



## Application and Advantages of PA's Precise Rice Cultivation Method in Chaiyaphum Province and Sisaket Province, Thailand

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**Abstract**— A research aimed to analyze the data comparison on physical growth rate, rice quality, quality of rice milling, and satisfaction of farmers on the PA's precise rice cultivation method and the broadcasting rice cultivation method. This research was conducted by both qualitative and quantitative approaches. Observation and in-depth interview were used to collect data from 14 farmers in Chaiyaphum and 8 farmers in Sisaket provinces as the research samples. Purposive sampling technique was used to select the farmers who had been affected by the flood disaster in 2013 and participated in the PA's precise rice cultivation project. Interview form was used to collect data. Independent Sample t-Test was applied to test the differences between the PA's precise rice cultivation method and broadcasting rice cultivation method by using rice "RD31" in Chaiyaphum province and rice "KDML105" in Sisaket province. Research results found that 1) there were differences at a significance level of 0.05 on physical growth. The PA's precise rice cultivation method had physical growth rate higher than broadcasting rice cultivation method. 2) There were differences at a significance level of 0.05 on rice quality and rice milling. The PA's precise rice cultivation method had the rate of rice quality and rice milling higher than broadcasting rice cultivation method, and 3) 90% of farmers satisfied with the PA's precise rice cultivation method more than the broadcasting rice cultivation method because the PA's precise rice cultivation method gave higher rice quantity, and saved time and cost of cultivation.

**Keywords**— Precise rice cultivation, chaiyaphum province, sisaket province.

### 1. INTRODUCTION

Rice is a major economic crop in Thailand. In the past, Thailand was the largest rice manufacturer and exporter in the world. In cultivating season of 2012/2013, rice cultivation area was total 61.715 million Rais, while there was 25.882 million tons of rice which was produced in Thailand. Comparing to 2011/2012, it was found that cultivation area, total rice quantity, and average rice quantity per Rai were increased by 1.05%, 12.55%, and 11.14% respectively. Cultivation area increased in the Lower North region and the Central region of Thailand, where faced with flood disaster last year. In addition, a policy of rice pledge, which issued by the government, resulted in higher price of rice in the market, and induced farmer to do rice cultivation. Thus, it could estimate that rice production was increasing in the season of 2013/2014, and there were rice cultivation area of 25.67 million Rais [2].

The area of rice cultivation in Thailand is 69.98

million Rais, while 42.75 million Rais located in the Northeastern region. However, most of cultivation area normally relied on rainfed, so rice in this area was produced lower than other parts of country. Separating where a dried area was, rice was produced with low quantity. Factors that affected to rice quantity in the rice cultivation in irrigated area, found that rice quantity was similar to other areas. In the case of the Jasmine rice, which cultivated in Thung Kula Rong Hai, Northeast were not only about the rainfed, but also about the process of rice cultivation. Farmers usually did the rice sowing method. They would not take care of rice cultivation so much, and resulted in high cost of cultivation while rice quantity was decreased [1]. The cost of rice cultivation in the wet season (whole process) in the present was averagely 3,035 Baht, and cost of rice cultivation in dry season was 5,725 Baht averagely. The different costs of rice cultivation were depending on different process of cultivation [4]. In addition, the sowing rice cultivation and transplanted rice cultivation contained high cost of production. Fertilizers and chemicals were major costs [5].

The Princess PA's Foundation, Thai Red Cross Society has developed new process of rice cultivation which called "the PA's precise rice cultivation" to reduce rice productions costs on seeds, fertilizers, chemicals, labour cost, and time. The project aimed to support farmers to have better quality of life, and promoted the organic rice cultivation. Based on the process, it was questioned that what is the advantage of the PA's precise rice cultivation method? What the PA's precise rice cultivation different from the traditional process? And how farmers satisfied on the PA's precise rice cultivation method? Thus, the objective of this research is to analyze the data comparison on physical growth rate, rice quality,

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quality of rice milling, and satisfaction of farmers on the PA's precise rice cultivation method and the broadcasting rice cultivation method. The study was conducted in Chaiyaphum and Sisaket provinces, Northeastern region, Thailand.

## 2. LITERATURE REVIEW

### 2.1 Rice cultivation in Thailand and in the Northeastern region of Thailand

Rice cultivation area in Thailand was 69.98 million Rais which could divide method of rice cultivation into 3 methods as followed:

1) Transplanting; transplanting is one of rice cultivation method that has taken place for a long time in Thailand. Farmers would plant rice seeds until the seeds were germinated to be rice seedlings. Then the seedlings were moved to plant in the rice field. However, farmers had to take care of the seedlings well because the strong seedlings would grow quickly, and gave high quantity of rice. Transplanting rice cultivation should be conducted with a horizontal line, which was easier for weed control, fertilization, disease control, and spraying. This method also led the rice grain received nutrition and sunlight regularly.

2) Broadcasting; broadcasting rice cultivation method has conducted by sowing rice seed into the prepared rice field. There were 2 forms of broadcasting rice cultivation included 1) dry seeded rice method, and 2) germinated rice method

3) Direct sowing; direct sowing rice cultivation has relied on rainfed. Dry seeds were sown into small holds in the rice field. The seeds would grow when it rained. This method usually conducted in the upland. There were 2 conditions of the direct sowing included 1) rice sowing in the upland, and 2) rice sowing in the rice [6].

Although the Northeastern region is a source of the Jasmine rice, which is well-known to the world, most of the area is the rice field which relies on rainfed. Farmers often used the direct sowing method which caused of high cost of production and low quantity of rice. Separating the rice cultivation in irrigated area, found that rice quantity was similar to other areas. In the case of the Jasmine rice, which cultivated in Thung Kula Rong Hai, where was a dried area, rice was produced with low quantity. Factors that affected to rice quantity in the Northeaster were not only about the rainfed, but also about the process of rice cultivation. Farmers usually did the rice sowing method. They would not take care of rice cultivation so much, and resulted in high cost of cultivation while rice quantity was decreased.

Department of Rice then conducted an approach to change method of rice cultivation from direct sowing into transplanting method by using technology in rice cultivating process, and preparing well-soil condition before planting. This method was called "the precise rice cultivation". Now the Department of Rice is cooperating with private sector to support agricultural machines to farmers to solve a labour shortage problem which is ongoing in the region [5].

### 2.2 Cost of rice cultivation in Thailand

The cost of rice cultivation which included every production costs would have 3,035 Baht for wet season while 5,725 Baht for dry season. The costs of cultivation were different depended on cultivating methods [4]. *The cost of rice cultivation was shown in Table 1.*

Table 1. represented the comparison of average rice cultivation cost in 2013 by cultivating method) [5].

Management costs (Baht/Rai)	Cultivation Methods			
	Broadcasting	Transplanting by person	Transplanting by machine	Parachuting
Preparing rice field (Precise method)	610	610	610	610
Seedlings tray	-	-	-	84-112
Seedlings cost	-	100	-	125
Sowing and transplanting cost	50	1200	1200-1500	100
Weed control, chemicals cost, labour cost	175+110+100	60+50*	60+50*	60+50*
seeds (22 Baht/Kilogram)	440	154	(220)	88
Weed control	400-600	-	-	-
Fertilizers	948	948	948	948
Harvesting cost	450	450	450	450
Total	3,283,363	3,482	3,318,3618	2,515,2,543

From the analysis in the table 1, found that factors affected to high cost of rice cultivation were as followed;

1. Over using of rice seeds. The suitable seed quantity should be 3-5 Kilograms/Rai, but on the present day farmers generally used 25-30 Kilogram/Rai

2. High cost of soil preparation due to high gasoline price.

3. Over using of chemical fertilizers.

4. Over using of chemicals for weed controlling due to many rice stems in the field.

5. High labour cost and shortage. According to the Thai minimum wage regulation and trend of working in industrial sector, the Northeastern region now is facing the high labour cost and shortage problem in agricultural sector.

Based on the study about cost of rice cultivation and income of farmers who had own land, found that the average total cost of transplanting method was 3,672 Baht, and broadcasting method was 3,243 Baht. Income from transplanting method was higher than broadcasting method. Factors affected to the cost of cultivation included seeds, planting method, labour cost, and take caring cost [7].

### 2.3 The PA's Precise Rice Cultivation Method precise rice

The PA's precise rice cultivation method is introduced as a new method of rice cultivation, created by the Princess PA's Foundation, Thai Red Cross Society. The goals of method are to take control of weed in the rice field, reducing the cultivation cost, and improving rice quantity. The PA's precise rice cultivation method consists of 6 processes including 1) rice seed selection, (2)rice growing and taking care of the rice seedlings for 12-15 days, (3) soil preparation, (4) Putting the rice seedlings into prepared holds, (5) taking care of rice stem, and (6) harvesting and rice milling. The PA's precise rice

cultivation method was conducted as the pilot cultivation in 2002-2005 at the Agriculture Academic Center, Pathum Thani) Thai Rice Foundation 2000 (to compare the cost of cultivation with other rice cultivation methods, found that the PA's precise rice cultivation method had lowest cultivation cost, and produced rice quantity more than other methods. In addition, a research on the age of rice seedlings and quantity of rice seedlings found that the seedlings which age 12-16 days and 50-60 trays (561 holds/tray) of seedlings quantity would be suitable for rice cultivation the most. The PA's precise rice cultivation method used rice seed about 3-4 Kilograms/Rai or the method could save 80-85% of seed using. This method could solve a problem on standard seed shortage effectively. The method also used labour to prepare cultivating process by 1 person could prepare the seedlings 150-200 trays/day, and 3-5 Rais/person for sowing [9].

## 2.4 Satisfaction

### 2.4.1 Definition of satisfaction

Kotler and Armstrong(2002) reports that human behavior happen to need have incentives (motive) or propulsion pressure (drive) is a requirement that pressured until much enough to motivate give Guest born behavior so Reply meet the needs of manually. Certain requirements is the requirement way Biology (biological) occurs of conditions tensions such as hunger thirst or hardships certain. Is the requirement psychological (Psychological) born from a like recognition. (Recognition) regarded (esteem). (Belonging) needs mainly may not much enough to motivate give Guest actions during that time. The needs became as incentives.

### 2.4.2 Measuring the level of satisfaction

Chatchawan Reungprapan (2000) said that measuring the level of satisfaction can be conducted as followed:

1. Questionnaire; which is the most widely used to measure the satisfaction by requesting the cooperation of sample group to conduct. Questionnaire can be designed based on research objectives and the measure can be done by rating scale.

2. Interview; it is generally used to find out qualitative data. Interview guideline is used as a tool to find out the data.

3. Observation; is used to observe farmer's behavior in pre and post cultivation practice. Observation can be done by both participatory and non-participatory observation based on the objective

This research applied an interview method to find out the satisfaction of farmers on the PA's precise rice cultivation, and measured the satisfaction level by percentage.

## 3. RESEARCH METHODOLOGY

This research conducted with the mixed method approach. Details of research approach as followed;

### 3.1 Qualitative study

Secondary data was collected by literature reviews. In-depth interview and observation were applied to collect data from farmers who participated in the PA's precise rice cultivation method and broadcasting rice cultivation method in Chaiyaphum Province.

### 3.2 Quantitative study

The sample was 14 farmers in Chaiyaphum Province and 8 farmers in Srisaket Province. Purposive sampling was applied to select the participants. The selected participants were farmers who affected to the flood disaster in 2013 and participated in the PA's precise rice cultivation project. Interview Form was used to collect data. Independent Sample T-Test was used to analyze the data to find out the differences between the PA's precise rice cultivation method and broadcasting rice cultivation method.

## 4. FINDINGS and DISCUSSIONS

### 4.1 Rice "RD31" cultivation in Chaiyaphum Province

Comparing the data of physical growth of rice cultivation between the PA's precise rice cultivation method and broadcasting rice cultivation method, found that there were differences at a significance level of 0.05 on physical growth included number of clump, number of stem, number of stem per clump, number of seed per ear of rice, and weight of 1,000 seeds. The PA's precise rice cultivation method had physical growth rate higher than broadcasting rice cultivation method. Regarding on rice quality and rice milling, found that there were differences at a significance level of 0.05 on percentage of contaminants, brown rice, whole rice, and broken rice. In addition, there was no difference on product quantity per Rai, percentage of rice, and rice bran. The PA's precise rice cultivation method had the rate of rice quality and rice milling higher than broadcasting rice cultivation method. The analysis was presented on table 2.

### 4.2 The "KDML105" rice cultivation in Sisaket Province

Comparing the growth rate between the PA's precise rice cultivation method and broadcasting rice cultivation method, found that there were differences at a significance level of 0.05 on physical growth included number of clump, number of stem, number of stem per clump, number of seed per ear of rice, and rice product per Rai. Regarding on rice quality and rice milling, found that there were differences at a significance level of 0.05 on percentage of purified rice seed, contaminants, rice, whole rice, broken rice, and rice bran. The PA's precise rice cultivation method had the rate of rice quality and rice milling higher than broadcasting rice cultivation method. In addition, there was no difference on weight of 1,000 seeds, percentage of brown rice, and chaff. The results were presented in table 3 and 4.

**Table 2. Comparing the physical growth rate on the “RD31” rice cultivation between the PA’s precise rice cultivation method and broadcasting rice cultivation method**

Variables	Method				df.	t-value	Sig.	meaning
	The PA (n=14)		Broadcasting (n=2)					
	$\bar{X}$	SD	$\bar{X}$	SD				
1. Plant height (cm)	74	1.06	79	1.87	12	-2.254	0.02	Difference
2. No. of grain/panicle	77	0.96	55	1.22	12	8.081	0.00	Difference
3. Weight/panicle (g)	2.14	0.87	1.53	1.12	12	5.778	0.00	Difference
4. Weight of 1,000 seeds	27.85	1.24	28.00	1.21	12	-1.614	0.88	No difference
5. No. of panicle/m <sup>2</sup>	469	1.36	424	2.11	12	11.619	0.54	No difference
6. Length of panicle (cm)	24.5	0.87	22.7	0.98	12	-.405	0.60	No difference
7. Yield/m <sup>2</sup> (kg)	0.60	0.99	0.58	1.54	12	-5.124	0.73	No difference
8. Yield/rai (kg)	958	1.25	922	1.47	12	6.492	0.71	No difference

**Table 3. Comparing the physical growth rate on the “KDML105” rice cultivation between the PA’s precise rice cultivation method and broadcasting rice cultivation method**

Variables	Methods				df.	t-value	Sig.	meaning
	The PA		Broadcasting					
	(n=8)		(n=1)					
	$\bar{X}$	SD	$\bar{X}$	SD				
1. Plantheight (cm)	79	1.11	64	1.32	7	2.987	0.01	Difference
2. No. of grain/panicle	81	0.98	34	1.24	7	.912	0.00	Difference
3. Weight /panicle (g)	2.4	1.32	1.0	0.96	7	-.154	0.00	Difference
4. Weight of 1,000 seeds	30	1.21	29	1.41	7	4.914	0.71	No difference
5. No. of panicle/m <sup>2</sup>	411	0.89	640	1.22	7	1.582	0.00	Difference
6. Length of panicle (cm)	23	0.97	20	1.31	7	-	0.00	Difference
7. Yield/m <sup>2</sup> (kg)	0.54	1.14	0.19	1.25	7	-1.547	0.00	Difference
8. Yield/rai (kg)	860	1.25	278	1.33	7	1.225	0.00	Difference

#### 4.3 Satisfaction of farmers on the PA’s precise rice cultivation method and broadcasting rice cultivation method

Research results on satisfaction of farmers on the PA’s precise rice cultivation method and broadcasting rice cultivation method, found that 18 of 20 farmers (90%) satisfied on the PA’s precise rice cultivation method more than the broadcasting rice cultivation method as reasons below.

1. Cost saving; cultivating cost of the PA’s precise rice cultivation method was lower than the broadcasting rice cultivation method about 600-700 Baht/Rai especially costs of seeds and pesticides.

2. Time saving; space of the PA’s precise rice cultivation method was suitable, so the grass and weeds were found and eliminated easily. This helped farmers saving time and had more time to do other activities.

Reduction of risk on chemical usage; according to suitable space of rice cultivating, the grass and weeds were found and eliminated easily. Farmers did not take any risk on chemical usage.

**Table 4. Comparing the rice quality and rice milling rate on the “KDML105” rice cultivation between the PA’s precise rice cultivation method and broadcasting rice cultivation method**

Variables	Methods				df.	t-value	Sig.	meaning
	The PA		Broadcasting					
	(n=8)		(n=1)					
	$\bar{X}$	SD	$\bar{X}$	SD				
1. %moisture content	11.90	0.96	11.30	0.99	7	0.479	0.01	Difference
2. %pure seed	98.30	1.24	95.70	1.22	7	0.628	0.00	Difference
3. %inert material	1.70	1.24	4.30	1.36	7	2.988	0.00	Difference
4. No. of other seed	9.00	1.40	17.00	1.24	7	3.654	0.00	Difference
5. No. of red rice	0.00	1.21	0.00	1.21	7	-1.744	0.00	Difference
6. %brown rice	73.92	1.36	73.29	1.36	7	12.124	0.34	No difference
7. %hull	26.09	0.52	26.72	0.52	7	5.981	0.34	No difference
8. %milled rice	65.69	1.24	54.98	1.24	7	5.778	0.01	Difference
9. %head rice	44.61	0.99	35.96	0.99	7	-1.614	0.05	Difference
10. %broken rice	23.13	0.87	20.77	0.55	7	-5.461	0.56	No difference
11. %bran	14.96	1.28	13.08	1.24	7	4.214	0.46	No difference

#### 4.4 Discussions

The PA’s precise rice cultivation method with both “RD31” and “KDML105” rice had physical growth rate higher than broadcasting rice cultivation method because it has proper spacing crops which positive affect the high growth of crops. Whereas, broadcasting cultivation has too little space, resulting in insufficient nutrients and unwholesome seeds.

Moreover, the PA’s precise rice cultivation method produced better rice quality than the broadcasting rice cultivation method which was supported by Kanya Chaupant [9]. which studied the factors affecting the quality of rice milling and found that it depended on the rice variety, the environment and attention both before and after harvest.

The physical growth rate and quality of rice cultivation on the PA’s precise rice cultivation method was different from the broadcasting rice cultivation method. The PA’s precise rice cultivation method produced more rice quality and rice quantity than the broadcasting rice cultivation method. This result was supported by Pimprapai Suksai [11], which showed that transplanted rice cultivation produced more rice seeds than the broadcasting rice cultivation method by an average of 91 and 65 seeds per band respectively. Transplanting method produced the average rice quantity of 604 KG./Rai, while broadcasting method produced 443 KG./Rai. Therefore, it should be encouraging the precise rice cultivation method to be known and accepted for creating new alternative choice of rice cultivation to farmers who want to modify rice cultivation method for getting higher productivity and reducing their cost of cultivation.

## 5. CONCLUSIONS

Comparing the physical growth rate between the PA's precise rice cultivation method and the broadcasting rice cultivation method, found that the PA's precise rice cultivation method had data score of rice quality and milling quality higher than the broadcasting rice cultivation method significantly. However, there was no difference on rice quantity/Rai, percentage of rice, and rice bran because the farmers did not control some productive factors such as crop space and soil quality, fertilizers, and the watering.

90% of farmers satisfied on the PA's precise rice cultivation method more than the broadcasting rice cultivation method because the PA's precise rice cultivation method gave higher rice quantity, and there were agricultural agencies to advise the cultivating process suitably. This result was supported by Pisit Khemmee [12], which examined factors related to technology acceptance on rice cultivation. The study found that related factors included educational level, number of agricultural labour within households, number of employees, and cost of cultivation. To ensure that farmers were satisfied on this method of rice cultivation, the government should provide the training course to farmers.

## 6. RECOMMENDATIONS

Farmers should learn the PA's precise rice cultivation method thoroughly, including field preparing, cultivating process, maintenance, and the cultivation cost for better effectiveness on rice cultivation.

The Princess PA's Foundation, Thai Red Cross Society which is a foundation that creates the PA's precise rice cultivation method should provide training course to farmers who are interested in because this method is the new type of cultivation. Farmers have to clear understand concepts and practical processes of it before start cultivation. This foundation should also provide the experts to advise the farmers for implementation. In addition, monitoring the output should be conducted to find out problems or positive effects to develop the cultivation form better.

Cooperation among agricultural-related agencies should be conducted to promote the training course to farmers in other areas.

The PA's precise rice cultivation method has just been introduced to farmers, so related agencies should do more researches on The PA's precise rice cultivation method. For instant, a research on various rice seeds cultivation, or research on crop area in the Northeastern region to confirm that the cultivation is enable and accepted widely.

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