Marginal farmers and agri-environmental schemes: evaluating policy design adequacy for the Environmental Fallow measure

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Marginal farmers and agri-environmental schemes: evaluating policy design adequacy for the *Environmental Fallow* measure[*]

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This paper examines the factors affecting farmers' participation in an agri-environmental scheme (AES) in marginal areas implying few changes in the traditional farm management (environmental fallow). The enrolment theoretical micro-economic model reveals that farmers` (extrinsic) factors as well as decision makers' (intrinsic) factors are important for farmers' participation, without disregarding the role of social capital. The farm and farmer characteristics (intrinsic factors) as well as the influence of the social capital have been tested trough the specification and estimation of an adoption model for dry-land marginal farmers in Granada (southern Spain). 300 farmers with cereal dry-land specialization have been surveyed in order to identify factors influencing their enrolment decision and to derive scheme design modifications to improve the AES success, understood as participation rate.

Due to the fact that the effects of applying this measure do not have significant effect on the food and animal production, the participation decision is hypothesized to be mainly driven by the farmers' attitude reflecting the importance of the social capital in order to educate farmers. Nevertheless, AES interaction with other agricultural policies, such as LFA compensatory payments, restraints the possibility of this scheme's success specially when these payments imply greater financial resources. Further research is needed to see whether this same pattern holds when considering AES implying a more intensive change in the farm management.

Key-words: *Agri-environmental policy, participation, marginal areas, policy design.*

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A. INTRODUCTION

In the EU context, focus of agricultural policy is shifting from food and fibre production towards its multifunctional role in the wider rural world, providing inter alia environmental goods and services, food safety, social cohesion and cultural heritage (Baéz *et al.*, 1999). This shift has occurred driven both by social pressure and international trade liberalization needs, a shift which gained public attention during the CAP reform of Agenda 2000 and the following mid term review.

From an economic point of view, multifunctionality as a policy objective or an argument in favour of public intervention as such, is based in solid concepts such as joint-production, externalities and market failure when considering the multifuncional outputs of agriculture (Atance and Tió, 2000). As a result of these three attributes, market equilibrium cannot be considered as the optimum outcome and public intervention is needed. Among the many potential policy instruments available, agri-environmental policy is one of the most widespread in the developed world and in the EU framework is characterised by voluntary multi-annual agreements with flat-rate payments which promote positive externalities (i.e. extensification measures) and the reduction of negative externalities (input-use reduction in intensive agriculture).

Following Hanley *et al.* (1999) success or failure of agri-environmental policy should be evaluated combining both ecological and economic efficiency. Due to the uncertainty surrounding joint-production relationships as well as ecological indicator selection and the high costs associated with their quantification, adoption rate has been the most widely used measure of success. Even though this measure overestimates programme achievements, as some of the outputs could have been obtained even in the absence of such policy (Smith and Weinberg, 2004), we consider that while further scientific and technological base is achieved and taking for granted that policy design is efficient in so far requirements assure outputs, adoption rates are valid indicators.

Due to the voluntary nature of this policy instrument, the decision process by which farmers enrol in agri-environmental schemes and factors influencing this decision is a key issue that needs to be considered when designing these schemes. Our objective is to identify the main factors guiding farmers' behaviour with regards to low-requirement agri-environmental measures in order to assist with policy design, in particular environmental fallow in the northern area of Granada (Spain). Our attention is focused on non-monetary attributes of policy design and farmer's characteristics, attitudes and believes, leaving aside policy design based on non flat-rate payments such as contract auctions (Latacz-Lohman, 1998) which will be considered in future developments of the current research agenda undertaken in our Institute.

The rest of the paper is structured as follows. We first review agri-environmental policy development in the EU and then introduce a theoretical model for farmers' uptake of such measures, focusing on prior research as far as individual factors' influence is regarded. Following, the agri-environmental measure under consideration (environmental fallow), the study area and the survey instrument are described prior to the presentation of the application of the theoretical model to our case study. The paper ends with some conclusions, policy implications and directions for further research.

B. AGRI-ENVIRONMENTAL POLICY IN THE EU

Agri-environmental policy in the EU dates back to the establishment of "accompanying measures" (together with the early retirement scheme, less favoured areas scheme and forestation of agricultural land) under the McSharry reform in 1992. Regulation 2075/92 states that agri-environmental schemes' objectives were: a) reduction or stabilization of production levels, b) assure farmers' income and c) improve the quality of the environment. Most programmes designed under this regulation opt for limiting polluting input use (such as fertilizers), thus encouraging less intensive production systems, as the strategy to achieve the above-mentioned objectives (Salhofer and Glebe, 2006). Programmes are voluntary and have a multi-annual nature (5 years). Compensation payments are based on costs borne by farmers when undertaking the prescribed measures as well as reduced income due to production decrease, with a discretional 20% increase considered as an incentive for increasing participation. These payments are reflected in Annex II of the WTO Uruguay Agreement as they are considered to be non trade distorting (Directorate General for Agriculture and Rural Development, 2005). Co-financing by the Unions is set at 75% for objective 1 regions and 50% for other regions.

Agri-environmental measures should imply tighter requirements than Good Agricultural Practices (GAP, which have been introduced in the framework of cross-compliance) due to the application of the "polluter pays principle" by which, private actors should bear the costs of avoiding or restoring damages to the environment[1]. The degree of implementation of Regulation 2075/92 and its follow-ups (Regulation 1257/99 for Agenda 2000 and Regulation 1698/2005 for the Rural Development Program 2007-13) varies widely among Member States both regarding the scope of measures designed and the proportion of UAA involved (Van Huylenbroeck and Whitby, 1999). While Austria, Finland and Luxembourg have more than two thirds of the UAA involved in agri-environmental measures; in Belgium, Denmark, Greece, the Netherlands and Spain the coverage is just a mere 5% of their total UAA (Salhofer and Glebe, 2006).

EAGGF-Guarantee funds devoted to agri-environmental schemes (AES) during the 2000-2006 programming period amount to 13,906 MEUR, with Spain receiving approximately 6.4% of the overall budget (894 MEUR) (DG AGRI, 2006). Financial importance of the AES steadily increased during the 1993-1999 period and has now stabilized at around 2,000 MEUR per annum. Although the figure can seem large, it only represents 4% of EAGGF-Guarantee funds, but it accounts for nearly 50% of all rural development expenditure coming from this fund in the EU-15, a figure that declines drastically in the case of Spain to a mere 20%. This trend is reversed however in Andalusia where 79% of total EAGGF-Guarantee funds devoted to rural development are channelled through AES (in the case of Granada, this figure is reduced to 48% but nevertheless, the figure is more than twofold the Spanish average).

In Spain programmes currently in force are set up in Royal Decree 4/2001. Programmes can be grouped under eight horizontal concepts which include: extensification, organic agriculture, crop rotation, landscape/nature, autochthonous varieties and breeds, input reduction and other actions. The distribution of AES funds among concepts is reflected in Graph 1. Andalucía, and Granada as part of it, show a strong predominance of two measures (landscape/nature and organic farming), measures which are also concentrated in permanent crops (mainly olive trees), crops that account for 85% and 71% of all contracts signed under these concepts (MAPA, 2005). Extensification represents nearly 15% of all funds in Spain and in the case of Granada, the environmental fallow is the only available measure under extensification accounting for 45% of all measure payments in Andalucía.

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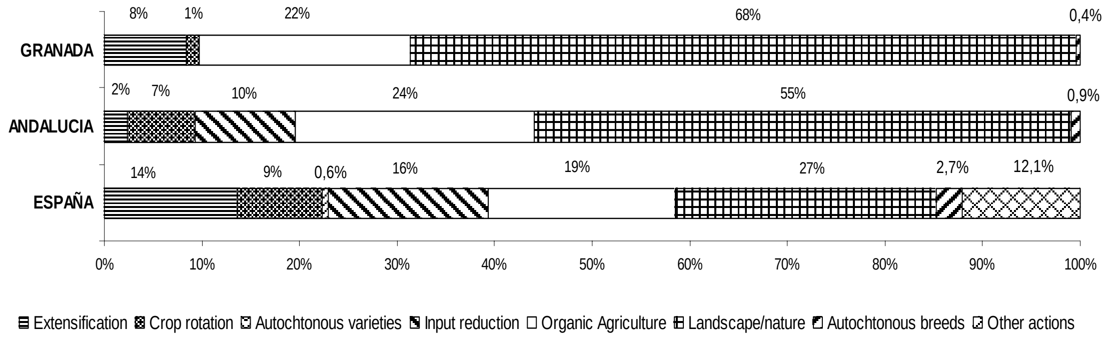
[1] From a property rights point of view, agri-environmental schemes assume that farmers have the right to undertake any production method in so far as it complies with GAP while society has the right to prevent any production method not complying with GAP.

Graph 1. Distribution of AES expenditure among measures 2004



Source: Own calculation with data from Ministry of Agriculture and AES managing authority

Nowadays, 28% of all area under AES in Spain is located in Andalucía receiving 23% of total expenditure. The province of Granada receives annually 4.6 MEUR as AES payments, close to 15% of total payments in Andalucía. The province of Granada receives annually 4.6 MEUR as AES payments, close to 15% of total AES payments in Andalucía.

C. A THEORETICAL MODEL FOR EXPLAINING THE ADOPTION OF AES

Factors affecting farmers' individual decision to enrol in AES can be grouped in four main categories (Vanslembrouck *et al*., 2002). Programme (type of measure, compensation paid, application costs, etc.) and market (food and environment demand) characteristics are two groups of extrinsic factors while farm (size, crop portfolio, etc.) and farmer (age, education, etc.) characteristics are intrinsic factors.

If we consider environmental provision by farms (Q_E) to be represented by the following function: $Q_E = g\left(X_E, Z\right) \geq \overline{Q_E}$, where X_E are the variable inputs devoted to environmental production, Z the quasi-fixed inputs (labour, land, etc.) which are devoted indistinctly to food and fibre or environmental production and $\overline{Q_E}$ the minimum provision of environmental outputs[2] which is a pre-condition for being eligible for agri-environmental payments.

Then, farmer's decision can be considered at a micro-economic level as a maximization problem where farmers maximize their utility (U) which is comprised of two variables: profit (π) and environmental provision (Q_E);

[2] This amount could be associated with good agricultural practices (GAP), needed to receive the single farm payment (Council Regulation N 1782/2003 and Commission Regulation N 796/2004).

$$\max U(\pi, Q_E) \quad [1]$$

Subject to the following restrictions:

$$\pi \leq p'_F \; f(X_F, Z) + p'_E \; Q_E - w'(X_E + X_F) - r'Z$$
$$X_E \geq 0 \quad [2]$$

Where p'_F, p'_E and w' are the price vectors for food and fibre products, environmental goods and inputs respectively; X_F inputs devoted to food and fibre production; and r´ the unit cost of quasi-fixed inputs.

A farmer has to select his production level by combining X_E and X_F in order to maximize his utility which as shown in equation [1] is affected by profit and environmental good provision. Restriction [2] states that farmer's profit is restricted by food and fibre income and participation in AES (where price is compensation paid by the managing authority) and production costs.

This model implies the following relationships:

a) Higher food and fibre prices (p'_F) reduce input use for environmental provision (X_E) as relative productivity of environmental provision decreases and, therefore, environmental provision (Q_E) decreases too.

b) Higher AES payments (p'_E) and/or higher marginal utility of environmental provision increase Q_E.

c) Lowering costs or efforts of programme participation (expressed as input requirements for environmental provision) also increases Q_E.

d) The higher the prices of food and fibre inputs the higher the provision of environmental goods (Q_E).

If the AES payment ($p'_E \; Q_E$) is not introduced in the model presented, the above-presented model reflects that participation is not only based on farm characteristics, as farmer characteristics enter the model through the utility function (U).

Previous research has tested the effect of many of these variables on farmer participation in AES (Q_E provision). Programme characteristics are not considered in our study as we are centred in one single measure with homogenous attributes for all farmers, but mainly payment levels (Wossink and Van Wenum, 2003; Vanslembrouck *et al.*, 2002; Van Huylenbroeck and Whitby, 1999) and contract duration (Wilson, 1997) are the main aspects which have been studied empirically while monitoring and targeting have been studied theoretically (Moxey *et al.*, 1999; Fraser, 2002 and 2004), with special focus on risk aversion. Market characteristics, although described in many cases (i.e. Gómez-Limón and Atance, 2004) have not been considered in enrolment decisions.

As far as farmer characteristics are concerned, there is a wide consensus regarding younger farmer participation (Wilson and Hart, 2000; Mathijs, 2003; Morris and Potter, 1995; Bonnieux *et al*., 1998; Vanslembrouck *et al*., 2002; Paniagua, 2001; Jongeneel *et al*., 2005). Nevertheless, when the AES is focused on extensification (as in our case study) older farmers are more prone to participate (Potter and Lobley, 1992; Drake 1999) as this type of AES require less labour and does not request new investments either in capital and/or knowledge which are the main reasons for deterring older farmers from participating. In this sense, in the evaluation of an extensification programme in Spain, Paniagua (2001) concludes that part-time farmers also tend to participate more often in programmes which require less involvement. The same conclusion has been obtained by Mathijs (2003) related to the willingness to adopt a countryside stewardship scheme in Belgium. In a research made by Jongeneel *et al*. (2005) on the adoption of different multifunctional activities by farmers in the Netherlands, having an outside job has a negative effect on participation in on-farm selling, agricultural services and recreation services due to the fact that these are activities that require quite a relative high amount of time and therefore there is less time available to participate in off-farm activities. However, an opposite and significant effect was found for participation in nature and conservation activities, which require less labour contribution.

Regarding farmer's education, Delvaux *et al*, (1999) and Dupraz *et al,* (2000) confirm that a better understanding of AES requirements or a higher environmental concern positively affect participation, while formal education is positively related to participation in studies undertaken by Wilson and Hart (2000), Delvaux *et al.* (1999), Dupraz *et al.* (2000) and Drake *et al.* (1999). On the other hand, a minority of studies (Bonnieux *et al.*, 1998; Jongeneel *et al.*, 2005) reach the opposite conclusion although the former alerts of collinearity between education and farm size that may have distort the coefficients and the latter is justified by the fact that higher education levels allow for higher opportunity costs of labour in other sectors.

Related with education, we can also consider farmer's attitudes towards the environment. Attitudes have been measured using several approaches (Bonnieux *et al.*, 1998; Morris and Potter, 1995; Drake *et al.*, 1999) but independently of the approach chosen, there is consensus regarding the positive relationship between participation and farmer's positive attitude towards the environment. Attitudes towards risk can also have an impact on farmer participation, mainly due to income security assured by environmental payments (Fraser, 2004). Nevertheless, Slangen (1997) and Sumpsi *et al.* (1998) claim that uncertainty regarding the future of AES and the impact of practices in future production ability may hamper participation. Risk aversion has also been highlighted as a factor interacting with monitoring and penalty programme characteristics (Ozanne *et al.*, 2001).

An additional attitude that shows divergent effect on participation is that of innovativeness, although Willock *et al.* (1999) detect that pioneer farmers are participating more often in AES in Scotland, Wossink and Van Wenum, (2003) do not find significant relationships between these two concepts by Dutch arable farmers in biodiversity conservation programmes, indicating that farmers associate participating in the existing conservation programmes with a traditional, non-innovative way of farming. Therefore, this influx is contingent on the degree of change the measure introduces into farm management.

Finally, farm characteristics also affect farmer participation in AES. The most important factors considered in previous studies include farm size, property regime and farmer's succession. The latter two factors provide divergent evidence regarding the sign of their influx, while size seems to affect positively participation (Wilson, 1997; Morris and Potter, 1995; Paniagua, 2001). However participation in some specific programmes such as biodiversity conservation schemes seems to be negatively related with size (Siebert *et al.*, 2006) and other authors find size not significant when analysing farmer participation in AES (Bonnieux *et al.*, 1998; Wynn *et al.*, 2001; Wossink and Van Wenum, 2003). Nevertheless, the most significant factor affecting participation seems to be prior participation in similar schemes (Potter and Lobley, 1992; Morris and Potter, 1995; Wilson, 1997; Wilson and Hart, 2001; Drake *et al.*, 1999) indicating that once a farmer has shifted its technology towards environmental goods provision, this provision tends to prevail in the long term as long as the scheme is offered.

A final component affecting participation, and resulting from the interaction of the former four can be described as "social capital formation" which results from the relationships between farmers, managing authorities, extension agencies and other farmers. These relationships foster information dissemination and programme promotion, which in turn results in higher enrolment. This hypothesis has been confirmed by the empirical research undertaken by Mathijs (2003) or Jongeneel *et al*. (2005) in different settings and for different AES.

To sum up, and quoting the review undertaken by Siebert *et al* (2006) based on 160 studies of AES, "*farmers' decisions are the result of complex social and cultural interactions as well as of wider economic and programme design features*". Our study will identify how far these prior finding apply to marginal dry-land areas and low requirement programmes.

D. CASE STUDY

As mentioned above, we want to identify the factors influencing the decision whether to enrol or not in the agri-environmental measure "environmental fallow" in three counties in the province of Granada (southern Spain). In this section we briefly present the main characteristics regarding agricultural production in the area, the AES characteristics and the questionnaire used as well as the sample selection.

D.1 STUDY AREA

The counties of Baza, Huéscar and Guadix are located in the northern high-plain of Granada province with an average altitude of 900 m above sea level. The area has a high water deficit (300-500 mm per annum) which associated with a high degree of soil erosion resulting in low yields (1,000 kg per hectare in dry-land cultivation). All three counties are considered as Less Favoured Area (LFA) areas within the EU LFA scheme classification.

The most extended cultivation pattern is that of extensive dry-land cereal (barley) following a 50% fallow ("*año y vez*") in combination with permanent crops (mainly almond and olive trees). Additionally, dry-land farming is associated with ovine livestock breeding in a semi-extensive production regime. The total number of sheep in the area according to the 1999 Census is 289.609 representing more than 75% of the cattle total numbers, with an average herd size of 207 animals. These herds are composed mainly of individuals of an autochthonous breed, with production under the geographical protected indication (GPI) "Cordero Segureño". Although the employment generation capacity of this ecosystem is not very impressive (it can be considered a low-input low-output ecosystem), agriculture accounts for 17.8% of total employment in the area (INE, 2004) and its relationship with local population provides an exclusive income support to approximately 70% of all farmers who are dedicated exclusively to this activity. Moreover, over 50% of total farmers are above 55 years of age, and therefore have little, if any, chances of obtaining employment in other sectors.

This traditional way of farming generates little environmental impact as the extensive production regime implies a minimum use of agro-chemicals which in turn favours flora and fauna conservation. This degree of conservation has been recognized by the fact that 5 out of the 6 protected natural areas in the province of Granada comprise surface within the study area. The combined agro-pastoral land use leads also to a sustainable resource use which combined with the predominance of rain-fed agriculture (over 85% of all cereals are non-irrigated) do not put additional pressure on the limited water resources in the area.

D.2 "ENVIRONMENTAL FALLOW" AGRI-ENVIRONMENTAL SCHEME

The AES selected for our case study is the "environmental fallow". The measure is enforced through RD 708/2002 and its positive impacts on the environment are related to steppe birds populations caused by the increase of animal feed (due to the reduction of fertilizer use that lowers mortality), the increase of winter habitat (due to the maintenance of stubble on the field) and the reduction of bird mortality (by banning harvesting at night and limiting the ovine density)(CMA, 2005). Main characteristics of the AES are reflected in table 1.

Table 1. Main characteristics of the "environmental fallow" agri-environmental scheme

<table>
<tr><td>Requirements</td><td colspan="2">Holding located in municipalities with fallow index[a] higher than 10.
Minimum uptake surface 1 ha.</td></tr>
<tr><td rowspan="2">Compromises</td><td>Tier1</td><td>Implementation of a Farm Management Plan
Keeping stubble on the field for at least 5 months.
Not using phytosanitary products during the no-cultivation period.
Livestock limited to 80% of maximum load reflected in GAP (1 LU/ha).
Harvesting at night forbidden.</td></tr>
<tr><td>Tier 2 (add.)</td><td>Cereal stubble must be left on the field on fallow surface.
Chop and leave straw on the field on at least 50% of fallow surface.
Livestock grazing period on stubble areas restricted to 3 months and the intensity must be controlled in order to avoid leaving bare soil.</td></tr>
<tr><td rowspan="2">Compensation</td><td>Tier 1</td><td>40.87 € per hectare and year.</td></tr>
<tr><td>Tier 2</td><td>19.26 € per hectare and year.</td></tr>
</table>

[a] Fallow index reflects the number of has that must be left idle per 100 has of "arable COP crops and set-aside".
Source: own elaboration using data from RD 708/2002

The analysis of the compromises summarized in table 1 combined with the farm characteristics described in the previous section concludes that this AES can be characterised as a “low-requirement” measures (Vanslembrouck *et al*., 2002). The “environmental fallow” measure has negligible or none effects of farmers’ utility function as its implementation has no high costs and it implies no income loss or novel practices to be implemented[3]. This is due to the fact that farmers growing cereals in non-irrigated lands have to comply with the compulsory fallow index leaving that area uncultivated. The only limiting factor, confirmed by our field work, is that of the livestock load limitation and the additional costs associated to “chop and spread the cereal straw”[4], action needed to apply for the additional Tier 2 payments (42% of our sample declares that this task is the one that requires the biggest effort).

During the 1996-2003 period, expenditure in Granada for the “environmental fallow” AES amounts to 1.5 MEUR which represents 12% of total AES expenditure. Mean payment is 1,183 € per beneficiary and 39 € per ha, figures that are significantly lower than the average payment for AES in Granada (1649 €/beneficiary and 96 €/ha for the period 1996-2003 according to Cala Rodriguez, M., 2003). This is not surprising as compensation has been calculated as “forgone income” and the most popular measures (“erosion control in olive orchards” (50% of all payments) and “organic agriculture” (28%)) imply tougher restrictions than this “extensification” measure. Notwithstanding the low requirements of this measure, only 4.5% of all eligible land (fallow and non-occupied lands) has been subject to the “environmental fallow” AES. Our case study area comprises 80% of all land under this AES in Granada.

D.3 QUESTIONNAIRE AND SAMPLE SELECTION.

A total of 300 farmers in the study area have been interviewed. Sample size has been allocated discretionally between farmers currently signed-up for the AES (40% of total sample) and the rest of cereal dry-land farmers (60%). Our sample of farmers under the AES represents 33% of total programme signups in the study area (see table 2).

[3] We do not consider here, due to lack of data, the effect on farmer’s utility related to land environmental quality.

[4] The mean cost of chopping the straw can be estimated in the range of 30-35 €/ha.

Table 2. Sample size distribution

County	Farms under AES			Farms not under AES		
	N	*%*	*Sample size*	*N*	*%*	*Sample size*
Guadix	188	49.1	59	829	33.9	55
Baza	69	17.8	21	742	30.4	63
Huéscar	131	33.1	40	874	35.8	62
TOTAL	**388**	**100.0**	**120**	**2,445**	**100.0**	**180**

Source: own calculations based on 1999 agricultural census and AES managing authority monitoring reports.

The questionnaire was designed by the research team and field tested with 5 farmers before generating the final version. It included 70 questions and generates 310 variables. Farmers were randomly selected from the population in each strata (enrolled / non-enrolled farmers in each municipality) and interviewed in their homes by two agronomists, the average interview lasted 45 minutes. The questionnaire gathered data regarding three main topics: a) farm basic data with special interest in cattle management, b) attitudes, opinion, knowledge and enrolment in AES and c) basic farmer socio-economic data.

E. ECONOMETRIC MODEL

Our dependant variable is of dichotomous nature (to enrol or not in the AES), thus the modelling approach used has been the logistic regression (Anemiya, 1985; Greene, 1997) where the independent variables will reflect both farm, farmer and market characteristics. The enrolment decision can be modelled as

$$P_i = E(y_i = 1 | x_i) = \frac{1}{1 + e^{-(\beta_0 + \beta xi)}} \qquad [3]$$

Where y_i is a binary variable reflecting whether the farmer has enrolled the AES or not, x_i are the independent variables reflecting the individual characteristics, β are the estimated model coefficients (including a constant). The model has to be estimated using maximum likelihood as OLS estimates are biased due to heterodasticity and non-normality distribution of residuals (Cramer, 1991). The model results as well as the univariate descriptive statistics for the independent variables are shown in table 3.

Table 3. Adoption of EF AES model results

	Logit model				Variables Description			
Variable	Parameter Estimate (β)	S.d	P-value	Exp (β)	Mean	Max.	Min	S.d
Constant	-5,622	1,344	0,000		-	-	-	-
AGE	0,057	0,018	0,002	1,059	49,327	23	83	12,544
EDU	0,502	0,239	0,036	1,651	1,971	1	4	0,915
INNOV	1,906	0,358	0,000	6,724	0,555	0	1	0,498
GRAZE	-1,245	0,681	0,067	0,288	0,104	0	1	0,306
ASO	0,580	0,334	0,083	1,785	0,427	0	1	0,496
Number of observations = 211 -2log likelihood null = 281,951 -2log likelihood model = 222,603 χ^2= 59.347					Nagelkerke's R^2 = 0,333 Mc_Fadden R^2 = 0,210 % of correct predictions = 75,4% p-value= 0.000			

Where AGE is farmer's age; EDU reflects farmers education with four incremental levels (1=no formal education; 4=university education); INNOV is a binary variable reflecting farmers attitude towards new policy measures (1=innovative; 0=precautions)[5]; GRAZE is a binary variable that reflects whether farmer needs additional grazing area outside the farm and ASO is a binary variable reflecting whether the farmer belongs to a farmer association or not. Overall, assessed by the pseudo R^2 measures and the % of correctly predicted observations the model is very significant. The model provides an improvement of 23 % with regards to a naïve model including only a constant as independent variable.

Regarding the independent variables which have been included in the model, we will analyse them following the characterization presented in section C. As far as farmers' characteristics are concerned significant effects have been detected for age, education and innovativeness. Related to farm characteristics, animal feed regime has been identified as having a significant impact[6]. Last, and confirming the importance of

[5] This variable is constructed from a question in the survey in which the farmer declared his willingness to adopt new proposals in farm management related to policy developments, the original to a four statement scale which have been recoded to reflect only those considering themselves "pioneers" (i.e. willing to adopt any development offered).
[6] This variable could also be related to market characteristics, as input market price for alternative feeding sources. As we have no spatial or time variation regarding this price we have decided to include it as a farm management characteristic.

the social capital, it is important to note the variable ASO ("belonging to a farmers organization") in order to explain participation.

Older farmers show a greater probability of participating in the AES. This finding supports the low-requirement character of the environmental fallow measure, with an effect similar to that detected by Potter and Lobley (1992) and Drake *et al*. (1999) for measures also implying minor changes in farm management. The positive effect related to education can be understood from the strong correlation that this variable has with the understanding of the AES requirement, so it's the lack of knowledge regarding this measure what partially limits its adoption. This finding is further supported by the effect of ASO variable, as we can assume that farmers participating in professional bodies (such as farmer´s unions or cooperatives) have a better access to policy requirements. As stated in section C, farmers' attitude to institutional innovation can have a positive or negative effect on AES enrolment. In our case, the influence is positive mainly due to risk issues (the measure cannot be considered innovative from a farm management point of view). Although the measure studied does not imply any risk in the market production crops, there is risk and uncertainty derived of the possibility of being sanctioned for not applying the measure correctly or a delay in the payments. The variable INNO is the one with the most significant marginal effect on the logit model as it is shown in the highest odd ratio (Exp (β)) value in table 3.

One of the main restraints detected during the surveying was livestock load restrictions. This is confirmed by the effect of the GRAZE variable indicating that compensatory payments are not enough to cover the additional costs of paying for pasture outside the farm associated either with big herd sizes or 20% restriction on livestock load. This restriction also affects the possibility of benefiting from LFA compensation schemes in the case of full time farmers.

E. SUMMARY AND POLICY IMPLICATIONS

In order to improve the design of AES, evaluating factors influencing farmer's enrolment decision is a key aspect. Moreover considering that in the New Rural Development Program 2007-13 (Council Regulation 1698/2005), Spain has chosen a de-centralized application leaving regional administration a big degree of freedom when designing new measures (implementation plans are currently being drafted) in order to meet environmental needs with a higher degree of success.

Besides the fact that the agri-environmental measure studied does not imply an important change in farm management (specially for those farmers which do not combine cereal production with ovine production) and therefore compensation is received for traditional farm management (Gonzalez de Molina, 2002), our results suggest that besides intrinsic factors related to the farm and farmer characteristics which can not be changed by AES[7], more attention should be paid to behavioural aspects and programme design. Farmer's attitude can be influenced through education and extension, if measure knowledge is increased a higher uptake can be predicted. Therefore it is important to improve the social capital in both professional and non professional organizations to stimulate farmers to adopt sustainable farming practices. AES interaction with other policy measures, specially LFA compensation and ovine premiums, also constraint the capacity of AES to provide viable alternative to participating farms, a fact that must be taken into account when AES payments account only for a small portion of overall agricultural policy expenditure. In this case, farmers not participating requested on average an additional 33% premium in order to participate, a quantity affected by the existing LFA premiums. The new rural development regulation could allow changes in cross-compliance and policy resource intensity taking into account these findings.

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