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# Assessing farmers' preferences to participate in agri-environment policies in Thailand

## Abstract

Incentive based policies can play an important role in improve agricultural sustainability. This paper applies a Choice Experiment approach to elicit small scale farmers' preferences for a potential policy scheme. Latent class models were used to analyse the farmers' responses to investigate their preferences, heterogeneity in preferences and the willingness to accept compensations. The results revealed that farmers are willing to participate however; overall they show an aversion to drastic changes in their farming activities. The analysis suggested that majority of the farmers preferred schemes with shorter contract lengths and moderate reduction in chemical use. Furthermore, the study also informs policy makers by identifying the farm and farmer characteristics that influence farmers' behaviour.

**Keywords:** Sustainable agriculture, Choice experiments, Agri-environment schemes, Latent Class model, Preference heterogeneity

## 1 Introduction

Natural landscapes in the past century have been transformed into human managed lands mainly used for food production. This agricultural expansion and intensification has primarily been caused due to concerns about food security for the ever growing population. However, agricultural practices not only determine the level of food production but also to a large extent the state of the environment through its ability of providing various ecosystem services (regulating, supporting, provisioning and cultural services). With the ever increasing agricultural intensification the provision of the services has been affected negatively. For example high applications of fertilizers and pesticides increase the nutrients and toxins in ground and surface water; intensive farming activities such as ploughing and mono-cropping can degrade the soil quality and its ability of water retention, which leads to increased water runoff, loss of topsoil and nutrient leaching into the water systems.

Environmental concerns along with concerns for sustained food production gave rise to interest in the sustainability of agricultural and food systems. The idea was to develop agricultural technologies and practices that do not have negative impacts on the environment, are adoptable and effective for farmers and can improve the provision of the ecosystem services. Sustainable Agriculture involves efficient production of agricultural products, resource conservation, protection of farm biodiversity, protection and improvement of the natural environment along with safeguarding the social and economic conditions of the farming communities (Lee, 2005). It also helps in the provision of a range of public goods & services, such as, clean water, biodiversity conservation, carbon sequestration, flood protection, improved landscapes (Pretty *et al.*, 2003). It integrates natural processes such as nutrient recycling, soil regeneration, carbon storage, pest control into food production processes in order to enhance the provision of ecosystem services provided by the agroecosystems and minimises the use of pesticides and inorganic fertilizers and makes better use of knowledge and skills of the farming community (Pretty *et al.*, 2003; Pretty, 2008).

Thailand has become one of the biggest exporters of agricultural products for many years. The majority of poor households are in agricultural sector and it is their main household' source of

income. However, they are still in debts and many of them have to work in non-agricultural sector as well as only agricultural income is not enough to improve their quality of life and pay off the farm debts (Office of Agricultural Economics, 2010). The total agricultural area in Thailand is around 114.6 million rai<sup>1</sup>. Around 26 percent of Thai households own agricultural land about 19.4 rai each (National Statistical Office, 2014) and 80 per cent of agricultural land is not in the irrigation areas (Office of Agricultural Economics, 2012). The expansion in agriculture in Thailand, in order to support food security and Thai economy, is also associated with various problems as well, such as soil degradation from intensive use of land, high chemical uses in agricultural, health problems from chemical uses, conflicts in water uses between different stakeholders, low production price. There have also been protests for compensation's or price guarantee's policy for some kind of agricultural products. This leads to the need of formulation of agricultural policies in the area. Although the concept of sustainability has been there since the fifth national plan (1982-1986), however, there was not much implementation until the eighth national economic and social development plan (1997-2001). This lack of implementation can be attributed to constraints such as lack of corporations between governmental organizations, lack of property right over agricultural areas, complications in the process of certificate scheme for organic agriculture for small-scale farmers, lack of participation from grass root people in the planning process. These all constraints and problems show inefficiency in agricultural policy's implementation. Hence, it is important to study scope of sustainable policy from the farmer's preferences in order to increase efficiency of policy implementation (Schiavone, 2010).

Monetary and financial incentive policies (Payments for Ecosystem Services (PES)) combined with agricultural policies are increasingly being promoted as incentive potential tool to attract farmers to change their land use and land management practices (Engel *et al.*, 2008; Pagiola 2008; Wunder, 2008). These payment programmes have been implemented worldwide (for example in the US, EU, UK, Mexico) to enhance the efficiency of supply of associated ecosystem services (Sauer and Wossink, 2010) however, such programmes are still not widespread in Thailand (Sangkapitux *et al.*, 2009).

Effective implementation of these schemes has been attributed to farmers' decision to participate (Wilson, 1996). Rate of participation, compensation requirements and the characteristics of participating farms are considered as determinants of successful implementation of schemes (Crabtree *et al.*, 1998; Zandersen *et al.*, 2016). Hence, it is important to have an understanding of the motivations of farmers to participate. Much of the recent studies have used the Willingness to Accept (WTA) for research towards PES schemes' effectiveness as it provides an estimate of the lowest level of compensation farmers expect for adopting changes in farming activities according to the scheme designs (e.g. Broch and Vedel, 2012; Beharry-Borg *et al.*, 2013; Zandersen *et al.*, 2016). These estimates provide an assessment of how farmers trade off different levels of attributes against per hectare payments (Espinosa-Goded *et al.*, 2009). Studies have focused on identifying the factors affecting the farmers' participation decision by investigating potential scheme attributes (e.g. Wilson, 1997; Ruto and Garrod, 2009; Espinosa-Goded *et al.*, 2010; Broch and Vedel, 2012) and by exploring the heterogeneity in farmers behaviour based on both farm and farmer characteristics (see Wilson and Hart, 2000; Vanslebrouck *et al.*, 2002; Hudson and Lusk, 2004; Ruto and Garrod, 2009)

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<sup>1</sup> 1 rai equal to 0.16 hectare or 1600 square meters

Various methods have been used to evaluate farmer responses such as contingent valuation survey method (Purvis *et al.*, 1989) a dynamic mathematical programming model (Varela-Ortega *et al.*, 1998), however, Choice Experiments (CE) are particularly suited for hypothetical policy scenarios, where no real data is available. Studies have used CE to address improvements in PES scheme designs by concentrating on farmers' preferences for scheme attributes (Ruto and Garrod, 2009; Broch and Vedel, 2012; Beharry-Borg *et al.*, 2013; Zandersen *et al.*, 2016).

However, there is not much relevant literature available in the context of Thailand. Given the heavy dependence of Thai culture on agriculture, it is important to assess the feasibility of such schemes in the country. Therefore, this paper proposes to provide policy recommendations regarding potential changes in land use activities that can help to enhance sustainable agriculture specifically in the northern regions of Thailand. It also addresses the effective design and implementation of policies by providing an understanding of the impact of various factors (farm and farmer) on the decisions of small scale farm holders. The study employs a CE approach to (i) investigate farmers' preferences towards various scheme attributes, (ii) quantify farmers' WTA requirements for changes in farming practices, and (iii) explore farmers' heterogeneity in land use decisions and if it is associated with particular farm and farmer characteristics.

## 2 Methods

### 2.1 CE theoretical framework:

CE is based on the Lancasterian Economic Theory of Value (Lancaster 1966) and Random Utility theory (McFadden, 1974). The conditional Logit Model (CLM) is the most commonly used and simplest of all the choice models. The CL model postulates that a farmer '*n*' will choose to participate in a scheme alternative '*I*' from a specific choice,  $C_n$ , given that the indirect utility ' $U_{ni}$ ' from doing so, is greater than the indirect utility of other alternatives. The utility for CLM, including a constant term to capture the effect of unobserved influences exert over the selection of the 'business as usual' or 'do not want to participate' option, becomes:

$$U_{ni} = ASC_{SQ.BAU} + \beta_1 X_{1ni} + \beta_2 X_{2ni} + \dots + \beta_k X_{kni} + \varepsilon_{ni} \quad (1)$$

The  $ASC_{SQ}$  is a dummy variable that takes a value of 0 if one of the hypothetical payment programmes is selected by a respondent on a particular choice card or 1 if the 'do not want to participate' option is selected.  $\beta_k$  is the utility coefficient and  $X_{kni}$  is the level of attribute *k* for alternative *i* for a farmer *n*.

The CLM assumes that unobservable components are identically, independently distributed and follow a Gumbel distribution (Train, 2003; Hensher *et al.*, 2005). Therefore, the probability of selecting the alternative *i* will be:

$$P_{ni} = \frac{\exp(\beta_1 X_{1ni} + \beta_2 X_{2ni} + \dots + \beta_k X_{kni})}{\sum_{j=1}^I \exp(\beta_1 X_{1nj} + \beta_2 X_{2nj} + \dots + \beta_k X_{kni})} \quad (2)$$

The simple CLM imposes homogenous preferences across respondents, which is considered as a limitation, since preferences can be heterogeneous (Milon and Scrogin, 2006). The heterogeneity can be based on the varying socioeconomic characteristics and attitudes of the respondents which effect the decision making. In order to identify this preference heterogeneity the Latent Class Model (LCM) was used.

## 2.2 Latent Class model (LCM)

The Latent Class model (LCM) is a more flexible method which captures taste heterogeneity by classifying the respondents into segments and predicts their choice behaviour according to the segment they belong to. The segments are determined endogenously by the data (Milon and Scrogin, 2006) and each segment is unique and thus accounts for taste variation across the population.

The LCM is specified as a random utility model where farmer  $n$  belongs to latent class  $s = (1, 2, \dots, S)$ . The utility function can now be expressed as  $U_{ni|s} = \beta_s X_{ni} + \varepsilon_{ni|s}$ . Where,  $X_{ni}$  comprises of the attributes that appear in the utility function and  $\beta_s$  is a segment-specific parameter vector while  $\varepsilon_{ni|s}$  represents the random variation for the farmer  $n$ . The error terms are assumed to be distributed independently across segments and individuals (Swait, 1994).

The probability that the farmer  $n$  belonging to segment  $s$  will choose alternative  $i$  is given by:

$$P_{ni|s} = \frac{e^{\beta_s X_{ni}}}{\sum_i e^{\beta_s X_{ni}}} \quad (3)$$

The LCM estimates joint probability to account for both choice and segment membership,  $P_{nis} = P_{ni|s} \cdot P_{ns}$ . Where  $P_{ns} = \frac{e^{\alpha \lambda_s}}{\sum_{s=1}^S e^{\alpha \lambda_s}}$ , with  $\lambda_s$  denoting a vector of the segment-specific parameters and  $\alpha$  being a scale factor that is assumed to be equal to one, hence, each respondent has a probability of belonging to a particular segment (Boxall and Adamowicz, 2002).

Therefore, adding the  $P_{ns}$  to the probability expression provides the marginal probability of observing farmer  $n$  in segment  $s$  choosing alternative  $i$ :

$$P_{nis} = \sum_{s=1}^S \left[ \frac{e^{\beta_s X_{ni}}}{\sum_i e^{\beta_s X_{ni}}} \right] \left[ \frac{e^{\alpha \lambda_s}}{\sum_{s=1}^S e^{\alpha \lambda_s}} \right] \quad (4)$$

Where the probability of selecting alternative  $i$  is equal to the sum over all latent classes  $s$  of the class-specific membership model conditional on the product of class  $P_{ni|s}$ , and the probability of belonging to that class  $P_{ns}$  (Swait, 1994).

The model estimations were carried out using Nlogit 5.0.

## 2.3 Marginal Willingness to Accept (WTA) estimations

The WTA was estimated for each attribute of the policy scheme by taking the ratio of an attribute's parameter coefficients to the marginal utility of the payment attribute. This provides the marginal rate of substitution between the attribute and money (Hanemann, 1994).

Individual-specific conditional estimates of minimum WTA for a specific change in a particular land management attribute can be estimated using:

$$WTA_{n,k,l} = \sum_{s=1}^S P_{n,s} \left( \frac{-\beta_{s,att}}{\beta_{s,comp}} \right) \quad (5)$$

### **3 Survey design and data collection**

The study was conducted in the north of Thailand which is crucial for ecosystem services conservation as it consists of forested areas and is upstream of the main rivers of Thailand. Most of the agriculture in these areas is rain-fed. Recent droughts and floods had also caused a great damage to the agri-ecosystems in the area (Meteorological Department, 2015). More than half of Northern household are farmers (132,000 farmer households) (Lampang provincial agricultural extension office, 2015). The dominant crops here are rice, corn, sugar cane, beans, pineapple, red onion, garlic. Farmers here are vulnerable group especially small-scale farmers due to the limitation of advanced farming skills, budget, knowledge, technology. In addition, they are highly dependent on the nature. There was an evidence of decrease in agricultural productions due to environmental pressure leading to lower household income (Warner and Afifi, 2013).

The survey was conducted during September-November 2016 with the head of small-scale agricultural households in Chaehom districts of Lampang province, Thailand. In total 532 households were surveyed, through face to face interviews in 14 villages across the district. Some questionnaires had to be discarded due to missing data, reducing the final sample size to 529.

Stated preference (SP) method was considered appropriate for this research as it explores hypothetical scheme where no revealed data is available. Choice Experiment was considered as the preferable approach. As a first step in the construction of the CE survey, it is important to identify attributes which are realistic and could represent possible future values if policy measures were to be implemented (Bennett and Blamey, 2001). The choice and selection of the attributes and levels was based on a combination of evidence from the findings in the existing literature and information from the pilot study of this research (Table.1).

(Insert Table.1 here)

## **4 Result**

### **4.1 Survey Results**

The majority of respondents very well understood the questionnaire and choice alternatives. The average age of respondent is 55 year-old and the average of agricultural experience is 30 years. 74 per cent of farmers were graduated from primary school. The main household income comes from agriculture however most of them also earn from non-agricultural sources. The average agricultural area for each household is about 9 rai and there are on average only 2 labours per households. The factors that influence land manager to decide type of crop are market price, water supply and supporting schemes from government respectively. For irrigation they use either water ponds or furrow irrigation. Adoption of sustainable agricultural practices is low, only 19%, because it requires more labour, no organic product market, complicated standard certification process and lack of revenue.

## 4.2 CE Results

### 4.2.1 Conditional Logit Models

The basic Conditional Logit Model (CLM) was specified so that the probability of selecting a particular alternative was a function of attributes and the alternative specific constant ( $ASC_{SQ}$ ), which had a value of 1 if the 'do not want to participate' option was chosen and 0 if either of the other alternatives was chosen. The model provided a modest fit to the data (Pseudo  $R^2=0.05$ ) and shows (Table.2) that all attributes except the contract length have significant utility coefficients and the signs of the coefficients are as expected. Overall respondents show a reluctance to adopt drought tolerant crops and higher reduction in chemical use. A negative ASC also reveals a preference to move away from status quo. However, the positive and significant compensation attribute suggests that farmers are more likely to participate when a scheme offers higher compensations other things being equal.

Farm and farmer characteristics were introduced as interaction terms with the choice attributes in a conditional logit plus interactions (CL-int) model to investigate whether preference heterogeneity might be related to those characteristics. After extensive testing of various interactions with all farm/farmer characteristics, the variables with significant coefficients were *household size* and *agricultural experience*. The estimations reveal that farmers with larger household size require higher compensations in order to participate in potential payment schemes, on the other hand, farmers with more farming experience are more willing to participate as they require lower compensations and are also less averse to higher percentages of reduction in chemical use.

(Insert Table.2 here)

### 4.2.2 Latent Class Models

#### Latent class model selection

The Latent class models (LCM) were estimated up to 6-segments in an attempt to accommodate for taste variation or unobserved taste heterogeneity. The selection of the model with appropriate number of classes which best describes the data was based on its ability to provide interpretative simplicity, statistical criteria, McFadden's Pseudo- $R^2$ , AIC and BIC statistics, for model fit along with analyst's judgement (Swait, 1994; Boxall and Adamowicz 2002; Scarpa and Mara, 2005). The LCMs show sufficient improvement in predictive capability over the basic CL and CL-int models. The loglikelihood decreases and Pseudo- $R^2$  increases as more segments are added, indicating the presence of multiple segments while the AIC and BIC statistics decreases. The 4-segment model was considered better at predicting the farmers' choices (Pseudo- $R^2$ ) and was chosen as the most appropriate model for subsequent interpretation of the segmentation of the preferences that could be meaningfully related to actual farmers in the sample.

#### Latent class model results

The results of the model estimations suggest considerable heterogeneity in preferences between the farmers (Table.3). The LCM significantly divided the sample into four classes. 54% of the sample belongs to the segment 1 while segment-2, 3 & 4 have 22%, 9% & 13% of respondents respectively. The results reveal that segment 4 includes the population group which show strong aversion to adoption of agroforestry, longer contract terms and higher reduction in chemical use. Segment 3 coefficients reveal that it includes a small group of farmers which were only

concerned about the monetary compensations. Segment 1 farmers are willing to switch to higher reductions in chemical use, while segment 2 farmers are averse to longer contracts and higher reduction in chemical use however they can be willing to adopt agroforestry as an alternative on their farmlands if provided with sufficient compensations. Segment 3 is the only segment that shows aversion to move away from the status quo.

Post hoc analysis of respondent specific segment membership probabilities as the dependent variable in a multinomial logit model that uses farm and farmer characteristics was used to investigate which types of characteristics might be associated with particular segments (Wedel and Kamakura, 2000). Segment 2 of the 4-segment LCM model was considered as the ‘baseline’ farmers. The estimations revealed that segment 1 predominantly consists of farmers with lower education levels and lower agricultural income. There is higher probability of belonging to Segment 3 if farmers are uneducated or have acquired lower levels of education. Younger farmers with considerable higher household expenditure and agricultural experience have a higher probability to be associated with segment 4.

(Insert Table.3 here)

#### **4.2.3 Minimum marginal WTA Estimations**

The results of the model estimation suggest that there is considerable taste heterogeneity within the farmers. The results of the overall marginal WTA estimates for each of the model (Table.4) show that the highest compensation of **36,992 Baht/rai/year** are required by segment 4 farmers for adopting drought tolerant crops. It was also revealed that within each model and each segment the highest compensation are required for crop diversity. This reveals that implementation of policies requiring farmers to diversify their crop production or to adopt multi-cropping systems would be considerably expensive.

(Insert Table.4 here)

## **5 Discussion and conclusions**

This paper reports the results of CE to investigate how farmers trade-off changes in land use management practices against compensation payments offered to adopt those changes. The analysis involved an ex-ante evaluation of farmer uptake based on attributes of a policy scheme by analysing the impact of different attributes and attribute levels on their participation behaviour. In compensation for undertaking the changes the farmers were offered various levels of annual payments.

Changes in land use management such as uptake of drought resistant crops or agroforestry, changes in the application of chemical substances to the farms, together with differences in the length of management agreement were proposed in this policy scheme. In return the scheme also offered various levels of annual compensations. A conditional logit model (CLM), a conditional logit model with interactions (CL-int) and a latent class model (LCM) were used to analyse the data.

In common with previous studies (Christensen *et al.*, 2011; Beharry-Borg *et al.*, 2013; Zandersen *et al.*, 2016) farmers were found to show heterogeneous preferences for different changes in land use and land management activities. Overall the results suggest that farmers in general show a preference to move away from status quo. The CL and CL-int models reveal that



farmers show a reluctance to adopt drought tolerant crops and higher reduction in chemical use. This implies that farmers would prefer to participate in schemes with flexible and less restrictive measures, which has also been suggested by Ruto and Garrod (2009) and Wynn *et al.*, (2001). For the LCM estimations the 4-segment model was found to provide the best portrayal of observed choices and a clear and relevant segmentation of farmers' choice behaviour. It was revealed that the aversion to drought tolerant crops was much stronger than for agroforestry. Similarly most of the farmers have shown reluctance towards the reduction of higher percentage of chemicals used on their farm. Segment 4 proved to be the most averse group of farmers which consisted of farmers within the lower age groups, higher house expenditure and agricultural experience. Estimations also revealed a preference for shorter contract length which has also been identified by Zandersen *et al.*, (2016) and Christensen *et al.*, (2011).

The willingness to accept (WTA) estimations revealed that a significant proportion of respondents do not require high compensation for enrolling in policies which have shorter contract lengths. Similarly, it is also possible to engage farmers in policy schemes which require them to reduce lower amounts of chemical use on their farms. Uptake of drought tolerant crops proved to be the most expensive attribute. Overall we can see a disutility towards restrictive measures, which has also been observed by other studies such as Ruto and Garrod (2009) and Espinosa-Goded *et al.*, (2010). The individual specific estimates show that segment 4 is the most averse group of farmers as they require highest amounts of compensations for most of the attributes. In line with the emerging literature it is revealed that a considerable number of farmers in our study are willing to change their farming practices if compensations are sufficient (Ruto and Garrod, 2009; Beharry-Borg *et al.*, 2013; Zandersen *et al.*, 2016).

Linking the conditional logit estimations with farm and farmer characteristics indicated that household size and agricultural experience influenced farmers' participation preferences and displayed that farmers with larger household size would require higher compensations. Farmers with higher agricultural experience would be willing to participate even at lower compensation levels. Methodologically, our results suggest that a basic CL-int model can provide useful information towards the factors affecting preference heterogeneity, however, LCMs may still be required to explain the extent and distribution of that heterogeneity.

The findings presented in this paper can be used to address the agricultural sustainability issues in Thailand by designing attractive and cost-effective schemes for small scale farmers. This study provides an insight into the attitudes and behaviour of the farmers, which influence their decisions to adopt land use management changes. It not helped to identify the target group among the sampled farmer population but also presents the policy makers with an understanding about the attributes, which could be included in potential policy schemes to make them attractive for participation.

Future work includes calculating welfare estimates for various scheme combinations and linking the values with spatial attributes to explore their spatial distribution. This spatial analysis can help to identify the locations of the least resistant farmers for effective policy implementation.

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## 7 Tables

**Table.1: Explanation of the policy attributes their explanation, levels and variable coding**

Attribute	Explanation	Levels	Coding
Agricultural diversification	Adopting drought tolerant crops or agroforestry practices	Drought tolerant cropping, Agroforestry	Dummy coded 0,1
Use of chemicals	To reduce chemical use on arable farms by x (%)	25, 50, 75, 100	Specified linearly
Length of agreement	Number of years	1, 2, 5, 10	Specified linearly
Compensation	Annual payments for participation (baht/rai/year)	500, 1000, 2500, 5000, 7500, 10000	Specified linearly

**Table.2: Parameter estimates for CL and CL-int models**

<b>Model</b>	<b>CLM</b>		<b>CLM-int</b>	
<b>Loglikelihood</b>	<b>-4485.48123</b>		<b>-3837.44</b>	
<b>Pseudo-R<sup>2</sup></b>	<b>0.051</b>		<b>0.099</b>	
<b>AIC</b>	<b>1.886</b>		<b>1.621</b>	
<b>BIC</b>	<b>1.89</b>		<b>1.632</b>	
<hr/>				
<b>Attributes</b>	<b>Coefficients</b>	<b>Std.error</b>	<b>Coefficients</b>	<b>Std.error</b>
Crop diversity	-0.27749***	0.0430	0.21568***	0.04260
Chemical use	-0.00663***	0.0007	-0.00498***	0.00184
Contract length	0.00620	0.0061	0.03526***	0.00778
Compensation	0.00012***	0.0000	0.00017***	0.0000
ASC-SQ	-1.45995***	0.1008	0.86079***	0.0567
<hr/>				
<b>Characteristics</b>				
Household size*compensation			0.00002***	0.000042
Agricultural experience*chemical use			0.00016***	0.00051
Agricultural experience*compensation			-0.000015**	0.000006

\*\*\*, \*\*, \* Significance at 1%, 5%, 10% level

**Table.3: Parameter estimates for Latent class models (standard errors in parenthesis)**

Loglikelihood	-3659.30330			
Pseudo-R <sup>2</sup>	0.30			
AIC	1.547			
BIC	1.53			
Chi squared	3142.37			
Degrees of freedom	23			
Attributes	Segment 1	Segment 2	Segment 3	Segment 4
	Coefficients	Coefficients	Coefficients	Coefficients
Crop diversity	-0.0244 (0.06594)	1.6791*** (0.2920)	-0.0102 (0.21907)	-5.5489*** (0.58843)
Chemical use	0.0050*** (0.00133)	-0.0678*** (0.00717)	-0.00595 (0.00374)	-0.0439*** (0.00626)
Contract length	0.00392 (0.00847)	-0.1194*** (0.02600)	-0.2726 (0.03124)	-0.00647 (0.04067)
Compensation	0.00011*** (0.0000)	0.00030*** (0.0000)	0.00009*** (0.0000)	0.00015*** (0.0000)
ASC-SQ	-1.8787*** (0.19506)	-4.1328*** (0.42628)	1.3711*** (0.49437)	-9.7197*** (1.02966)
Percentage	54%	22%	9%	13%
Segment membership: farm & farmer characteristics				
Constant	3.4378*** (1.3129)	-	0.3302	0.7854 (1.4477)
Household expenditure	-0.0122 (0.0082)	-	-0.0042 (0.1236)	<b>0.02685**</b> (0.01294)
Agricultural experience	0.0123 (0.0108)	-	0.0057 (0.0165)	<b>0.0272**</b> (0.0143)
Agricultural income	<b>-0.00001**</b> (0.00000)	-	0.000001 (0.000002)	-0.000000 (0.000002)
Edu	<b>-0.3741**</b> (0.1987)	-	<b>-0.3703**</b> (0.1993)	<b>-0.3767**</b> (0.1988)
Age	-0.02526 (0.01607)	-	-0.0146 (0.0242)	<b>-0.02706**</b> (0.0161)

\*\*\*, \*\*, \* Significance at 1%, 5%, 10% level

**Table.4: Minimum individual WTA (bt/ha/year) estimations for the policy attributes**

Attributes	CLM	CLM-int	LCM			
			segment 1	Segment 2	Segment 3	Segment 4
Crop diversity	2312.4	2081.8	221.5	-5596.9	108.0	36992.4
Chemical use	55.3	20.6	-45.5	226.0	63.1	292.7
Contract length	-51.7	-41.5	-35.6	398.1	288.9	43.1