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Abstract—Land-use in rural areas may be reallocated between farmland and forest and nature areas. This paper addresses reasons for forest and landed estate owners to own their property and motivations for different activities of forest and real estate owners, including leasing out land to farmers. In 2006 we carried a survey among 171 forest and landed estates owners in the Eastern part of the Netherlands (response rate of 44%). Preserving family property, preserving nature and landscape, and hobby or spending free time are ranked as important reasons for having a forestry enterprise or a landed estate. Most of the owners can be characterised as multifunctional. They often fulfil a combination of wood production, preservation of nature and landscape, providing facilities for tourism and hunting, leasing out of land and agriculture. Based on results of regression analysis we can conclude that not every forest and landed estate owner prefers multifunctionality in a similar way. Leasing out land to farmers is one of activities where income is an important reason.

Keywords— Landownership, multifunctionality, forest and landed estate owners

I. INTRODUCTION

Certain rural communities are presently overwhelmed with intense growth and development pressures, others are threatened by opposite pressures and are experiencing concentrated losses of population and employment opportunities [1]. Even though agriculture and forestry are by far the largest land users, they are no longer the main source of economic activities and employment in the rural communities. As forest and real estate owners are important as suppliers of agricultural land it is important to know what motivates them for instance to switch from leasing out land to agriculture to other activities like forestry or tourism? In this paper we will focus on owners in dense populated areas. This paper addresses reasons for forest and land owners to own their property and motivations for different activities of forest and landed real estate owners.

The paper is organized as follow. In Section 2 we present a theoretical model on decision-making behaviour of the forest and landed estates owners. Section 3 gives a brief description of the data used in this paper. In Section 4 we analyze the driving factors behind the multifunctional activities of forest and landed estates owners by making use of regression analysis. Section 5 gives some conclusions.

II. THEORETICAL BACKGROUND

The analytical framework chosen for analyzing the decision-making behaviour of the forest and landed estates owners is an adapted *farm household model*. In this model the household members undertake actions and make choices to maximize the household's expected utility [2]. Farm, forest and landed estate households are assumed to not only maximize a single variable like profits, but also take into account their preferences for certain types of farm and labour activities as well as social interactions. Social interaction is defined as participating in a social network, so that higher levels of network participation can be labelled as a higher level of social capital. The expected utility function approach makes it possible to introduce forest and landed estates owners' attitudes, trust in the government, social capital and education level as explicit factors in explaining participation in multifunctional activities (see [3], [4] and [5]).

Assume that the forest and landed estates household maximises an expected utility function $U(.)$ dependant on a composite consumption good, leisure, a vector of forest and landed real estate owners and non- forest and landed real estate owners activities (denoting the utility derived from these activities), full income and a vector of forest and landed real estate owners household characteristics. The vector of forest and landed real estate owners and non- forest and landed real estate owners activities accounts for the possibility that certain activities generate a positive (or

negative) psychic income. For example, producing impure public goods (e.g. preserving wildlife and landscape) can increase the utility of the forest and landed real estate owners household via positive psychic income as well as by income compensation. Full income is assumed to be directly included in the utility function to account for risk aversion ($U(.)$ is a concave function in full income). Since the different activities experience different degrees of risk and uncertainty, by adjusting the activity mix the household can influence the variability of full income (e.g. increasing the share of off-forest and landed real estate owners employment probably creates a more stable stream of income than having a speculative activity, which faces both a price and quantity risk).

The household has to take into account two constraints. The first constraint is the budget constraint, which states that the money spent on the consumption good should be less or equal to the money earned with productive activities. The latter include the production of (traditional) forest and landed real estate owners commodity outputs (wood and food), the production of (multifunctional) private good outputs (e.g. camping), the production of impure public goods (e.g. nature and landscape) and off-forest and landed real estate owners employment. The aggregated net-revenue of these activities is the total amount of money available for consumption. Investment and the possibility of borrowing are ignored for the sake of convenience.

The second constraint the household faces is a time constraint. The time spent on forest and landed real estate activities, other activities, and leisure should be no more than the total time that is available to the household. As is often done in household models, the two constraints can be combined into one so-called full-income constraint [6]. According to this constraint the money spent on the consumption good plus the money spent on leisure (opportunity cost of labour times the amount of leisure time consumed) should be less or equal to full income. Full income is equal to the profits earned with all forest and landed estate activities plus the monetary value of the total time endowment (total time available by the household multiplied by the opportunity costs of labour).

III. DATA

This section gives a brief description of the survey and a description of the respondents. The survey was carried out in Eastern part of the Province of

Gelderland, more precisely all of the 15 communities East of the river IJssel were included. In total, 75 out of 171 Dutch forest and landed estate owners sent back the filled in questionnaire; a response rate of 44 %. After incomplete questionnaires were discarded a sample of 71 forest and landed estate owners remained.

About 62 % of the respondents ($n = 71$) was single owner, 25 % of the respondents had shared ownership and about 10 % was a manager. The average age was 61 year. About 90% of the respondents are male. The average education level is high. The most part of the respondents has a School of Higher Vocational Education or higher done. The average area forest and landed estate of the respondents is 63 ha. However, the dispersion in size is large, from about 5 ha to 530 ha. Almost 40% of the respondents has more than 50 ha forest and landed estate, and 13 % even more than 100 ha. For the respondents, the dominant category of land use is forest. On average about half of the area (30 ha) of the enterprise is forest, grassland and arable land are 20 and 13 ha respectively.

Preserving family property, preserving nature and landscape, and hobby or spending free time are ranked as important reasons for having a forestry enterprise or a landed estate. About 90% of the respondents or their partner has an income outside the forestry enterprise or landed estate. In spite of importance of the income outside of the forestry enterprise or landed estate it is interesting to know the contribution of the forest enterprise or landed estate to the family income. Almost 45 % of the respondents have to make up each year from family income to the forest enterprise or landed estate, 30 % break even, about a quarter has small or some contribution to family income, and only 3 % has a substantial contribution to family income and enough for living. In general, it means that having a forest enterprise or landed estate is impossible without an outside income.

IV. EXPLAINING THE DIFFERENT MULTIFUNCTIONAL ACTIVITIES

In this section five models are presented in order to explain multifunctional activities in forest and landed estates. A set of five binomial models are estimated to explain the specific types of multifunctional activities (wood production, nature and landscape conservation, agriculture, leasing out of land, and tourism (including hunting)). These five models are called *activity-specific models*.

A Logit model was used to estimate several specifications for the model to explain the choice for multifunctional forestry and landed estates. We started with a model specification which included all the variables simultaneously. Subsequently we tried to simplify the model by eliminating variables based on their theoretical and statistical significance (size, type of land use, e.g. grassland, arable land). The statistical significance was based on the test results of the null hypothesis that the effect of an individual explanatory variable is not different from zero, using p-values. For comparability and symmetry reasons the same set of explanatory variables is used in all models. If a variable appeared to be significant in one of the models, it was also kept as an explanatory variable in

all other models, even if it was not always significant there.

The set of explanatory variables contains variables based on factor analysis characteristics and control variables (education level and age). The variable selection process resulted in the elimination of the variables which were not significant in any of the models estimated. The variable size in ha was dropped for theoretical reasons, since it shows strong correlation with income and leasing out of land. The variable income is also to some degree a measure of business size. The final estimates for the five binomial ordered logit models including the factor analysis are available upon request by the authors. Table 1 provides the variables which were significant in one of the presented models.

Table 1. Estimation results for activity-specific models

	Multifunctional activities of forest and landed estates owners				
	Wood production	Nature and landscape management	Agriculture	Leasing out of land	Tourism (including hunting)
Income from exploitation	+	-***	+	+	+
Limited restrictions on land use is important		-**			
Preserving nature and landscape and sufficient knowledge are important		+			
Owning property as a hobby		-**		-**	
Trust in provincial, national and EU government					
Trust in State Forestry commission and Nature Monuments	-**				
Trust in ownership interest groups	+				
Trust in local government					+
Dummy strong autonomy in ownership is preferred					+
Dummy free public use is important		+			
Dummy working time		+	+		
Age		-*			
Education				+	-**
Number of obs	67	67	67	67	67
Chi square	34.5	34.4	27.7	29.9	37.8
Count R2	88%	81%	81%	76%	84%
Pseudo R2 (McFadden)	0.44	0.41	0.31	0.32	0.45

Legend: * significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

The pseudo-R² for the five activity-specific models are satisfied and varies between 0.31 (agriculture) and 0.45 (tourism including hunting). It appears that multifunctional activities are reasonable to explain given the choice of explanatory variables. The goodness of fit for the five activity-specific models is fairly reasonable. All five models have significant Chi-squares, indicating that all variables are jointly different from zero for each model. This confirms the relationship between the dependent and explanatory variables in the model. Overall between 76 per cent (leasing out of land) and 88 per cent (wood

production) of all the forest enterprises and landed estates were correctly classified as having a certain type of multifunctional activity or not. The results of the five individual models for each explanatory variable are discussed and interpreted in more detail below.

The variable *Income from exploitation* is statically significant for all the five models. The coefficient is positive for wood production, agriculture, leasing out of land and for tourism (including hunting). This implies that earning an income from operating the enterprise important is for the respondents. It is based

on gaining an income from the enterprise as investment object, an income from exploitation of the property, and an income from leasing of land. However, the coefficient of the variable *income from exploitation* is negative for nature and landscape conservation. Apparently, if owners would like to earn an income from their enterprise they will not choose for nature and landscape conservation. This activity involves producing and preserving (public) goods lying in the public domain.

The variable *limited restrictions on land use* means that the respondents think that it is important that there are not too many regulations from the government and informal restrictions from the local community. This variable is only statically significant for nature and landscape conservation and the coefficient is negative. It means that respondents who think it is important that there are not be to many restrictions on land use are less likely to be involved in nature and landscape conservation.

The variable *preserving nature and landscape and sufficient knowledge are important* refers to the combination of sufficient knowledge and preserving nature and landscape. It proves that this variable is statically significant for nature and landscape conservation. It means that sufficient knowledge and preserving nature and landscape is important for choosing the activity of nature and landscape conservation and not for the other activities.

The variable *owning property as a hobby* refers to hobby as a reason to be an owner of a forest enterprise or landed estate. The variable is statically significant and negative for the activities nature and landscape conservation and leasing out of land. It means that nature and landscape conservation and leasing out of land are not done or can be seen as hobbies. The motivation for being involved in nature and landscape management seems to follow more from the attitude that it is important to preserve nature and landscape than from argument like income and hobby. Apparently, they are more driven by intrinsic motives. For leasing out land income is the driving factor.

The attitude variable trust in the provincial, national or EU government has no effect on the probability of participation in one of models. It is against our expectations. Since these activities are dependent on (the rules of) the government (time-consistency, green service policies, local rural planning policies etc.) or as contract giver trust in the different levels of government is an important requirement. *Trust in State Forestry Commission and Nature Monuments* is

statically significant negative for the activity wood production. Apparently, the respondents consider both organisations as not positive for wood production. *Trust in ownership organisations and interest groups* is based on trust in the Bosschap (Board for Forestry and Silviculture) and Federation of private landownership. The variable is statically significant positive for wood production.

The attitude variable *trust in local government* is only statically significant for tourism. The coefficient is positive. The relationship with the local government is important for instance because of licences for camping sites (e.g. the allowed number of places for caravans on the property). Further zoning policies (destination plans) are also important.

Autonomy in ownership is only statically significant for tourism (including hunting). It has a positive effect on the probability of participation in tourism. Respondents who value autonomy in ownership highly are more likely to become involved in these activities. Autonomy in ownership implies that the owner is free to manage his property in the way he likes. It is a dummy variable; 1 if the respondent believes that he has a large autonomy concerning the way he uses his property. It means that he highly values the property rights of his property.

Free public use is a dummy variable; indicating the respondent thinks that public has freedom of entry. This variable is only statically significant for nature and landscape conservation. It has a positive effect on the probability of participation in nature and landscape conservation. Apparently, they do it for the public which is in line with altruistic motives. Respondents who value free public use highly are more likely to become involved in this activity. This question refers to use of paths and roads only. From the survey follows that respondents have a negative attitude towards the use of the property outside paths, after sunset and by mountain bikes. These variables were not included in model.

Working time is also a dummy variable, indicating that the respondent spend more than 10 hours a week on his enterprise or landed estate. This variable is statically significant for nature and landscape conservation and leasing out of land. Respondent who spend more than 10 hours a week on their enterprise or landed estate are more likely to become involved in these activities. Age is statically significant for nature and landscape conservation. The coefficient is negative. It means older respondents are less involved in this activity.

Education is a dummy variable which is 1 if the respondent has a higher vocational or university education. This variable is statically significant for leasing out of land and tourism. The coefficient is positive for leasing out of land. This means that respondents with a high education level are more likely to become involved in this activity. The coefficient is negative for tourism (including hunting). This means that respondents with a high education level are less likely to become involved in this activity.

V.CONCLUSIONS

From the analysis we can conclude that not every forest and landed estate owner prefers multifunctionality in a similar way. The attitude towards policy restrictions on land-use influences the participation in nature and landscape conservation differently compared to other activities. The motivation for being involved in nature and landscape management seems to follow more from the attitude that it is important to preserve nature and landscape than from arguments like income or hobby. Apparently, they are more driven by intrinsic motives. For leasing out of farmland income is the driving factor. This suggests that policy makers should clearly target rural development policies to take into account the characteristics of forest and landed estate owners.

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