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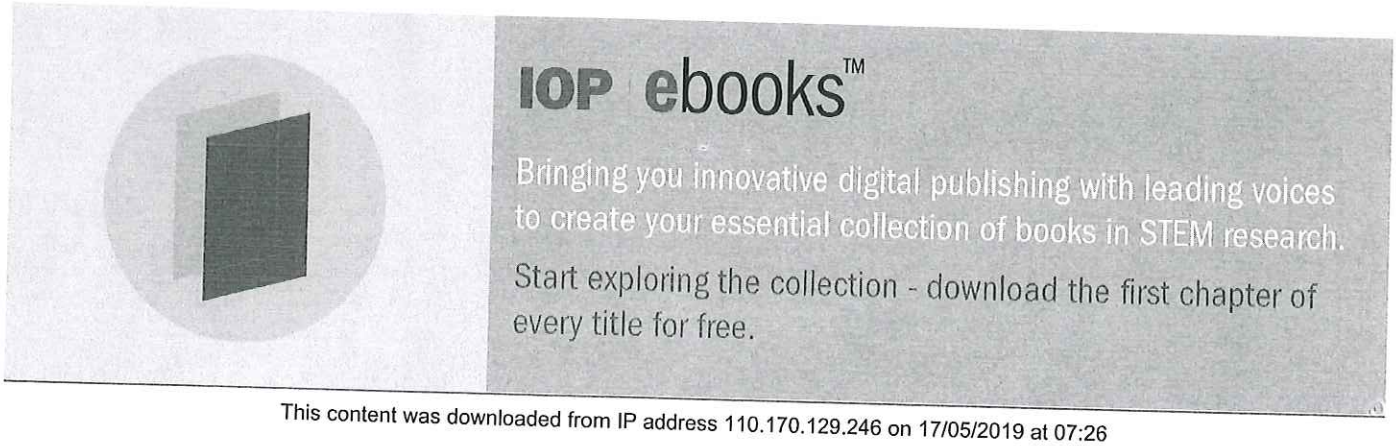

Farmers' Health Effects and Attitude Towards Agrochemicals Use in Rice Production

Waraporn Nunthasen[1,*], Ke Nunthasen[1] and Wipasiri Jaengsaengthong[2]

1 Department of International Economics, Faculty of Economics, Maejo University, Chiang Mai, 50290, Thailand
2 Department of English, Faculty of Humanities and Social Sciences, Thepsatri Rajabhat University, Lopburi, 15000, Thailand

* corresponding author: ke_nunt@hotmail.com

Abstract. This descriptive research determined the conventional farmers' health effects and attitude towards agrochemicals use. A five-level Likert scale questionnaire was applied to measure the respondents' attitude. The conventional farmers were asked to express their health problems and attitude related to agrochemicals use. The majority of them were old men with small and middle farm size and working in their fields between 21-40 years. The empirical results of conventional farmers' health problems informed that most of health problems the participants faced were itching symptom after using agrochemicals. In term of attitude towards agrochemicals use, they indicated a highly favorable attitude (average score: 4.32 out of 5).

1. Introduction

According to the classic Malthusianism which presented that an exponential population growth cannot be maintained if food supply rises linearly as shown in figure [1]. Moreover, the estimates of global population for 2050 are between 7.96 billion to 10.46 billion (figure 2) [1]. Therefore, in case of supply side, we need to rapidly produce food supply to meet the increasing population growth.

Thailand is an agricultural country which rice is the main crop. To complete in the world market, Thailand's rice farming pattern has changed from traditional farming to conventional farming for increasing more yields. Therefore, Thailand is the world largest rice exporting country that leads India, Vietnam, and Pakistan in 2017 [2].

Nowadays, agrochemicals use in agriculture has continuously increased both insecticides and herbicides. [3] Agrochemicals use can increase productivity but at the same time causes environmental problems which affects farmers' and consumers' health [4,5]. Farmers in developing countries used agrochemicals with the poor understanding of sustainable pesticide use, ignorance the effects of pesticide use on health in short term and long term and used without sufficient awareness of poisoning effects [6,7]. Moreover, the economic concept presents that the human body is one of the production factors (human capital). They use their bodies for earning income if they get sick or die, implying that their economic value of human capital is loss [8].

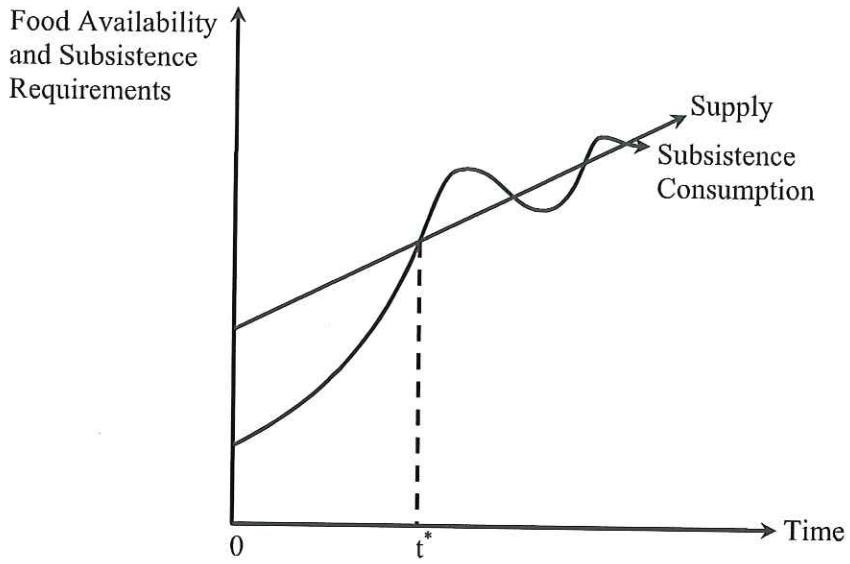

Figure 1. Malthusian trends in food demand and supply (Southgate et al., 2011).

In term of health cost researches in Thailand, Opal (2000) studied cost of illness (COI) of herbicide chemicals cabbage farmers in Chiang Mai. The result showed that the integrated farming system farmers cost was 832.50 Baht/household and the conventional farmers cost was approximately 1,292.40 Baht/household [8]. As well, Agate (2004) evaluated the economic value of health in chemicals used vegetable farmers. He applied human capital concept in his study. The human capital result was approximated 1,326.37 Baht/year [10]. Moreover, the 2016 annual report of Bureau of Occupational and Environmental Diseases (BOED) presented that field crops and vegetable crop farmers were the highest risk group of pesticides toxic effect [11]. Therefore, this descriptive research was conducted to determine farmers' health effects and attitude towards agrochemicals use in their paddy fields.

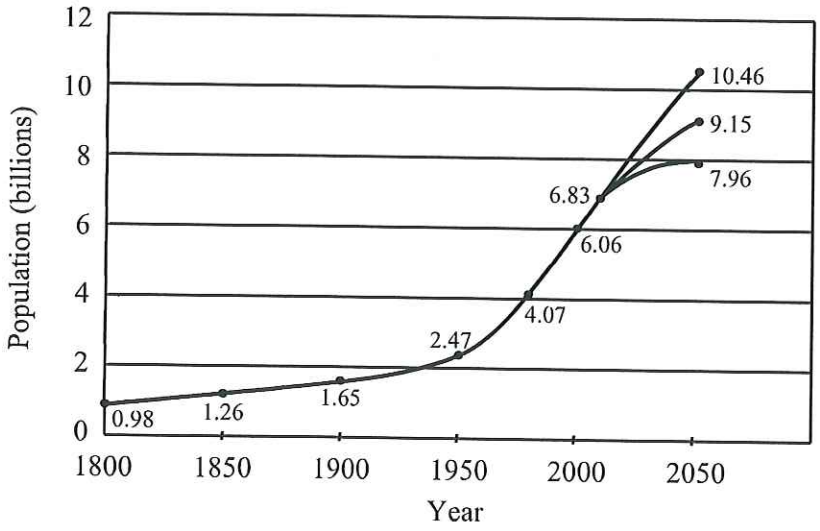

Figure 2. World population from 1800 to 2050 (Southgate et al., 2011).

2. Methodology

This research collected the primary data from conventional farmers in Phrao district, Chiang Mai Province, Thailand. This area was chosen to study because Phrao district is one of food safety district

network however it appeared the highest number of pesticide poisoning cases in Chiang Mai [10,11]. As well, table 1 presented number of top 5 pesticide poisoning cases.

The closed questionnaire was applied to collect the data. The questionnaire consisted of 2 parts; personal characteristics and conventional farmers' health problems and attitude towards agrochemicals use by the random sample technique. They were asked to answer their health problems from chemicals use and how much money they spent to cure their health problems as well as how many days they use to cure the health effects.

The attitudes of conventional farmers were considered as dependent variable of this research. Gender of farmers, farmers' age, educational qualification, rice farming experience and total land area were considered as independent variables.

The conventional farmers were asked to express their attitude regarding 18 statements related to agrochemicals use. A five-level Likert scale was applied to measure the respondents' attitude ranging from 1 (strongly disagree) to 5 (strongly agree). The average score of attitude was interpreted to 3 levels including 1.00-2.33, 2.34-3.66 and 3.67-5.00 were a less favorable attitude, a moderately favorable attitude and a highly favorable attitude, respectively as follow:

$$\frac{Maximum - Minimum}{Interval}$$
$$= \frac{5-1}{3}$$
$$= 1.33$$

The descriptive statistics in this research consisted of mean, standard deviation, and percentage were performed. The attitude score was calculated by computing mean of sum of the ranges.

Table 1. Top 5 district of pesticide poisoning cases in Chiang Mai

District	Percentage
Phrao	48.75
San Pathong	32.22
Mae Cham	38.81
Mae Rim	13.29
Doi Saket	12.83
Mae Taeng	12.83

3. Results

The results of socio-demographic profiles of conventional farmers presented that most of them were old men, had primary level of education (85.42%). Their main occupation was rice farmers (78.00%) following by field crops farmers (19.36%) As well, they had worked on their fields between 21-40 years. Most of them had their own lands (70.00%) with small and middle farm size. Moreover, most of them had title deed of their land (83.64%) (Table 2).

In term of total cost and income of conventional farmers, total cost of plantation was approximately 3,923.52 THB/Rai including paddy seed, plantation, chemicals and organics use, water and cultivation and carriage cost as well as total income was approximately 8,614.49 THB/Rai. The average plantation and cultivation land was 9.42 Rai/household. Both chemicals and organic were used in their farms where chemicals cost is twice as high as organics cost. The cost of cultivation and carriage was almost 20 percent of total cost. (Table 3).

Table 2. Socio-demographic profiles of conventional farmers.

Variables	Categories	Percentage
Gender	Male	65.20
	Female	34.80
Age	Young (up to 30)	0.91
	Middle (31-50)	28.74
	Old (>50)	70.35
Education qualification	Illiterate to 6 years	85.42
	7-12 years	11.86
	> 12 years	2.72
Main Occupation	Rice farmer	78.00
	Field crops	19.36
	Merchant	2.27
	Off-farm	0.45
Rice farming experience	Up to 20 years	37.28
	21-40 years	51.82
	> 41 years	10.90
Total land area	Up to 5 Rai	35.00
	6-15 Rai	46.82
	16-25 Rai	13.63
	> 26 Rai	4.55
Land tenure	Owner	70.00
	Rental	27.73
	Free	2.27
Title to land	Title deed	83.64
	Certificate of utilization	5.45
	Agricultural land reform	0.91
	No evidence	5.45
	Not specify	4.55

Table 3. Land of rice plantation and cultivation, total cost and income.

Categories	Average
Land of rice plantation (Rai)	9.42
Land of rice cultivation (Rai)	9.42
Cost of rice seed (Baht/Rai)	292.76
Cost of plantation (Baht/Rai)	1,570.73
Cost of chemical fertilizer/pesticide/herbicide (Baht/Rai)	887.05
Cost of organic fertilizer/pesticide/herbicide (Baht/Rai)	343.40
Cost of water (Baht/Rai)	39.58
Cost of cultivation and carriage (Baht/Rai)	695.95
Total cost (Baht/Rai)	3,923.52
Total income (Baht/Rai)	8,614.49

1 Hectare = 2.529 Rai

The health problems of participants from chemicals use was mainly itchy symptom (50%) and their average spending to cure was 126.67 THB. Although there were only 16.67 percent of fungus illness, it costed the highest spending and took the longest to cure. Some of them faced the numb problem and they waited to cure themselves (Table 4). Table 5 shows the average score of conventional farmers' attitudes. Nevertheless, farmers presented a highly favorable attitude at 4.32.

Table 4. Health problems of participants.

Health problems	Percentage	Average Spending to cure (Baht/time)	Average Days to cure
Itchy symptom	50.00	126.67	4.25
Headache	25.00	30.00	2.50
Fungus illness	16.67	315.00	15.00
Numb	8.33	No cure	7.00

Table 5. Average score of conventional farmers' attitudes towards agrochemicals use.

Categories	Average score
Highly favorable attitude	4.32
Moderately favorable attitude	2.72
Less favorable attitude	1.76

The results of paddy farmers' attitude towards agrochemicals use indicated a highly favourable attitude, 12 statements out of 18 statements [11]. The 12 statements included (1) wear protective clothing and mask during spraying, (2) always wearing gloves during spraying and holding agrochemicals, (3) take a bath immediately after spraying, (4) take a training course before using agrochemicals, (5) wash agrochemical spraying clothes separately and always change washing water, (6) wash immediately spraying clothing with washing detergent, (7) clean body immediately after spraying agrochemicals, (8) read instructions carefully and follow it conscientiously, (9) show warning sign at the agricultural areas, (10) keep children away from chemicals, (11) if feeling sick, stop spraying immediately and seeing doctor and (12) annual health check-up. These showed that the majority conventional farmers had highly favorable attitude which similarly to Gesesew et al. (2016) [13] Nevertheless, there had 2 statements showed a less favorable attitude; (1) agrochemicals not harmful to human and (2) clean chemicals bottles and use for containing drinking water (table 6). These implied that some farmers are less understand to use chemicals in their farms [6,7]. Therefore, the government sector should promote the training courses how to use chemicals safely to farmers and environment. Moreover, government should stimulate them to change from chemicals use in their farms to use organic. Making organic farming has higher income; the organic farming can sustain [14].

4. Conclusion

This study determined the conventional farmers' health problems and attitude towards agrochemicals use. The five-level Likert scale questionnaire was applied to explore their attitude. The descriptive analysis was performed. The empirical results showed that most of conventional farmers of this study were old men with primary education level, 21-40 years of farming experience, had small and medium farm holding. The health problems were mainly itchy symptom, followed by headache, fungus illness and numb, respectively. The majority conventional farmers towards agrochemicals use had positive attitudes. They presented a highly favourable attitude at 4.32. Some examples of highly favourable attitude that farmers presented were wear protective clothing and mask during spraying, take a training course before using agrochemicals, clean body immediately after spraying agrochemicals, keep children away from chemicals, and if feeling sick, stop spraying immediately and seeing the doctor.

Table 6. Level of conventional farmers' attitudes towards agrochemicals use.

Statements	Average score	S.D.	Level of attitude
1. Agrochemicals not harmful to human	2.12	1.32	Less
2. Wear protective clothing and mask during spraying	4.29	0.76	Highly
3. Always wear gloves during spraying and holding agrochemicals	4.48	0.55	Highly
4. Take a bath immediately after spraying	4.48	0.69	Highly
5. Take a training course before using agrochemicals	3.95	0.90	Highly
6.Sun bathing spraying clothing for next time used	2.74	1.46	Moderately
7. Separately wash agricultural spraying clothing and always change washing water	4.11	0.95	Highly
8. Wash immediately spraying clothing with washing detergent	4.35	0.56	Highly
9. Clean body immediately after spraying agrochemicals	4.46	0.52	Highly
10. No wound, no danger of agrochemicals	2.75	1.45	Moderately
11. Read instructions carefully and follow it conscientiously	4.40	0.56	Highly
12. Show warning sign at the agricultural areas	4.01	0.64	Highly
13. Keep children away from chemicals	4.38	0.63	Highly
14. Put agrochemicals with other without labeling	2.66	1.48	Moderately
15. Clean chemicals bottles and use for containing drinking water	1.41	0.53	Less
16. Bury or burn agricultural bottles	2.74	0.63	Moderately
17. If feeling sick, stop spraying immediately and seeing the doctor	4.41	0.65	Highly
18. Annual health check-up	4.50	0.50	Highly

5. Suggestion

The result revealed that most of the conventional farmers were the old people with the primary level of education although they expressed a highly favourable attitude of agrochemicals use. Moreover, rice farming experience had influenced conventional farmers' attitude and Thailand now is moving to the aging society, old persons' knowledge and experiences are significantly useful to country development.

Therefore, the policymakers should lay emphasis on continuously informing the correct agrochemicals use, agricultural safety practices and to promote using organic increasingly which will not only reduce their costs but also getting a better health both farmers and consumers as well as really good for the environment.

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