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Factors affecting adoption behavior of farmers in Bulgaria - agri-environment public goods for flood risk management

Фактори влияещи на нагласите на фермерите в България – агроекологични публични блага за намаляване на риска от наводнения

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ABSTRACT

The study examines several factors affecting the adoption behaviour of farmers in Bulgaria for provision of agri-environment measures. Recently, research interest focuses on how agriculture can provide ecosystem services and public goods. The role of the Common Agricultural Policy has been also studied for creating economic incentives for that matter. Provision of agri-environment public goods from agricultural ecosystems raises many practical and theoretical questions mainly due to the nature of public goods and ecosystem functioning. However, the role of farmers as main actors in taking care for the environment in rural areas has been focusing the attention of researchers on examining the factors that affect the uptake of conservation measures. The study analyses the behaviour of 77 farmers in Iskar River Basin in Bulgaria for three measures – buffer strips, crop rotation and grasslands. A logit model was used covering socio-economic factors, environmental awareness, characteristics of the agri-environment schemes and information provision. As a result, land tenure, environmental awareness and clarity about the scheme requirements appear to be the significant factors affecting adoption.

Keywords: agri-environment measures, ecosystem services, adoption behaviour, logistic regression

РЕЗЮМЕ

Проучването разглежда няколко фактора, влияещи върху поведението на фермерите в България за внедряването на агроекологични мерки. Напоследък изследователският интерес се съсредоточава върху това, как селското стопанство може да поддържа екосистемни услуги и да предоставя публични блага. Оценява се и ролята на Общата селскостопанска политика за създаване на икономически стимули и мотивация. Предоставянето на агроекологични блага от агроекологичните екосистеми повдига редица практически и теоретични въпроси главно поради естеството на публичните блага и функционирането на екосистемите. Ролята на земеделските стопани като основни участници в грижата за околната среда в селските райони обаче насочва вниманието на изследователите към изследване на факторите, които влияят върху въвеждането на мерки за опазване. Докладът анализира поведението на 77 фермери в басейна на река Искър в България за три мерки - буферни ивици, поясно редуване и превръщане на обработваемите земи в пасища. Използван е логистичен модел, обхващащ социално-икономически фактори, екологична осведоменост, характеристики на агроекологичните схеми и предоставяне на информация. В резултат се оказва, че наличието на собствена земя, осведомеността за околната среда и яснотата относно изискванията на схемата са сред основните, които влияят върху внедряването на мерките.

Ключови думи: агроекологични мерки, екосистемни услуги, нагласи за внедряване на мерки, логистична регресия

INTRODUCTION

The aim of the paper is to present the results from the first of a kind study in Bulgaria which addresses the factors influencing the adoption behaviour of conservation practices on farmlands, namely agri-environmental measures. The paper is organized as follows. In the first part, a literature review is presented which covers the topics of public goods provision, ecosystem services from farmlands and factors affecting famer behavior for adoption of agri-environment measures. In the second part, details on the survey and description of the logit method are presented. In the results and discussion part, the main findings from the logit models for three agri-environmental measures can be found. After discussion of the results, the paper concludes with recommendations for policy making and future research.

Literature review

The term public good is closely related to the so-called externalities which are the result of an activity on the welfare of third parties. Simply put, these are the effects that come from a given economic entity that imposes benefits or costs, respectively positive or negative externalities, to third parties outside this activity (Samuelson and Nordhaus, 1985). According to Samuelson and Nordhaus (1985), public goods represent a positive external effect that everyone can enjoy and no one can be excluded from deriving the benefits. Hence, some agricultural activities may lead to non-commodity output in the form of public goods (OECD, 2015; Kolstad, 2011; Laffont, 1988) which in some cases are form of a positive externality on society, given that public goods coming from agriculture are mainly connected to improved environment (or its aspects such as water, biodiversity, etc.). It is the multifunctional role of the farmers to create positive externalities, generated by farms' activities, that take the form of non-marketed outputs (Randall, 2002). The term public good has a well-established foundation in the economic literature. Generally, the term refers to goods and services that have clear benefits for society, but their delivery cannot be achieved through market mechanisms, mainly due to the fact that it is not possible to determine their demand and supply. This distinguishes them from private goods for which there are well-built functioning markets. The concept for public goods as part of the neoclassical economy is mainly related to the work of Paul Samuelson (1954, 1955), where he defines collective consumption goods as those, from which everyone can benefit, and the individual consumption for one does not impede others from taking advantage as well (Samuelson, 1954). On this basis the two main features of the public goods can be derived - non-rivalry and non-excludability (Ostrom and Ostrom 1977). The first characteristic means that consumption of the good by one consumer does not reduce the benefits to other consumers. The second characteristic means that if a commodity is available for one individual, it is available for everyone, or the consumption of the benefit of one person does not exclude its consumption from another person. On the other ground, ecosystem services are the direct product of the ecosystem potential and functions of a given ecosystem. Thus, taking care and maintaining the potential of the ecosystem, we can influence the provision of ecosystem services. Both concepts, for public goods and ecosystem services, have their own theoretical background and school of scientific thought but somehow they overlap as many ecosystem services from farming can be also public goods (Dwyer et al., 2015). But it is the enhanced ecosystem functions that will provide the ecosystem service as an outcome, which being translated into market terms will in some cases have the characteristics - non-rivalry and non-excludability. Moreover, as Constanza et al., (2008) noted, another way to classify ecosystem services is according to their "excludability and rivalness" status. For example, most of the provisioning services are both rival and excludable which make them pure private goods and services, while some regulatory services (including flood risk control) are non-rival and non-excludable, which make them pure public goods.

Activities in a given agricultural holding can often have the characteristics of public goods or services which provoked research interest in the field of agri-environmental public goods. The decision to provide

different ecosystem services from agricultural land places a focus on the inclusion of farmlands in the scope of policies to promote delivery of public goods. Depending on the nature of consumption, some ecosystem services fall into the scope of the public goods definition defined by the neoclassical economy. According to that, the extent to which an ecosystem service falls into the category non-rivalry and non-excludability can also determine the way in which it can be provided.

On the other hand, the provision of agri-environmental public goods has two debatable aspects – who provide the incentive (the government or private incentive) and the scale of provision (farm level/ landscape level). The national policies of many countries in the European Union (EU) apply a set of adaptation and mitigation measures related to flood risk management within the boundaries of agricultural holdings, as they are primarily based on public investments and are focused on improvement of drainage systems (Morris et al., 2010). Few policies are targeted to reduce the formation of floods on agricultural land (Morris et al., 2010) such as agri-environment payments which target soil erosion reduction, but at the same time have the potential to reduce surface water runoff. One of the objectives of the EU rural policy is agricultural development but with conservation of natural capital. Farmers often face trade-offs between farm profitability and environmental performance, but as they are the main actors in taking care of the latter, their role in improving the environment is immense. Therefore, in order to motivate the farmers (the "seller) to implement practices which can lead to better environmental quality, an economic incentive is needed. The compensation mechanism for encouraging farmers to adopt agri-environment measures (AEMs) is based on the income forgone and additional costs associated with the implementation of the measures. It should be clarified that the public intervention and the creation of incentives for farmers to adopt conservation practices, lies on the concept for public goods provision from agriculture where in some cases the farmers need an incentive to provide these public goods and an economic transaction is needed in the form of compensation (Cooper et al., 2009). The most commonly used example for provision of public goods from farmlands is the conservation of biodiversity, when the latter depends on suitable conservation practices which otherwise wouldn't be implemented as farmers would prefer more profitable allocation of their resources as land and labor. Public intervention in some cases might be justified on the grounds that if some public goods can be provided incidentally without targeted intervention, for others with insufficient supply is necessary to create an appropriate economic incentive. The governmental support for the provision of public goods raises many theoretical and practical questions, mainly in two directions: 1) does the support lead to actual provision of public goods (do the policy instruments help in achieving the policy objectives), and 2) is there a more privately-oriented incentive to provide voluntarily public goods.

Another aspect which needs to be considered is the scale of implementation. Currently, in most cases in the EU, the AEMs are adopted on individual bases, rather than on collective one. When speaking of biodiversity conservation or water quality/quantity we must take in mind the spatial characteristics of the ecosystem, which may require collaboration of farm managers. Hence, a mismatch appears between the privately managed farmland and the scale of the needed actions. A "scale mismatch" appears between the scale of administrative management of the measures (the farm scale) and the scale of the ecological processes, because the goods and services from ecosystems may be localized or derived from a larger area, which is the case with flood control (Cumming et al., 2006). The agri-environment schemes do not encourage landscape level coordination which leads to individual and uncoordinated actions, especially in the case of services such as flood prevention, which require landscape scale (Prager et al., 2012) in order to deliver more effective and efficient provision.

In this regard, another important element in the provision of AEMs is the factors that influence the farmer behavior and public goods provision. A number of researchers define the processes of implementing agricultural practices as a complex one that requires a

combination of different theoretical models (Upadhyay et al., 2003). Generally, the studies on the introduction of new practices in agriculture are related to the theory of diffusion of innovation, created by Everett Rogers in the 1940s. However, some authors note (Pampel and Van Es, 1977; Murray, 2000) that environmental measures differ from those for commercial purposes, and argue that conventional models used to explain the adoption behaviour are not suitable when examining measures related to the protection of the environment. For example, the introduction of new technology is often triggered by the market-oriented behaviour of the economic agent, while the implementation of conservation practice is triggered by public policy or is caused by public pressure for better environmental quality (Roling and Jiggins, 1994). Also, in the first option, the market is the driving force, while in the second, it is the need for compensation for the existence of negative externality.

Some researchers are looking at the adoption behaviour of a measure in terms of individual utility while others find that maximizing the profits may not be the only reason to implement a given practice, and that other factors may be relevant (Lynne et al., 1988; Defrancesco et al., 2008; Vanslembrouck et al.,2002; Jongeneel et al., 2008). Nowak (1987) questions the economic motives as the only way to explain the behaviour of farmers, noting that the economic motive fails to explain the heterogeneity of farmers' preferences and does not take into account that behaviour is driven by a set of attitudes and preferences. Chouinard et al., (2008) offers a very different view of farmers' behaviour in the implementation of conservation measures. The study uses a multi-utility model, which does not consider farmers only in terms of maximizing profits and personal gain. It takes into account heterogeneity in the motives of farmers and how it influences their behaviour. On this basis, they are divided into ones that aim only to maximize their profit regardless of whether their activity generates positive or negative environmental externalities, and those that put a value on environmental quality which is the more altruistic behaviour. Other research relates the implementation of of agri-environment measures to socio-economic factors. Some researchers analyse the financial aspects of the change that may occur on an agricultural land, for example the change from productive agriculture to one that produces ecosystem services (Yu and Belcher 2011; Patrick and Barclay, 2009; Lynch et al., 2001; Genghini et al., 2002; Kabi and Horowitz, 2006). Others assume that farm features such as size and productivity affect the adoption of conservation measures. For example, the larger the farm is, the more likely it is for the farmer to participate in such measures (Ghazalian et al., 2009; Yu and Belcher, 2011). Also, some studies show (Bachev et al., 2011), that there is a strong correlation between duration of the period of existence of the farm holdings and the period during which farmers take care to improve their sustainability. Regarding the characteristics of the farmer, studies show (Sattler and Nagel, 2010; Wilson and Hart, 2000) that the level of education, participation in off-farm activities and government trust contribute to a positive attitude towards the introduction of environmental measures. Farmers' characteristics such as experience, age and education may prove to be important for the willingness to implement water management measures (Dwyer et al., 2010). It is important to note that personal perceptions and attitudes may vary depending on where the farm is located in a given river basin (Rouillard et al., 2010).

Another important factors influencing how a certain support scheme can lead to a real implementation of measures are the duration and requirements of the scheme, bureaucratic burden, compensation levels, and whether the proposed practices would really have an effect (Lynch et al., 2001; Yu and Belcher 2011; Patrick and Barclay 2009; Christensen et al., 2011). The positive attitude towards environmental protection are also found to have an influence on adoption behaviour. Durpaz et al. (2003) argues that environmental awareness can have a positive impact on decision-making. For example, Gould et al. (1989), exploring the implementation of soil erosion measures, focuses specifically on soil erosion awareness. Morris and Potter (1995) also focus on the importance of understanding farmers' attitude towards environmental protection as decision makers. Young et al. (2003) found

that, in addition to the attitude towards the environmental protection, proper information is important when deciding on the implementation of a measure. Lack of information on the economic and technical aspects of the measure may adversely affect the owner's decision to implement it (Nowak, 1991). It should be noted that the costs of obtaining the information may be high, which further prevent the farmer from implementing the measure.

Since the 1990s, there has been a strong research interest on the implementation behaviour of conservation measures and the study of farmers' attitudes towards EU policies (Burton, 2004). In Europe, research focuses on farmers' participation in the CAP schemes and agri-environmental programs (Morris and Potter, 1995; Falconer, 2000; Wilson and Hart, 2001; Vanslembrouck et al., 2002). Wilson (1996) divides the factors that affect farmers in two groups - external and internal. In the first category is the impact of policies and the level of compensation, and in the second - the attitude towards the scheme and the environment as a whole. Vanslembrouck et al. (2002) use a conceptual model that reflects this duality influencing the decision of the farmers. On one hand is the characteristic of the scheme and on the other - the characteristics of the farmer himself.

From the review of the studies, which try to assess the likelihood of introducing agri-environmental activities, it can be concluded that although different assessment approaches and different variables are used, all have several common features. Almost all of them are based on the rule that the farmer aims to maximize his benefit when participating in voluntary agri-environment schemes. Therefore, a significant impact on its decision has the level of compensation, which covers lost profits and increased costs resulting from the application of the measure (Todorova, 2017a). A number of authors (Vanslembrouck et al., 2002; Ervin and Ervin, 1982; Kingsbury and Boggess (1999); Wilson, 1996; Wynn et al., 2008; Defrancesco et al., 2008) identify groups of factors beyond the level of compensation, because it is not sufficient to cover the complexity of the choice a farmer faces. This implies a more in-depth analysis in order to capture more closely the relationship between attitudes of farmers to implement a measure and the factors affecting their behavior.

MATERIALS AND METHODS

The study examines several factors affecting the adoption behavior of farmers in Bulgaria for implementation of agri-environmental measures for provision of public goods, based on the theoretical findings. The study analyzes the behavior of farmers in the Iskar River Basin for three measures – buffer strips, crop rotation and conversion of arable land into permanent grasslands. These three conservational measures are proved to have positive impact on soil erosion and reducing surface runoff and flood risk from farmlands. The chosen agri-environment measures fall within the agri-environment scheme in Bulgaria. The technical requirements for the first measure, buffer strips, is that they should be positioned along the contours or across the slope of the farmland, with a width of 4-8 m, and the distance between them ranges between 20 m and 80 m (Ruseva et al., 2010). The technology of the second measure includes rotation of different types of crops (e.g. corn and wheat) which has direct effect on limiting the removal of the soil and creating preconditions for increasing the soil moisture and reducing the surface runoff (Nekova and Lazarov, 2007). The measure for conversion of crop land into permanent grassland is usually suitable for land with a very high erosion risk and low productivity. The practise has high anti-erosion effect and impact on surface water runoff.

Survey details

For the analysis of the factors affecting the uptake of agri-environmental measures, structured interviews were carried out in the period December 2016 – January 2017. A sample of 77 farmers was formed, who cultivated mainly grain-cereals, technical crops, oil and fodder crops, whose land is mainly on the upstream of the Iskar river watershed and in municipalities with semi-mountainous and hilly terrain with high risk of erosion and high runoff formation. The interviews were carried out on the phone and face to

face. The questions in the survey were formed in several sections: 1) characteristics of the farm –land tenure, size; 2) socio-economic information - age, education, income; 3) flood risk perception; 4) agri-environmental schemes – clarity regarding the requirements of the scheme, feasibility assessment, bureaucratic burden, attitudes toward conservation activities.

Based on the literature review and the author's assumptions, all these aspects were assumed to have influence on the decision-making about the adoption behavior of AEMs. The predicted influence of these factors (independent variables) on the adoption of AEMs is summarized in Table 1.

Logit model

Logit model was used to assess the probability π (chance of event Y) that a farmer implements one of the three measures. A binary model is preferable since the dependent variable is a dichotomous - two choices - to implement or not a certain agri-environment measure. Since the dependent variable is a dichotomous, it is not possible to predict its numerical value in the multiple linear regression. Using the logistic function is the better option in this case compared to the linear (e.g. probit model) since the goal is to reveal what is the odds ratio about the effect of a predictor variable on the likelihood that one outcome will occur.

In binary logistic regression, the dependent variable Y can only accept two values from 0 to 1. The purpose of the logistic regression is to predict the probability of the two possible categories of event Y, which should be coded as 0 and 1 (Ganeva, 2015). Logistic regression uses binomial probability distribution theory where there are only two values for the forecast and where the probability of the event is calculated to take 1 rather than 0.

For analysing the factors affecting the adoption of AEMs, participation is defined as: P=1, if yes P=0, if no. Since π is the likelihood that a farmer will implement the measure, the likelihood for not implementing the measure is 1- π. The chance is defined as the likelihood

Table 1. Expected influence of independent variables on adoption behaviour

Independent variables		Expected influence on adoption behaviour		
		Buffer strips	Crop rotation	Grasslands
Age	More younger farmers	+	+	+/-
Education	Higher level	+	+	+
% of income from farmland	Higher % of income	-	-	-
Size (ha)	Willingness to implement AEMs is higher with bigger farmland	+	+	+
Land tenure	Existence of own land and / or longer-term land use contracts	+	+	+
Attitudes environment	Positive attitude	+	+	+
Previous experience	Positive experience of previous participation in any of the RDP measures	+	+	+
Information	High level of information about the possibilities for AEMs	+	+	+
Duration	The duration of the measure is acceptable to the respondents	+	+	+
Scheme requirements	Respondents are aware of the conditions and requirements of the measure	+	+	+

Source: Own findings

of implementation versus the probability of refusal to implement. Using a logarithmic transformation of probability π to result into the event Y, the probability of implementing a given practice (π = 1) can be written as follows:

$$\text{Logit}(\pi)=\text{Ln}\left(\frac{\pi}{1-\pi}\right) = \beta 0 + \beta 1X1 + \beta 2X2 \ldots\ldots + \beta nXn \quad (1)$$

Where X1, X2,.....Xn are the independent variables, and Bo, B1, ...Bn are the parameters of the model. The dependent variable is the probability of implementing one of the measures, while the independent variables included in the model are presented in Table 1.

The implementation of a logit model requires a correlation analysis. Ideally, the independent variables must be correlated with the dependent variable, but to have a poor correlation with each other (Ganeva, 2015). The result is presented as a correlation matrix. Its size is equal to the number of the examined variables. As the correlation coefficient is closer to 0, the relationship is weaker. To assess the correlation between the independent variables and the dependent variable, a correlation analysis was performed using the programming tool SPSS. It will provide the statistical stability of the logit model by tracking whether the relationship is accidental and how strong it is.

When using a logit model to study a set of independent variables, it is appropriate to use forward regression - Forward or Backward (Ganeva, 2015). Thus, the regression equations include the independent variables according to their influence on the dependent variable. This ensures that the independent variables with the most statistically significant impact are included in the model.

RESULTS AND DISCUSSION

Buffer strips

The first step in implementing the logit model for the measure building and maintaining buffer strips is to perform the correlation analysis. The correlation between the dependent variable and the independent variables is evaluated. The independent variables proved to be statistically significant are: 1) land tenure, 2) previous experience of participation in the RDP, 3) attitudes for the environment, and 4) clarity about the conditions and requirements for implementing the measure. After inclusion of a stepwise method of analysis, the following regression equation is formed:

$$\text{Ln}\left(\frac{\pi}{1-\pi}\right) = \beta 0 + \beta 1 \text{ land tenure} + \beta 2 \text{ previous exp} + \beta 3 \text{ attitudes env} + \beta 4 \text{ clarity measure} \quad (2)$$

All independent variables are statistically significant (Table 2 – correlation matrix results). The Omnibus test of model coefficients shows the statistical significance of the logit model (P≤0.05). This test determines whether the model is better off with all of the independent variables included compared with the "Block 0" condition, when none of them are in the model. The other important aspect for the goodness of the test is the R Square Nadelkerkes. It shows the part of the variance in the dependent variable, which can be explained by logistical regression. According to this indicator, 62% of the variance in the dependent variable is explained by the combination of the independent variables, which is a high percentage. The greater the value of this indicator, the better the regression model is.

The value of the exponent of the regression coefficient Exp (B) shows the increase in the probability of the expected event resulting from the increase of the selected independent variable. Interpretation of land tenure factor shows that if a farmer has his own land and / or long-term lease agreements, he is 4.6 times more likely to implement the measure. If a farmer has previous experience with public intervention schemes (including agri-environmental schemes), the chance to implement the measure is 5.8 times higher. The positive attitude towards environmental protection increases the chance of introducing the measure by 9.3 times and if a farmer feels he understands the conditions and requirements for implementing the measure, the chance to implement the measure increases by 7.5 times. The results for the four independent variables confirm the initial assumptions about their impact on the resulting variable.

Table 2. Logit model and correlation results for buffer strips

Parameter	Logit model results				Correlation matrix results
	Exp(B)	Std. error	Wald	Sig.	
Land tenure	4.60	0.68	4.98	0.026	0.427
Previous experience	5.85	0.77	5.24	0.022	0.432
Environmental attitude	9.37	0.80	7.83	0.005	0.460
Clarity	7.52	0.76	7.13	0.008	0.510

Number of observations = 77
Omnibus test - P≤0.05; -2 Log likelihood - 55.8; R Square Nadelkerkes - 0.62
Correlation is significant at the 0.01 level (2-tailed)

Crop rotation

Following the correlation analysis, the independent variables proved to be statistically significant are:1) size of the arable land; 2) Land tenure; 3) Past experience with public schemes; 4) Duration of the scheme contract; and 5) Clarity of the measure. After inclusion of a stepwise method of analysis, only the independent variables with the most statistically significant impact are included in the regression equation:

$$\mathrm{Ln}\left(\frac{\pi}{1-\pi}\right) = \beta 0 + \beta 1 \text{ land tenure} + \beta 2 \text{ clarity requirements} \quad (3)$$

All independent variables are statistically significant at P<0.05 (Table 3 – correlation matrix results). The Omnibus test of model coefficients shows that the logit model is statistically significant. The R Square Nadelkerkes shows that 58% of the variance in the dependent variable is explained by the combination of independent variables. Interpretation of the land tenure variable shows that if a farmer has his own land and / or long-term lease agreements, the chance of introducing the measure of crop rotation increases by 7.6 times. If a farmer feels that the conditions and requirements for implementing the measure are clear, the chance is increased by 23 times. This high score is due to the fact that the majority of respondents said they were not fully aware of the conditions and requirements of this particular measure. This shows that low awareness of opportunities and requirements may lead to a lack of willingness to adopt AEMs. The results for both independent variables confirm the initial assumptions about their impact on the resulting variable.

Pastures

Following the correlation analysis, the independent variables proved to be statistically significant are:1) Size of arable land; 2) Land tenure; 3) Attitude towards environmental protection; 4) Past experience with public schemes; 5) Duration of the scheme contract; and 6) Clarity of the measure. After using the stepwise method of analysis, only the independent variables with the most statistically significant impact are included in the regression equation:

Table 3. Logit model and correlation results for crop rotation

Parameter	Logit model results				Correlation matrix results
	Exp(B)	Std. error	Wald	Sig.	
Land tenure	7.63	0.70	8.37	0.004	0.437
Clarity	23.41	0.72	19.37	0.000	0.629

Number of observations = 77
Omnibus test - P≤0.05; -2 Log likelihood – 57.6; R Square Nadelkerkes - 0.58
Correlation is significant at the 0.01 level (2-tailed)

$$Ln\left(\frac{\pi}{1-\pi}\right) = \beta 0 + \beta 1 \text{land tenure} + \beta 1 \text{ attitudes env} + \beta 3 \text{ clarity requirements} \quad (4)$$

Table 4. Logit model and correlation results for grasslands

Parameter	Logit model results				Correlation matrix results
	Exp(B)	Std. error	Wald	Sig.	
Land tenure	7.77	0.58	12.35	0.000	0.533
Environmental attitude	2.66	0.58	2.81	0.093	0.350
Clarity	4.19	0.59	5.78	0.016	0.411

Number of observations = 77
Omnibus test - P≤0.05; -2 Log likelihood – 73.5; R Square Nadelkerkes - 0.47
Correlation is significant at the 0.01 level (2-tailed)

All independent variables are statistically significant at P<0.05 (Table 4 – correlation matrix results). The Omnibus test of model coefficients shows that the logit model is statistically significant. The R Square Nadelkerkes shows that 47% of the variance in the dependent variable is explained by the combination of independent variables. Long-term contracts and own land will increase the chance of adopting the measure with 7.7 times. A positive attitude towards environmental protection will increase the chance of implementing the measure by 2.7 times. If a farmer considers he understands the terms and requirements for implementing the measure, the chance is increased by 4.2 times.

CONCLUSIONS

Often some agricultural activities may result in externalities – positive or negative. The agricultural policy in the EU provides incentives for conservation behaviour of farmers in order to enhance the provision of public goods from agricultural ecosystems. For that matter, understanding farmers' behaviour is an integral part for further developing and improving the European agricultural policy.

The paper analyzed several groups of factors assumed to have an influence on the adoption behaviour for implementing three agri-environment measures - buffer strips, crop rotation and conversion of arable land into permanent grasslands. Logit model was then used to reveal the likelihood of adopting these three measures and the impact on farmers' decisions. Not surprisingly, one of the main independent variables included in all of the three logit models is land tenure. Long-term contracts and possession of own land can be a prerequisite for the implementation of specific agri-environmental measures. Unfortunately, the prevailing practice in Bulgaria is for one-year land use contracts, which implies a lack of motivation to undertake a long-term environmental commitment. Furthermore, the peculiarity of the regulating ecosystem service requires adopting the measures on a catchment scale. This implies the initiation of collective actions, which will allow the implementation of agri-environmental measures on a catchment scale. However, the fragmentation of the agricultural land, the short-term contracts and the resulting uncertainty, may delay the initiation of collective actions. Undertaking long-term land use initiatives, including the implementation of a land consolidation policy may promote a long-term environmental engagement and security to the farmers that the longer period of provision of certain measure will not be compromised because of a short duration of the contracts.

The lack of adequate information and familiarity with the requirements appears to be a strong barrier for involvement into agri-environment schemes. Raising awareness about the requirements for the implementation of agri-environmental activities, including the provision of training campaigns for farmers, could have an effect on the clarity aspect of the measures. Providing a local source of information namely increasing the capacity of the Municipality agencies can provide guidance and

information for the farmers. There is a need to strengthen the link between municipal information services and farmers in particular in terms of raising awareness of the scheme's conditions and the effects and the importance of the implementation of agri-environmental activities for ecosystem conservation.

The results of this paper are important regarding further policy design and decision-making, as the low interest and information may prevent further use of the instruments of the CAP. Distinct studies have explored the barriers on the adoption of these practices (Todorova, 2017b), but it is necessary to further broaden the research on how to motivate the adoption of agri-environment measures. Keeping in mind that some ecosystem services, like flood control, demand broader scale of implementation, it is necessary to explore the opportunities for collective action for the provision of public goods. Also, it is crucial to explore other approaches apart from the currently used agri-environmental schemes that will embed long-term attitudes towards environmental conservation and will have an effect on forming long-lasting values among farmers.

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