International Journal of Agricultural Technology 2022Vol. 18(6):2435-2446
Available online http://www.ijat-aatsea.com
ISSN 2630-0192 (Online)

The development of a training curriculum program on rice production for stakeholders

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Junlek, P., Yinglap, O., Napasintuwong, O. and Poungsuk, P. (2022). The development of a training curriculum program on rice production for stakeholders. International Journal of Agricultural Technology 18(6):2435-2446.

Abstract The knowledge on pre-growing rice production included rice culture, botanic characteristics, varieties selection, seed source, as well as time span of rice-growing, rice plot management, diseases and prevention. During harvesting period, rice farmers must gain knowledge about the process resulting to increase rice value, rice processing, and marketing channels. Findings showed that the body of knowledge on rice production must be consistent with both rice-growing process and farmer's way of life. From the knowledge gained in the training, rice farmers must apply for growing method which appropriated to the area's condition and geo-social aspect of the community. The assessment of knowledge found that the participants had increased knowledge after the training with a statistical significance level at 0.01. As a whole, It was found that the sample group improved their professional rice production at a high level. Based on it's the following were found at highest level: increase the professional rice farmer networks; efficialcy in increased yields; and rice production cost production and production management. Overall, the participants had a high level of satisfaction with the training program. The benefits of basic rice-growing training program and smart rice farmer program were found at a high level.

Keywords: Training program, Body of knowledge construction, Rice farmers, Rice production process

Introduction

Rice is important goods to economic system of Thailand. However, the country still faces a problem in the efficiency of rice production due to uncontrollable circumstances such as the conditions of unusual distribution of rainfall and prolonged flood resulted in difficulty in planning of growing rice, low yields, an increase in pest or insect population, occurrence of new kinds of weed, decreased rice and export prices. In fact, poor basic structure of rice production has an effect on the price of rice purchased from rice farmers (Chai-

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udom, 2010). In addition to this, the present Thai rice farmers are beset by production, low efficiency in production, low quality due to inappropriate varieties with the area condition, and marketing. There has also been a change in the culture of producing rice as rice producers shift from subsistent farming to commercial farming. It begins with the use of new agricultural technology to improve rice quality and increase the amount of yields which results in high production costs. Moreover, some rice farmers lack the knowledge on how to reduce production costs whilst able to gain high yields (Katchawattana, 2015), it should therefore be developed. This is in terms of useful data before rice-growing, selection of rice varieties, and good seed sources which includes rice growing methods, rice plot care, and harvest and account preparation for financial planning (Sriwongchai and Roongmekharat, 2014). An appropriate technology is also an effective tool for enhancing agricultural knowledge and marketing as well as convenient access. In addition, using an online system, such as smart farming, can promote new technology to new generation farmers to develop quality rice production. Networking or connection can expand networks and move on to the growth of agro-industry (Phongphit, 2022, OARD, 2022). Farmers need to be skillful in theories and practice about rice production. The training program covers needed content such as required clear objective knowledge, expected attitudes and skills in rice-growing, and knowledge transfer of the target group while simultaneously maintains the cultural and traditional aspect of rice-growing for sustainability. This body of knowledge can be topped up by effective integration leading to sustainable country development. The objective of the study aimed to develop a training curricular program for the body of knowledge transfer on rice and investigate results on the adoption of the program by the participants.

Materials and methods

The curriculum development is a process of systematic curriculum preparation or improvement (Marsh and Willis. 1995). A curriculum should be designed by the actual practictioner rather than an organization (Taba, 1962). According to Saylor and Alexander (1974) and Saylor, *et al.* (1981), curriculum development comprises 4 important steps: 1) formulation of goals, objectives, and domains, 2) designing of curriculum, 3) implementing of curriculum, and 4) evaluation by the teacher and concerned personnel. Andragogy is used for farmer training science they are adults. It is the arts and science of helping adults learn (Knowles, 1980). It is believed that adult learning is different from children learning because adults have more experience than children. Hence, it must put the impotance on the nature of adults regarding their predominant

points. The farmer training aslso focuses of learning-by-doing. Dewey (1963) adopted this can concept for the experiment about learning through actual practice or situation. The teacher should only act as an advisor and the learner can direct himself learning to learning which he wants to be supported by the teacher leading to learning which wants to be supported by the teacher (Wilcox, 1996). There is a theory for developing the training curriculum program from Tyler's (1949) which focuses on clear formulation of objectives and the facilitation of lrarning experience that must be consistent with the goals as determined. Besides, Taba (1962) focused on curriculum development based from needs of the curriculum users.

This study was in accordance with Research and Development process comprising of 5 steps as follows:

Step 1: Exploration of basic data and context related to curriculum development

The analysis related documents such as research reports, rice production, and curriculum development were made, and content analysis was conducted. Focus group discussion were conducted on needed data from 3 reperesentatives from Rice department and the in-depth interview was conducted with 13 farmer leaders from each region, 8 academics on rice, 4 rice entrepreneurs, 10 interested persons in the training. The obtained data were collected and made conclusion for curriculum development.

Step 2: Curriculum construction and quality checking

Data gained from Step 1 were considered for making a draft curriculum. Quality of the draft curriculum was based on appropriateness and consistency using a rating scale assessment form conducted with 5 specialists. The obtained data were analyzed for an average mean score and standard deviation. The accepted mean and standard deviation criteria were 3.51 and above and ≤ 1, respectively. Suggestions of the specialists were incorporated for the improvement of the draft to assess the possibility usage of the curriculum for the training program. There was brainstorming among scholars and stakeholders—farmer leaders on rice production, seed production, processing, and selling; agricultural academics and personnel of Rice Department; interested persons in the training; and the team of researchers representing on curriculum development. The obtained data were recorded and suggestions were used for the improvement of the curriculum.

Step 3: Curriculum implementation

Sixtyfour farmers was purposive sampling selected form 4 batchers (124 farmers) of curriculum implementation through the basic rice-growing and rice production skills of smart farmers were concerned the issues of concern in the training. A group pretest–posttest design (Leekitwattana, 2012) in the form of 4

multiple choices passing the quality checking was used. The IOC range was 0.60-1.00; the difficulty (P) range was 0.34-0.80, the discrimination value (B) range was 0.24-0.74, the reliability value gained from KR-20 formula of Kuder Richardson was 0.95. The obtained data were analyzed by testing the difference of knowledge/understanding and adoption before and after the training. The statistical package program was used for t-test (dependent) (Punpinij, 2011). In the actual training process, learning is organized in accordance with the program of the curriculum. There is transferred various knowledge by providing online learning together with the integration of training management with a group process (Khammanee, 2013) and blended learning (BL) (Carman, 2005). It was focused on using a smartphone for communication and group focusing among the trainees and trainers through online media systems such as Line mobile application in the training room and practice of planting in experiment rice fields of Rice depatment. Apart from this, trainers had fulfilling experienced through the educational tours.

Step 4: Assessment of the training curriculum

The systematic assessment form was used for the reliability value of the questionnaire at 0.874 (Cronbach, 1970), the assessment was based on 3 aspects: - input factor, process, and yields. After that, it was analyzed for an average mean score and standard deviation.

Step 5: Dissemination of the training program

The knowledge transfer on rice in particular to rice production training was directly disseminated to the concerned government agencies such Rice deparment, Department of agriculture extension, etc. Benefits of the curriculum were assessed using an assessment form that had passed the content validity test. Then, data were collected from 10 agricultural academics at the Rice department and 5 representative farmers.

Results

The data collection from stakeholders found that the body of knowledge on rice production can be done and consistent with both rice-growing process and the way of life of the farmers.Moreover, rice-growing methods could be appropriately applied to topographic condition and geo–social aspect of the community. The rice production knowledge included rice before growing period in which the participant would gain knowledge from such as ecosystem in the rice field, rice culture, rice botanical traits, rice varieties selection, rice seed sources, an analysis of production costs, rice plot management, diseases and insects in the rice field, water system in the rice field, harvest technology, inspection and recognition of rice production standards, rice marketing and value-added and production process innovation (Table 1).

Table 1. Presentation of knowledge on rice production contained in the curriculum (time span of growing rice)

Step of Rice Production	Content of knowledge
1. Pre-growing of rice period	This is basic knowledge before growing rice that rice farmers must have in preparing readiness which includes the following: 1. Eco-system in the rice field 2. Rice seed selection 3. An analysis of production costs and preparation of farm account 4. Nutrients and soil preparation and water for rice production 5. Farm machinery for growing rice
2. Rice-growing period	Rice farmers must have the knowledge about rice growing for good growth performance and rice yields which includes:: 1. Diseases and insects occurred in rice production 2. Fertilizers and pesticides 3. Irrigation system in the rice field
3. Post–growing rice period	This is when the rice reached maturity and ready to be harvested, they must have knowledge about the following: 1. Harvest technology 2. Inspection and recognition of rice production standards 3. Marketing and rice value added 4. Data for rice farmers in the age of Thailand 4.0 5. Learning exchange for the construction of the learning community (Sharing for Professional Learning Community: PLC) (Hord, 1997, Hord, *et al.*, 2012 and Martin, 2011).
4. Rice processing and value-added	After harvesting, most rice farmers sell unmilled rice so they should have additional knowledge about value-added as follows: 1. Rice product business and marketing 2. Packaging and product development 3. Rice-made cosmetics and by–products 4. Intellectual property registration

Form of the training curriculum

The training curriculum for the body of knowledge transfer on rice was developed for the needs of stakeholders who were comprised of: rice farmer leaders from each region, personnel of the Coordination Division of the Royal Initiative Project under the Rice Department, interested persons who attended the training, and the team of researchers. The developed curriculum had the following components: principles, objectives, target groups, rice production content, training steps, and measurement/evaluation (Figure 1).

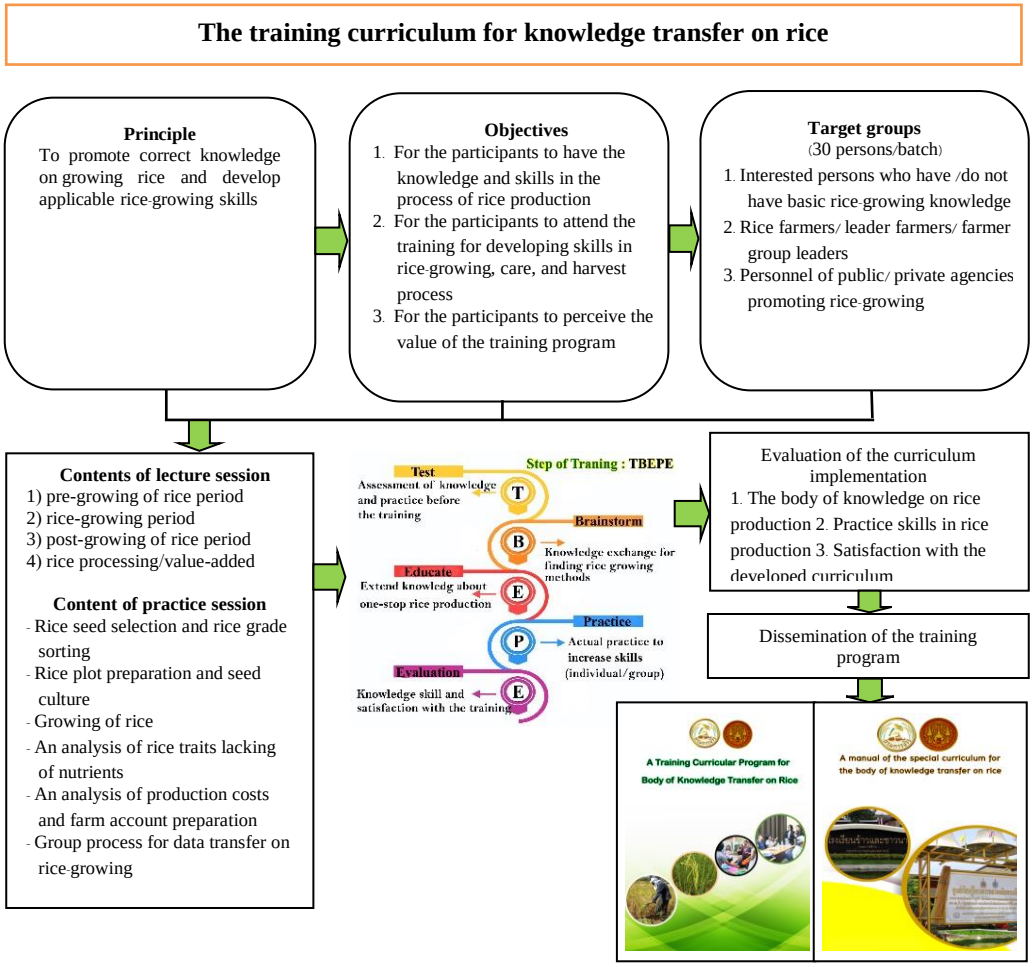

Figure 1. The training curriculum for knowledge transfer on rice

Table 2. A comparison of knowledge about rice production of smart farmers (n=64)

Batch	Total score	Before		After		t	P
		$\bar{x}$	S.D.	$\bar{x}$	S.D.		
Batch 1 (29 persons)	30	17.14	0.592	21.72	0.931	-7.55	0.00**
Batch 2 (35 persons)	30	15.57	0.731	21.63	0.794	-11.53	0.00**

** P < .01

Based on the knowledge assessment by a test paper, it was found that two batches of participants had knowledge about rice production as based on smart

farming which was higher than prior to attending the training, with a statistical significance level (P < .01) (Table 2).

The assessment of participant satisfaction

As seen on Table 3, the participants, as a whole, were satisfied with the training at a high level ($\bar{x}$=4.37, S.D.=0.194) in particular to training activities, continuity of the training, and participant's participation ($\bar{x}$=4.51, S.D.=0.315) (Table 3).

Table 3. Participants' satisfaction rate with the training curriculum

Items	$\bar{x}$ (n=64)	S.D.	Description
1. Input factors: document/resource person, training time span/venue/convenience of facility, etc.	4.32	0.263	High
2. Process: training activities/continuity of training/ participation, etc.	4.51	0.315	Highest
3. Outcomes: Knowledge gained from the training/ adoption/knowledge transfer or dissemination, etc.	4.29	0.321	High
Total	**4.37**	**0.194**	**High**

Assessment of the training curriculum benefits

According to the assessment of benefits of the training curriculum after it was disseminated by scholars, it was found that both basic rice-growing and smart farmer training programs had a high level of benefits ($\bar{x}$=4.47, S.D.=0.157 and $\bar{x}$=4.31, S.D.=0.124, respectively). Consequently, the scholars perceived that completeness of the content and convenience in the adoption with the highest level of benefits ($\bar{x}$=4.62, S.D.=0.324 and $\bar{x}$=4.54, S.D.=0.183, respectively). Meanwhile, the smart farmer training program had shown a high level of benefits in all aspects (Table 4).

Table 4. Assessment of the training curriculum benefits

Benefits	Basic rice-growing (n=29)			Smart farmer (n=35)		
	$\bar{x}$	S.D.	Description	$\bar{x}$	S.D.	Description
1. Curriculum and its documents or printed materials	4.24	0.443	High	4.36	0.342	High
2. Completeness of content and the body of knowledge on rice production	4.62	0.324	Highest	4.22	0.391	High
3. Connection to the community	4.36	0.301	High	4.44	0.302	High
4. Convenience in the adoption	4.54	0.183	Highest	4.30	0.194	High
Total	**4.47**	**0.157**	**High**	**4.31**	**0.124**	**High**

Monitoring after the training

According to the one year monitoring, as a hole, it was found that professional rice production of the sample group improved at a high level ($\bar{x}$=4.38, S.D.=0.294). Based on its details, increased professional rice farmer networks for knowledge/ learning exchange was found at a highest level ($\bar{x}$=4.68, S.D.=0.345). This was followed by efficiency in increased yields compared with rice production after the training ($\bar{x}$=4.52, S.D.=0.532) and Production management cost reduction ($\bar{x}$=4.51, S.D.=0.315), respectively (Table 5).

Table 5. Monitoring the farmers' performance after the training

Items	$\bar{x}$ (n=64)	S.D.	Description
1. Having increased professional rice farmer networks and knowledge/learning exchange	4.68	0.345	Highest
2. Efficiency in increased yields compared with rice production after the training	4.52	0.532	Highest
3. Production management cost reduction	4.51	0.315	Highest
4. Application of knowledge/experince gained from the marketing	4.56	0.362	High
5. Processing and marketing management	4.29	0.324	High
6. Increased incomes making better family livelihoods	4.32	0.463	High
Total	**4.38**	**0.294**	**High**

Discussion

It was revealed from the results that the body of knowledge on rice which the stakeholders who needed to contain in the training program that must be consistent with both rice-growing process and the way of life of the farmers. This was due to the clear objectives in the development of a training curriculum. The focus on knowledge transfer on rice production was consistent with the research results of Lertdejdecha (2017), Traiyang *et al*. (2015), Thong-on (2015), ARDA (2017) and Tyler (1949) who claimed that the strong point of curriculum development wais clearly formulated to the objectives and the facilitation of learning experiences which must be consistent with the goals as set. The training curriculum was developed from the data of the rice farmers and stakeholders to understand the nature of rice production process. This conformed with Taba (1962) focused on the curriculum development from the bottom basis by practioners, or curriculum users.Likewise, the curriculum development of Saylor, Alexander, and Lewis focused on curriculum

development regarding the appropriateness with the learner and social traits (Saylor and Alexander, 1974, Saylor *et al.*, 1981).

The assessment of knowledge on rice production found that the participants had higher level of knowledge than before attending the training, as well as a high level of satisfaction. With these results, the knowledge gained could be adopted at a high level in all courses. This might be due to their intention to participate in the training session as a new body of knowledge were never learned (Yinglap *et al*., 2021; Rice and Farmers School, 2020; Poungsuk and Junlek, 2017) and the training process facilitated learning activities in accordance with adult learning theory by Knowles (1980) wherein he claimed that adult learning was different from child learning because the former had more experiences than the latter.The teaching/learning facilitation must put the importance on responsiveness to the nature of adults. The training activities which consisted of 5 steps of TEBPE: 1) Test – assessment of knowledge and practice before training; 2) Brainstorm – knowledge exchange for finding methods of good practice on rice production; 3) Educate – extension of knowledge about one-stop rice production; 4) Practice – practice to have increased skills; and 5) Evaluation – assessment of knowledge, skills, and satisfaction with training was focused on learning-by-doing (Yinglap, 2017). It helped the participants to understand and apply what they had learned through actual practice until there was the occurrence of skills (Dewey, 1963).

Considering that the rice training curricular program for the body of knowledge transfer based on stakeholders must be consistent with the way of life of rice-growing, rice farmers must apply a rice-growing method which is appropriated with the area condition and geo-social aspect of the community. Therefore, comprehensive knowledge of rice production is crucial to farmers. Consequently receiving a developed training program could result to farmers for enhancing their knowledge with a high level of satisfaction. Likewise, the effect of additional learning obtained from the training program was enable the farmers to develop rice production with high quality and sustainability in the future.

According to the monitoring of the farmer sample group after the training, it was found that they applied skills and experience gained from the training to their rice production within the one year-round and could improve it at a high level. This was because of the following: increased professional rice farmer networks; efficiency in increased rice yields; and management of yield/rice production cost reduction. Besides, the farmer sample group could well manage rice marketing and distribution which resulted increased household incomes. This truly showed the success of curriculum development and extension for the development of professional farmers (Yinglap, 2017 and Rice Department,

2019). For sustainability, network development must be in a new form of the digital age for smart farmers using new technology such as databased system to reduce production costs. Not only this, it must increase the efficiency in production and development of modern market system for effective product distribution (Poungsuk and Junlek *et al*., 2017 and DGTi Thailand, 2022). This was for the exchange of body of knowledge and experiences in efficiency development of rice production as well as economic networks effecting a better livelihoods and sustainability (Dam-orn *et al*., 2021 and Damrongwattanakool *et al*., 2021).

It is suggested that prior training, the resource persons should adapt to the current rice production concerning photoperiod sensitivity varieties, short-period of rice production with a large amount of rice yields, and rice cropping which maintain natural resources and environmental conservation.Moreover, there should be supported personnel taking charge with data collection and assessment considering the diverse age range of the participants. Lastly, there should be monitored and evaluated in terms of outputs and post-training outcomes.

Acknowledgements

This research was supported by the Division of Royal Development Projects Coordination under the Rice Department of the Ministry of Agriculture and Cooperatives Thailand.

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(Received: 31 July 2022, accepted: 30 October 2022)