Farmers' Attitude on Tobacco Growing for Reducing Smog from Maize Stubble Burning, Mae Chaem District, Chiang Mai, Thailand

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Abstract

Thailand is facing severely problem of smog from maize stubble burning. Negative impact in peoples' health was happened as its effect. So, plant exchanging for cultivation such as tobacco, is one of the good alternatives for the mentioned problem solving. However, the study of farmers' attitude on plant exchanging for cultivation is primary needed. Thus, this research was attempted to find out truly farmers' attitude in Mae Chaem district which is the most animal feed maize growing area in Thailand, including impact analysis to Thai animal feed industry. Interview schedule was employed for data collection from 378 of animal feed maize growing farmers. A set of question was used for qualitative data collection from 4 administrators of private organization in animal feed industry. Obtained data were analyzed by descriptive and inferential statistics as well as rationale content analysis. The results reveal that, 62.70% of farmers were male with 47.39 years old on average age. Farmers more than one-half reached primary school with average income from animal feed maize growing was 52,912.70 baht per year in growing area of 1.55 hectares on average. Most of farmers had growing area with soil fertility but 67.72% of farmers have not enough natural water resource and had good level in knowledge of tobacco growing (69.58%). In terms of farmers' attitude, farmers had moderate level in readiness of tobacco growing. While had high level in needs of tobacco

growing and had low level in possibility of tobacco growing instead of animal feed maize. Furthermore, the study found 6 main factors significantly correlating farmers' needs as follows: educational attainment, income from animal feed maize growing, animal feed maize growing area, soil fertility, adequate water, and farmers' readiness. In terms of effect, negatively impact to need of raw material and animal feed production might be happened by private sector action measures and government policy.

Keywords: Attitude, smog, tobacco, maize stubble burning

Introduction

Thailand has been promoting maize cultivation for a long time, since it is an important cash crop needed by domestic markets. Meanwhile, many provinces of northern Thailand are now facing the problem in forest encroachment for animal feed maize growing. This is because of its good price and the private sector promotes animal feed maize and sweet maize growing in the form of contract farming (Poung-ngamchuen and Poonnoy, 2018) (Figure 1). In addition, maize still be needed inside and outside the country (Chiang Mai Agricultural Office, 2017) making a lot of famers turn to grow maize.

Figure 1 Animal feed maize growing in Mae Chaem district, Chiang Mai

Animal feed maize growing under contract farming helps ensure a certain income of farmers. However, maize stubble burning after the harvest season causes the smog problem (Poung-ngamchuen and Poonnoy, 2018). That is, farmers prefer to burn maize stubble after harvest because, it is the easiest method without expenses (Tantiwittayapit, 2015). According to the initial data obtained, found that the yield of maize growing is only the shuck of an ear of maize which can be sold. Part of

maize stubble can be used for compost and the rest are burned. Besides, maize stubble burning to wait for the first rain involves culture of farmers. That is, they believe that Melientha suavis and hygroscopic earthstar will grow and be harvested for consumption or selling. However, maize stubble burning results in the severe problem of smog happening for years. BBC News (2019) supported that, Chiang Mai ranks number one in terms of the highest air quality index in the world which surely harms human health.

Mae Chaem Agricultural Office (2017) reported that Mae Jam district is the biggest animal feed maize production place in Chiang Mai covering an area of 15,492.04 hectares. Besides, it is the highest hotspot area raised from burning in Chiang Mai on it is the biggest origin of smog (Promtha, 2018). According to Office of Disease Control and Prevention, Region 10, there are 70,000 patients using service of 85 hospitals per day. In Chiang Mai, there are 2,000–3,000 patients and their ailments can be sorted into 4 main groups: 1) heart disease and vascular disease, 2) respiratory disease, 3) inflammatory eye disease, and 4) skin disease. And with an increase rate at 5–10% (Prachachat Business, 2015). Smog harms the health and livelihoods of people in Chiang Mai. A good way to solve this problem in a long term is to grow such as tobacco.

Tobacco is a short-stemmed plant and has large leaves. So, there will have only a few stem fragments left after harvesting, which can be plowed to prepare the soil for next crop. More importantly, there will be no longer smog from incineration of post-harvest scraps (Figure 2).

Figure 2 Tobacco growing in Thailand
Source: Thairat online (2012)

Aside from helping the alleviation of the smog problem but tobacco also support Thai tobacco industry which generates an annual income for more than 20,000 million baht (Tobacco Authority of Thailand, 2015). Indeed, domestic tobacco consumers prefer Thai cigarettes rather than the imported ones (Post Today, 2018). Moreover, the study of Poung-ngamchuen and Promtha (2021) confirmed that farmers in upper northern Thailand had high and moderate levels of needs and readiness for tobacco growing instead of animal feed maize. Therefore, the researchers agree to conduct this study to help indirectly solve the smog problem by growing another kind of plant-tobacco and it is hoped to be successful. Also, this study contains an analysis of impacts which may happen to feed industry of Thailand.

Objectives of the Study

Specifically, this study aimed to investigate attitudes of the farmers based on 2 aspects: readiness and needs. Also, there was a study on the possibility of tobacco growing to replace maize and reduce the problem of smog or maize stubble growing. Minor objectives included the investigation of personal factors, social factors, economic factors, environmental factors, factors on knowledge and understanding about tobacco growing of the farmers, and factors effecting needs for growing tobacco of the farmers.

Research Methodology

This survey research was conducted in Mae Chaem district, Chiang Mai, Thailand. Population in this study were 7,004 farmers maize grower with a total maize cultivation area of 15,492.04 hectares (organic/chemical systems) in 7 sub–districts as follows: 1) Chang Khoeng 2) Tha Pha 3) Ban Thap 4) Mae Suck 5) Mae Na Chon 6) Pang Hin Fon and 7) Kong Khaek (Mae Chaem Agricultural Office, 2017). The sample group for quantitative data collection consisted of 378 maize growing farmers and they were obtained by formula of Taro Yamane (Thaweerat, 1997), Slovin's formula (Poung–ngamchuen and Namviset, 2012), and simple random sampling. Besides, another administers of private organizations on feed industry, northern Thailand were included in the sample group for qualitative data collection. Interview schedule was used for the maize farmers. It consisted of 3 parts: 1) the basic information of farmers (personal, economic, social, environmental information, and knowledge/understanding about tobacco growing); 2) attitudes of the maize farmers based on readiness in tobacco growing and needs for maize

growing. Focus group discussion and in-depth interview were conducted with the 4 administrators of private feed industry. Fifteen question items were created for the measurement of knowledge/understanding about tobacco growing (true or false) with the criteria as followed: 0-9=Fair, 10-12=Rather high, and 13-15=High.

Regarding attitudes of the maize farmers based on readiness in tobacco growing, it was on the basis of 5 levels: 1) highest, 2) high, 3) not sure, 4) low, and 5) not ready. In the case of needs for tobacco growing, it was in terms of 3 aspects: 1) environmental conservation, 2) promotion by the public sector and 3) rate of return. Obtain data were analyzed by descriptive statistics. For the possibility of tobacco growing, it was based on maize growing area reduction and cancellation of maize growing. The question items were in the form of Likert 5 rating scale: highest, high, moderate, low, and lowest. The determination of score interval for the consideration of a level of needs for tobacco growing of the maize farmers are shown in Table 1 (Poung–ngamchuen, Poonnoy and Buwjoom, 2016).

This study was composed of 2 steps: 1) documentary review and field study and 2) data analysis by descriptive and inferential statistics such as percentage, mean, standard deviation, minimum score, maximum score, and Chi-square test were used for the consideration of factors relating to farmers' needs for tobacco growing. Qualitative data gained from focus group discussion and in-depth interviews were analyzed by rationale content analysis.

Table 1 Score interval for consideration of farmers' readiness, needs, and possibility for tobacco growing

Score range	Level of readiness/needs and possibility
4.50-5.00	Highest/Highest
3.50-4.49	High/High
2.50-3.49	Not sure/Moderate
1.50-2.49	Low/Low
1.00-1.49	Not ready/Lowest

Results and Discussion

Basic information of the farmers growing animal feed maize

It was found that, about two-thirds of the maize farmer respondents (62.70%) were made and 47.39 years old on average. More than half of the maize farmer informants (55.56%) were elementary school graduates. Most of the maize farmer informants (84.13%) were married and they had 4.08 family members on average and 2.98 persons were household workforce. Each maize farmer informants had 1.55 hectares of maize growing area and they earned an income from it for 52,912.70 baht per cropping on average. However, they had debts due to maize growing for 4,637.57 baht on average. They perceived the information about tobacco growing 0.58 time and attended training 0-50 time on overage in 2017. Almost all the maize farmer informants' land (91.53%) had fertile soil, but 67.72 percent did not have enough water for growing tobacco throughout the year.

Many pieces of research on agriculture fix farmers to be unit of analysis. It is often found that the number of male farmers participating in agriculture activities is more than female and it is the same as this study. This might be because males in the Thai agricultural society usually play social roles more than females such as community leaders and farmer representatives. So, they have more chances to learn gain experience (Sompakdi, Phonprapai and Sindecharak, 2014). Besides, it is found that males have good instinct in decision making to do various tasks (Poung-ngamchuen, Supa-udomlerk and Leerattanakorn, 2015).

Knowledge/understanding of farmers in tobacco growing

The results revealed that, more than two-thirds (69.58%) of the maize farmer informants had a high level of knowledge/understanding about tobacco growing and only 2.65 percent were found at the moderate level (Table 2). Regarding knowledge about the organic farming system, most of the maize farmer respondents (95.24%) perceived that tobacco can be used as a traditional medicine and it can eliminate insects. They also perceived that tobacco can be propagating by cuttings. After the harvest of tobacco, the leaves are dried in the sunlight for 15-20 days (84.39% of the maize farmer informants). However, 57.94 percent did not know that it takes about 150 days of tobacco growing by or harvest.

Table 2 Knowledge/understanding of farmer in tobacco tree growing

Level of knowledge and understanding	F	%
High	262	69.58
Rather high	105	27.78
Fair	10	2.64
Total	**378**	**100.00**

Findings showed that the maize farmers had knowledge and understanding about tobacco growing at a high, rather high, and moderate level, respectively. This implied experience in growing diverse crops of the maize farmers. That was, some maize farmers used to grow tobacco and some of them used to do organic farming. This was in the same direction of a study of Poung-ngamchuen, Poonnoy and Buwjoom (2016) which found that farmers had knowledge and understanding about organic standards at a moderate and high level due to their experience in growing diverse crops for more than 20 years. Regarding 3 aspects of the maize farmers' attitude, it was found that they were ready in cultivation area, plant varieties, and production costs which were found at a moderate level. For their needs, the maize farmers needed for growing tobacco at a high level. Besides, they needed for upstream forest and conservation chemical free water sources.

Attitudes of the maize farmers towards tobacco tree growing to replace maize

This was on the basis of readiness and needs for tobacco growing of the maize farmer informants.

Readiness in tobacco growing

Findings showed that the maize farmer informants had readiness in tobacco growing at a moderate lever ($\overline{x}$=2.85). Based on its details, they had a moderate level in terms of 1) plantation area, 2) tobacco varieties, and 3) costs ($\overline{x}$=3.30, 2.61, and 2.64 respectively) (Table 3). It was found that the plantation area was sandy loam soil most ($\overline{x}$=3.80). They are mostly ready to grow tobacco varieties having appropriateness with climate and topographic conditions ($\overline{x}$=2.94). But they did not have tobacco varieties to grow ($\overline{x}$=2.17). However, they were confident that could find a capital source for growing tobacco ($\overline{x}$=2.87).

Table 3 Farmers' readiness of tobacco growing

Readiness	$\bar{x}$	SD	Description
Growing area	3.30	0.74	Not sure
Plant varieties	2.61	0.74	Not sure
Capital source	2.64	0.76	Not sure
Total	**2.85**	**0.75**	**Not sure**

Needs for tobacco growing

In general, it was found that the maize farmer informants had high level of needs for tobacco growing ($\bar{x}$=3.73) in three aspects: environmental conservation ($\bar{x}$=4.02); promotion by personnel of the public sector ($\bar{x}$=3.43); and incomes/returns ($\bar{x}$=3.74)(Table 4). Besides, the maize farmer informants did not destroy upstream forest most ($\bar{x}$=4.26). This was followed by did not want water sources to have chemical contamination ($\bar{x}$=4.26). The maize farmer informants wanted training about tobacco growing most ($\bar{x}$=3.58). They also needed concern personnel to always supervise and monitor tobacco growing ($\bar{x}$=3.46). Regarding incomes and benefits, the maize farmer informants wanted to have assurance of tobacco price most ($\bar{x}$=4.08) as well as a certain price ($\bar{x}$=4.02).

Table 4 Need of farmers in tobacco growing

Needs	$\bar{x}$	SD	Description
Environmental conservation	4.02	0.82	High
Government support	3.34	0.70	High
Benefit and income	3.74	0.70	High
Total	**4.10**	**0.74**	**High**

Possibility of the maize farmer informants to grow tobacco

There was a low level of the possibility in tobacco growing ($\bar{x}$=2.55). Based on its details, the reduction of maize growing area was found at a moderate level ($\bar{x}$=3.28) and the cancellation of maize growing was found at a low level ($\bar{x}$=1.82) (Table 5). However, the maize farmer informants were confident that they could reduce maize growing area in order to grow tobacco ($\bar{x}$=3.13). Meanwhile, few of them had an idea to cancel maize growing to grow another kind of crop ($\bar{x}$=1.93).

Table 5 The possibility of farmers in tobacco growing

Possibility	$\bar{x}$	SD	Description
Reduction of maize growing area	3.28	0.74	Moderate
Cancellation of maize growing area	1.82	0.72	Low
Total	**2.55**	**0.72**	**Low**

Factors relating to needs for growing tobacco to replace maize of the maize farmers

According to the study, there were 6 main factors found to have relationship with needs for growing tobacco to replace maize of the maize farmer informants with a statistical significance level. This included the following: educational attainment, income from animal feed maize growing, animal feed maize growing area, soil fertility, adequate water, and farmer readiness of tobacco growing. In general, all of these had a high level of relationship with needs for tobacco growing of the maize farmer informants (Table 6).

According to an interview about the farmers' needs on tobacco farming in three aspects (environmental conservation, government support, and benefit and income), there were eight factors relating on needs for tobacco growing of the farmer informants based on environmental conservation with a statistical significance level. This included the following: gender, age, educational attainment, marital status, incomes earned from maize growing, animal feed maize growing area, debts due to maize growing, and informational perception about tobacco growing.

The informants wanted to grow tobacco although these people had certain incomes and a large area of maize growing they wanted to use part of it for growing tobacco. They also stated that tobacco growing could help reduce the smog problem caused by maize stubble burning. This was in the same direction with a study of Japichom and Tongdeelert (2015) which found that farmers had readiness most in terms of economy, since they used a small piece of land for vegetable production based on land rotation and household workforce. Meanwhile, there were 2 main factors relating on needs for the promotion by the public sector: incomes from maize growing and adequate water throughout the year. According to an interview, it was found that in case of a satisfactory level of incomes earning from maize growing, the maize farmer informants used part of the incomes for the investment of tobacco growing. However, they were worried about lack of rain which would influence tobacco and maize growing.

Table 6 Factors' relating to needs of farmers in tobacco growing in general

Independent Variables	Farmers' Needs of Tobacco Growing in General	
	Chi-square	Sig.
Gender	1.413	0.493
Age	8.112	0.423
Educational attainment	26.185**	0.010
Marital status	1.665	0.797
Number of household members	5.790	0.215
Number of household workforce	5.408	0.248
Income from animal feed maize growing	14.756**	0.005
Debt due to animal feed maize growing	9.677	0.288
Animal feed maize growing area	14.243**	0.007
Information perceiving of tobacco growing	3.395	0.758
agricultural training and educational tour	2.609	0.856
Soil fertility	7.440*	0.024
Adequate water throughout the year	15.498**	0.000
Level of knowledge and understanding of tobacco growing	3.697	0.449
Farmers' readiness of tobacco growing	7.941*	0.035
Farmers' possibility of tobacco growing	5.620	0.233

In terms of income and benefits, there was statistically significant relationship between needs for tobacco growing and the level of knowledge/understanding of tobacco growing. This was in the same direction with results of a study of Kananit, Prapatigul and Wongsamun (2017) which reported that farmers having high educational attainment or knowledge/understanding on agriculture tended to want to be developed themselves about good agricultural practice rather than those having low educational attainment or knowledge/understanding about agriculture. Furthermore, the study of Sujaritturakarn and Tanapanyaratchawong (2010) confirmed that, knowledge about organic fertilizer production and utilization had an effect on the adoption of organic fertilizer production and utilization and this could motivate

farmers to grow new crop varieties. Likewise, a study of Kaewpipop, Yothakong and Kaewwan (2012) supported that, a level of educational attainment and an income earned from the agricultural sector had relationship with need for the promotion of farmers to participate in rubber growing project.

An analysis of impacts of tobacco growing to replace maize and reduce the smog problem on Thai feed industry

According to an in-depth interview with administrators of private companies (Thai feed industry) and secondary data, it was found that an amount of feed in the world had increased to reach more than 1,000 million tons or with the growth rate of 2.5 percent per year on average (Figure 3). Recently, Alltech's e-newsletters (2018) had collected data from 144 countries and found that this growth rate was due to an increase in the needs for meat, egg, and milk consumption by 3 percent. Meanwhile, growth of feed for pigs in China is inadequate following a number of yields each year. Interestingly, the growth of feed for pig in Russia increased due to an increase in the amount of pig production under the policy of the government on pig rearing extension to replace imported pork (National Swine Farmers Association, 2018). According to these data, it could be concluded that the feed production of Thailand drastically decreased due to the decrease in domestic and foreign markets.

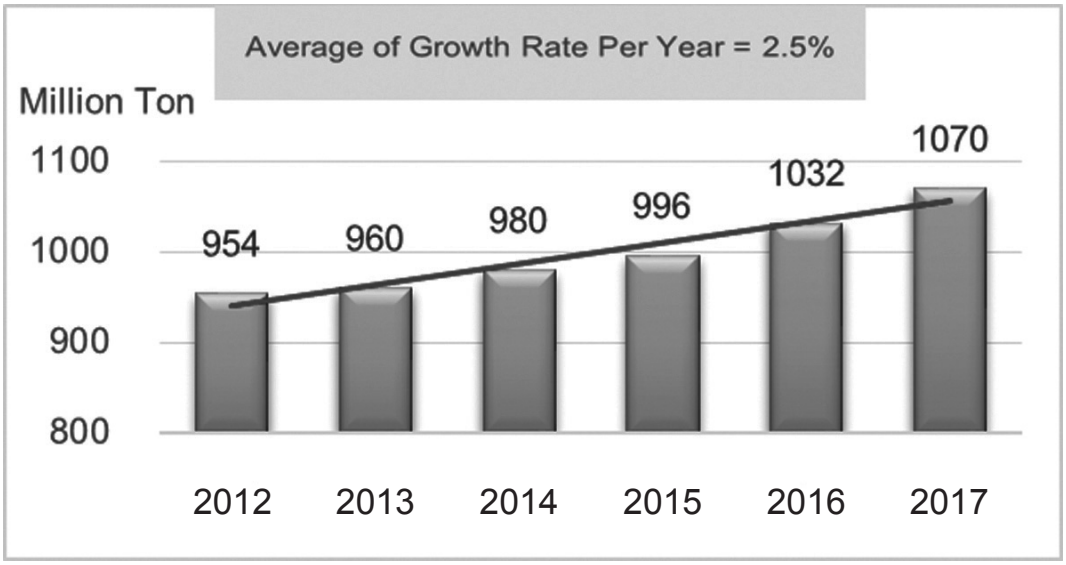

Figure 3 World situation of animal feed production during the year of 2012-2017

Feed mill plants in Thailand produce 3 feed types based on nutrition components: 1) complete feed, 2) concentrates, and 3) pre-mixtures (Animal Feed and Veterinary Product Control, 2015), but only complete feed needed as much maize as possible. Regarding animal feed maize production in Thailand, it is found that this production is somewhat problematic. The National Swine Farmers Association (Alltech's e-newsletter, 2018) reported that there was a decline in an area of animal feed maize from 1.16 million hectares in 2014-2015 to 1.08 million hectares in 2018-2019 (1.29% per year). This was because of a low price of animal feed maize and most of animal feed maize farmers turned to grow other field crops such as cassava and sugar cane. Besides, the private sector had measures not to purchase animal feed maize grown in the area having no right document. Meanwhile, the public sector had a policy on the promotion of animal feed maize growing in the dry season for increased its production. However, it was still not enough, so Thailand had to import animal feed maize from neighboring countries along with alternative finding such as wheat (Kantanamallakul, 2019). Since maize is an important energy source for animal feed, so it is expected that the reduction of maize growing area for growing tobacco will harm maize growing for animal feed industry of the country.

Conclusion

In general, it can be concluded that farmers could grow tobacco to replace animal feed maize, but it depends on soil fertility of the cultivation area, adequate water, and a good price of tobacco leaves. However, the reduction of maize growing was may harm the animal feed industry in terms of an amount of raw material and instant animal feed, therefore, concerned public and private agencies should acceleratory seek advice for the determination of measures to cope with crop varieties changing of farmers as well as the curation of confidence in a good yield price. Nevertheless, all concerned parties should be aware of readiness preparation of farmers particularly on production factor in the case of high tendency to grow tobacco to replace maize.

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