTRODUCTION

From the second half of the 20th century agriculture and livestock have changed significantly in many European countries. At the origin of the transformation were several technological revolutions within the context of the rapid development of the agricultural industry and the big global food corporations (Bacaria & Alfranca, 1994). At the same time, developed industrial and tertiary sectors coexisted. The consequence of these trends is that nowadays the agricultural sector in Catalonia, one of the most dynamic regions in Spain, consists of about 55,000 farms, most of which are small-sized and run by households. The agriculture sector contributes about 1% of both Catalan GDP and total employment. For 2007, Catalonia's agricultural GDP was 8.5% of Spanish agricultural GDP. Furthermore, agriculture and agrofood industry exports accounted for 11% of total exports in Catalonia (Idescat, 2010).

Nevertheless, the previous data does not show the whole picture, given that the primary sector generates a multiplier effect on the economy. Cat-

*(*) Departament d'Economia, Universitat de Girona. Facultat de Ciències Econòmiques i Empresarials.*
*(**) Departamento de Economía, Pontificia Universidad Católica del Perú.*
*(***) Departament d'Economia, Universitat de Girona. Facultat de Ciències Econòmiques i Empresarials.*

- Revista Española de Estudios Agrosociales y Pesqueros, n.º 238, 2014 (37-64).
*Recibido marzo 2013. Revisión final aceptada mayo 2014.*

alonia is one of the most important producers of pork in Europe and enjoys a worldwide reputation as a producer of wine and cava (a Champagne-type wine). This is because a network of companies across the country have created a powerful food industry, which could not be understood without farms that have had to adapt to the environment and whose owners in some cases have become workers paid by large corporations and, therefore, lost their autonomy (Garrabou, 2006).

The transformation undergone by agriculture has not been straightforward, and nowadays farmers find it increasingly difficult to break even. There are several causes at the origin of this. Firstly, the high volatility in the price of raw materials. Secondly, the increase in production costs. Thirdly, the increasing globalisation of agricultural markets induced by the World Trade Organization has increased competition in agricultural markets.

Given this scenario, farmers' descendants are often unwilling to continue the family business and prefer undertaking other activities. This has contributed to the process of ageing of rural populations, the abandonment of many farms and the concentration of the remaining active farms.

In spite of this process of concentration, 91% of farms in Catalonia are family farms, with an average size of 21 hectares of agrarian land use. Most of them are located in rural areas covering 62% of all the Catalan territory and are endowed with both landscape and environmental resources which generate some positive externalities.

In parallel to the process of farm reduction and concentration, non-farm activities have increased in rural areas. On the one hand, these activities come from those inherent to the general growth of different sectors of the economy. On the other hand, they come from the activities supported by the European Union since the 1980s as a result of its strategy on the future of rural areas with the aim of producing less and better (1). In many cases the final outcome has been a division between agricultural groups, rural development groups and environmentalists (Moyano, 2008).

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*(1) With respect to this, research addressing the issue of the impact of the Common Agriculture Policies' reform on farm diversification and farm behaviour has been carried out (among others, Shucksmith and Herrmann, 2001; Gellynck and Viaene, 2002; Defrancesco et al., 2008; and Brady et al., 2009).*

The convergence and worldwide spread of the food, fuel, economic and financial crises, against the backdrop of climate change, has exacerbated the difficulties of farmers and rural economies. At the European level, the development of an agricultural policy with the capacity to respond to fluctuations in prices and costs is required. Furthermore, agricultural supply is expected to be adapted to changes in demand and ultimately help to relaunch global economic activity and employment (Massot, 2009). An integral approach of the problems faced by rural areas is needed. It should incorporate agriculture at the heart of development, value the natural resources and commit to the diversification of activities as part of a rural development strategy based on agriculture (Moyano, 2008).

Currently, less than 5% of farms in Catalonia develop some type of diversification, against 16.1% for the average of countries in the EU-15 (Eurostat, 2009). Although Catalonia is below the European average, in recent years diversification activities have increased significantly not only in absolute numbers but also in relative terms. Findings from the 2003 and 2007 Farm Structure Survey (hereafter FSS) confirm this trend for rural tourism (22%), organic farming (119%) (2), processing farm products (39%) and contractual work performed with the farm's equipment (52%) (Idescat, 2009).This evidence suggests that more farmers carry out other gainful activities in the holding itself, or that they use its resources or products.

In this context, the goal of the paper is to identify which factors determine on-farm diversification in Catalonia. This work contributes to the literature on on-farm diversification in three ways. Firstly, this issue has already been analysed in different regions of the world, but in the case of Catalonia, it has received limited attention in the empirical literature (3). This paper aims to fill this gap in knowledge. Secondly, it uses a national representative farm survey, the 2007 FSS, elaborated by the Statistical Institute of Catalonia (Idescat) and the Spanish National Institute of Statistics (INE). The sample size consists of 3,435 farms and is based on a survey designed by Eurostat and, hence, identical for the whole European Union.

*(2) An analysis of the productive efficiency of organic grape farms in Catalonia is found in Guesmi et al., 2012.*
*(3) See Viladomiu et al. (2002) and López-i-Gelats et al. (2011).*

Finally, the main value added of this paper is the analysis of an area with many characteristics representative of farming in the Mediterranean, such as having a high percentage of small family farms in rural areas, endowed with both landscape and environmental resources which generate positive externalities, and with a low degree of diversification, as are the cases of Spain, Greece and Italy (Eurostat, 2009; Ortiz-Miranda, et al., 2013) (4). Therefore, it seems reasonable to think that the results obtained can be safely extrapolated to these countries.

## MATERIALS AND METHODS

### Definition of on-farm diversification

Over the past few years the interest in analysing farm diversification has increased significantly. And this has occurred not only in Europe, but also in other regions with a high degree of dependence on agriculture (Haggblade *et al.*, 2007; Reardon *et al.*, 2001). This interest has prompted the development of a large number of studies which try to identify the causes behind diversification.

Although, because of its breadth, diversification is not easy to define, it seems appropriate to outline the concept in the context of the main studies on European farms. The first studies on diversification in the agricultural sector in the European Union were conducted in the early 1980s (Bryden & Fuller, 1988; Fuller, 1990). They highlight pluriactivity as one of the solutions carried out by small farmers in order to ensure their future. From the second half of the 1990s many studies have focused primarily on the role of multifunctionality in the largest farms, investigating the interaction between new features along with food production within a broader process of income diversification (Evans & Ilbery, 1993; Kinsella et al., 2000; Salvioni *et al.*, 2009; Turner et al., 2003).

*(4) According to the Eurostat-Farm Structural Survey, the extent of diversification is measured as the percentage of farm holdings with another gainful activitity. For 2007, this corresponds to 3.8% in Spain, 1.7% in Greece and 7.2% in Italy (Ortiz-Miranda, et al., 2013).*

Studies assume that farms have essentially two types of economic incentives to diversify. Firstly, raising revenue from various activities in order to reduce the risk of both environmental effects and high volatility of agricultural markets (Finocchino & Esposti, 2008). Secondly, optimising the available resources on farm by creating new activities, internal or external, to obtain additional income for farm members (Pieniadz *et al.*, 2009).

Focusing on the definition of the types of activities included in diversification, some studies suggest quite restrictive definitions. However, others argue that diversification activities are those not defined as conventional agricultural production (Ilbery & Bowler, 1993; Turner et al., 2003). The literature also highlights that this concept is quite dynamic (Walford, 2003) and it is also related to agricultural change and farm adjustment strategies (Evans, 2009). Furthermore, it now refers to the predominant version of a productivist and standardised agriculture (Viladomiu *et al.*, 2002).

When classifying diversification activities, the main difference is based on location. That is, if the activity originates inside the farm (on-farm) or outside the farm (off-farm). Recent studies extend this classification, distinguishing not only according to location, but also on the basis of the production factors needed (OECD, 2009). However, studies show that the total potential capacity to generate capital is the most important factor when choosing between different types of diversification (Maye et al., 2009). Therefore, some studies use three main groups of diversification, ranked from highest to lowest in terms of capital requirements: activities related to agriculture, activities not related to agricultural products or services, and any form of employment outside the farm (Van der Ploeg *et al.*, 2002; Meert *et al.*, 2005; Finocchino & Esposti, 2008).

In the context of livestock farming systems, evidence has been pointed out that in a long-term perspective farm diversification plays an important role in the process of adjustment and reallocation faced by the sector over the last decades (Cialdella et al., 2009; García Martínez et al., 2009; López-i-Gelats et al., 2011). In the case of the Catalonian Eastern Pyrenees, López-i-Gelats et al. (2011) analysed the nature of farm diversification and found four different typologies of farms: absence of diversification, agricultural diversification, farm land diversification and farm labour diversification. A classification of different groups of farms

ranges from productivist industrial models to farms that can be considered as semi-abandoned. Considering the different types of farms, income diversification (off-farm), i.e. any form of employment outside the farm, is the type of diversification that requires less capital. Indeed, in most cases it does not require any investment or expense. Thus, in studies on farm diversification which exclude off-farm activities, the real contribution of diversification to income may be reduced or neglected for smaller farms since they cannot afford certain investments. The same occurs with female members, who according to various studies have a higher participation in off-farm employment (Maye *et al.*, 2009).

However, smaller farms also implement on-farm activities in some cases, but they do it more unconsciously and with the ultimate goals of long-term survival and of reducing their marginality rather than as a result of a specific farm strategy. This implies that when small farms are compared to larger farms, the former face constraints to take advantage of a wider diversification process. This outcome could be explained by the limited land size and low entrepreneurial skills (Salvioni *et al.*, 2009).

Nevertheless, the economic capabilities of each farm holding are not the sole deciding factor when undertaking a particular type of diversification. The features underlined by diverse studies as favouring certain types of diversification are: location, own motivation, availability of inputs, existence of a market for new products and enhancing succession of family farms (Finocchino & Esposti, 2008). Furthermore, the more or less resources available by the family farms (land, labour capital, etc.) have also been shown to be a fundamental driving force leading on-farm diversification (Meert at al., 2005; López-i-Gelats et al., 2011).

## Framework of analysis

This section develops a theoretical model which explains farmer's time allocation decisions. We assume that a farm allocates total available labour, $L$, across farm work ($L_F$), on-farm diversification work ($L_{FD}$) and off-farm work ($L_{OF}$).

$$L = L_F + L_{FD} + L_{OF} . \quad (1)$$

Non-negativity constraints are imposed on farm, on-farm work and on market work:

$L_F \geq 0$, $L_{FD} \geq 0$ and $L_{OF} \geq 0$,

where $w$ is the wage rate in the off-farm labour market. For simplicity it is assumed that both farm and on-farm outputs are produced only by labour inputs ($L_F$ and $L_{FD}$, respectively) and a set of variables that include farmer's characteristics, fixed inputs, equipment, access to market and local economy features ($Z_F$ and $Z_{FD}$). Those latter variables affect the efficiency of farm and on-farm diversification production but are mainly exogenous to current production decision. The production functions are assumed to be strictly concave:

$$q_F = f_1(L_F; Z_F), \qquad \frac{\partial q_F}{\partial L_F} > 0, \text{ for the farm production} \tag{2}$$

$$q_{FD} = f_2(L_{FD}; Z_{FD}), \quad \frac{\partial q_{FD}}{\partial L_{FD}} > 0, \text{ for the on-farm diversification production} \tag{3}$$

$P_F$ and $P_{FD}$ are the farm price and on-farm price, respectively. The farm profit can be written as:

$$\pi = P_F q_F + P_{FD} q_{FD} + wL_{OF}. \tag{4}$$

This consists of farm income, $P_F q_F$, on-farm diversification income, $P_{FD} q_{FD}$, and off-farm labour income, $wL_{OF}$. The farmer optimisation problem involves maximising profits ($\pi$) subject to the time and non-negativity constraints. The optimal solution is characterised by the Kuhn-Tucker conditions, which are the first order conditions for maximising the Lagrange function:

$$\ell = P_F q_F + P_{FD} q_{FD} + wL_{OF} + \lambda\left[L - L_F - L_{FD} - L_{OF}\right]. \tag{5}$$

By replacing equations (2) and (3) into (5), the following expression of the maximisation problem in terms of labour allocation variables is obtained:

$$\ell = P_F f_1(L_F, Z_F) + P_{FD} f_2(L_{FD}, Z_{FD}) + wL_{OF} + \lambda\left[L - L_F - L_{FD} - L_{OF}\right]. \tag{6}$$

The farm work, on-farm diversification work and off-farm work participation conditions are, respectively, a subset of Kuhn-Tucker conditions:

$$\frac{\partial \ell}{\partial L_F} = P_F \frac{\partial f_1}{\partial L_F} \leq \lambda , \tag{7}$$

$$\frac{\partial \ell}{\partial L_{FD}} = P_{FD} \frac{\partial f_1}{\partial L_{FD}} \leq \lambda , \tag{8}$$

$$\frac{\partial \ell}{\partial L_{OF}} = w \leq \lambda . \tag{9}$$

Participation, an internal solution, takes place when the equality holds. Therefore,

$$P_F \frac{\partial f_1}{\partial L_F} = P_{FD} \frac{\partial f_2}{\partial L_{FD}} = w . \tag{10}$$

Equation (10) implies that if an internal solution occurs for all choices, the value of labour productivity for both farm and on-farm diversification work is equal to the market wage. The reduced-form solution for the participation equations has the form:

$$L_i = g_i(P_F, P_{FD}, w, Z_F, Z_{FD}) , \tag{11}$$

where $i = L_F, L_{DF}, L_{OF}$. Keeping this framework of analysis in mind and using the 2007 FSS, the next section describes the most relevant variables in order to examine on-farm diversification in Catalonia ($L_{DF}$) (5).

## The Empirical Model

This section focuses on the determinants of farmer's participation in on-farm diversification. In the context of this work, the labour allocation

(5) *Previous studies have used the FSS for the analysis of pluractivity in Europe, such as the European Commission (2008) and Perrier-Cornet & Aubert (2009).*

variable in equation (11) is proxied by using a dichotomous variable that takes the value one if a farm holding is engaged in on-farm diversification activities, and zero otherwise.

A binary choice (logit) model, is used to model the choice between two discrete alternatives faced by agricultural holdings: carrying out on farm diversification or not. It is assumed that there are $N$ farms ($i = 1....N$), with a vector $X_{ki}$ containing observations on $K$ independent variables that explain farm decision on diversification. The binary variable $y_i$ is defined as:

$y_i = 1$ if farm $i$ carries out on-farm diversification
$y_i = 0$ if farm $i$ does not diversify

The logistic binomial model estimates the probability $F(y_i)$ of diversification by a farm as a function of different characteristics (independent variables):

$$F(y_i) = \frac{1}{1+e^{-y_i}} \tag{12}$$

The variable $y$ in equation (12) can be expressed as a linear function:

$$E(y_i) = \beta_0 + \sum_{k=1}^{K} \beta_{ki} x_{ki} + \varepsilon_i \qquad \varepsilon_i \sim NID(0,1) \tag{13}$$

where:

$y_i$: Farm diversification as a discrete variable
$E$: Expectation
$i$: The surveyed farm
$\chi_{ki}$: Determinants of on farm diversification for agricultural holding $i$
$\beta_k$: Parameter that indicates the effect of $\chi_k$ on $y_i$
$\beta_o$: Intercept that indicates the value of when all the $x$'s are equal to zero
$\varepsilon_i$: A normally and independently distributed error term (NID) for farm $i$

Maximum likelihood is used to estimate the parameters of the logit model. The estimates are not easy to interpret directly. An alternative way is to consider the marginal effects, that is, the probability that $y_I$ equals 1 with respect to the $k$-th element in $\chi_i$ (Verbeek, 2000).

## Diversification and the 2007 Farm Structure Survey

The biennial FSS updates the Agricultural Census data (produced every 10 years). It is the most important source of information on the agrarian structure and provides information on the agricultural sector which is fully comparable between the different European countries. This section identifies the main variables to be used in the analysis.

The basic unit of the survey is the agricultural holding, defined as a unit under single management engaged in agricultural production. The FSS takes into account those farms that meet at least one of two requirements: a) having a surface of at least 0.2 ha of Utilised Agricultural Area (UAA) corresponding to vegetables, flowers or ornamental plants, b) having at least one Livestock Unit (LU) with a total Standard Gross Margin (SGM) greater than or equal to 0.75 European Size Units (ESU, where 1 ESU = 1,200 euros).

Regarding the legal form and management of holdings, two major groups are identified. The first one consists of holdings owned by natural persons including individual or groups of individuals. The second group comprises the holding owned by legal persons such as companies, public undertakings, production cooperatives and other types of legal status. For the sake of simplicity, these groups are named family farm and company farm, respectively.

In Catalonia, according to the 2007 FSS, 50,072 farms out of 55,097 have individual status, 2,049 are companies, 304 agricultural processing companies (*Sociedades Agrarias de Transformación*), 233 public undertakings, 72 cooperatives, and 2,367 have other societal forms. Therefore, the majority of farms, 91%, are family owned and managed, while the remaining 9% are owned by an institution or limited liability company.

Focusing on the sub-sample of farms that carry out on-farm activities, Table 1 describes the activities analysed in this paper. Most of the farms, 91.8%, are devoted to one on-farm activity, 7.5% to two, and 0.7 to three. 80% of the farms are run by family farms and the remaining 20% by company farms. Around 74% of the farms undertake tourism, contractual work using the holding's equipment or processing of farm products. A similar pattern is identified when considering the farms' legal and management status.

*Table 1*

CATALONIA: TYPES OF DIVERSIFICATION BY LEGAL STATUS INCLUDED IN THE 2007 FSS

| Activity | All sample (%)† | Farm by legal form and management | |
|---|---|---|---|
| | | Family Farm (%) | Company Farm (%) |
| Farm tourism | 25.1 | 25.2 | 24.8 |
| Handicraft | 1.4 | 1.8 | 0.0 |
| Processing of farm products | 19.4 | 15.7 | 33.6 |
| Wood processing | 0.2 | 0.2 | 0.5 |
| Renewable energy production | 2.5 | 2.3 | 3.3 |
| Contractual work using holding's equipment | 29.5 | 28.6 | 33.0 |
| Organic Farming | 17.9 | 20.1 | 9.5 |
| Other | 12.8 | 12.8 | 12.9 |
| Weighted sample size | 2844 | 2264 | 580 |

† Only for sample of farms that carry out on-farm activities.

*Source:* FSS 2007, Idescat (February 2010).

## Variables

In order to identify the determinants of on-farm diversification, and given the analysis that yields equation (11), we focus on 14 variables divided into three groups: territorial factors at the district level (*comarca*) (6), farm type variables and characteristics of the farm owners and managers. Those variables, according to the literature, may be relevant to explain the likelihood of on-farm diversification (Perrier-Cornet & Aubert, 2009; Pieniadz et al., 2009). Next we describe each of these characteristics for Catalonia.

### *Territorial factors at the district level*

The first group of variables refers to the territorial factors which affect agricultural production. Proximity to attractive geographic areas and to urban or metropolitan areas may encourage diversification (Meert *et al.*, 2005). Besides, high unemployment rates may limit the opportunities to find work outside the farm and therefore favour on-farm activities (Bowler *et al.*, 1996; Nienaber & Potočnik Slavič, 2013).

*(6) A comarca is roughly equivalent to a UK district. According to the Law 6 of the Parliament of Catalonia (2006), the comarca is a local government entity with legal personality. It is formed by municipalities for the purpose of managing local powers and services.*

The variable related to type of area classifies each farm depending on whether it is located in a disadvantaged area or not (Council of the European Union, 1997). This is especially important in Catalonia, since the country presents an adverse orography to agriculture, limited rainfall and has many mountainous areas (Idescat, 2009).

The second variable to consider is the degree of rurality of the district where the farm is located. OECD criteria are employed for defining areas as rural, intermediate or urban. The OECD describes a rural community (municipality) as one with density lower than 150 inhabitants per $km^2$.

The third variable classifies each farm according to the contribution of the agricultural sector in the district where it is located. It is interesting to analyse whether those districts where agriculture plays a more important role also display a higher degree of diversification as a result of the difficulty of earning a living outside the agricultural sector.

Finally, it is important to analyse the unemployment rate in the district where a farm is located. It could be assumed that high unemployment encourages on-farm diversification.

*Farm type variables*

This group of variables includes those related to internal structural aspects which can be modified in the long run by farm managers (Pieniaz *et al.*, 2009). The first two variables analysed refer to the physical and economic dimension of farms.

As mentioned above, inputs are important when considering diversification decisions. Thus, it is relevant to analyse both physical and economic variables. The physical dimension is captured by means of "used agricultural area" (UAA) in hectares. That is, surface of tilled land and land for permanent pasture. The economic dimension is captured by Standard Gross Margin (SGM) in "European Size Units" (ESU, where 1 ESU = 1200 euros).

Another variable is the production orientation. The structure of farms varies substantially depending on their type of production. The production orientation may affect farms diversification decisions. Several studies indicate that, since dairy farms require intense dedication, producers have less free time to engage in alternative activities and, therefore, dairy farms

are less diversified (Bowler *et al.*, 1996), whereas farms aimed at producing crops are more likely to diversify (Pieniaz *et al.*, 2009). However, there are also some studies that find no significant differences between the farms that diversify and those that do not based on the product orientation features (Viladomiu *et al.*, 2002).

Another variable is the legal status of the farm. The survey questionnaire includes six options: individual owner, companies, public undertakings, cooperative, agricultural processing companies and others.

### *Characteristics of farm owners and managers*

The third group of variables consists of those referring to socio-demographic features of farm owners and managers. Therefore, we hypothesise that these factors can also influence the decisions on farm diversification (Bowler et al., 1996; Viladomiu *et al.*, 2002; McNally, 2001; Mishra et al., 2004; Pieniadz et al., 2009; Glauben *et al.*, 2008).

Relevant variables here include the farm manager's gender and age. In the case of farms operated by natural persons (mainly family farms), unlike other legal statuses, the farm manager may be the owner of the farm, a family member or an employee. The agricultural training of the farm manager is also relevant. The survey provides data regarding the following variables on the level of agricultural training: practical experience, agricultural university education, vocational training and other courses related to agriculture.

Finally, the variable young labour (family labour under 35 years old) is considered for farms with natural person legal status. Some studies indicate that farms that are more optimistic with respect to succession and continuity of the business are more likely to diversify (Viladomiu *et al.*, 2002). Thus, by taking into account those farms with young family members working on the farm, it is possible to assess a relationship between the presence of young labour and a higher incidence of on-farm diversification.

The sample includes 3,435 observations, of which 327 reported on-farm activities. Table 2 presents some descriptive statistics, sample means and standard deviations of the dependent and explanatory variables as well as each variable code names and description. Furthermore, sub-samples according to farm's legal status are also displayed.

*Table 2*

## VARIABLES AND SUMMARY STATISTICS

| Variable | All sample | | Farm diversifies | | Farm does not diversify | | Description |
|---|---|---|---|---|---|---|---|
| | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. | |
| **Dependent Variable** | | | | | | | |
| Diversifies | 0.10 | 0.29 | 1.00 | 0.00 | 0.00 | 0.00 | Diversification by the farm |
| **Independent Variables** | | | | | | | |
| **Territorial factors at the district level** | | | | | | | |
| **Type of Area** | | | | | | | |
| Normal | 0.66 | 0.47 | 0.61 | 0.49 | 0.68 | 0.47 | Reference category |
| Depopulated | 0.10 | 0.31 | 0.10 | 0.30 | 0.10 | 0.31 | Sparse population and low productivity land |
| Mountain | 0.22 | 0.41 | 0.26 | 0.44 | 0.21 | 0.41 | Elevated location or steep slopes |
| Special | 0.02 | 0.13 | 0.04 | 0.19 | 0.01 | 0.12 | The environment must be preserved due to its interest |
| **Rurality** | | | | | | | |
| Urban | 0.15 | 0.35 | 0.13 | 0.33 | 0.15 | 0.36 | Less than 15% of the population lives in a rural community |
| Intermediate | 0.43 | 0.50 | 0.46 | 0.50 | 0.43 | 0.50 | Between 15-50% of the population live in a rural community |
| Rural | 0.42 | 0.49 | 0.42 | 0.49 | 0.42 | 0.49 | More than 50% of the population lives in a rural community (rural community = <150hab/Km$^2$) |
| Unemployment | 5.18 | 1.01 | 5.09 | 1.02 | 5.2 | 1.10 | Unemployment rate registered in the region where the farm is located |
| Sector | 7.40 | 6.7 | 7.04 | 6.8 | 7.44 | 6.70 | Weight (%) of the agricultural sector in the region's Gross Value Added (GVA) |
| **Farm Type Variables** | | | | | | | |
| **Production Orientation** | | | | | | | |
| Cereals | 0.10 | 0.30 | 0.11 | 0.31 | 0.10 | 0.30 | Farms specializing in cereals, oilseeds and proteaginose plants |
| C_diverse | 0.04 | 0.20 | 0.08 | 0.27 | 0.04 | 0.20 | Farms with general crops: plants, vegetables, etc. |
| Horticulture | 0.04 | 0.20 | 0.03 | 0.17 | 0.04 | 0.21 | Farms specializing in horticulture: intensive crops, flowers and ornamental plants |
| Viticulture | 0.05 | 0.22 | 0.11 | 0.31 | 0.05 | 0.21 | Farms specializing in viticulture |
| Fruits | 0.15 | 0.36 | 0.08 | 0.27 | 0.16 | 0.37 | Farms specializing in fruits and citrus |
| Olive tree | 0.06 | 0.23 | 0.02 | 0.15 | 0.06 | 0.24 | Farms specialized in olive trees |
| Woody | 0.08 | 0.27 | 0.07 | 0.26 | 0.08 | 0.27 | Farms with various permanent crops |
| C_dairy | 0.04 | 0.20 | 0.06 | 0.23 | 0.04 | 0.19 | Specialist dairy farms |
| C_meat | 0.06 | 0.23 | 0.10 | 0.30 | 0.05 | 0.22 | Farms specializing in breeding and fattening beef cattle |
| C_various | 0.00 | 0.04 | 0.00 | 0.06 | 0.00 | 0.04 | Farms with cattle for producing dairy and meat |
| C_herbivores | 0.09 | 0.29 | 0.12 | 0.33 | 0.09 | 0.28 | Farms specialized in sheep, goats and other herbivores |

*Table 2 (continuación)*

VARIABLES AND SUMMARY STATISTICS

| Variable | All sample | | Farm diversifies | | Farm does not diversify | | Description |
|---|---|---|---|---|---|---|---|
| | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. | |
| Pigs | 0.09 | 0.28 | 0.05 | 0.22 | 0.09 | 0.28 | Specialist pig farms |
| Poultry | 0.05 | 0.22 | 0.03 | 0.16 | 0.06 | 0.23 | Specialist poultry farms |
| O_granivorous | 0.02 | 0.14 | 0.02 | 0.13 | 0.02 | 0.14 | Farms producing several granivorous animals |
| Polycultures | 0.04 | 0.20 | 0.06 | 0.23 | 0.04 | 0.20 | Farms with polycultures: large crops, horticulture, permanent, etc. |
| I_various | 0.03 | 0.17 | 0.02 | 0.13 | 0.03 | 0.17 | Mixed livestock farms: herbivorous and granivorous |
| C_I | 0.05 | 0.22 | 0.05 | 0.22 | 0.05 | 0.22 | Mixed crop and livestock farms |
| Uaa_ha | 89 | 281.7 | 180 | 429 | 79.7 | 259.7 | Utilized Agricultural Area: surface of tilled land and land for permanent pasture. Units in hectares |
| Uaa_owner | 66 | 38.5 | 56.2 | 38.9 | 66.6 | 38.4 | % of UAA |
| Gm_esu | 98 | 265.7 | 144 | 497 | 93.4 | 227.4 | Gross margin in the farm's ESU. Monetary value of gross production minus monetary and the value of certain direct costs. 1 ESU = 1,200 euros |
| **Farm legal status** | | | | | | | |
| Family | 0.70 | 0.46 | 0.54 | 0.50 | 0.72 | 0.45 | Manager is an individual person |
| Business | 0.13 | 0.34 | 0.19 | 0.40 | 0.12 | 0.33 | Registered company, public limited company, limited company or general partnership |
| Public | 0.03 | 0.18 | 0.05 | 0.22 | 0.03 | 0.17 | State-owned company |
| Cooperative | 0.01 | 0.09 | 0.02 | 0.13 | 0.01 | 0.09 | Cooperative |
| Apc | 0.03 | 0.17 | 0.05 | 0.22 | 0.03 | 0.16 | Agricultural processing companies |
| L_other | 0.10 | 0.30 | 0.15 | 0.35 | 0.10 | 0.30 | Other types of firm not included in previous categories |
| **Owner and manager characteristics** | | | | | | | |
| Sex | 0.10 | 0.30 | 0.09 | 0.29 | 0.10 | 0.31 | Gender of manager (1 if the holding is headed by a woman) |
| Age | 52.6 | 12.8 | 48.3 | 11.1 | 53.1 | 12.9 | Age of the manager of farms in years |
| Practical | 0.73 | 0.45 | 0.54 | 0.50 | 0.75 | 0.43 | Training acquired through practical work on farm |
| University | 0.06 | 0.23 | 0.11 | 0.31 | 0.05 | 0.22 | Completed university studies in a specialised field of agriculture or related |
| Vocational | 0.10 | 0.30 | 0.15 | 0.35 | 0.09 | 0.29 | Vocational training in a specialised field of agriculture or related |
| T_Other | 0.12 | 0.32 | 0.21 | 0.41 | 0.11 | 0.31 | Includes all training courses in a specialised field of agriculture or related |
| Owner | 0.88 | 0.33 | 0.93 | 0.26 | 0.88 | 0.33 | The person responsible for the management and daily running of the farm is the actual owner |
| P_Family | 0.11 | 0.31 | 0.07 | 0.26 | 0.11 | 0.31 | The person responsible for the management and daily running of the farm is a relative of the owner |
| P_other | 0.01 | 0.11 | 0.00 | 0.00 | 0.01 | 0.12 | The person responsible for the management and daily running of the farm is a hired external individual |
| Young | 0.25 | 0.43 | 0.33 | 0.47 | 0.24 | 0.43 | Farms individually owned with family labour under 35 years old |

*Source:* 2007 FSS, Idescat (February 2010), Fundació del Món Rural (2000).

For the empirical analysis, in alignment with current literature, three main groups are considered (European Commission, 2008; Maye et al., 2009). As a result, the sample is divided according to the farm's legal and management status (family and company farms). By doing this, we can determine to what extent the type of farm makes any significant difference in the factors explaining on-farm diversification.

The first model consists of the whole sample with the variable and defined as:

$$\begin{aligned} y_i = {} & \beta_0 + \beta_1 \text{depopulated}_i + \beta_2 \text{mountain}_i + \beta_3 \text{special}_i + \beta_4 \text{intermediate} + \\ & + \beta_5 \text{rural}_i + \beta_6 \text{unemployment}_i + \beta_7 \text{l\_sector}_i + \beta_8 \text{cereals}_i + \beta_9 \text{c\_diverse}_i + \\ & + \beta_{10} \text{horticulture}_i + \beta_{11} \text{viticulture}_i + \beta_{12} \text{fruits}_i + \beta_{13} \text{olive\_tree}_i + \\ & + \beta_{14} \text{woody}_i + \beta_{15} \text{c\_dairy}_i + \beta_{16} \text{c\_meat}_i + \beta_{17} \text{c\_various}_i + \beta_{18} \text{herbivores}_i + \\ & + \beta_{19} \text{poultry}_i + \beta_{20} \text{o\_granivorous}_i + \beta_{21} \text{polycultures}_i + \beta_{22} \text{l\_various}_i + \\ & + \beta_{23} \text{c\_l}_i + \beta_{24} \text{uaa\_ha}_i + \beta_{25} \text{uaa\_owned}_i + \beta_{26} \text{gm\_esu}_i + \beta_{27} \text{business}_i + \\ & + \beta_{28} \text{public}_i + \beta_{29} \text{cooperative}_i + \beta_{30} \text{apc}_i + \beta_{31} \text{l\_other}_i + \beta_{32} \text{gender}_i + \beta_{33} \text{age}_i \\ & + \beta_{34} \text{university}_i + \beta_{35} \text{vocational}_i + \beta_{36} \text{t\_other}_i + \varepsilon_i \end{aligned} \quad (14)$$

were $\beta_j$ are the coefficients to be estimated and $\varepsilon$ is the error term.

The second and third models are related to family farms. Model 2 considers variables that refer to family labour under 35 years old and the profile of the farm manager. This variable captures whether the person responsible for the management and daily running of the farm is the owner, a family member or a hired external person. The third specification does not take into account the above-mentioned variables. The fourth model consists of the subsample of company farms. Summing up, four regression equations allow us to estimate the effect on the likelihood of diversification attributable to territorial factors at the district level, farm type and socio-demographic characteristics of the farm owners and managers.

## RESULTS AND DISCUSSION

Table 3 reports the results for the four models. Table 4 reports average marginal effects for the probability of on-farm diversification. For the case of family farms, the estimation is drawn from specification 2.

*Table 3*

## REGRESSION RESULTS

| Variable | Whole Sample (1) | | Farms by Legal Form and Management | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Family Farm (2) | | Family Farm (3) | | Company Farm (4) | |
| | Coefficient | Standard error | Coefficient | Standard Error | Coefficient | Standard error | Coefficient | Standard Error |
| **Territorial Variables** | | | | | | | | |
| Depopulated | 0.5239** | 0.2478 | 0.4867* | 0.3016 | 0.4982* | 0.3021 | 0.7254 | 0.5450 |
| Mountain | 0.1765 | 0.1621 | 0.1851 | 0.2250 | 0.1954 | 0.2251 | 0.1367 | 0.2539 |
| Special | 0.7848* | 0.4158 | 1.3480*** | 0.5052 | 1.3206*** | 0.4949 | -0.2476 | 0.7161 |
| Intermediate | -0.0599 | 0.2241 | 0.0531 | 0.3036 | 0.0409 | 0.3048 | -0.0349 | 0.3508 |
| Rural | 0.1280 | 0.2622 | 0.0757 | 0.3474 | 0.0431 | 0.3486 | 0.4577 | 0.4347 |
| Unemployment | -0.0540 | 0.0686 | -0.0828 | 0.0922 | -0.0812 | 0.0926 | 0.0049 | 0.1027 |
| Sector | -0.0333** | 0.0138 | -0.0230 | 0.0174 | -0.0225 | 0.0173 | -0.0518** | 0.0254 |
| **Farm Type Variables** | | | | | | | | |
| Cereals | 1.1771*** | 0.3348 | 1.2091** | 0.5346 | 1.2242** | 0.5337 | 1.2025** | 0.4859 |
| C_diverse | 1.5343*** | 0.3640 | 1.8864*** | 0.5683 | 1.9039*** | 0.5695 | 1.2793*** | 0.4978 |
| Horticulture | 0.3516 | 0.4707 | 0.8052 | 0.7276 | 0.8189 | 0.7289 | 0.0875 | 0.6465 |
| Viticulture | 1.8722*** | 0.3493 | 1.7468*** | 0.5534 | 1.7888*** | 0.5535 | 2.1245*** | 0.4906 |
| Fruits | 0.3498 | 0.3564 | 0.7426 | 0.5500 | 0.7438 | 0.5503 | -0.1587 | 0.5479 |
| Olive tree | 0.1598 | 0.4985 | 0.2555 | 0.6835 | 0.2677 | 0.6838 | 0.7342 | 0.9049 |
| Woody | 0.9448** | 0.3778 | 1.0870** | 0.5686 | 1.1128* | 0.5712 | 1.1524* | 0.6179 |
| C_dairy | 0.9073** | 0.3610 | 1.0066 | 0.6954 | 1.0255 | 0.7115 | 0.8638** | 0.4372 |
| C_meat | 1.2351*** | 0.3319 | 1.2476** | 0.5499 | 1.2682** | 0.5466 | 1.2691*** | 0.4392 |
| C_various | 0.6795 | 1.1139 | | | | | 0.9570 | 1.2160 |
| C_herbivores | 0.9738*** | 0.3794 | 1.2852** | 0.5641 | 1.3017** | 0.5626 | 0.0740 | 0.5210 |
| Poultry | -0.1532 | 0.4449 | 0.0061 | 0.7128 | 0.0409 | 0.7115 | -0.3922 | 0.5743 |
| O_granivorous | 0.6336 | 0.5271 | 0.4997 | 0.8874 | 0.5081 | 0.8747 | 0.7225 | 0.6560 |
| Polycultures | 1.3957*** | 0.3858 | 1.4446*** | 0.5905 | 1.4697** | 0.5869 | 1.4928** | 0.5976 |
| L_various | 0.1588 | 0.5126 | 0.6140 | 0.7227 | 0.6331 | 0.7204 | -0.4449 | 0.8058 |
| C_I | 0.8978** | 0.3775 | 0.5045 | 0.6746 | 0.5473 | 0.6716 | 1.2443*** | 0.4776 |
| Uaa_ha | 0.0005** | 0.0002 | 0.0010** | 0.0004 | 0.0010** | 0.0004 | 0.0005** | 0.0002 |
| Uaa_owner | -0.0030* | 0.0016 | -0.0041* | 0.0023 | -0.0046** | 0.0023 | -0.0008 | 0.0024 |
| Gm_esu | 0.0004** | 0.0002 | 0.0015** | 0.0006 | 0.0014** | 0.0007 | 0.0004** | 0.0002 |
| Business | 0.5955*** | 0.1914 | | | | | | |
| Public | -0.4893 | 0.4736 | | | | | | |
| Cooperative | 0.6806 | 0.5315 | | | | | | |
| Apc | 0.6736** | 0.3060 | | | | | | |
| L_other | 0.5594*** | 0.1926 | | | | | | |
| **Manager/owner Characteristics** | | | | | | | | |
| Sex | -0.2054 | 0.2146 | -0.2572 | 0.2931 | -0.2391 | 0.2898 | -0.2318 | 0.3441 |
| Age | -0.020*** | 0.0050 | -0.0163** | 0.0068 | -0.0165*** | 0.0063 | -0.0238*** | 0.0090 |
| University | 0.5702** | 0.2432 | 1.5358*** | 0.3717 | 1.4994*** | 0.3700 | 0.0869 | 0.3072 |
| Vocational | 0.4453** | 0.1971 | 0.6388* | 0.2759 | 0.7068*** | 0.274 | 0.1623 | 0.2726 |
| T_other | 0.9044*** | 0.1669 | 0.9377*** | 0.2272 | 0.9975*** | 0.2248 | 0.6374** | 0.2583 |
| P_Family | | | -0.4607 | 0.3211 | | | | |
| Young | | | 0.1906 | 0.1958 | | | | |
| Constant | -2.040*** | 0.6028 | -2.4088** | 0.8655 | -2.3915*** | 0.8421 | -1.4335 | 0.8820 |
| Log-likelihood | -972.3 | | -563.8 | | -566.9 | | -387.2 | |
| Wald Chi2 | 204.06 | | 137.63 | | 135.17 | | 74.76 | |
| Significance level | 0.000 | | 0.000 | | 0.000 | | 0.000 | |
| Pseudo R2 | 0.0997 | | 0.1042 | | 0.1025 | | 0.0955 | |
| Sample size | 3435 | | 2369 | | 2399 | | 1034 | |

Notes: Asterisks indicate significance at 10% (*), 5% (**), and 1% (***).

*Table 4*

MARGINAL EFFECTS ON THE PROBABILITY OF ON-FARM DIVERSIFICATION

| Marginal Effect (percentage points) | | | | |
|---|---|---|---|---|
| **Variable** | **Change** | **Whole sample** | **Family Farm†** | **Company Farm** |
| Depopulated | | 4.20 | 2.99 | 9.77 |
| Special | | 7.30 | 12.69 | not significant |
| Sector | | -0.22 | -0.12 | -0.55 |
| Cereals | | 11.88 | 9.68 | 18.40 |
| C_diverse | | 18.52 | 21.16 | 20.13 |
| Viticulture | | 24.97 | 18.30 | 39.98 |
| Woody | | 8.96 | 8.46 | 17.78 |
| C_dairy | | 8.73 | not significant | 11.84 |
| C_meat | | 13.25 | 10.80 | 19.71 |
| C_herbivores | +1 if x = 0 | 9.25 | 11.14 | not significant |
| Polycultures | | 16.06 | 13.60 | 25.21 |
| C_I | | 8.55 | not significant | 19.33 |
| Business | | 4.86 | | |
| Apc | | 5.95 | | |
| L_other | | 4.56 | | |
| University | | 4.77 | 15.49 | not significant |
| Vocational | | 3.50 | 4.29 | not significant |
| T_other | | 8.22 | 6.88 | 7.95 |
| Uaa_ha | +1 ha | 0.004 | 0.005 | 0.005 |
| Uaa_owner | +1 % | -0.02 | -0.02 | -0.009 |
| Gm_esu | +1 ESU | 0.003 | 0.008 | 0.004 |
| Age | + 1 year | -0.13 | -0.09 | -0.25 |

† It corresponds to version 2 from Table 3.

A high number of variables are statistically significant. For all regressions, the hypothesis that the coefficients associated with each of the explanatory variables are jointly zero can be rejected (the p-value for the chi-square

test is smaller than 0.001 for each of the specifications). Regarding the goodness of fit, pseudo-$R^2$ is 0.0997 for the first regression for the whole sample, 0.1042 and 0.1025 for the farms run by family farms (specifications 2 and 3, respectively), and 0.0955 for the farms run by company farms.

The analysis across all samples suggests that no major differences are found regarding the same set of variables which are relevant in explaining on-farm diversification. However, it is important to assess the magnitude of their impact using marginal effects.

### *Territorial factors at the district level*

Location in an unpopulated area leads to a 4.2% increase in the likelihood of diversification for all farms when compared to normal areas. For family farms, the effect is 3% and it reaches 9.8% for company farms. Therefore, we can conclude that farms located in disadvantaged areas are more likely to diversify when compared with areas classified as normal.

For the whole sample, for farms located in special districts the likelihood of diversification increases by 7.3% for those whose environment must be preserved when compared to a normal district. The increase in likelihood is 12.7% for family farms.

The other significant territorial variable is associated with the district's main productive sector. A 1% decrease in the weight of the primary sector in the district where the farm is located implies an increase by 0.22% in the likelihood of developing some kind of diversification for the whole sample, 0.12% for family farms and 0.55% for company farms.

### *Farm type variables*

The variables utilised agricultural area (UAA) and gross margin are statistically significant for all the samples. They exert a negligible (but positive) impact on the likelihood of on-farm diversification. For instance, for the full sample of farms, each additional hectare of UAA increases the

likelihood of diversification by 0.004%. Similarly, an additional unit of ESU (1200 euros) increases the likelihood of diversification by 0.003%.

Relating to legal status, "other legal status" increases the likelihood of diversifying by 4.5% with respect to family farms, agricultural processing companies by 6% and corporations by 4.8%. Therefore, we can conclude that farms with a business-like structure are more likely to diversify on-farm than other types.

With regard to the farm type variables, the analysis of farm production confirms that there are certain farm activities that have a higher probability of diversifying when compared to pig farms (which is the reference variable and one of the most intensive orientations).

For comparative purposes, here the discussion mainly relies on specialist holdings with cereals and diverse crops, permanent crops and dairy farms, which represent approximately 80% of total gross margin of agricultural holdings and more than half of arable land.

The cereals and diverse crops sectors have been experiencing fluctuations in production and prices for decades. This has been exacerbated by the international food price volatility which started in 2007 (Garcia & Vega, 2008). These sectors are characterised by a significant mechanisation. This process has been moderated in recent years due to the decrease in the number of farms and the saturation of farm machinery stock (Bacaria & Alfranca, 1994). Focusing on cereal farmers, on-farm diversification is not explained by cereal extensive production and the farmer's higher time availability; it is mainly due to the farmer's aim of optimising the large investment made in machinery. The main on-farm activities carried out by those holdings are farm tourism (29.7%) and contracted work using holding equipment (21.3%). Regarding cereal farms, the likelihood of diversification for the whole sample increases by 11.88% and for diverse crops farms by 18.52%. Looking at family farms, a different pattern is found. For family farms, the highest increase in the probability of diversification is for diverse crop farms (21.6%) while for cereal farms the increase in likelihood is of 9.68%. For company farms, the increases in the probabilities are of 20.13% and 18.40%, respectively.

Findings in Table 4 suggest that viticulture is the only significant activity within the permanent crop category. Viticulture farms show an increase of 25% in the probability of carrying out on-farm diversification when compared to pig farms. The likelihood to diversify increases by 40% for company farms and 18.30% for family farms. The main on-farm activities involve processing of farm products (28.2%), and organic farming (25%). The lack of significance of the other groups could be due to the increase in part-time farming, and the recruitment of foreign workers during the harvesting season. Those farms are involved mainly in off-farm activities and do not carry out any type of on-farm diversification.

It is important to mention the case of olive-oil, a typical Mediterranean crop. From 1999 to 2007, land allocated to olive trees has fallen by 10% (Idescat, 2009). Farmers have been unable to take advantage of any product diversification or organic production.

The restructuring of the dairy sector in Catalonia is characterised by a sharp decline in the number of farms (from 1999 to 2007 the number of farms has fallen 43%), an increase in the scale of holdings, a rise in the amount of milk quotas and the number of cows per farm. However, the number of cows of all dairy farms in Catalonia has declined 16% from 1999 to 2007. It is important to highlight that unlike other types of intensive production that have showed increased dynamism in the past 20 years and good adaptation to the European Union market, milk production has faced a more complex situation, in a setting of stricter limits to production through milk quotas and by a trade deficit especially with regard to cheese and milk powder (Sineiro, 2008).

For the whole sample, dairy farms increase the probability of on-farm diversification by 8.73%, while the increase in the likelihood to diversify is not significant for family farms and the likelihood increases by 17.78% for company farms. On-farm diversification covers all activities, and given that the sector is facing difficulties, it could be suggested that diversification is driven by the need to increase incomes in order to survive (Sineiro, 2008). In theory, those farms exhibit some constraints, in terms of time allocation and physical infrastructure, which would preclude them to be fully engaged in on-farm diversification. However, their actual involvement in such activities could be an indication of their economic difficulties.

*Characteristics of farm owners and managers*

Focusing on the variables related to the farm manager, gender shows a negative sign, but it is not significant. Age is clearly significant: an increase in age of the farm manager by one year reduces the probability of diversifying by 0.13% for the whole sample, 0.09% for family farms and by 0.25% for company farms.

Regarding the variables that capture the training of farm managers, the data shows that for the whole sample any type of academic training enhances the likelihood of diversification when compared to practical training. Specifically, university studies increase the likelihood to diversify by 4.8%, vocational training by 3.5% and other types of training by 8.2%. With respect to the type of farms, a noticeable difference to find out is that this variable is significant for all its categories for family farms, whereas for company farms it is only relevant for the other training category. Finally, the two variables specific to family farms, i.e., profile of the farm manager and presence of young workforce, are not significant.

## CONCLUSIONS

The analysis developed in the paper outlines the variables which favour the development of on-farm diversification activities. In order to assess to what extent the farm's legal and management status make any difference in the factors determining on-farm diversification, the sample was divided into family farms and company farms. Empirical results suggest that no major differences are present across the samples with respect to the same set of variables explaining on-farm diversification. However, the discussion of the marginal effects denotes some differences in the magnitude of their impacts but not in the direction.

Thus, farms located in disadvantaged areas are more likely to diversify when compared with areas classified as normal. A decrease in the weight of the primary sector in the GDP of the district where the farm is located implies an increase in the likelihood of developing some kind of diversification. The probability of diversification is also higher for farms owned by legal persons. Arable land and gross margin also exert a positive influence on diversification.

Moreover, holdings engaged in both extensive and intensive farming (holdings specialised in cereals and diverse crops, viticulture and dairy production) display a higher probability of developing on-farm diversification. Finally, with respect to the characteristics of the farm manager, agricultural training increases the likelihood of diversification, whereas age reduces the probability of diversifying.

Our results provide insights for agricultural stakeholders from several points of views. Firstly, farm owners and managers can obtain relevant insights regarding which variables are more likely to lead to successful diversification. This is especially pertinent in the case of the Mediterranean, where studies on the main determinants of diversification that take into account the specificities of its agriculture do not abound (Viladomiu et al., 2002; García-Martínez, et al., 2009; López-i-Gelats et al., 2011; Giourga & Loumou, 2006; Perrier-Cornet & Aubert, 2009; Pieniadz et al., 2009; Corsi & Salvioni, 2013).

In addition, our results are also important for policy makers. Indeed, given that on-farm diversification can bring valuable resources, it seems necessary to focus agricultural policies on the benefits of diversification (especially for farms at risk of neglect). This is particularly important nowadays, in a context of economic crisis in many Western economies. Since public resources need to be allocated as efficiently as possible, it is crucial to direct resources to the variables which provide the highest likelihood of increasing diversification. Our estimates provide factual evidence in this regard.

Clearly, this research exhibits some limitations due to shortcomings of the 2007 FSS. Regarding on-farm activities, the percentage of revenues with respect to the total activity of the farm or if the farm holding has benefited from a grant that favours the development of these activities are not known. In the future, as a line of further research, it could be interesting to use the Agricultural Census of 2009, since it resolves the deficiencies described and introduces substantial improvements with respect to the variables analysed in this paper.

Last, but not least, from a general point of view, the analysis presented here is timely given the convergence and worldwide spread of food, fuel, economic and financial crises, in a context of concerns linked to climate

change, which has exacerbated the difficulties faced by farmers and rural economies both in developing and developed countries. In this context, on-farm diversification is considered by many governments as a mechanism to ensure sustainable development in rural communities.

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## ABSTRACT

### Determinants of on-farm diversification: The case of farmers in Catalonia

In recent decades, the agricultural and livestock sector in Spain has experienced a decline in its contribution to GDP and employment. Since the food industry and the maintenance of natural resources in rural areas largely depend on agriculture and livestock farms, analising on-farm diversification as a strategy to increase profitability and to try to avoid their abandonment is a relevant issue. This paper explores the factors affecting participation by farmers in Catalonia in on-farm diversification activities. A theoretical model explains farmers' time allocation decisions. The analysis of the 2007 Farm Structural Survey with a sample size of 3,435 farms using a logit model reveals that location in disadvantaged areas and a low weight of the primary sector in GDP encourage on-farm diversification. Holdings owned by legal persons, arable land size and gross margin also exhibit a positive impact on diversification. Holdings engaged in both extensive and intensive farming also carry out on-farm diversification. Finally, agricultural training and age of the farm manager positively and negatively influence diversification, respectively.


**KEY WORDS:** Spain; pluriactivity; Farm Structure Survey; agriculture.

**JEL CODES**: Q12, Q13, Q18.


## RESUMEN

### Determinantes de la diversificación en las explotaciones agrícolas: El caso de Cataluña

En las últimas décadas, el sector agrícola y ganadero en España ha experimentado una disminución de su contribución al PIB y al empleo. Dado que la industria alimentaria y el mantenimiento de los recursos naturales en las zonas rurales dependen de las explotaciones agrícolas y ganaderas, es relevante analizar la diversificación de las explotaciones agrícolas como estrategia para aumentar su rentabilidad y evitar su abandono. Este trabajo analiza los factores que explican la participación en actividades de diversificación en las explotaciones agrícolas en Cataluña. Un modelo teórico explica las decisiones de asignación del tiempo de los agricultores. El análisis empírico se realiza con una muestra de 3.435 explotaciones de la Encuesta sobre la Estructura de las Explotaciones Agrícolas del 2007. Los resultados de un modelo logit evidencian que la ubicación en zonas desfavorecidas y un bajo peso del sector primario en el PIB favorecen la diversificación agrícola. Las explotaciones que son propiedad de personas jurídicas, la extensión de la tierra cultivable y el margen bruto también afectan positivamente a la diversificación. Las explotaciones dedicadas tanto a la agricultura extensiva como a la intensiva diversifican. Por último, la formación y edad del responsable de la explotación influyen positiva y negativamente, respectivamente, en la diversificación.


**PALABRAS CLAVE:** España; pluriactividad; encuesta sobre la estructura de las explotaciones agrícolas; agricultura.

**CLASIFICACIÓN JEL:** Q12, Q13, Q18.