The Satisfaction Factors of Farmers in using Soil Analysis Service of the Land Development Regional Office 6

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Abstract

The farmers who would like to use the soil analysis service of the Land Development Regional Office 6 must submit soil samples through the Volunteer Soil researcher and receive soil analysis results as specified. The service period is to submit the soil for analysis more than two months before planting and receive the results within two months. This study aims to analyze the satisfaction factors of the farmer that using the soil analysis service of the Land Development Regional 6. The ordinal regression model was used to find the satisfaction factors and soil sampling collection is accurate or calculated as 67%. However, farmers had a high level of overall awareness towards service quality with the highest level including service certainty. The result of this study revealed that perceived levels of Reliability, Facility, Information, and Responsibility had high levels, respectively. The farmers were satisfied with the soil analysis services provided by the office in the factors of process and staff and all overall aspects had high levels. The results revealed that there were nine major factors as follows: age, educational level, period of soil analysis, soil sample submission channel, reliability, certainty, facility, information, and responsibility. Suggestions are to develop a soil sample submission channel to be faster and more modern as well as further training to provide knowledge on a soil analysis to increase the level of satisfaction for farmers.

Keywords: Land development regional office 6, Ordinal logistic regression, satisfaction factors, Soil analysis service

Introduction

Most of Thailand's soil resources are relatively highly developed soils. It will result in poor soil fertility. Each region had different characteristics and properties that depended on the influence of soil formation factors. For example, soil resources in the north, especially the plains, have moderate to high agricultural potential, but they are largely limited to mountainous areas and very steep slopes [1]. In the northern region, most problems occur in areas wit h steep slopes. It causes soil erosion, depletion of the nutrient and organic substrate, as well as degradation of soil structure. In addition, there are problems with improper soil management, land use without maintenance, and forest encroachment to expand agricultural land. These problems resulted in lower soil fertility and productivity. As a result, farmers have lower yields and incomes, but their debt increased dramatically. Therefore,

Land Development is responsible for developing the land to have suitable conditions for sustainable agriculture, reduce costs and increase the productivity of farmers. Therefore, a group of stakeholders was established to inspect and analyze soil called "soil testing specialists" which have been distributed in land development offices across the country to provide farmers with efficient soil analysis services.

Previous research on infrastructure sustainability may be classified into two categories: assessment index research and evaluation model creation. In this study, satisfaction is defined as a farmer's successful response to the utilization of soil analysis service. This research specifically employed Raboca definition of satisfaction, which defines it as the fulfillment of certain prior expectations about a product or service. Several factors influence farmer satisfaction with agricultural extension services, including personal and farm characteristics (age,

education, family size, land size, and livestock ownership), perceived economic return, perceived package appropriateness, participatory nature of extension program, use of multiple communication methods, access to credit and training, frequency of extension contact, and year of extension participation.

The other research revealed that older farmers are happier with extension services than younger farmers, according to Lavis and Blackburn [2] and Terry and Israel [3], which may be due to their farm experience. Older farmers, on the other hand, are frequently seen as less flexible and less ready to engage in new or creative activities owing to a fear of danger, whereas young farmers may be more risk-averse when it comes to implementing new technology on their farm [4]. As a result, the impact of age on farmer satisfaction is uncertain. Education not only boosts a person's resources and capacity to attain goals but also broadens one's understanding of options and the benefits that may be anticipated from one's actions. Literacy, according to Aphunu and Otoikhian [5], is required for effective extension communication. Extension services are more effectively used by people with higher educational status [6,7]. Furthermore, Terry and Israel [3] discovered that the higher the client's educational level, the more likely they are to be satisfied with extension service. Following the logic, we claim that a farmer's educational standing has a beneficial impact on their satisfaction with the extension service.

Currently, farmers have more knowledge and support in receiving soil analysis services for farming. The number of soil samples submitted for analysis increases every year. Areas that have a lot of agriculture such as the Land Development Regional Office 6. It consists of five areas as follows: Chiang Mai, Lamphun, Lampang, Mae Hong Son, and the Land Development Operation Center for Royal Project in Chiang Mai, and to operate the soil analysis service effectively, it is necessary to understand the service behavior, quality, and service satisfaction of the users as well as the factors of customer satisfaction. Finally, The findings of this research provide policy recommendations for managing agricultural systems, as well as a background on agricultural land management in Thailand.

Material and Methods

Sampling and Instrument Analysis

This study was conducted in 2020 and collected primary data from 400 farmers from a total of 7,450 population. This study allocated quota proportionally to farmers who received soil analysis service using the average farmer attendance database in the fiscal year 2014-2019 classified by the five areas. This Project was located in mountain areas, 120 farmers in Chiangmai, 48 farmers located in Lamphun District, 96 farmers located in Lampang District, 16 farmers in Mae Hong District, and 120 farmers under the Land Development Operation Center for Royal Project, respectively. (Figure 1)

The data were collected by questionnaires Service characteristics and methods, perception of service quality, and level of satisfaction towards soil analysis services were analyzed by using descriptive statistics and ordinal logistic regression to study the farmers' satisfaction. The model used in the study was as follows:

Ordinal regression model [8]

$$\theta_j = (\text{Prob}(Score \leq j))/(\text{Prob}(Score > j))$$

When testing the suitability of the link function, then decided to use the logit as the link function.

$$\text{Prob}(Score \leq j) = 1/(1+e^{-(\alpha_j-\beta X)})$$

$$\text{Prob}(Score > j) = 1 - 1/(1+e^{-(\alpha_j-\beta X)})$$

$$= e^{\wedge}(-(\alpha_j-\beta X))/(1+e^{(\alpha_j-\beta X)})$$

$$\theta_j = (1/(1+e^{\wedge}(-(\alpha_j-\beta X))))/(e^{-(\alpha_j-\beta X)})/(1+e^{-(\alpha_j-\beta X)}))$$

Linear equation form as follows:

$$\ln[\theta_j] = \alpha_j - \beta X$$

$$\ln[\theta_{(k,j)}] = \alpha_{(k,j)} - \Sigma\beta(k,i) X_i$$

When, $\theta_{(k,j)}$ Is the opportunity for farmers to have a satisfaction level of k at level j

k is the satisfaction level of the farmers who received the soil analysis services had 3 characteristics as follows:

k = 1 means the satisfaction level of farmers in the process.

k = 2 means the satisfaction level of farmers in staff.

k = 3 means the satisfaction level of farmers in the overall picture.

j is the level of the dependent variable (j = 1,…,5)
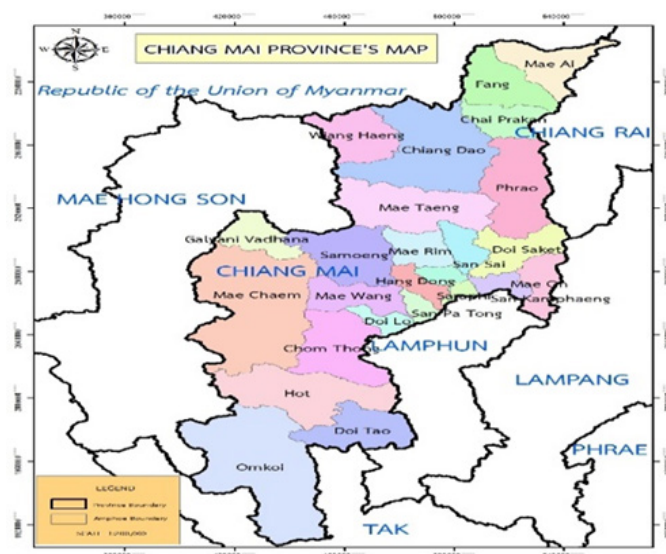
i is the level of the independent variable (i = 1,…,11)

Figure 1: Map of Chiang Mai Province.

(source: http://www.chiangmai.go.th)

Results and Discussion

Characteristics and Methods of using Soil Analysis Services by Farmers

The results revealed that most farmers would like to use mobile soil analysis service by using laboratory equipment, there were channels for submitting soil samples via a volunteer soil doctor and receiving soil analysis results respectively including the tendency to receive soil analysis results in the future through relevant staff. The service period was that the soil was analyzed more than two months before planting, and the soil samples were analyzed 2-3 times every season or some season, and the soil analysis result was obtained within two months. Most of the monoculture farmers took an average of three soil samples per rai. The soil samples were randomly collected at two points per rai. Which is the correct sampling of soil or calculated as 67.00% and farmers had the highest level of awareness of service quality, service reliability. The remaining four factors were the responsibility of the service staff, the reliability of the service, the service information, and the facility being at a high level, respectively.

Satisfaction in Service Quality of Farmers who Received Soil Analysis Services

The results revealed that most farmers were satisfied with the overall soil analysis service of the Land Development Regional Office 6. Overall service processes and staff were at a high level. When considering process factors, it was found that farmers' satisfaction was at a high level. When considering each aspect, it was found that the highest level of satisfaction was the service process because it was flexible and

simple. As for the staff factor, the farmers had overall satisfaction at a high level. When considering each aspect, it was found that the highest satisfaction was the willingness and courteous service from staff.

Factors Affecting the Farmers' Satisfaction with Soil Analysis Service

The significance of each independent variable was tested by Wald test statistics. When considering a Wald statistic greater than 1 and a significant Sig. At more than 95%, the study found that the variables influencing farmers' satisfaction with soil analysis services of the Land Development Regional Office 6 had 9 of the 11 considered variables. It was considered in three areas:

As for process factors, it revealed that seven effective variables resulted in increased satisfaction levels: age (41- 60 years old), education level (grade 4, elementary and high school levels), period (less than two months and in two months), soil's submission channel (via the Land Development Regional Office 6 staff only once). The three aspects of service quality were reliability, certainty, and information. The process was at a high level to the highest level and can be forecasted accurately 72.75% as in Table 1.

The summary statistics of the socio-economics variables for rice farmers are shown in Table 1. The overall situation of rice farmers' production system was obtained through deep interviews with 100 sample rice farmers in Chiang Mai Province, and the findings of this study are as follows.

As for the overall picture factors, it was revealed that seven effective variables result in increased satisfaction levels: age (41- 60 years old), education level (grade 4, elementary, high school, high vocational certificate, high vocational certificate levels), soil's submission channel (via myself only once). The three aspects of service quality were reliability, certainty and responsibility were at a high level to the highest level. Information was at a high level. While the soil's submission channels (via staff more than one time) decreased the satisfaction. The staff was at a high level to the highest level and can be forecasted accurately 76.50% as in Table 2.

As for overall picture factors, it was revealed that nine effective variables resulted in increased satisfaction levels: age (41- 60 years old), education level (grade 4, elementary and high school levels), period (less than two months), soil's submission channel (via the Land Development Regional Office 6 staff only once). The five aspects of service quality were reliability, certainty, facility, information, and reliability. While the soil's submission channels (via staff more than one time) decreased the satisfaction and can be forecasted accurately 76.25% as in Table 3.

Therefore, there were nine variables affecting farmers' satisfaction with soil analysis services from the Land Development Regional Office 6: Age, education level, period, soil sample delivery channel, reliability, certainty, facility, information, and responsibility (Table 4).

Table 1: Variables affecting the forecasting of farmer satisfaction on soil analysis service of the Land Development Regional Office 6.

Independent variable	Variable value	Estimate	S.E.	Wald	df	Sig.
Age 41-60 years old	Age = 2	0.856	0.368	5.413	1	0.020**
Grade 4	Educa = 1	2.24	0.612	13.4	1	0.000***
Elementary school level	Educa = 3	1.632	0.542	9.061	1	0.003***
High school level	Educa = 4	1.51	0.536	7.918	1	0.005***
Obtain soil analysis results <2 months	Time_receive = 1	1.39	0.359	15.002	1	0.000***
Obtain soil analysis results within 2 months	Time_receive = 2	0.69	0.29	5.655	1	0.017**
Submit to the land development regional office 6 (Only once)	Routesent_ receive = 2	2.345	0.697	11.319	1	0.001***
[Reliability = Highest]	Reliability = 3	2.472	0.606	16.639	1	0.000***
[Reliability = High]	Reliability = 2	1.27	0.452	7.906	1	0.000***
[Certainty = Highest]	Certainty = 3	2.377	0.588	18.131	1	0.000***
[Certainty = High]	Certainty = 2	1.399	0.404	11.99	1	0.001***
[Information = Highest]	Information = 3	1.364	0.472	8.341	1	0.004***
[Information = High]	Information = 2	0.947	0.33	8.219	1	0.004***
Note: Threshold's Estimate at [Process = 1] is 5.845 and Threshold is at [Process = 2] is 9.917.						
** Statistically significant at level 0.05 and *** Statistically significant at level 0.01.						

Table 2: Variables affecting the forecasting of farmer satisfaction on soil analysis service of the Land Development Regional Office 6.

Independent variable	Variable value	Estimate	S.E.	Wald	df	Sig.
Age 41-60 years old	Age = 1	1.043	0.389	7.206	1	0.007***
Grade 4	Educa = 2	2.059	0.648	10.09	1	0.001***
Elementary school level	Educa = 3	1.648	0.58	8.086	1	0.004***
High school level	Educa = 4	1.414	0.576	6.021	1	0.014***
Obtain soil analysis results <2 months	Time_receive = 1	1.026	0.382	7.222	1	0.007***
Submit by the land development regional office 6 (Only once)	Routesent_receive = 2	1.432	0.666	4.616	1	0.032**
Submit by Land Development Operation Center for Royal Project staff (More than 1 time)	Routesent_receive = 5	-1.291	0.571	5.115	1	0.024**
[Reliability = Highest]	Reliability = 3	2.234	0.643	12.07	1	0.001***
[Reliability = High]	Reliability = 2	1.641	0.493	11.063	1	0.001***
[Certainty = Highest]	Certainty = 3	3.316	0.589	31.724	1	0.000***
[Certainty = High]	Certainty = 2	1.979	0.437	20.481	1	0.000***
[Facility = Highest]	Facility = 3	2.28	0.62	13.503	1	0.000***
[Information = Highest]	Information = 3	1.287	0.502	6.573	1	0.004***
[Information = High]	Information = 2	0.768	0.354	4.706	1	0.004***
[Responsibility = Highest]	Responsibility = 3	2.153	0.702	9.407	1	0.002***
[Responsibility = High]	Responsibility = 2	1.798	0.588	9.358	1	0.002***
Note: Threshold's Estimate at [Overall = 1] is 5.845 and Threshold is at [Overall = 2] is 9.917.						
** Statistically significant at level 0.05 and *** Statistically significant at level 0.01.						

Table 3: Variables affecting the forecasting of farmer satisfaction on soil analysis service of the Land Development Regional Office 6.

Independent variable	Variable value	Estimate	S.E.	Wald	df	Sig.
Age 41-60 years old	Age = 1	1.043	0.389	7.206	1	0.007***
Grade 4	Educa = 2	2.059	0.648	10.09	1	0.001***
Elementary school level	Educa = 3	1.648	0.58	8.086	1	0.004***

High school level	Educa = 4	1.414	0.576	6.021	1	0.014***
Obtain soil analysis results <2 months	Time receive = 1	1.026	0.382	7.222	1	0.007***
Submit by the land development regional office 6 (Only once)	Routesent receive = 2	1.432	0.666	4.616	1	0.032**
Submit by Land Development Operation Center for Royal Project staff (More than 1 time)	Routesent receive = 5	-1.291	0.571	5.115	1	0.024**
[Reliability = Highest]	Reliability = 3	2.234	0.643	12.07	1	0.001***
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[Facility = Highest]	Facility = 3	2.28	0.62	13.503	1	0.000***
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[Information = High]	Information = 2	0.768	0.354	4.706	1	0.004***
[Responsibility = Highest]	Responsibility = 3	2.153	0.702	9.407	1	0.002***
[Responsibility = High]	Responsibility = 2	1.798	0.588	9.358	1	0.002***
Note: Threshold's Estimate at [Overall = 1] is 5.845 and Threshold is at [Overall = 2] is 9.917.						
** Statistically significant at level 0.05 and *** Statistically significant at level 0.01.						

Table 4: Variables affecting the forecasting of farmer satisfaction on soil analysis service of the Land Development Regional Office 6.

Independent variable	Variable value	Factors		
		Process	Staff	Overall picture
Age 41-60 years old	Age = 2	√	NS	√
Grade 4	Educa = 2	√	√	√
Elementary school level	Educa = 3	√	√	√
High school level	Educa = 4	√	√	√
High Vocational Certificate / High Vocational Certificate level	Educa = 5	NS	√	NS
Obtain soil analysis results <2 months	Time_receive = 1	√	NS	√
	Time_receive = 2	√	NS	NS
Obtain soil analysis results within 2 months				

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Submit to the land development regional office 6 (Only once)	Routesent_receive = 2	√	NS	√
Submit by yourself (More than 1 time)	Routesent_receive = 6	NS	√	NS
Submit to Land Development Operation Center for Royal Project staff (More than 1 time)	Routesent_receive = 10	NS	√	√
[Reliability = Highest]	Reliability = 3	√	√	√
[Reliability = High]	Reliability = 2	√	√	√
[Certainty = Highest]	Certainty = 3	√	√	√
[Certainty = High]	Certainty = 2	√	√	√
[Facility = Highest]	Facility = 3	NS	NS	√
[Information = Highest]	Information = 3	√	√	√
[Information = High]	Information = 2	√	NS	√
[Responsibility = Highest]	Responsibility = 3	NS	√	√
[Responsibility = High]	Responsibility = 2	NS	√	√
Note: NS was not a statistically significant difference at a level of significance more than 0.05.				

Conclusions

Most farmers would like to use mobile soil analysis service by using laboratory equipment, there were channels for submitting soil samples via a volunteer soil doctor and receiving soil analysis results respectively including the tendency to receive soil analysis results in the future through relevant staff. The service period was that the soil was analyzed more than two months before planting, and the soil samples were analyzed 2-3 times every season or some season, and the soil analysis result was obtained within two months. Most of the monoculture farmers took an average of three soil samples per rai. The soil samples were randomly collected at two points per rai. Which is the correct sampling of soil or calculated as 67.00%.

The farmers' satisfaction of service quality in 2 aspects shows that most farmers were satisfied with the overall soil analysis service of the Land Development Regional Office 6 both process and staff at a high level. Most of the farmers were satisfied with the staff more than the process slightly. The farmers' satisfaction of service quality in 3 aspects showed that overall, there were nine effective variables: age, educational level, period of soil analysis, soil sample submission channel, reliability, certainty, facility, information, and responsibility. As for process factors, it revealed that seven effective variables resulted in increased satisfaction levels: age, education level, period, soil's submission channel, reliability, certainty, and information. As for staff, it revealed that six effective variables resulted in increased satisfaction levels: an education level, soil's submission channel, reliability, certainty, responsibility, and information. The factors affecting farmers' satisfaction were staff, process Overall, five factors were found: study, soil's submission channel, reliability, certainty, and information. These factors provided a positive effect on the level of satisfaction [9-20].

Recommendation

Factors affecting farmers' satisfaction level on soil analysis service of the Land Development Regional Office 6 were found that it was consistent with the recommendation for soil analysis service of the Land Development Regional Office 6 from 105 farmers. It can be considered into each area as follows:

Age and educational level factors, farmers affecting the satisfaction level were 41-60 years old and graduated from grade 4 to Vocational Certificate/Vocational Certificate. Therefore, relevant agencies should organize or train farmers on soil analysis by using simple instructional materials and using appropriate and clear language.

For soil's submission channel and period factors, the process for soil's submission channel should be shortened as well as using technology to submit soil analysis results such as online results or may provide appropriate quotas and timing for soil analysis.

Another suggestion is production inputs that are needed. For example, expediting substance I, and expediting substance II or an additional fertilizer. Moreover, additional LDD test kits should be distributed to general farmers who are needed or may be available to farmers who require to purchase LDD test kits to analyze them by themselves for maximum convenience and speed.

This study found that the quality factors of the service had a very high effect on the farmers' satisfaction level in soil analysis. Therefore, the next study should study the feasibility of developing and improving the quality of soil analysis services of the Land Development Regional Office 6 as appropriate

Acknowledgement

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