

Development and Technology Adoption of Farmers in Thailand

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Abstract- This research is the study on development and technology adoption of farmers in Thailand and in-depth interview was conducted with the Chairman of Farmer Association of Thailand in accompanying with Technology Acceptance Model (TAM) on the way to adopt innovation and technology development for rice farming and the way to occur the acceptance on adoption for benefit. The finding indicated that the technology adoption by governmental sector in the initial period following by the private later resulted in the extension of more application among the rice farming groups by themselves when perceiving the benefits gained from technology adoption such as cost reduction, time decrease and output enhancement, creating the technology acceptance in agriculturalist group.

Keywords- development, technology adoption, farmers in Thailand

I. INTRODUCTION

Thailand has currently been in the 6th rank of the world for high rice production but when considering on rice cultivation potential, the finding indicated the low level of Thailand output per hectare due to the major dependence on rainfall for rice cultivation of Thailand since the irrigation area has been just 25 percent of all agricultural areas accompanied with lower soil mineral fertility due to agriculturalist neglect in soil development and improvement. Meanwhile, the competitors such as China has focused on high output yielded rice species cultivation and Vietnam has had numerous irrigation areas up to 80 percent, causing higher output per hectare than Thailand's output. Almost of 80 percent of paddies were wet season rice but when considering the output per rai, the finding described lower output of wet season rice than off-season rice due to the dependence of wet season rice cultivation on high volatile [1].

From simple way of life under production system for subsistence and consumption from the utilization of animal and human labors and most of wooden materials such as plough and pitch fork, has been transformed to be the economic system for selling with emphasis on

currency system for living, resulting in the transformation of production system to be more commercial production. Amidst such varying situation, the government and the private have tried to promote the agricultural sector to the agriculturalists for implementation in order to generate increasing output, gain maximum profit and correspond to the situation, leading to social and economic development of the agriculturalists. The new technological scheme or these agricultural innovations have included knowledge, notion, method or things which have been the newness for agriculturalists. However, some perspectives of innovations might not be the new knowledge for agriculturalists. The agriculturalists might possess that knowledge beforehand but their attitudes have not yet been developed to like or dislike and accept or reject for implementation. Then, the novelty of agricultural innovation has possibly been the novelty in the perspective of knowledge, attitude or decision making in that innovation utilization that has been learnt by the agriculturalist about that innovation for innovation acceptance or rejection with any reasons [2].

Therefore, the proper adoption of innovation and technology in helping for development and improvement of rice farming for high output quantity capability while having low cost has been able to create additional incomes to the agriculturalist as well as better quality of life from the acceptance on adoption of innovation and technology in management appropriate with rice farming.

II. OBJECTIVE AND METHODOLOGY

The research objective is to study on the technological development and acceptance of the farmer in Thailand. In this research, the in-depth interview will be conducted with the professional farmer and the farmer representative in Thailand who has been the Chairman of Farmer Association of Thailand and the evidences from different documents will be investigated.

III. LITERATURE REVIEW

A. Innovation and Technology in Agriculture

Pannell [3] evaluated the attractive factors for innovation application of the agriculturalist developed

from Vanclay [4] therefore including long term and short term cost of capital, gaining benefit and long term financial benefit, innovation complexity, loss of flexibility, risk, limited resources such as land, labor, money, intellectual capital or physical attempt, and urgency and soil deterioration problem. Pannell [5] said that agricultural innovation perception did not mean the perception of new thing existence but requiring perception on how its ability would be useful for agriculturalist, leading to his initiation to be open minded to collect external innovation relevant data for his decision making in his trial of new innovation. Nuray [6] studied in Turkey on agricultural promotion that was mostly operated by governmental institution such as Ministry of Agriculture and Countryside Affairs in agricultural training together with Research Institute and Faculty of Agriculture in various universities, emphasizing on new agricultural technology development with limitations of budget, motivation and morale accompanied with imperfection of non-dynamic organizational structure, internal and external communication among research institutes as well as the size of agricultural area, lack of unity in agriculturalist group and uncertainly of national agricultural policy.

B. Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) was firstly developed by Venkatesh and Davis [7] jointly developed TAM 2 (Technology Acceptance Model: TAM 2) (Figure 1) extending from the primary model since in primary model, Social Norm factor was be excluded. The measurement of Technology Acceptance Theory was conducted from Ease of Use Perception and Usefulness Perception and the variables in this group of measurement would result in the occurrence of behavioral intentions to actually use the technology.

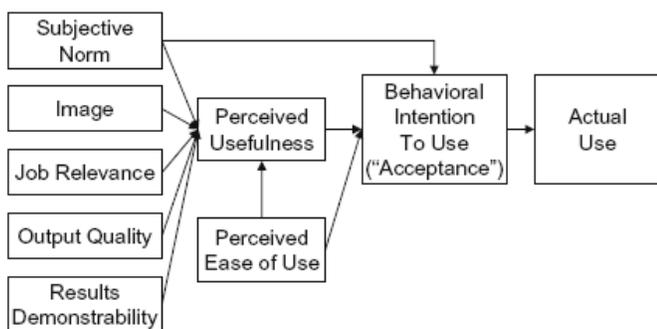


Figure 1: TAM 2(Technology Acceptance Model: TAM)

According to the model, five variables affecting the usefulness perception have included Subjective Norms the perception level of the individual influenced from people whom they give the precedence in the aspect of application or non-application of that technology; Image as the individual perception level in the aspect of

innovation application or perception on the promotion in social status mobility; Job Relevance as the individual perception on the adoption ability of that technology in consistent with their own jobs; Output Quality as the individual perception with belief in technology capability in helping for job achievement; Results Demonstrability as the individual perception level with belief in the communicable, perceivable, and tangible results of that technological application.

IV. RESEARCH RESULT

A. Innovation and technology development for rice farming.

The technology of rice species development was developed by governmental sector in the initial stage but the problem on how far for seed expansion to the market was existent. New cold weather tolerant, flood resistant and disease resistant rice species have been emerged. The farmer's cultivating decision has included the purchase of most appropriate species due to the effect on farmer cultivation by using the method of observation from occurring experience called as "folk philosophy". When new seed has been researched from the governmental sector, the agriculturalists would be called for more training and acquisition of rice species knowledge. The governmental production for sale has been in sufficient for sale as the seed demand has been about 1 million ton per year and the governmental sector could produce just 100,000 ton and over estimated to be 10 percent (Figure 2) and over of the demand quantity, resulting in more role playing of private sector that would be the capitalist groups of big sized rice mills such as Charoen Pokphand Group or CP with their own specie research, selling by themselves and relatively clear research and budget. The villager part has become the customers of CP Plc., Ltd. once again. The technology of seed development by farmer would be the trial and error development and some new generation of the agriculturalists have also acquired the body of rice seed knowledge studying from the use of internet in website of Rice Department. The external assistance in development technology has been the private and public sector integrated aid. The purchasing source of rice seed of the farmers would be the regular source of the farmers. Bank for Agriculture and Agricultural Cooperatives as the financial institution has been the financial supporter and over of rice community centers in each area nationwide both directly in technology purchase for application and indirectly in the use of money by the agriculturalist in order to engage the one with technologies to provide assistance in his production process by himself.

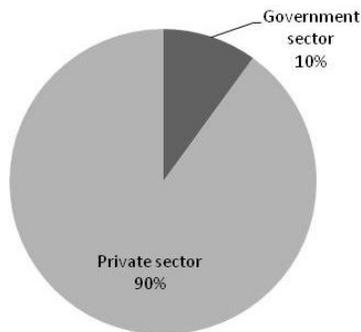


Figure 2: Production of rice species

In rice farming process, the technology has been recently adopted while traditionally, the domestic animal, the buffalo, was used for assistance. The development was from the public group travelling to study abroad perceived the benefit of technology and then had the idea that Thailand should develop new rice farming system from the use of buffalos for tillage to be machinery. In the past, if rice farming was done by the use of buffalos, it would take about one month and the output was not quite well as expected. Later, Ministry of Agriculture and Cooperatives has played the promoting role and assigned Department of Agricultural Extension to be the executor by firstly starting from the import of tractor from Japan around 30 years ago. It was purchased from Japanese company and later Thai people has developed and modified to be consistent with the area in Thailand through the development from plough, harrow, and soil pounding and constant adjustment from the use of transplanting rice cultivation to begin using broadcasting rice cultivation. In the former times, the broadcasting rice cultivation required the culture of seedling first. Today, the infusion of seedling in the water first for growing and the utilization of people for sowing have been developed. The previous fertilizer sowing done by people has been developed by the application of agricultural technologies such as medicine injector and fertilizer pill sprayer. From normal rice farming using two farmers with few rais of fertilizer applying ability, the adoption of sprayer has been able to do several tens of rais per day and more rapid speed would be acquired. This method has also been used in rice sowing causing in ability of today's farmers to sow the rice and it has been replaced by the use of fertilizer sprayer as the modern rice farming. The 20 rais rice farming would take no longer than 3 days from previously that about 15 days or reduce 80% was taken (Figure 3). The technology application has been highly initiated. The traditional harvest using people for harvest and buffalo for threshing has been changed by applying the machinery technology for rice threshing. Previously, the rice had to be dried in sun before threshing and took about 15 days in the former times; the technology then

has been adopted into help in this process with just 2 days time remaining to be salable or reduce 87% (Figure 4). In addition, the distinction in the past and present selling aspect has been the previous times, no moisture would be made and the selling would be quickly done without the application of moisture measurement technology and the selling would be done by valuation according to the area of farmland, house or agricultural field, and then would be immediately salable.

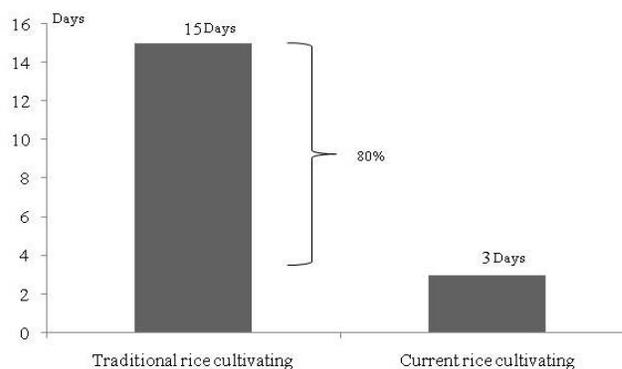


Figure 3: Period of rice cultivating Traditional and Current per 20 rais

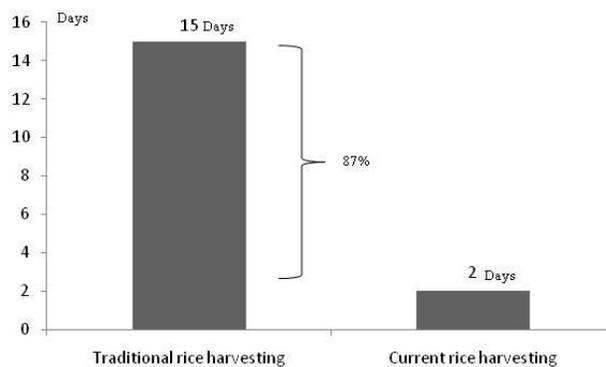


Figure 4: Period of rice harvesting Traditional and Current per 20 rais

According to the adoption of occurring technology and innovation change, the cost has been higher than the past that the agriculturalist income was 6,000-7,000 baht/ton. However, it has been currently sold for 10,000 baht and over but the agriculturalist could not make a living. The diseconomy of all costs and more disease availability has been caused from more advancement tendency. More access of the electrical system technology has made the moths to play the flame and then more insecticides have been required for use. On the contrary, it has returned to have good effect toward the capitalist of fertilizer and medicine producers for increasing product selling due to high availability of rice farming area in Thailand. In the beginning, the insect and disease resistance has been fine with few use of medicines but when the time has passed by, the medicine resistance has resulted in more use of

medicines and cost increase in the same way. Now the price has been from 200-2,000 baht and this medicine has been mainly the chemical harmful to the consumer. Anyhow, the development from the past 30 years until present has been relatively different from the involvement of the innovation and technology application. The regular inspection on soil used for rice farming has been performed. If the deteriorated soils have been found, the farmers would not concern on the subsequence and they would solve by solely applying the chemical fertilizers. In addition, the other aspect was that the farmers would consider on the way of most rapid harvest without consideration on the side effect of soil deterioration and soil recovery and improvement cost, then they have been the puppets of pharmaceutical company and fertilizer company for the requirement of additional using volumes and the requirement of increasing utilization by the farmer causing none of sustainable development.

If the comparison on traditional and new way of rice farming was taken, the differences were more time spending without cost in the past due to the way to gather the growing rice from villager assistance; continuous development from importing of technology from Japan about 30 years ago resulting in better domestic technology; the selling by someone who had none of drying yard to rice mill after finishing the harvest without moisture measurement depending upon the selling of dry rice or moist rice; and the use of transporting conveyor vehicle in selling causing labor reduction as the current working and then no recognition of new generation on traditional method previously done. The adoption of technology for 20 rais rice farming area has taken 2 days for harvesting completion.

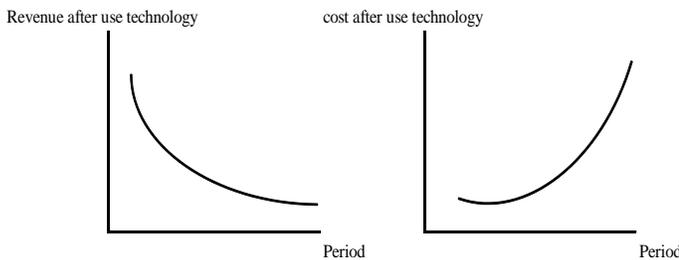


Figure 5: Revenue and cost after use technology in 30 years ago

The technological involvement in today's rice farming has started to eliminate the entire self-farming or self-labor farming by farmer and mostly become the way to hire of work. On the other hand, the farmers have become the capitalists, causing the beginning of lesser practical experiences. The hire for rice farming has not resulted in output or cost reduction but it would reduce or eliminate the development system of body of rice farming knowledge in the outsourcing process. For

example, the injection would be done by outsourcing and the control was been sometimes uncontrolled by them due to the use of trust, resulting in recognition inability whether injection in full area and proper insecticide compounding were done or not, etc., and the consequence why the rice was not fine and some diseases were incurable without cause traceability. The farmers would emphasize on more convenience and it would be different from the past that the farmers were early awake since 5 a.m. to completely do by themselves.

The adoption of technology and innovation by the agriculturalist has mainly included the production process and it was thought that the adoption of technology and innovation has resulted in escalating costs and shorter plantation duration but quality of life and knowledge creation have been impossibly developed in the same direction in accordance with technology and innovation. The entire alteration of rice farming labor to be alien labor will be the next future change after starting ASEAN Economic Community and 300 baht daily minimum wage increase policy due to dislike of Thai people in hard working compared with other ASEAN countries. However Thailand has still had more agricultural competitive potential than other countries. Therefore, the body of knowledge comprehension in this part should be built in order to continually create sustainable competitive capability.

B. Technology Acceptance Model 2 (TAM 2).

Subjective Norm: The agriculturalist have accepted new technology initially influenced from Japan and extensively entered through the support on technology transfer from government sector in primary period and properly developed for Thailand, causing the continuous perception and application of technology in agriculturalist group until present that technology has become the necessity for the agriculturalists.

Image: Most of the agriculturalists who have adopted the technology since the primary period have become the leaders, the leader groups in the communities and villages or the capitalists.

Job Relevance: The agriculturalists have perceived on new coming technology and realized that technology, machinery, production process, fertilizer and medicine could be applied conforming with their own jobs, resulting in constant adoption for rice farming.

Output Quality: Due to the application of technology for rice farming by the agriculturalist, the finding indicated the support on output enhancement and cost reduction, and rice farming time reduction has been considered to be well acceptance and belief in the support of technology for successful rice farming.

Results Demonstrability: After technology adoption, the demonstrability on the aspects of rice farming area expansion, increase in technology investment, and more

extensive and continuous application of technology in agriculturalist groups has been the individual perception level with belief that the results of technology application would be tangible, perceptible and communicable.

V. LIMITATION OF THE STUDY AND FUTURE STUDIES

The research limitation included the interview of the agriculturalist who has been only farmer residing in the central region of Thailand. The development may be different according to the access of different promotions from educational and agricultural government sector, resulting in the possibility for various slow and quick acceptances of innovation and technology adoption. In the future research, the interview may be increasingly conducted with agriculturalists in other regions and more different age groups of agriculturalists.

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