

## **Farmland improvement obligation: solution for land-tenure insecurity?** Pellon perusparannusvelvoite: ratkaisu pellon hallintaoikeuden epävarmuuteen?

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Vuokrapeltojen tuottavuuden ja sadontuottokyvyn on todettu heikentyneen, koska niiden perusparannuksia laiminlyödään. Tämä on yhteiskunnan kannalta ongelmallista, koska vuokrapeltojen tuottavuuden laskiessa kaikkia panoksia tarvitaan yhä enemmän saman elintarvikemäärän tuottamiseen. Samalla myös maatalouden ympäristöohjelmien tehokkuus alenee, kun vuokramaiden ravinnetalous heikkenee ja suurempi osa kasviravinteista päätyy vesistöihin.

Pellon hallintaoikeuteen liittyvä epävarmuus on kaventanut vuokramiehen taloudellisia kannusteita pellon kasvukuntaa parantaviin toimenpiteisiin. Vuokramarkkinat eivät ole myöskään kyllin tehokkaat, jotta pellonomistajat pystyisivät maan vuokran kautta realisoimaan perusparannusten kustannuksia niitä vastaavaksi tulovirraksi. Pellonvuokramarkkinoiden kummallakaan osapuolella ei näin ole kannusteita pitkävaikutteisten ja maatalouden tuottavuuskehitystä tukevien pellon perusparannusten tekoon. Tämän vuoksi on tarpeellista etsiä uusia ja järeitäkin keinoja perusparannustason ylläpitämiseksi. Yksi kovimmista vaihtoehdoista on perusparannusvelvoite maanomistajille.

Tässä tutkimuksessa keskityttiin ensin toteutuneisiin pellonvuokrauspäätöksiin ja tuleviin vuokrausaikomuksiin. Tavoitteena oli näin luoda profiili pellonvuokraajista ja saada käsitys pellonvuokrauksen todennäköisyyttä kasvattavista tekijöistä. Toisena keskeisenä tavoitteena oli selvittää pellonomistajiin kohdistuvan pellon kunnostusvelvoitteen vaikutusta pellon käyttöön ja erityisesti pellon pois vuokraamiseen.

Koska kunnostusvelvoite edustaa aivan uutta politiikkakeinoa, jonka vaikutuksia ei voida päätellä tilastojen avulla, käytettiin tutkimuksessa suomalaisiin pellonomistajiin kohdistunutta kyselyaineistoa. Postikyselyssä pellonomistajille luotiin skenaarioita kunnostusvelvoitteesta ja sen kustannusvaikutuksista. Omistajat kertoivat aikomuksensa pellonvuokraukseen olettaen kunnostusvelvoitteen toteutuvan.

Toteutunutta pellonvuokrausta ja pellonvuokrausaikomusta joko ilman kunnostusvelvoitetta tai velvoitettuna kunnostuksiin mallinnettiin logit mallein. Aineiston tarkastelu kolmen vuokrauspäätöksen paneelina mahdollisti pellonomistajien heterogeenisuuden esiintuomisen. Mallinnus voitiin myös kohdistaa pellonkäyttömuotoihin yleisesti, jolloin saatiin selville kunnostusvelvoitteen vaikutus muihin käyttömuotoihin ja valintoihin, kuten pellon myyntiin.

Tulokset osoittivat, että pellon vuokraus lisääntyy lähitulevaisuudessa, sillä nykyisen 56 % sijaan 62 % pellonomistajista aikoi vuokrata peltonsa pois. Vuokraamisen todennäköisyyttä lisäsivät ikä, pieni tilakoko ja käsitykset useiden vuokralle ottajien markkinoista. Kunnostusvelvoitteen euromääräinen kasvattaminen vähensi merkittävästi pellon poisvuokraamisen todennäköisyyttä. Pellonomistajat voitiin jakaa toteutuneen vuokrauksen ja aikomusten perusteella kolmeen ryhmään. ”Vuokraisännistä”, jotka olivat suurin pellonomistajaryhmä, 89 % aikoi vuokrata peltonsa pois. Viljelijäryhmässä (33 % pellonomistajista) vain 10 % harkitsi pellon poisvuokrausta. Pienin pellon poisvuokraushalukkuus (4 %) oli kolmannessa ryhmässä, joka arvosti voimakkaasti pellon omistukseen liittyviä aineettomia arvoja.

Pellonomistajiin kohdistuva kunnostusvelvoite vaikuttaisi merkittävästi nykyisin peltonsa pois vuokranneiden maanomistajien valintoihin. Se lisäisi erityisesti pellon myyntiä. Tulosten perusteella voidaan todeta, että peltomarkkinat reagoivat voimakkaasti pellon kunnostusvelvoitteeseen.

Avainsanat: rakennemuutos, pellon vuokraus, peruskunnostus, heterogeenisuus

## Introduction

In most Western countries, rapid structural change in agriculture has reduced the number of farms. However, the structural development in the ownership of arable land has only been moderate as previous farmers have maintained their capital in land when moving to off-farm occupations (Ryan et al. 2001). Some of the previous farmers have left their agricultural land idle while others have leased it to active farmers. Under fixed-term cash lease contracts, which are common in many European countries, the tenant's incentives to make long-term land improvements are in many cases weak because of land-tenure insecurity (Soule 2000, Holden and Hailu 2002; Fraser 2004). The neglect of or delay in land improvements has had significant effects not only on agriculture but more generally on the living environment and recreational value of rural assets.

Land improvements calls for a social planner to build up rules, directives and safeguards that give motivation mechanisms either for landowners or agricultural entrepreneurs to make long term investments in the quality of agricultural lands. One policy to solve the shortage of land improvements would be to encourage land owners to sell land to operating farmers with taxation policy (Myyrä & Pouta 2010). Other possibility that, to the best of our knowledge, has not been analysed in previous literature, would be to create land improvement obligation (LIO) policy in the case of land leasing. Previous literature of land leasing has focused mainly in land leasing contract types and the choice of contract (Bierlen et al. 1999, Slangen et al. 2008, Chaudhuri & Maitra 2002, Rainey 2005). However, the literature does not provide solutions of including land improvements in the land tenure contract terms on markets where the number of land owners exceeds the number of leaseholders.

As, there has been less interest in the effects of compulsory conservation regime or policies obligating land improvements the landowners reactions are unknown. Policies that enforce land improvement can also encourage landowners to select other land use alternatives instead of leasing out. That kind of policy can encourage land selling or afforestation. There may also be heterogeneity in reactions to policy for land improvement obligation.

The objectives and approach of this study are first to demonstrate severity of the problems related to leasing by analyzing the current agricultural land leasing behaviour and future leasing intentions based on a survey data of Finnish farmland owners. A policy to obligate the landowners to make land improvements is evaluated as potential policy instrument to prevent the degradation. To analyse the effect of land improvement obligation we use contingent behaviour method that focus on landowner land use choices either to lease land or to choose other land use alternatives under the policy. Finally, we analyse the heterogeneity of land use choices and that of reactions to improvement obligation. Our theoretical frame is based on utility maximization framework, where it is expected that a landowner selects a preferred, utility maximizing alternative of all land usage possibilities.

## Survey data

A mail survey was used to acquire data on landowners' sale preferences. A questionnaire was mailed to a sample of 5 762 land owners. These landowners represent all landowners in Finland. The mail survey yielded a total of 2 684 observations from the sample of landowners. This accounts for 47% from the total number of mailed questionnaires. In addition to the mail survey data, information from the register of agricultural taxation and income taxation was available for the respondents, including income from agriculture, capital investments and paid work.

The questionnaire focused on a single real estate owned by the responding landowner. After asking for general information on the real estate, current land use choices were measured by asking if the use of agricultural land during the previous summer 2006 included land uses of farming, managing without farming, leasing, setting aside and afforesting. Respondent selected in each alternative either yes or no. Future landuse intentions were assessed in similar way whether the respondent intended to farm, manage without farming, lease out, set aside or/and afforest all or part of the agricultural land on the estate in the next five years (yes/no).

The future landuse intentions were assessed also under LIO. The improvement obligation would cause measures every five year. The expense levels for improvements were 60, 90, 120 and 150 euro/hectare/year. The improvement obligation would cover out leased lands but also lands cultivated by the owner him/her self as well as lands managed without farming.

In addition to the typical background information, owner and farm characteristics, the landowner objectives for their land ownership were assessed using 28 separate items with a five-point

response scale. The items were developed based on landowner objective items used in forest owner studies in Finland (e.g. Kuuluvainen et al. 1996, Karppinen 1998). These items were used in latent class analysis to form landowner groups (Pouta et al. 2010). As a result of this latent class analysis based on objective statements five owner groups were formed: *agricultural earners*, *multiobjective owners*, *family-oriented owners*, *dispassionate amenity owners* and *indifferent owners*.

The land use choices are presented in Table 1. The first column describes land use choices in the survey year. The second column gives the land use intentions in 2011, and the third one land use intentions under LIO –policy in 2011. Approximately from 1200 to 1700 respondents responded to various dichotomous questions of land use alternatives. As several land use alternatives could be chosen at the same time the share of participants did not accumulate to 100% but to a higher number. Leasing out the land was the most often selected land use alternative under both time frames and also under LIO policy. However, the policy decreased the share of intended leasers 13 percents from 61% to 48%. The effect of the policy was negative in all other land use alternatives except in land selling that increased 14%, which represents a doubling in land sales.

Table 1. Choice of land use alternatives, present, future intention and intention under LIO policy.

	2006	2011	2011 LIO
	chosen alternative, % share		
farming	55.1	50.7	47.1
managed without farming	33.8	43.2	42.1
sold		14.9	28.4
leased out	56.1	61.2	48.2
set aside	19.6	25.4	21.2
afforestation	10.3	47.1	36.5
Total	174.9	242.5	223.5

### Econometric approach

First, the leasing decision is considered as an independent of other land use options, which means that the choice set in the modelling is constructed from two alternatives: either lease or select other alternative. Each leasing choice is modelled individually with logit models and then the choices are collected in a panel of choices modelled with panel logit. The heterogeneity in the leasing choice is further modelled with latent class for dichotomous choice. Second, all six land use options are considered to belong in the choice set and the model describes the choice between all land use alternatives. The presentation of econometrics concentrates on analyse of heterogeneity in the leasing choices.

#### *Latent class for leasing choice*

Behind the observed variables, a number of unobserved variables may exist that could indicate separate subpopulations, each having their own distribution of observed variables. In our application, there might be subpopulations of landowners with their own distributions in relation to the land leasing choices. To take this heterogeneity into account and improve the explanatory power of the logit models, latent owner groups were investigated with a latent class model for binary choices. The basic idea in a latent class model for binary choice data is that the parameters of a regression model differ across unobserved classes (Wedel and DeSarbo (1994).

Predictors whose values may change across replications are assumed to affect the dependent variable. These predictors were differences in the leasing choice,  $j$ , occasions, i.e. if the decision were past or intended  $t$  (past = 0, intention = 1, in this case in the coming five years), and the policy,  $p$ , related to land improvement obligation.

$$P_{i,j,t,p|s} = \frac{\exp(x_{ijt} \beta_s)}{1 + \exp(x_{ijt} \beta_s)}$$

The latent class model for binary choices in Latent Gold software was used to estimate the model in a logit form. Bayesian Information Criteria (BIC) were used to define the number of classes.

*Latent class for choice over landuse alternatives*

The land leasing decision  $j$  is only one option from the total choice set of landuse alternatives  $n$ . In the next step we were interested of these alternative landuses for leasing out the land. First we used conditional logit (McFadden 1974) model to model the choice between the landuse alternatives given attributes of landuse and the land improvement obligation cost. To allow heterogeneity of respondents we applied latent class model (Boxall and Adamowicz 2002) containing a component related to attributes of the choice and a latent component related to the socioeconomic and land ownership characteristics of the owner. Thus the probability that landowner will select land use alternative  $n$  conditional on being in segment  $s$  can be expressed as follows

$$Pr_{in|s} = \sum_{s=1}^S \left( \frac{\exp(z_i \lambda_s)}{\sum_{s=1}^S \exp(z_i \lambda_s)} \right) \cdot \left( \frac{\exp(x_{in} \beta)}{\sum_{n=1}^N \exp(x_{in} \beta)} \right)$$

where  $z$  is the vector of individual and plot specific variables and  $\lambda$  the vector of related parameters to be estimated. The first term in the parenthesis on the left hand side is the membership probability of class  $s$  and the second term is choice probability that individual  $i$ , who belongs to class  $s$ , chooses alternative  $n$  from a particular set  $N$ .

For modelling the choice between all land uses the data was rearranged so that those respondents who selected only one landuse alternative were coded to six rows to the new data set, each row representing one alternative. Those owners who selected more than one alternative got number of rows that were equal to selected alternative times six possible alternatives. Their rows in the data were weighted with factor  $1/\text{selected alternatives}$  to give each respondent an equal weight in the data.

The parameters for attributes and individual characteristics are estimated in the latent class model simultaneously by maximizing the likelihood function in the state of incomplete prior information of class membership or choice probabilities.

**Results***The single land leasing choice*

The single land leasing choice instead of other land use alternatives were modelled with three logit models (Table 2), first, for current behaviour, second, for future intentions with current policy and third, for future intentions with management obligation policy. The first model of current choice of leasing classified 57% of owner as leasers. The model revealed several farm and owner related variables that significantly predicted the leasing choice. From the farm variables the higher field area decreased the probability of leasing. In present state the leasing was more probable in agriculture oriented southern and western Finland than in northern and eastern areas of Finland where the leasing markets are very limited. These leasing farms represented a lower level in production buildings and machinery. The model shows that the owners' higher age and living outside the farm increased the probability of leasing out. From the objective classes particularly family oriented owners and passionless amenity owners decided to lease out more often than owners in other objective classes.

The intention to lease agricultural land in the future was on higher level than the current leasing as 62% of owners were intend to lease their land in the future. However, the leasing choice was not as easily explained with background variables as only few of the previous variables, such as owners age, objectives and field area, were significant in the model. In addition to these, the owners perceptions of rental markets, i.e. the number of potential renters, increased the intention to lease.

The variable of special interest in the third model predicting the intention to lease under LIO was the cost of the LIO for landowner. As in the data for contingent behaviour question all respondents faced positive costs and no zero cost were included, the cost variable was not significant in explaining the leasing intention in the model.

Table 2. Land leasing choices.

	Current leasers		Future leasers		Future leasers under LIO		All choices in panel	
	b	p-value	b	p-value	b	p-value	b	p-value
Intercept	-0.308	0.341	-1.230	0.000	-1.262	0.000	-2.877	0.003
Cfactor:intercept							4.043	0.000
Time							0.714	0.000
LIO cost					0.001	0.766	-0.013	0.000
Field area	-0.016	0.002	-0.036	0.000	-0.024	0.000	-0.053	0.000
Eastern Finland	-0.495	0.001			-0.285	0.051	-0.950	0.009
Northern Finland	-0.842	0.000					-1.377	0.002
Production buildings and machinery	-0.317	0.000					-0.722	0.000
Owners age	0.026	0.000	0.025	0.000	0.022	0.000	0.071	0.000
Lives on the farm	-0.267	0.067						
Owners perception of rental market			0.320	0.002			0.443	0.043
Objectives: agricultural earners (ref.)		0.000		0.048		0.002		0.001
multiobjective owners	0.267	0.222	0.291	0.169	0.311	0.147	1.484	
family oriented owners	0.908	0.000	0.583	0.005	0.584	0.004	2.031	
passionless amenity owners	0.664	0.000	0.469	0.013	0.168	0.365	1.977	
indifferent owners	-0.152	0.561	0.249	0.373	-0.389	0.150	1.934	
N	1233		1121		1076		859	
Lease on data, %	51%		62%		44%		53%	
Lease based on model, %	57%		80%		38%		55%	
Correctly classified	69%		70%		61%		92%	
Log-likelihood (model)	-725		-670		-700		-947	
Chi-squared	256		158		103		5944	
p-value	0.000		0.000		0.000		0.000	
R <sup>2</sup>	0.24*		0.18*		0.12*		0.80	

\* Nagelkerke-R<sup>2</sup>

To get more insights of the effect of the LIO costs on the landuse decision all three leasing choices were modelled as a panel data. The model for all three choices revealed the increasing interest for land leasing as the time variable got positive coefficient. The improvement cost related to LIO policy significantly decreased the probability of leasing out the agricultural land. Other explanatory variables followed the lines of the previous three models.

The model for panel data were used to simulate the effect of LIO cost on the share of land leasers and on the share of leased agricultural land. As there was a strong tendency the leasing to increase in the future it is interesting to define the level of LIO that would balance the growth. The level that would balance the growth to the current level of 51% of landowners was the LIO cost of 166 euros.

#### *Heterogeneity of leasing behaviour*

To analyse further the land leasing choices we used panel data in a latent class model to allow the heterogeneity of leasing behaviour. We were particularly interested to see if there were groups of land owners that react differently to LIO policy. After running several models with increasing number of classes we ended up to three class model based on BIC information criteria. Two of the three classes could be easily interpreted from the leasing behaviour and background variables. The landlords formed over half (55%) of the sample and farmers one third (33%). Their leasing probability based on the data differed considerably: in the group of landlords it was 89% and in the group of farmers 10%. However, they had equally strong reaction to LIO policy. In the third group, 12% of the sample, were named as amenity owners based on their landowner profile, the probability of leasing was even lower than among farmers, 4% in the data. They had also weaker reaction to LIO policy than the two other groups.

The groups were further described with farm and landowner variables having landlords as a reference group. In the group of farmers compared to landlords the farm profiles were quite apparent: large field area, previous investments in production buildings and machinery and lower share of forestry income. Also landowner profiles provided natural description of the difference between farmers and landlords, as farmers were younger and lived more often on the farm. Compared to farmers' objectives landlords belonged more often to owner groups emphasising other objectives than agricultural earnings.

Particularly interesting was the profile of the amenity owners. Their estates were even less production oriented than the estates of landlords. These estates were located in northern and eastern Finland. The field areas were small and there were no adequate production buildings or machinery on the forestry oriented estates. Owners' perception of the number of potential renters was lower than in other owner classes. Family and amenity oriented objectives were emphasised in this class. It seems that the estates were of value to owners from family historical or amenity reasons but the owners did not perceive any opportunities for agriculture by farming or even leasing out the land. Even though, the term "lifestyle land ownership" is not used in Finnish literature the results clearly indicate their existence.

The latent class model (Table 3) for the land use choices provided detailed picture of the heterogeneity of land use preferences. Based on this model the heterogeneous groups of land owners could be named as farmers, landlords and amenity owners. In the model with three classes leasing out land was preferred to farming only by landlord group. They also considered selling and managing without farming as positive alternatives compared with farming. For farmers, farming as reference land use alternative, all the other land use alternatives got negative sign. The amenity owners had totally different preference structure while they preferred management without farming but also afforestation. They considered selling as least preferred alternative. The covariates of this latent class models confirmed the socioeconomic profile for the three land owner groups.

Table 3. Choice between land use alternatives.

	Land- lords	Farmers	Amenity owners	Wald overall p-value	Wald equality p-value
	Class1	Class2	Class3		
Class size, %	55	34	11		
Attributes					
LIO cost	-0.009	-0.009	-0.003	0.000	0.080
Land use label					
farming				0.000	0.000
management without farming	0.552	-1.138	1.247		
selling	0.300	-3.228	-1.547		
leasing out	2.633	-2.033	-0.305		
setting aside	-1.048	-5.883	0.509		
afforestation	-0.057	-3.633	1.270		
Covariates are not presented here					
N	735				
Correctly classified, %	63 %				
Log-likelihood (model)	-1857				
R <sup>2</sup>	0.285				

## Conclusions

This study shows that despite of its problems, i.e. shortage in land improvements the farming based on land leasing is increasing in the future without targeted policy. Based on the characteristics associated with leasing, it seems very natural that the leasing is very preferred alternative for many owners that do not live on the farm, have not adequate production machinery or buildings or are older owners that have not had continuators of farming in the family. Although the probability of leasing is generally increasing there are also spatial differences as leasing is no longer an alternative on the regions where agriculture has declined and the markets for leasing are weak.

Although there are other attempts to solve the problems related with the divide between landownership and active farming, such as activating land markets with tax programs (Myyrä & Pouta 2010), this study assumes that all land owners are not willing to sell their land and obligations are needed to retain the quality of agricultural land and to prevent the shortage of land improvements. In this study we showed that land improvement obligation would solve some of the problems as the leasers would accept even 160 euro annual land improvement cost so that the level of leasing would

remain unchanged. Partly the obligation for improvement would solve the problem by activating land sales.

This study showed that there is strong heterogeneity among landowners with respect to their leasing behaviour and to their reactions to land improvement obligations. In addition to very obvious groups of landlords and farmers also amenity owners, with totally different preference structure for the use of agricultural land, were identified. Although, their share was small, around 10%, their existence showed that it is not realistic objective to keep all the land in production.

Several academic attempts have been made to find effective policy measures to achieve balanced structural development in agriculture and land ownership. However, the political acceptability of these measures is still an open issue to be focused in future studies.

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