SOCIOECONOMIC CONDITION AND LAND USE TRANSFORMATION OF FARMERS IN MAIZE FARMING: THE CASE STUDY OF NAN PROVINCE, THAILAND

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Abstract

This paper presents about socioeconomic condition and land use transformation of farmers in maize farming at Nan. Located in the northern region of Thailand, Nan is a province with limited arable areas. Since more than 87 percent of its landscape covers with mountainous forest and slope, the areas suitable for growing plants is barely 12 percent. The past 10 years thus have witnessed the increase of maize farming by forest encroachment. In contrast to the positive growth in quantity and price of maize, the poverty of Nan people however is getting worse. This is clearly evident in the rank of the poor across the Thai nation, while in 2004 Nan ranked number 39 but in 2011 its poor population ratio rose to number 21 of the country. Thus the key issues needed to be addressed by the government include the farmers' socioeconomic condition, the constraint of land use in the slope areas, and the introduction of alternative plants for sustainable income and career.

The researcher formulates the conceptual model that tries to infer about socioeconomic condition and land use transformation from field survey that includes 703 samples of farmers by questionnaires. This study found that the most influential factors affecting the decision to shift from growing maize to alternative plants were the market and the middleman, and the cost for growing alternative plants. However, the least influential factor was the knowledge in cultivating the alternative plants. In sum, the change in maize growing behavior was a result of price, income, and market factors.

Keywords

Socioeconomic, Maize

1. Introduction

With more than 87 percent of its land covered with mountainous forest and slope, Nan is left with only 12 percent of arable lands, and another 1 percent for residential areas. With the constraint from both the limit of agricultural areas and the magnitude of farmers without land tenure, this northern-region province then has to cope with the forest encroachment for short-run commercial farming, such as maize for animal feed. The level of deforestation has been also expedited in the past 4 years thanks to the increasing in price of maize. The severity that could be simply seen from the number of encroachment areas for 400,000 rais or equivalent to 153, 846 acres has affected the transformation of land use as well as the deterioration of the watershed forest areas. Besides the loss in biodiversity, the forest encroachment for maize farming has also caused soil erosion, degradation of water quality, and also other environment related problems. For many years up to the present, the rapid expansion of commercial farming areas has been also made possible from policies and measures supported by the government, for example The project promoting the cultivation of commercial plants to substitute the monoculture (rubber plant) in 2010, The minimum support prices insurance scheme (2009), and agricultural product pledging scheme (2005) etc. In spite of its benefit in alleviating the risk for the farmers' income, these policies or measures have helped expanding the commercial farming area up to the uncontrollable level. The most striking sample is the areas for growing maize for animal feed in Nan that enlarged 3 folds within only 5 years (2005 – 2009).

According to the statistic data of The Office of Agricultural Economics, while the maize farming areas in 2012 and 2013 were 601,950 rais and 603,120 rais respectively, the latest figure

from the same source indicated that the maize farming areas in Nan became 803,050 rais in 2014; this number was equivalent to 10% of the total areas of this province. There were 2 types of maize farming practice in Nan, the first one was conducted in the field or in the high land, and relied on natural waterway and also the irrigation for all year round. The second one was operated by preparing the cultivated area during dry season in the slope and high land, and it was basically rainfed agriculture. In one year, the former practice then can be done once or twice, while only once for the latter (Benjamas Chotithong et.al 2012.)

The rapid expansion of maize farming areas in Thailand especially in those slope areas has tremendously transformed the natural environment and the life of local people. The provincial level data showed that in the past 10 years, the level of maize growing in Nan and the product price has greatly increased but at the same time the poverty problem facing the local people has also exacerbated. The record indicated that the number of the poor in Nan was used to rank number 39 of the country in 2004, however in 2011 it became number 21 (Office of the National Economics and Social Development Board, 2013 as cited in Sittidaj Pongkijvorasin and Khemarat Talerngsri, 2015).

This paper sheds light on the socioeconomic condition and the land use transformation of those maize growing farmers for the past 10 years in Nan Province in Thailand. At the policy level, the derived data could be taken into consideration for solving the forest encroachment issue, the environmental problem, and the poverty of the farmers. Being aware of Nan provincial area as the headwaters of the Nan River – one of the key waterway of the North and Thailand, the government has seriously set the policy to solve the problem for the past 3 years: the reforestation policy of the National Council for Peace and Order (NCPO) and the abandon of maize price support insurance scheme. In addition to this the private sector also expressed its support for this policy; such as CP Group who, with the expectation of helping decrease the maize farming areas, reduced the purchasing volume of maize for animal feed in Nan. These policies not only benefited the farmers, but also the environment as well; the more the farmers continue their maize farming practice, the more the level of forest encroachment. Growing maize in slope areas can deteriorate the quality of soil and water because of the chemical usage and the burn of corncob after the harvest. After 3 – 5 years of cropping, the quality of the produce will become worse and led to more usage of chemical or to find new farming areas. If the encroachment forest to expand maize farming area declines, the forest areas could be expected to increase. Before the policy implementation, the government needs to clearly address the

socioeconomic condition of the farmers, the limitation of land use in the slope area, the promotion of alternative plants to substitute the maize and to provide the sustainable income and career for the farmers.

2. Objective

- To study the socioeconomic condition and the land use transformation of the maize farming farmers in Nan Province, Thailand.

3. The Methodology

- **Study Area**

The total areas of Nan province are 7,170,045 rais or 11,472.07 square kilometer with the altitude of 2,112 meters above the sea level. Nan is divided into 15 districts (amphoe) as follows: Mueang Nan, Mae Charim, Ban Luang, Na Noi, Pua, Tha Wang Pha, Wiang Sa, Thung Chang, Chiang Klang, Na Muen, Santi Suk, bo Kluea, Song Khwae, Phu Phiang, Chaloem Phra Kiat. (Office of Nan Province, 2014)

- **Population and Sample Group**

(1) Interview the local farmers within Nan Province on maize farming as well as their problems and obstacles in land use.

(2) Sample Group and Research Tools for Collecting Data

The sample group was derived from the population growing maize in Nan Province. The unit of analysis was at household level. While the questionnaires were applied, the sample selection was conveniently chosen, not employed non probability method.

(3) Sample Size Calculation Method

The proportional random sampling method was utilized in calculating the sample size. The calculation formula is shown below (Louis M. Rea and Richard A.Parker, 1997, pp.117 - 121).

Pre requirement

(1) Allow $p = 0.5$, then ($\sqrt{0.5(1-0.5)}$) will generate the highest value of the estimation. The pre condition of $p = 0.5$ implies that the probability of the random population is equal that of non random population.

(2) This study provide the variance in estimating the proportion of the population (P) not over 5 percent at the level of confidence of 95 percent (Standard score Z equals 1.96). This implies that in data collecting of 100 samples, the mistake is expected to be not over 5 samples. $C_p = 0.04$

From this formula

$$n = \left(\frac{Z_\alpha \sqrt{p(1-p)}}{C_p} \right)^2$$

Then

$$n = \left(\frac{1.96\sqrt{0.5(1-0.5)}}{0.04} \right)^2$$

$$n = 600$$

From calculation formula, it was found that the size of samples had to be at least 600 households at the level of confident 95 percent. However, in order to avoid the unforeseeable mistakes and to obtain the good representatives of the population, 703 samples in total were collected during this study's field work. The data will be randomly collected from those districts critically affected from maize farming such as the contamination of chemical substance in natural waterway, the expansion of slash and burn practice. This background led to specify the areas for collecting data in 3 districts, 13 sub-districts, and 29 villages.

4. Literature Review Relating to Socioeconomics of Nan Province

According to the Data on Basic Minimum Needs (Jor Por Tor) in 2012, the poverty line of Nan province was 23,000 baht per head per annum. The survey of farmers totally 92,586 households revealed that 91,241 households or 98.5% were above the poverty line while only 1,345 households or 1.5% lived below this minimum level (Office of Agricultural Economics, 2012). In term of net income during 2004 – 2010 from maize farming when classified into 3 categories: self-financing, formal loan, and informal loan, it was found that in case the buying price of maize production was good, those farmers who did maize farming in the slope areas by self-financing or formal loan would obtain income approximately 80,000 baht per annum, while those employed informal loan would make about 60,000 – 70,000 baht per annum. However, in a year that witnessed low maize price, those farmers without informal loan would receive about 30,000 baht per annum, while those with informal loan would only make 10,000 baht per annum. It is worth noting that the cost of production such as cost of labor, expenses on fertilizer and

chemical, milling and transportation, was averagely 3,712 per rai (Sittidaj Pongkijvorasin and Khemarat Talerngsri, 2015)

Geographically dispersed throughout the province, Nan's population is ranked 3rd in density per m2 (approximately 41 people per m2) and could majorly be categorized into two groups; the majority of the population is Tai Yuan or Khon Muang who migrated from Chiang Saen and different parts of Lanna Kingdom, and Tai Lue (Tai Lue, Tai Yong) who migrated from Xishuangbanna and various cities. Most of Nan's people are working in agricultural sector. And since most areas of this province are slope areas, the majority of farmers thus utilizes these incline plots for farming (Jiraphong Sa-nguanjai, 2014).

5. Land Use Transformation of Maize Farming Farmers

- According to the data on land use, in 2007 it showed that maize growing areas was 604,764 rais then became 1,183,705 rais in 2012. In 5 years, the increased areas thus equivalent to 578,941 rais or 8.15%.
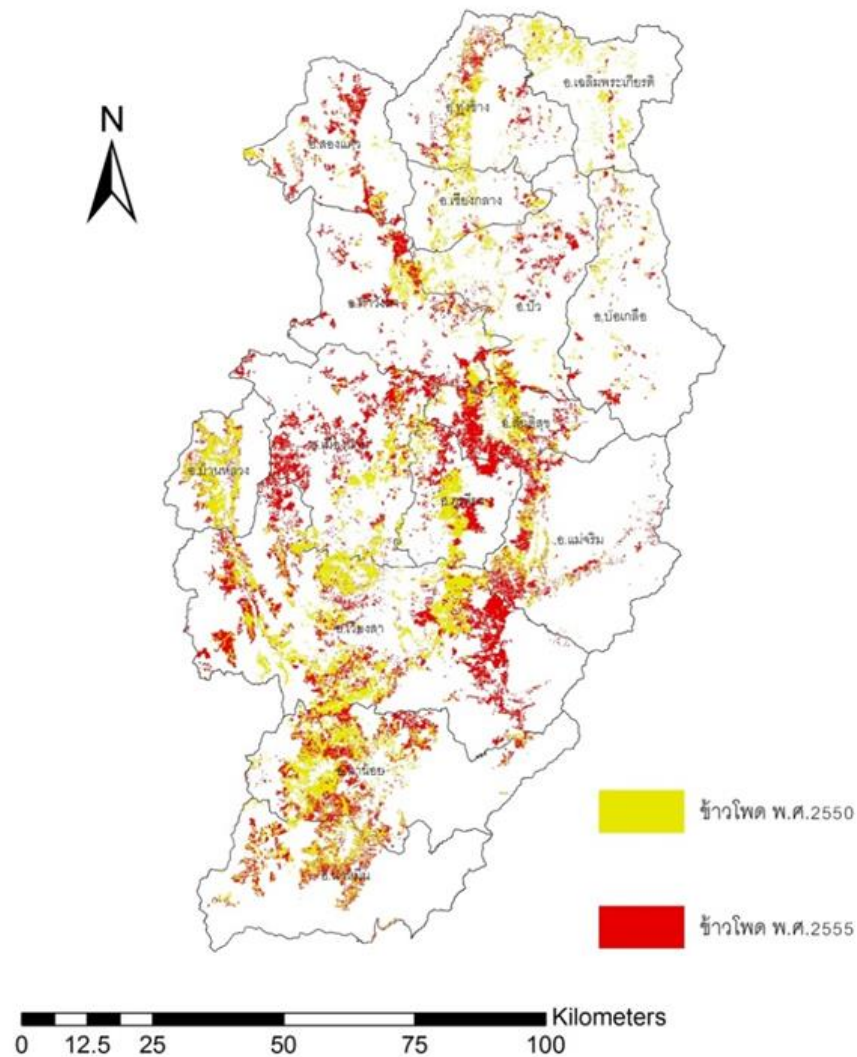
Figure 1: *Shows Maize Farming Area in Nan Province by Comparing between that of 2007 Year and of 2012 Year*
Source: Applied from the Land Development Department's Data Base

- According to land use data, in 2007 the total forest area was 5,542,678 rais then became 4,812,085 rais. This implies that the forest areas decreased 730,593 rais or 7.37 percent within 5 years.
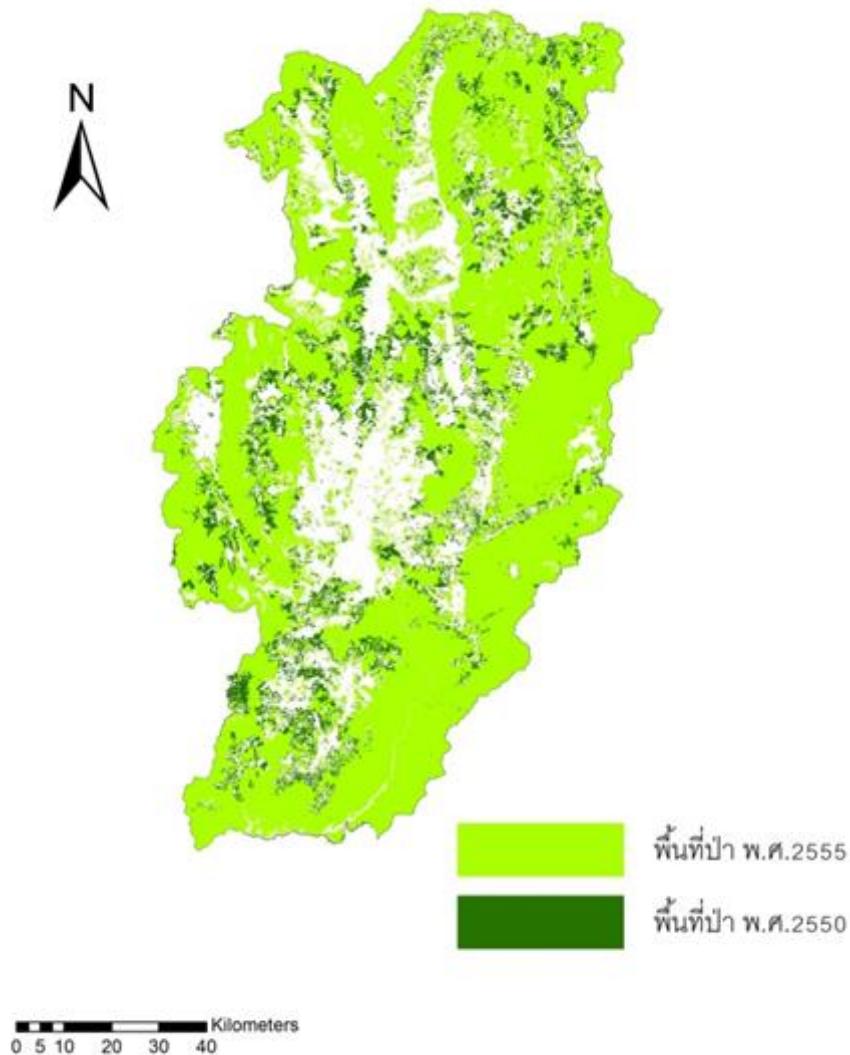
Figure 2: *Show the Forest Area of Nan Province by Comparing between that of 2007 Year and of 2012 Year*
Source: Applied from the Land Development Department's Data Base

6. Socioeconomic Condition of Farmers in Maize Faming

- **Population Structure of Household in the Sample Group**

According to the data collected from those registered houses within Nan, it was found that each household consisted of 4 – 6 members and mostly were authentic registration. In sum, the household of maize growing farmers in Nan was a medium size one. This was contrast to the large size family as it used to be in the past because labor for agricultural practice were

demanded. The majority of household in the sample group in Nan was Thai, followed with Hmong, and Mien (Yao) respectively.

- **Economic Structure of Household in the Sample Group**

The majority of the household in Nan Province worked in agricultural sector with the additional income from general employment. The survey on main income of each household in Nan also found that the majority earned lower than 120,000 baht per annum; implied that the maize farming household still earned a low income per annum (see Table 1).

Table 1: *Economic Data of Household*

Data	Frequency	Percentage
Income from Maize Farming		
1 .As a Main Source of Income	669	95.2
2 .As a Supplementary Source of Income	34	4.8
Total	703	100.0
Income from Maize Farming		
1 .Lower than120 , 000baht	415	59.0
2 .120,000 −200,000 baht	209	29.7
3 .200,001 −300,000 baht	59	8.4
4 .300,001 −500,000 baht	18	2.6
5 .More than 500,000 baht	2	0.3
Total	703	100.0

- **Economic Factors Affecting the Land Use Transformation of Maize Growing Farmers**

The household survey on income from maize farming after deducted the expenses found that the majority of the farmers earned profit more than loss. Besides the incentive from the profit, this finding also implied that there were markets for the maize production. These two main reasons tremendously contributed to the change in land use in Nan for the past 10 years.

However, the loss from maize farming also stemmed from the low price of production and the increase in production cost, the next were natural disaster and debt. Among these causes, the major one was the high cost of production; the household that manages the cost of production successfully could find the profit. By comparing to other plants in term of the market size and the suitability of the areas for growing, this initial study thus indicated that maize could be considered the significant cash crop of Nan (see Table 2).

Table 2: *The Break Even and Reason for the Loss in Maize Farming*

Data	Frequency	Percentage
Financial Performance		
1. Profit	420	59.7
2. Loss	214	30.4
3. Break Even	69	9.8
Total	703	100.0
Reasons for the Loss (answers could be more than 1)		
1. Low product price/Increasing Cost of Production	173	45.3
2. Loss from Natural Disaster	87	22.8
3. Plant Diseases	39	10.2
4. Pests	37	9.7
5. Impure Seeds	36	9.4
6. Infertility of Soil	4	1.0
7. Debt	6	1.6
Total	**382**	**100.0**

- **The Land Use of the Household**

The study on the quality of the maize seeds used in farming in Nan, the majority of the farmers confirmed that they obtained seeds in good quality. In addition, most of the sample households have grown maize in less than 10 years; this was exactly the period that maize farming practice in Nan has been obviously observed. Mostly the maize farmers owned their lands, but some rented them or utilized the lands that belonged to their relatives or public areas. The land size per household was between 21 – 40 rais. In case of rented land, the rental fee was approximately 300 baht per rais per annum. The land use of household in the sample group focused on maize growing, follow with rice/ upland rice. Some household however were facing with conflict on land tenure and land use with the government agency; the Royal Forest Department seized those lands and did not allow the farmers encroach the reserved forest areas and the lands without title deeds etc. (Table 3).

Moreover, in case substituting maize farming, the main factors affecting the decision to shift to other plants included the market and the buyers, and the cost of substitute plants. However, the least influential factor was the knowledge in growing and taking care of substitute plants. It is clear that the product price, the income, and the market were all key contributes to the transformation of the farmers' behavior in maize farming (see Table 4).

Table 3: *The Land Use of Household*

Data	Frequency	Percentage
Years of Experience in Maize Farming of the Household		
1. Less than *or* equivalent to 10 years	398	56.6
2. 11-20 years	174	24.8
3. 21-30 years	83	11.8
4. More than 30 years	48	6.8
Total	703	100.0

Table 4: *The Land Use of Household (Cont.)*

Data	Frequency	Percentage
Type of Land Tenure		
1. Owned by Oneself	649	84.6
2. Utilized Relatives' Land/Public Space	34	4.4
3. Rented from Others	84	11.0
Total	767	100.0
Number of Land Owned by Oneself (*rais*)		
1. Less than 20 *rais*	296	38.6
2. 21-40 *rais*	301	39.2
3. 41-60 *rais*	115	15.0
4. More than 60 *rais*	55	7.2
Total	767	100.0
Number of Land Rented from Others (*rais*)		
1. Less than 20 *rais*	739	96.3
2. 21-40 *rais*	24	3.1
3. 41-60 *rais*	4	0.5
4. More than 60 *rais*	0	0
Total	767	100.0
Farm Rental Rate		
1. Less than 300 baht/*rais*	724	94.4
2. 301-500 baht/*rais*	27	3.5
3. 501-1,000 baht/*rais*	13	1.7
4. More than 1,000 baht/*rais*	3	0.4
Total	767	100.0

Table 5: *Factors Influencing the Farmers' Decision to Shift from Maize to Other Substitute Plants*

Data	Influence		Not Influence		Total	
	N	%	N	%	N	%
1. Product Price and Production Cost of Substitute Plants	473	67.3	230	32.7	703	100
2. Market and Buyers of Substitute Plants	476	67.7	227	32.3	703	100
3. Harvest Period of Substitute Plants (*since cash crop could generate rather quick cash for*	389	55.3	314	44.7	703	100

the farmers)						
4. Land Size and Ownership	374	53.2	329	46.8	703	100
5. Knowledge in Growing and Taking Care of Substitute Plants	355	50.5	348	49.5	703	100
6. Public Policy on Substitute Plants	404	57.5	299	42.5	703	100
7. Household's Number of Labor	379	53.9	324	46.1	703	100

Table 6: *Factors Influencing the Farmers' Decision to Shift from Maize to Other Substitute Plants (Cont.)*

Data	Influence		Not Influence		Total	
	N	%	N	%	N	%
8. Health Concern over Substitute Plants	372	52.9	331	47.1	703	100
9. Environment of Substitute Plants	392	55.8	311	44.2	703	100
10. Capital Accessibility and Price Insurance of Substitute Plants	390	55.5	313	44.5	703	100

7. Conclusion and Remarks

With more than 87 percent of its land covering with mountainous forest and slope, Nan is left with only 12 percent of arable land. For the past 10 years, this province thus witnessed the increasing rate of forest encroachment for maize farming. The land use data in 2007 revealed that maize farming areas were 604,764 rais, however the number rose to 1,183,705 rais in 2012; this basically meaned the number of maize farming areas increased 578,941 rais during the period of only 5 years. The growing number of maize farming areas has been traded off with the loss of forest areas. This is clearly evident considering the decrease in number of forest during the same period: from 5,542,678 rais in 2007 to 4,812,085 rais in 2012, or basically the decrease number is 730,593 rais.

Despite the level of maize growing in Nan and the product price has greatly increased but at the same time the poverty problem faced by local people has also exacerbated. The record indicates that the number of the poor in Nan ranked number 39 of the country in 2004 but in 2011 it became number 21. The study on socioeconomic condition of maize growing farmers also found that the majority earned lower than 120,000 baht per annum; implied that the maize farming household still earned a low income per annum

The household survey on income from maize farming after deducted the expenses found that the majority of the farmers earned profit more than loss. Besides this profit incentive, this

finding also implied that there were markets for this maize production. These two main reasons tremendously contributed to the change in land use in Nan province for the past 10 years.

Factors needed to be aware of by the government included the socioeconomic condition of the farmers and the limitation of land use. The promotion of substituting maize with alternative plants that could generate sustainable income and career should be considered as a national policy; the government thus needs to proceed as soon as possible.

Moreover, in case for substituting maize farming, the main factors affecting the decision to shift to other plants included market and the buyers, and the cost of substitute plants. However, the least influential factor was the knowledge in growing and taking care of substitute plants. It is clear that the product price, the income, and the market were all key contributes to the transformation of the farmers' behavior in maize farming. To substitute maize farming, this study suggests that the agroforestry system should be introduced to the farmers. In order to develop the agroforestry system to substitute maize farming, it is thus urgent for the government to amend the laws that obstructs the promotion of this practice such as teak plantation.

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