ECONSTOR

WWW.ECONSTOR.EU

Der Open-Access-Publikationsserver der ZBW – Leibniz-Informationszentrum Wirtschaft
The Open Access Publication Server of the ZBW – Leibniz Information Centre for Economics

Ngokkuen, Chuthaporn; Grote, Ulrike

Conference Paper

Determinants Influencing Adoption of Geographical Indication Certification: The Case of Rice Cultivation in Thailand

Proceedings of the German Development Economics Conference, Hannover 2010, No. 52

Provided in cooperation with:
Verein für Socialpolitik

Suggested citation: Ngokkuen, Chuthaporn; Grote, Ulrike (2010) : Determinants Influencing Adoption of Geographical Indication Certification: The Case of Rice Cultivation in Thailand, Proceedings of the German Development Economics Conference, Hannover 2010, No. 52, http://hdl.handle.net/10419/39982

Nutzungsbedingungen:
Die ZBW räumt Ihnen als Nutzerin/Nutzer das unentgeltliche, räumlich unbeschränkte und zeitlich auf die Dauer des Schutzrechts beschränkte einfache Recht ein, das ausgewählte Werk im Rahmen der unter
→ http://www.econstor.eu/dspace/Nutzungsbedingungen
nachzulesenden vollständigen Nutzungsbedingungen zu vervielfältigen, mit denen die Nutzerin/der Nutzer sich durch die erste Nutzung einverstanden erklärt.

Terms of use:
The ZBW grants you, the user, the non-exclusive right to use the selected work free of charge, territorially unrestricted and within the time limit of the term of the property rights according to the terms specified at
→ http://www.econstor.eu/dspace/Nutzungsbedingungen
By the first use of the selected work the user agrees and declares to comply with these terms of use.

ZBW Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Mitglied der Leibniz-Gemeinschaft

Determinants Influencing Adoption of Geographical Indication Certification: The Case of Rice Cultivation in Thailand

Chuthaporn Ngokkuen[1] and Ulrike Grote[2]

Abstract

Geographical indications (GIs) have gained more interest since its protection has been ensured multilaterally under the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement of the World Trade Organization (WTO). Thung Kula Rong-Hai Thai Hom Mali Rice (TKR) is the first officially registered GI Jasmine rice in Thailand. A GI certification is licensed to producers and other business operators of the GI production line through a membership application in a GI club. This paper aims at identifying factors that are likely to predict the behaviour of Thai Jasmine rice households in the Thung Kula Rong-Hai (TKRH) area in adopting a GI certification. A logit model is applied for empirical analyses. The marginal effects of the key factors on the probability of adoption are estimated. All analyses are based on survey data collected through a formal survey in two districts of the TKRH area where 541 Thai Jasmine rice households were selected for interviews using a disproportionate stratified random sampling procedure. The results indicate that institutional and social factors such as information, transportation costs and membership of a cooperative influence the decision to obtain the GI certification of the Thai Jasmine rice households in the TKRH area significantly.

Keywords: Geographical Indications, Certification, Logit Model, Jasmine rice, Thung Kula Rong-Hai, Thailand

---

[1] PhD Student, Institute for Environmental Economics and World Trade, School of Economics and Management, Leibniz University of Hannover, Königsworther Platz 1, 30167 Hannover, Germany; Phone (49) 5117624087; Fax: (49) 5117622667; email: ngokkuen@iuw.uni-hannover.de.

[2] Professor, Institute for Environmental Economics and World Trade, School of Economics and Management, Leibniz University of Hannover, Königsworther Platz 1, 30167 Hannover, Germany; Phone (49) 5117624185; Fax: (49) 5117622667; email: grote@iuw.uni-hannover.de.

1. Introduction

As one kind of intellectual property rights, geographical indications (GIs) have recently gained more interest since its protection has been ensured multilaterally under the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement under the auspices of the World Trade Organization (WTO). In order to have GIs being protected by the TRIPS rules, Member countries are required to provide a legal and institutional framework of GI protection in its own national border (Grote, 2009). Being influenced by public pressure regarding bio piracy issue and given the EU's attempt in seeking alliance for better GI protection around the globe, the Royal Thai government has released its first specific Act on GI protection in 2003 known as "Act on Geographical Indications Protection B.E. 2546 (2003)". The GI certification system is a system which is new for the country and for many households in the GI regions. As of January 2010 there were totally 28 registered GIs with rice from different regions in Thailand being most often registered.

Under the protection of the Act, Thung Kula Rong-Hai Thai Hom Mali Rice (TKR) is the first registered GI Thai Jasmine rice from the Northeast region of Thailand. In order to reap benefits from the GI protection, stakeholders involved in each specific GI product production line can apply for membership in a GI club with the purpose of using a label on their certified product. In 2008, there were totally 13 TKR processors and exporters and 1,131 TKR households being certified as GI actors for the TKR production line.

There are many studies about technology and innovation adoption found in the literature (e.g. Feder et al., 1985; Fernandez-Cornejo et al., 2007 and Saka, J.O., Okoruwa, V.O., Lawal, B.O. and Ajijola, S., 2005). However, empirical studies on GI certification for Thai Jasmine rice are still missing. Nevertheless, studies on other certification schemes such as organic certification of rice in Thailand (Carambas, 2007), as well as some studies on certification from other countries (López and Requena, 2005; Kisaka-Lwayo, 2007; Dörr, 2009) have shed some light on the factors that play a crucial role in affecting the household's decision on adoption. The objective of this study is to identify factors that are likely to predict the behavior of Thai Jasmine rice households in the TKRH area in adopting a GI certification and to estimate the marginal effect of key factors on the probability of adoption.

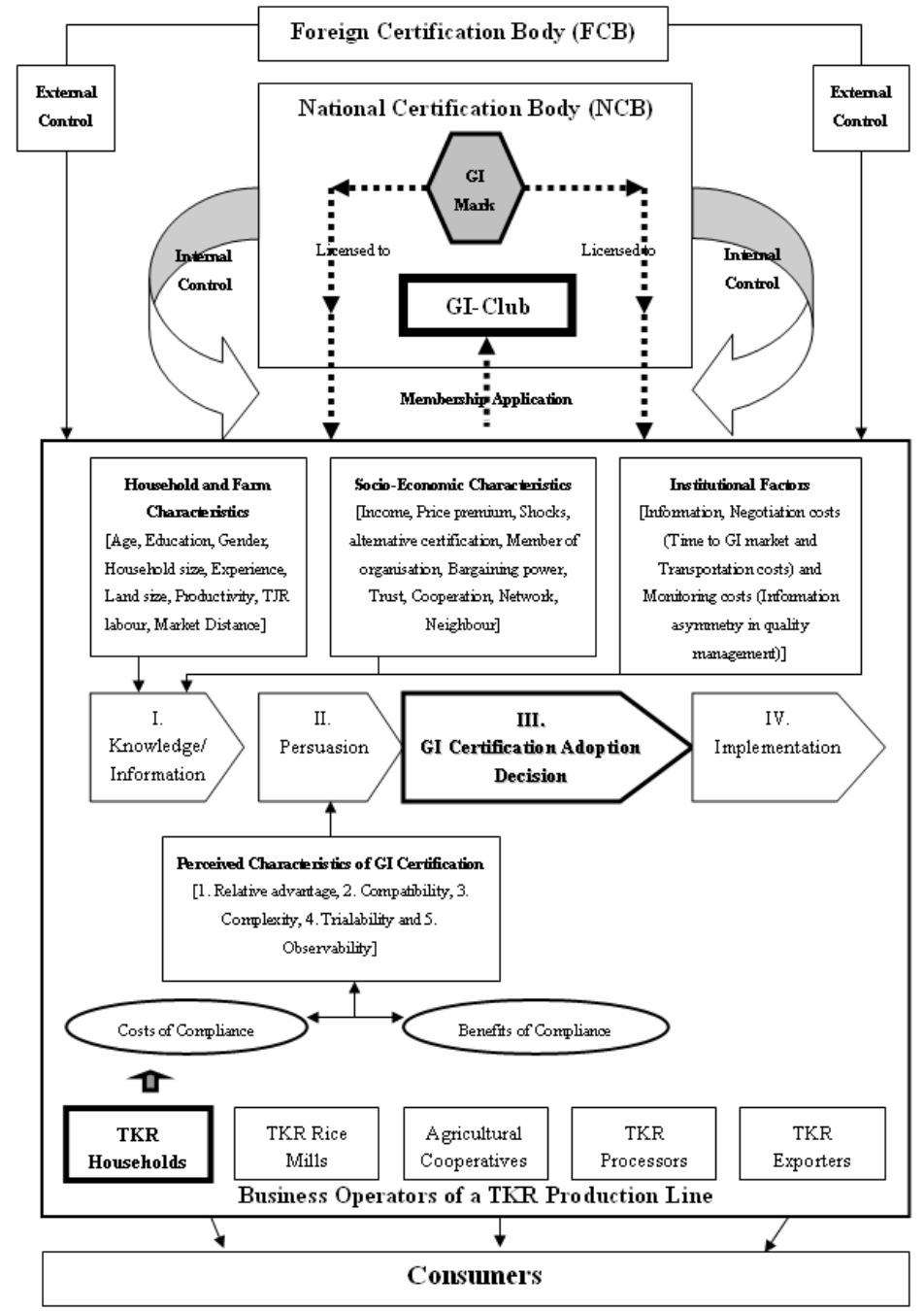
In order to achieve this objective, this paper is structured as follows: the second section describes the conceptual framework for the adoption of GI certification. In this context, the legal and institutional process for GI registration in Thailand will be presented more in detail. The third section describes the theoretical model and the model specification. Section 4 presents the case study of rice cultivation in Thailand,, including the data collection process and the empirical results. Section 5 concludes.

2. Conceptual Framework

This section presents the legal and institutional process for GI registration in Thailand which sets the conceptual framework for the case study. The establishment of distinctive quality labels, such as GI certification, enables the group of economic agents involved in the GI product value chain to gain economic advantages due to differentiation. Through the establishment of the quality labels, business operators in the value chain can obtain differentiated incomes via increasing the added value of the product (Cañada and Vázquez, 2005; Grote, 2009). Quality labels such as the GI label serve as information for consumers (Tregear et al., 1998; Addor and Grazioli, 2002; Josling et al., 2004; Rangnekar, 2004; Jena and Grote, 2010) and as a means of producers to signal reputation linked to the distinctive quality of their products to the consumers (Lucatelli, 2000; Cañada and Vázquez, 2005). The consumers use such distinctive signs as markers of quality and assurance of reputation in order to avoid risks of asymmetric information concerning product quality and are thus potentially more willing to pay for the price premium (Rangnekar, 2004). This economic incentive could be another key factor which drives TKR farmer households to decide to adopt a GI certification.

How a GI certification is adopted by a decision-making unit is conceptually informed by Rogers's (2003) Theory of Diffusion of Innovation. Rogers (2003) defines innovation as an "idea, practice, or object that is perceived as new by an individual or other unit of adoption." If an idea is perceived as new by individuals, it is an innovation. For the purpose of this study, a GI certification system is considered as an innovation since the GI certification is new to all parties in the GI area. What is exactly new in the context of GI certification is not only an introduction of GIs and the GI certification itself but also the result of such new institutions.

Figure 1: Conceptual Framework for GI Certification Adoption



Source: own presentation

As emphasized in the study by Cañada and Vázquez (2005), an organizational innovation resulting from such systems is seen as a key part in disseminating knowledge and innovation on the ground and in relating quality policy to the entire value chain

(Cañada and Vázquez, 2005). The process, as shown in figure 1, through which "an individual or other decision-making unit passes from first knowledge or information of an innovation, to forming an attitude towards the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision" is defined by Rogers (2003) as the innovation-decision process. It is actually an information-seeking and information-processing activity through which the decision-making unit is motivated to reduce uncertainty about pros and cons of the innovation (Rogers, 2003).

Four main stages in the innovation-decision process defined by Rogers (2003) are related to this study: (1) knowledge, (2) persuasion, (3) decision, and (4) implementation. In the context of GI certification adoption of TKR farmer households, knowledge occurs when the farmer households learn from the existence of a GI certification and gain some information and understanding of how it functions. When the farmer households form a favorable or unfavorable attitude toward the GI certification, this stage is called persuasion. At the third stage of the innovation-decision process is the decision which occurs when the farmer households engage in activities that lead to a choice to adopt or reject the GI certification (Rogers, 2003). Adoption is defined by Rogers (2003) as a decision that an individual makes "full use of an innovation as the best course of action available." The farmer households decide then to apply for membership in a GI club, the TKR club, by registering their names with the certification body or Regulatory Board. The final step of an innovation-decision process is implementation when the farmer households put an innovation into use. The use of an innovation by the farmer households in this context means that they follow the manuals for the TKR production received from the GI certification body. This production manual is released with the objective to manage the quality control of the TKR production at the initial stage of the TKR value chain.

Crucial factors such as socioeconomic characteristics, personality variables and communication behavior of the decision-making unit are considered by Rogers (2003) as key categorical factors that shape the adoption behavior of the decision-making unit. Such factors play a role at the initial stage of the innovation-decision process when the decision-making unit seeks for knowledge or information about the new innovation. It is hypothesized in this study that the farmer households' decision to adopt or reject a GI certification is influenced by a wide range of factors. These factors are categorized as: (i)

household and farm characteristics, (ii) socioeconomic characteristics and (iii) institutional factors such as governmental support, information availability, negotiation costs, time to market and transportation costs as well as monitoring costs due to information asymmetry in the quality control management.

However, before the household makes a decision, the stage of persuasion is crucial. The Theory of Diffusion of Innovation (Rogers, 2003) proposes that there are five attributes of an innovation that affect adoption at the persuasion stage: (i) relative advantage, (ii) compatibility, (iii) complexity, (iv) trialability, and (v) observability. These attributes play a role in the process in which the decision-making unit forms an attitude toward the innovation. Relative advantage is "the degree to which an innovation is perceived as being better than the idea it supersedes". The theory suggests that the clearer and more unambiguous advantages the innovation has the more easily it will be adopted and implemented. As current research evidence indicates, the innovation will not be adopted if a potential user sees no relative advantage. Compatibility is the degree to which an innovation is perceived as consistent with the existing values and beliefs, previously introduced ideas or past experiences, and client needs or needs of potential adopters for the innovation. There is evidence that the likelihood of adoption is increased with the compatibility of the innovation with the values and beliefs or past experiences. Complexity is the degree to which the decision-making unit perceives something as being relatively difficult to understand or use. If the innovation is perceived by the decision-making unit as being simple, it will be more easily adopted. Trialability is "the degree to which an innovation may be experimented on a limited basis" (Rogers, 2003, pp. 16 and 258). Innovations that can be fully tried before being fully implemented are more likely to be adopted, since new innovations require investing time, energy and resources. And finally, observability is the degree to which the results of some ideas or innovations are easily observed and communicated to others. If there are visible or observable positive outcomes from the implementation of the innovation, the innovation will be more likely adopted. In the persuasion stage, the farmer household considers the relative advantage by comparing costs and benefits of compliance before making a decision for adoption or rejection. If they consider the adoption as beneficial (benefits > costs), it is more likely that they will decide to adopt the GI certification.

3. Theoretical Model

When trying to answer the question which factors are thought to influence the decision of the decision-making unit to adopt, the economic theory as stated in previous adoption studies (Kalyebara, 1999; Asfaw, 2008; Dörr, 2009) is based on the rationality assumption. The economic theory, precisely the decision theory, tells us what the decision-making unit, namely the farmer household, may rationally prefer between choices (Dreier, 1996) (to adopt or to reject). The economic theory of adoption presupposes that rational farmer households want to optimize their objective function such as expected utility (Dreier, 1996: Kalyebara, 1999; Asfaw, 2008; Dörr, 2009) or net present value of benefits from adopting the innovation (Dörr, 2009).

The linear random utility model provides an alternative interpretation of the data on the individual's utility of two choices. Let $U_{j,k=1}$ and $U_{j,\ k=0}$ represent the individual's utility of two choices with j=1,2,3,…,N denoting an individual in the sample k=1 denoting the decision to adopt and k=0 otherwise. For simplicity, we might denote U^a and U^r where U^a is the utility of GI certification adoption and U^r is the utility of rejecting the GI certification. The observed choice between the two reveals which one provides the greater observable utility. The linear random utility model is formulated as:

$U^a = \mathbf{X}_i\beta_a + \varepsilon_a$ and $U^r = \mathbf{X}_i\beta_r + \varepsilon_r$,

Where $\mathbf{X}_i$ is a vector of characteristics that influence the choice selection (household and farm characteristics, socioeconomic characteristics and institutional factors) which is observable and β is the coefficient vector and ε is the term of unobserved random disturbances. If we denote by Y=1 the farmer household's choice to adopt a GI certification, also alternative a, we then have

$$\text{Prob}[Y=1|\ \mathbf{X}] = \text{Prob}[U^a > U^r]$$

$$= \text{Prob}[\mathbf{X}_i\beta + \varepsilon > 0|\ \mathbf{X}] \text{ (Greene, 2003).}$$

Due to the fact that the farmer household's perceptions of utility or profit, or its level of risk aversion and the weights the household puts on profitability, risk and subsistence requirements are difficult to estimate, the adoption decision variable predicts therefore the probability of adoption as a function of proxy factors that are likely to predict the expected values of the farmer household's objective function (Kalyebara, 1999). However, as stated

in the literature (Carambas, 2007; Kalyebara, 1999), economic theory provides limited guidance in the selection of variables to explain the behavior of the farmers in the adoption decision. This study therefore uses an empirical investigation by using an econometric model of a logistic regression (logit model) in order to help selecting key variables which could best explain the behavior of the farmer households to adopt a GI certification.

A logit model can be expressed in two forms, either in terms of logits or in terms of event probability (Liao, 1994). This monograph concentrates on the latter expression. In the basic model, let Y_k be the observed response for the k^{th} observation of the response variable Y which can take two values: $Y_k=1$ if the farmer households decide to adopt a GI certification and $Y_k=0$ if they do not decide to adopt the GI certification. X_k is supposed to be a vector of independent variables (household and farm characteristics, socioeconomic characteristics and institutional factors) which determine the probability of adoption (P) of the GI certification. The logit model uses a logistic cumulative distribution function to estimate P as follows:

$$P(Y=1 \mid X_1, X_2, ..., X_k) = \frac{e^{\beta_0+\beta_1 X}}{1+e^{\beta_0+\beta_1 X}} = \frac{1}{1+e^{-(\beta_0+\beta_1 X)}} \quad (1)$$

$$P(Y=0 \mid X_1, X_2, ..., X_k) = 1 - \frac{e^{\beta_0+\beta_1 X}}{1+e^{\beta_0+\beta_1 X}} = \frac{1}{1+e^{(\beta_0+\beta_1 X)}} \quad (2)$$

(Aldrich and Nelson 1984; Liao, 1994; Ryan, 1997; Pampel, 2000; Hosmer and Lemeshow, 2000)

The term $\frac{e^{\beta_0+\beta_1 X}}{1+e^{\beta_0+\beta_1 X}}$ or E(Y|X) or $\pi(x)$ as expressed in Ryan (1997) and Hosmer and Lemeshow (2000) or P_i as expressed in Pampel (2000) is called the conditional mean or probabilities of Y given x when the logistic distribution is used. It is according to the above-mentioned equation therefore a probability that leads the farmer households to adopt a GI certification.

The logit model is a probability model which is a regression of the conditional expectation of Y on x. The model can then be expressed as follows:

$$L_i = P(Y=1 \mid X_1, ..., X_k) = \ln\left[\frac{P_i}{1-P_i}\right] = \beta_0 + \beta_1 X \quad (3)$$

where β_0 is the unknown constant term or intercept and β_1 is a vector of regression coefficients to be estimated. The model in terms of Y would then be written as:

$$Y_i = \alpha + \sum_{k=1}^{K} \beta_k X_k + \varepsilon \quad (4)$$

where Yi = dichotomous dependent variable; and Yi=1 when a household adopted GI certification and Yi=0 otherwise. The parameter α is the unknown constant term and β_k are regression coefficients of k explanatory variables to be estimated and ε is the error term. Once the coefficients are estimated, the probability that leads the farmer households to adopt a GI certification can be calculated as follow:

$$P(Y=1)=\pi(x)=E(Y|X)=\frac{e^{\beta_0+\beta_1 X}}{1+e^{\beta_0+\beta_1 X}}=\frac{1}{1+e^{-(\beta_0+\beta_1 X)}} \quad (5)$$

In contrast to the ordinary regression models which are estimated by the method of Least Squares Estimation (LSE) or OLS if the "ordinary" Gauss-Markov assumptions are made, logit parameters are typically estimated by a method of Maximum Likelihood Estimation (MLE) (Aldrich and Nelson, 1984; Pampel, 2000; Hosmer and Lemeshow, 2000). The MLE for logistic regression begins with an expression of the likelihood function (LF) which is the likelihood of observing the pattern of occurrence (Y=1) or $\pi(x_{ik})$ and nonoccurrence (Y=0) or 1- $\pi(x_{ik})$ of an event of characteristics in a given sample (Pampel, 2000) (see equation 1 and 2). Assuming that observations (Y_i) are independent of each other, the likelihood function for a sample of N observations and k coefficients is obtained to express the probability of the observed data as:

$$LF(\beta)=\prod_{i=1}^{N}\left\{\pi(x_{ik})^{Yi} * (1-\pi(x_{ik}))^{1-Yi}\right\} \quad (6)$$

where β is a vector of parameters β_0 and β_1 which are unknown. Taking logarithms the LF can be turned into a logged likelihood function (LLF) which is easier to work with because the products are turned into sums:

$$LLF(\beta)=ln\,LF=\sum_{i=1}^{N}\left\{\left[Y_i * ln\,\pi(x_{ik})\right]+\left[(1-Y_i)*ln(1-\pi(x_{ik}))\right]\right\} \quad (7)$$

The key is therefore to find β that produce the logits and the conditional mean of Y given x values that maximize the LLF or have the greatest likelihood of producing the observed data (Aldrich and Nelson, 1984; Pampel, 2000; Hosmer and Lemeshow, 2000).

Table 1: Description of independent variables used in the model

Variable	Description	Values/measure	Expected Sign	Type of Variable
Age	Age of household head	years	-	Continuous
Gender	Sex of household head	1= male; 0= female	+	Binary
Education	Schooling of household head	years	+	Continuous
Experience	Rice cultivation experience	years	+	Continuous
Household size	Size of household	persons	+	Discrete
Land size	Total land size for Thai Jasmine rice cultivation	Rai (1 Rai = 0.16 ha)	+	Continuous
Member of cooperative	Membership status of cooperative	1= yes; 0= no	+	Binary
Trust	Household trusted governmental bodies	1=yes; 0=no	+	Binary
Information	Access to information from governmental bodies	1=yes; 0=no	+	Binary
Time to markets	Time to the nearest markets for rice sale	hours	-	Continuous
Transportation costs	Total costs for transporting rice to markets	Baht	-	Continuous
Monitoring costs	Household faced the problem of information asymmetry in quality management (quality control).	1=yes; 0= no	-	Binary

Source: own compilation

A binomial logit model is applied to model the TKR farmer households' behavior regarding the adoption of GI certification. Sampling weights are applied to the data during the data analysis with the purpose to correct for unequal probabilities of selection and finally to obtain unbiased estimates for the whole study (Singleton and Straits, 1999 and Magnani, 1997). The dependent variable, GI certification adoption, is regressed on 12 independent variables as outlined in Table 1. The factors influencing the adoption decision are classified into three main categories in which the first two were predicted in the adoption decision theory (Rogers, 2003): (i) household and farm characteristics, (ii)

socioeconomic characteristics, and (iii) institutional factors. The general logit model for this study is therefore written as:

Yi = f (Household and Farm Characteristics, Household's Socioeconomic Characteristics and Institutional Factors)

These factors are derived and based on the general findings of previous studies on related topics and on researchers' expectations. Key factors believed to influence adoption are namely information (especially provided by governmental bodies) (e.g. Brown, 1975, Zhao, 2005, Doss, 2006 and Fernandez-Cornejo et al., 2007), and access to information via being a member of some organizations such as cooperatives (e.g. Nwankwo et al., 2009 and Mburu et al., 2007). The model used in the study is specified as:

$Y_{ik} = f(\mathbf{X_{ik}}) =$ f(age, gender, education, experience, household size, land size, member of cooperative, trust, information, time to markets, transportation costs, monitoring costs).

4. Case study of rice cultivation in Thailand

A case study was conducted in 2009 in Northeastern Thailand. After a short description of the data collection and sampling procedure, the descriptive and econometric results will be presented and discussed.

4.1 Data Collection and Sampling Procedure

For the sampling purpose, certification proportion I and certification proportion II are generated. Certification proportion I is the number of certified farmers of the district divided by the total certified farmers of the province and certification proportion II is the number of certified farmers of the province divided by the total certified farmers of all TKRH provinces. Two provinces, namely Roi Et and Sisaket, were purposively selected according to certification proportion II due to the highest rate (see Table 2). In order to avoid distorting effects caused by other certification schemes, Surin province was taken out of consideration due to the presence of organic certification in the area. Then, two districts of the TKRH area were purposively selected considering the certification proportion I (see Table 2). The two districts were chosen following the criterion of having the highest rate of certification proportion I. Following this criterion, Kasetwisai District of Roi Et province

and Rasrisalai District of Srisaket province were chosen with the certification proportion I of 59.35% and 83.61% respectively.

Table 2: Certified GI households of all provinces in the TKRH area

Province	District	No. Of Sub-Districts	No. of certified GI farmers	Certification Proportion I* (%)	Certification Proportion II** (%)
Roi Et	Kasetwisai	7	330	59.35	29.18
	Patumrat	9	55	9.89	4.86
	Ponsai	4	58	10.43	5.13
	Suwannaphoom	5	113	20.32	9.99
	Total		**556**		**49.16**
Surin	Chumponburee	9	250	85.32	22.10
	Tatum	3	43	14.67	3.80
	Total		**293**		**25.91**
Sisaket	Rasrisalai	13	102	83.61	9.02
	Silalad	4	20	16.39	1.77
	Total		**122**		**10.79**
Mahasarakam	Payakkaphoompisai	9	90	100	7.96
	Total		**90**		**7.96**
Yasothorn	Mahachanachai	3	70	100	6.19
	Total		**70**		**6.19**
	TOTAL		**1,131**		**100**

* Certification proportion I = certified farmers of the district divided by total certified farmers of the province

** Certification proportion II = certified farmers of the province divided by total certified farmers of all TKRH provinces

Source: own compilation based on data from DIP, 2007.

Using the disproportionate stratified random sampling technique, the total population for each district was then stratified into two main groups: GI group and Non-GI group. However, due to the recent adoption of organic farming practices to the cultivation of Thai Jasmine rice which is likely to result in organic certification in these districts, the Non-GI group was separated into two groups: Non-GI households with application for organic certification in process; and Non-GI households without organic farming intention. This separation in the sampling procedure helps identifying the distorting effects deriving from another certification scheme for Thai Jasmine rice in the same district. After grouping the

population into three strata, a sample of 90 households from each stratum was drawn using the random sampling technique. The total sample size was planned to be 540 households.

Before the data collection was conducted from March to June 2009, a pilot study took place in May 2008 in Kasetwisai District of Roi Et province to pre-test the questionnaire, and to collect some further secondary data on the GI certification in Thailand. The data was then collected through a formal survey in the two mentioned districts of the TKRH area. In total, 541 households were interviewed face-to-face using a structured questionnaire with some open-ended questions as a survey instrument. The questionnaire was structured into 12 main parts, namely socio-demographical characteristics, production and farm income, non-farm income, migration, perception about GI, experience, social capital such as cooperation, trust and network buildings, bargaining power, obstacles in GI registering procedure, cost and benefit of certification, assets, expenditures for food and non-food consumption, shocks, and borrowing and savings. After the data collection, data were entered and cleaned for the purpose of data analysis.

4.2 Results and Discussions

Results of the descriptive and comparative analysis of some institutional and socioeconomic factors as well as farm characteristics will be first presented. As shown in Table 3, the rice farmers are on average around 53 years old. More than 50 percent of the rice farmers are women. The farmer household has five members and the household heads had around six years of schooling. On average, they have a long experience in Thai Jasmine rice cultivation with around 37 years and the land cultivated with rice covers around 33.6 Rai or 5.38 hectares. More than 60 percent of the farmer households are member of cooperative. Whether the farmer households received information about GI can be seen in Table 3 which shows that about 54 percent of them received it. Less than 50 percent, however, trusted information provided by governmental bodies. Obviously, the rice farmers faced the problem of the distance to the rice markets. As can be seen in Table 3, they spent almost 1 hour (0.82 hour or around 50 minutes) to reach the markets in order to sell their rice and it cost them approximately 727 Baht for transportation for each sale. Furthermore, almost 90 % of the farmer households reported an information asymmetry in the quality control regarding the measurement of the rice humidity when selling rice.

Table 3: Descriptive and comparative statistics of factors affecting GI certification adoption

Variable	Mean or % for Total Sample (N=346)	Mean or % for GI Group (n=128)	Mean or % for Non-GI Group (n=208)	Test of significance
Household and farm characteristics				
Age (years)	52.39	53.97	52.19	1.27
Gender (1=male) in %	48.51	59.47	34.85	11.88***
Household size (persons)	4.6	4.68	4.59	0.16
Education (years)	6.31	6.33	5.22	5.94**
Land size (rai)	33.6	41.04	32.16	3.47*
Experience (years)	36.43	38.34	38.63	0.03
Socioeconomic factors				
Member of cooperative (1=yes) in %	66.37	79.24	67.1	3.47*
Trust (1=yes) in %	43.75	49.59	42.23	1.00
Institutional factors				
Information (1=yes) in %	54.46	65.66	38.74	3.08*
Time to markets (hours)	0.82	0.95	0.85	1.20
Transportation costs (Baht)	726.96	981.51	543.93	8.71**
Monitoring costs (1=yes) in %	11.01	11.36	8	0.58

* Significant at α=10%; ** significant at α=5%; *** significant at α=1%

Source: own calculation

The GI and Non-GI groups do not differ much in terms of age, education, household size and experience. Whereas some other factors such as gender, information about GI from local governmental bodies, status of being member of a cooperative, transportation costs and trust seem to differ between groups. The comparison of the mean values between the groups clearly indicates that the GI group has a higher number of male farmers than the Non-GI group with 59.47% compared to only 34.85%. The means of both groups are significantly different at the 1% level. Regarding education and transportation costs, the means of these two groups also differ significantly, namely at 5%. The farmer households in the GI group paid higher costs for transportation than those in the Non-GI group. The GI farmers paid around 980 Baht for transportation, whereas the Non-GI farmers paid only 544 Baht for transportation, says almost 450 Baht different. The difference in education between both groups is however only one year. Regarding the status of being member of a cooperative and information, the two groups also differs. About 80% of the households in the GI group are members of the cooperative compared to the Non-GI farmers with only 67%. About 66% of GI farmer households got the information about GI compared with

around 39% of Non-GI farmers. The results show that the means of both groups are significantly different at the 10% level.

Table 4: Parameter estimates for adoption model of GI certification

Variable	Coefficient	Linearized Std. Err.	P>|t|	[95% Confident Interval]	
Intercept	-5.659633	1.536235	0.000	-8.681581	-2.637686
Age	0.0296697	0.0362804	0.414	-0.041698	0.1010373
Gender	1.066721	0.4723977	**0.025****	0.1374613	1.995981
Education	0.1432729	0.0569667	**0.012****	0.031213	0.2553328
Experience	-0.0429957	0.0290286	0.140	-0.1000983	0.0141069
Household size	-0.1740961	0.1678821	0.300	-0.5043394	0.1561471
Land size	0.009548	0.0049074	**0.053***	-0.0001054	0.0192013
Member of cooperative	1.04912	0.4504567	**0.020****	0.1630206	1.93522
Trust	0.5175631	0.3647612	0.157	-0.1999636	1.23509
Information	0.357067	0.2146942	**0.097***	-0.0652609	0.779395
Time to markets	-0.0890576	0.2673626	0.739	-0.6149903	0.436875
Transportation costs	0.0006046	0.0002115	**0.005****	0.0001885	0.0010207
Monitoring costs	0.1457045	0.6443198	0.821	-1.121746	1.413155

* Significant at α=10%; ** significant at α=5%; *** significant at α=1%

Source: own compilation

The following discussion is focused on identifying factors that can be used to explain the adoption decision behavior of Thai Jasmine rice households in the TKRH area of the Northeastern Thailand. The estimated parameters presented in Table 4 are not an indication of the marginal effects of the various factors on the probability of adoption. They provide a simple linear and additive summary of the influence of a variable on the logged odds of adopting a GI certification. The parameter estimates for the logit model presented in Table 4 shows that six factors have an impact on the decision of the Thai Jasmine rice households in the TKRH area to adopt a GI certification. Member of cooperative, transportation costs, gender and education are the variables having the most significant effects on household's adoption of a GI certification at a significance level of 5 %, whereas land size and information have a significant effect on an adoption decision at 10%.

Limited access to information about new technologies caused by a lack of well-functioning extension services by the government influences the decision making of farmers to adopt new technologies. The farmers may be extremely uncertain about the profitability of the new technologies (Zhao, 2005). Information given by the government

via local governmental bodies is therefore very helpful for GI actors to understand and gain knowledge about GI before making a decision to adopt.

Organizations such as cooperatives play a key role not only in facilitating the farmer households in case of the membership application for a GI club, but also serve as a source of information and help disseminating information to their members (Mburu et al., 2007 and Nwankwo et al., 2009). Since the level of trust ascribed to information from the cooperatives was higher than from other sources (Nwankwo et al., 2009), being member of the cooperative has thus a great impact on farmers'ability to access information about GI and their decision to adopt. The logistic regression results for these variables are therefore convincing.

As mentioned by Torre (2006), trust is very important for the quality system. In a club-based organization such as Appellation d'Origine Contrôlées (AOCs, Designation of Controlled Origin), organizational trust, besides collective action and contractual relations, is very important in such a governance system. Since a GI system is innovative and new, having trust in such new and innovative system has therefore a significant effect on the adoption decision of the farmer households. The issue of trust in a new system is crucial, since the GI certification system is considered as an important quality policy tool for many other agricultural and handicrafts products in Thailand. However, the regression result for the variable trust does not support these statements. The parameter estimate for trust is not significant. Nevertheless, such outcome could mainly be due to an imperfect proxy selected for trust, since no direct measure of trust for the GI system was available.

As stated by Brown (1975) and Brown and Lentnek (1973), transportation costs are factors that may be significantly considered in the adoption decision. Besides the market price and the level of information, the costs of transporting the innovation also affect the response of the potential adopter (Brown, 1975). The location of roads and markets and the road condition have an impact on the extent of transaction costs (Yesuf and Köhlin, 2008). As the TKRH area is such a huge area so that the households are widely dispersed, accessing to Thai Jasmine rice markets could be considered as a hurdle for the households since these markets are normally located very far away (approx. 10 km or taking almost one hour) from their residence. Moreover, the road condition inside the area is mostly bad so that the households often have to make a detour by using other roads with better condition

to reach the markets. With respect to the logistics, the results indicate that transportation costs have significant effects on the adoption decision of the TKR households and have a positive correlation with adoption. The higher the transportation costs, the more likely it is that the households would adopt a GI certification. This sign is contrary to *a priori* expectation (see Table 1) and implies that a direct relationship exists between transportation costs and adoption.

Land size represented by Jasmine rice cultivation area was statistically significant at the 10% level. The result confirms that an increase in land size for Thai Jasmine rice cultivation might after all lead to adoption of GI certification. The positive relationship between land size and adoption has already been shown by other empirical studies as stated by Feder et al. (1985). The study of Schutjer and Van Der Veen (1977, p.28), for example, concluded that "there appears to be no consistent pattern of land size acting as a constraint to technology adoption".

Table 5: Marginal effects of explanatory variables at mean characteristics

Variable	dy/dx	Std. Err.	P> Chi-Sq	X
Age	0.0006943	0.00085	0.414	52.2594
Gender*	0.0299776	0.01513	0.047	0.357729
Education	0.0033528	0.00127	0.008	5.26849
Experience	-0.0010062	0.00066	0.127	38.6168
Household size	-0.0040742	0.00377	0.279	4.59728
Land size	0.0002234	0.00011	0.051	32.4954
Member of cooperative*	0.0214261	0.00768	0.005	0.675551
Trust*	0.0126871	0.00908	0.162	0.425046
Information*	0.008356	0.00483	0.083	0.598236
Time to markets	-0.0020841	0.00625	0.739	0.855859
Transportation costs	0.0000141	0.00001	0.006	560.36
Monitoring costs*	0.003616	0.01693	0.831	0.081332

* dy/dx is for discrete change of dummy variable from 0 to 1. The marginal effect is the marginal change in probability (after svy: logit) evaluated at the sample means.

Source: own calculation

The preceding discussion however provides little information how these factors affect the probability of adoption and whether they affect it positively or negatively. Such knowledge would shed some light on possible implications for policies that affect the above factors such as information, transportation costs or member of organizations such as cooperative.

In terms of marginal effects, results presented in Table 5 suggest that being member of a cooperative and a gender issue have the highest positive marginal effect on adoption of GI certification. All other significant variables also have positive effects on the probability of adoption for the TKR farmer households. However, the results indicate very low (approximately zero) marginal effects of some explanatory variables such as transportation costs, land size and education, confirming the same trend as in the parameter estimates in Table 4.

Overall, it can be observed that the model predicts higher and more significant marginal effects for three factors, namely gender, membership in a cooperative and information. The importance of these factors, especially the latter two, were already stated by other authors like in Simon (1955) who emphasized the importance of the access to knowledge of rational individuals or by Longo (1990) who analyzed the way in which information transferred through different channels to influence farmers' decisions to adopt agricultural innovations and by Mburu et al. (2007) who emphasized the important role of cooperative in information dissemination to the farmers.

5. Conclusions

The analysis of adoption reveals several aspects involved in a new quality policy. A major finding of this study is that some institutional and social factors such as information, transportation costs and membership in a cooperative were found to have the largest impact on the probability of adoption of the GI certification by Thai Jasmine rice households in the TKRH area. The results of this study imply several important issues regarding a quality policy and could raise interests of policy makers of the country.

How a GI system is successfully introduced and promoted in specific GI regions depends particularly on the information and facilitation provided by the government to GI actors and finally on the information source which creates the level of trust ascribed to such information. Being member of a cooperative supports farmers in the way that disseminated information was already adjudged relevant to members' needs (Nwankwo et al., 2009). The cooperative serves as a crucial intermediary between farmer households and the government which is a primary source of information about GI. Due to rising challenges for the agricultural cooperatives in the liberalized global economy, it is therefore recommended

that the role of the cooperatives should be strengthened for the effectiveness of information dissemination. With the objective of enhancing the efficiency of the cooperative movement, its organization should also be restructured (Thuvachote, 2007).

Acknowledgements

The authors are grateful for financial support from the Royal Thai Government and granted funds for field surveys from PEGNet (Poverty reduction, Equity and Growth Network).

References

Addor, F. and Grazioli, A. (2002). Geographical Indications Beyond Wines and Spirits. A Roadmap for a Better Protection for Geographical Indications in the WTO/TRIPS Agreement. The Journal of World Intellectual Property 5(6), 865-897.

Adulavidhaya, K. and Tocetharat, S. (1981). The Adoption of New Rice-Rrowing Techniques in the Central Plain, Thailand.

Aldrich, J.H. and Nelson, F.D. (1984). Linear Probability, Logit, and Probit Models. A SAGE UNIVERSITY PAPER. Series: Quantitative Applications in the Social Sciences. SAGE Publications. UK

Ali, G. (2008). Expected Utility in Econometric Random Utility Models. The Indian Journal of Statistics 70(B) part 1, p. 63-68.

Asfaw, S. (2008). Global Agrifood Supply Chain, EU Food-Safety Standards and African Small-Scale Producers: The Case of High-Value Horticultural Export from Kenya. PhD Thesis.

Brown, L.A. (1975). The Market and Infrastructure Context of Adoption: A Spatial Perspective on the Diffusion of Innovation. Economic Geography 51(3), p. 185-216.

Brown, L.A. and Lentnek, B. (1973). Innovation Diffusion in a Developing Economy: A Mesoscale View. Economic Development and Cultural Change 21(2), p. 274-292.

Cañada, J.S. and Vázquez, A.M. (2005). Quality Certification, Institutions and Innovation in Local Agro-Food Systems: Protected Designations of Origin of Olive Oil in Spain. Journal of Rural Studies 21, p. 475-486.

Carambas, M.C. DM (2007). Economic Analysis of Eco-Labeling: The Case of Labeled Organic Rice in Thailand. In: Grote, U.; Basu, A.K.; Chau, N.H. (Eds.). New frontiers in Environmental and Social Labeling. Physica-Verlag, p. 83-110.

Dörr, A.C. (2009). Economic Analysis of Certification in the Brazilian Fruit Chain. Cuvillier Verlag. Göttingen.

Doss, C.R. (2006). Analyzing Technology Adoption Using Microstudies: Limitations, Challenges, and Opportunities for Improvement. Agricultural Economics 34, p. 207-219.

Dreier, J. (1996). Rational Preference: Decision Theory as a Theory of Practical Rationality. Theory and Decision 40 (3), p. 249-276.

Feder, G., Just, R.E. and Zilberman, D. (1985). Adoption of Agricultural Innovations in Developing Countries: a Survey. Economic Development and Cultural Change 33, p. 255-297.

Fernandez-Cornejo, J., Mishra, A., Nehring, R., Hendricks, C., Southern, M. and Gregory, A. (2007). Off-Farm Income, Technology Adoption, and Farm Economic Performance. Economic Research Report No. 36. Economic Research Service. United States Department of Agriculture.

Greene, W.H. (2003). Econometric Analysis. Fifth Edition. Pearson Education International. New Jersey.

Grote, U. (2009). Environmental Labeling. Protected Geographical Indications, and the Interests of Developing Countries. The Estey Center Journal of International Law and Trade Policy 10(1), p. 94-110.

Hassan, R and Nhemachena (2008). Determinants of African Farmers' Strategies for Adapting to Climate Change: Multinomial Choice Analysis. African Journal of Agricultural and Research Economics 2 (1), p. 83-104.

Hosmer, D.W. and Lemeshow, S. (2000). Applied Logistic Regression. Second Edition. A Wiley-Interscience Publication. New York.

Jena, P.R. and Grote, U. (2010). Changing Institutions to Protect Regional Heritage: A Case for Geographical Indications in the Indian Agrifood Sector. Development Policy Review 28(2), p. 217-236. Downloadable at www3.interscience.wiley.com/cgi-bin/fulltext/123270072/PDFSTART.

Josling, T. (2005). What's in a Name? The Economics, Law and Politics of Geographical Indications for Foods and Beverages. Paper Presented at: The Institute for International Integration Studies, Trinity College, Dublin, 11 November 2005.

Kalyebara, R. (1999). A Comparison of Factors Affecting Adoption of Improved Coffee Management Recommendations etween Small and Larger Farmers in Uganda. Paper to be

Presented at the CIAT Internationl Workshop:" Assessing the Impact of Agricultural Research on Poverty Alleviation". San Jose, Costa Rica: 14-16 September 1999.

Kisaka-Lwayo, M. (2007). A Discriminant Analysis of Factors Associated with the Adoption of Certified Organic Farminig by Smallholder Farmers in Kwazulu-Natal, South Africa. AAAE Conference proceedings. Ghana, p. 411-416.

Levy, P.S. and Lemeshow, S. (1999). Sampling of Populations. Methods and Applications (Wiley Series in Probability and Statistics). Third edition. Wiley-Interscience Publication. New York.

Liao, T.F. (1994). Interpreting Probability Models. Logit, Probit, and other Generalized Linear Models. A SAGE UNIVERSITY PAPER. Series: Quantitative Applications in the Social Sciences. SAGE Publications. UK

López, C.P. and Requena, J.C. (2005). Factors Related to the Adoption of Organic Farming in Spanish Olive Orchards. Spanish Journal of Agricultural Research 3(1), p. 5-16.

Lucatelli, S. (2000). Appellations of Origin and Geographical Indications in OECD Member Countries: Economic and Legal Implications. The Study Carried Out under the Programme of Work for 1999/2000 Adopted by the Committee for Agriculture and Endorsed by the Trade Committee. COM/AGR/APM/TD/WP(2000)15/FINAL.

Magnani, R. (1997). Sampling Guide. Food and Nutrition Technical Assistance Project (FANTA). Academy for Educational Development. Washington D.C.

Mburu, L.M., Wakhungu, J.W. and Gitu, K.W. (2007). Determinants of Smallholder Dairy Farmers' Adoption of Various Milk Marketing Channels in Kenya Highlands. Livestock Research for Rural Development. Volume 19, Article No. 134. Retrieved April 28, 2010, from http://www.lrrd.org/lrrd19/9/mbur19134.htm.

Menard, S. (2002). Applied Logistic Regression Analysis. Second Edition. A SAGE UNIVERSITY PAPER. Series: Quantitative Applications in the Social Sciences. SAGE Publications. UK

Nwankwo, U.M., Peters, K.J. and Bokelmann, W. (2009). Can Cooperative Membership and Participation Affect Adoption Decisions? Issues for Sustainable Biotechnology Dissemination. AgBioForum 12 (3&4), p. 437-451.

Pampel, F.C. (2000). Logistic Regression. A Primer. A SAGE UNIVERSITY PAPER. Series: Quantitative Applications in the Social Sciences. SAGE Publications. UK

Rangnekar, D. (2004). The Socio-Economics of Geographical Indications. Issues Papers No. 8. UNCTAD/ICTSD.

Roger, E.M. (1995). Diffusion of Innovations. Fourth Edition. The Free Press, New York.

Roger, E.M. (2003). Diffusion of Innovations. Fifth Edition. The Free Press, New York.

Saka, J.O., Okoruwa, V.O., Lawal, B.O. and Ajijola, S. (2005). Adoption of Improved Rice Varieties Among Small-Holder Farmers in South-Western Nigeria. World Journal of Agricultural Sciences 1 (1), p. 42-49.

Short, T.H. and Pigeon, J.G. (1998). Protocols and pilot studies: Taking Data Collection Projects Seriously. Journal of Statistics Education 6 (1). Available online at http://www.amstat.org/publications/jse/v6n1/short.html.

Simon, H.A. (1955). A Behavioral Model of Rational Choice. The Quarterly Journal of Economics 69 (1), p. 99-118.

Singleton, R.A. and Straits, B.C. (1999). Approaches to Social Research. Third Edition. New York.

Thuvachote, S. (2007). Agricultural Cooperatives in Thailand: Innovations and Opportunities in the 21st Century. FFTC Publication. Retrieved April 29, 2010, from http://www.agnet.org/library/eb/579/.

Torre, A. (2006). Collective Action, Governance Structure and Organizational Trust in Localized Systems of Production. The Case of the AOC Organization of Small Producers. Entrepreneurship & Regional Development (18), p. 55-72.

Tregear, A., Kuznesof, S. and Moxey, A. (1998). Policy Initiatives for Regional Foods: Some Insights from Consumer Research. Food Policy 23(5), 383-394.

Wooldridge, J.M. (2006). Introductory Econometrics. A Modern Approach. Third Edition. Thomson South-Western. Mason, OH.

Yesuf, M. and Köhlin, G. (2008). Market Imperfections and Farm Technology Adoption Decisions. A Case Study from the Highlands of Ethiopia. Environment for Development. Discussion Paper Series.

Zhao, J. (2005). The Role of Information in Technology Adoption under Poverty. UNU-WIDER Research Paper No. 2005/41.