
Needs for processing career promotion course to add value for freshwater fish farmers in Nakhon Sawan Province

Khrueahong, J.*, Pongsuk, P. and Junlex, P.

Department of Agricultural Education, Faculty of Industrial Education and Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand.

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Abstract Results revealed that the respondents needed training courses for fish crackers, dried fish strips, sour pickled fish, fish sausage, and fermented fish. They needed a 1-2 days training course at the training place in the village during the off-season for rice growing. The participants should be around 21-30 persons and the training program that informed at least one week in advance. Training activities should focus on actual practice (91.50%) and the training organizer must be responsible for expenses (99.02%). Each time of the training should have only one topic (\bar{x} = 3.55; S.D. = 1.08). Assessment through observation during the training should be done (\bar{x} = 3.77; S.D. = 0.58) and assessment after the training must be conducted (\bar{x} = 3.75, S.D. = 0.79), For the training session, it should include demonstration (\bar{x} = 4.23, S.D. = 0.67) actual practice (\bar{x} = 4.40, S.D. = 0.61) and diverse use of media (\bar{x} = 4.29, S.D. = 0.68). According to the comparison, there was a statistical difference between the needs for training and the socio-economic attributes of the respondents. The latter included sex, educational attainment, farmer group membership, number of household labor, and debts or sources of loans. A training course for value-added processing of freshwater fish has tended to develop for future training sessions with farmers.

Keywords: Freshwater fish, Processing career, Farmers, Training course

Introduction

Due to a rapid increase in the world's population, there are continual a great amount of consumption of aquatic animals. This is because they are sources that are rich in protein (FAO, 2022). In fact, fish is a source of unsaturated fatty acids, taurine, and omega-3 fatty acids that are beneficial to the human body. This make many people be interested in the consumption of protein gained from fishes (Yanfika *et al.*, 2018). Nowadays, Thailand has increased fish farming since fishing from natural water sources tends to decrease. There is an estimated amount of fish for cultivation in 2022 of 420,300 tons, which is worth more than 9,950.3 million baht (Department of Fisheries, 2023).

*Corresponding Author: Khrueahong, J.; Email: Jamree.k@nsru.ac.th; 65036062@kmitl.ac.th

Nakhon Sawan Province is located in lower northern Thailand and is very well prepared in terms of fisheries. This is because there are important rivers flowing through, namely Ping, Wang, Yom and Nan which converge to form the Chao Phraya River. Besides, the province has a lake called Bueng Boraphet as well as 1,401 water sources for increasing fish farming potential. Fresh water fish farming in Nakhon Sawan is mostly found in Muang and Chumsaeng districts and it includes catfish, Nile tilapia and pink tilapia (Nakhon Sawan Provincial Office, 2022). In 2022, Nakhon Sawan had the amount of freshwater aquaculture in the earthen pond for 14,678 tons, which was worth more than 722million baht. In other words, the province had the highest production volume of aquatic animals in the North and ranked ninth in the country. About 94 percent of the aquatic animals were freshly consumed, only 5.58 percent of the aquatic animals were freshly consumed, only 5.58 percent were processed such as dried fish (1.62%) (Department of Fisheries, 2023).

Actually, aquatic animals are easily perishable, so post-harvest quality control is required throughout the supply chain. Therefore, appropriate management, processing, keeping and packaging are essential for extending shelf life and safe food with nutritional value (FAO, 2022). In Nakhon Sawan, selling fresh fish is at an average price of 35-45 baht per kilogram and processed one can reach 150-200 baht per kilogram (Wisitpanit *et al.*, 2019). According to Tonwan and Boonkong (2023), creative product development on food processing for food health is found in Sakon Nakhon, Nakhon Phanom and Mukdahan Provinces. This includes fermented fish paste with herbs, fermented fish sauce mixed with cannabis, sour fermented fish with herbs, etc. This is similar to the development of potential in catfish production and processing which can be further developed commercially (Plodpai *et al.*, 2023). In addition, there are many processing entrepreneurs and fish farmers who have developed fish products for value added (Peeraphatchara *et al.*, 2016; Wahalo *et al.*, 2017; Duanguppama and Phuworakij, 2020; Tappa *et al.*, 2020; Sirinthnathorn and Thewtanom, 2022).

Nakhon Sawan really has potential in freshwater fish processing since the province is a big freshwater source. Furthermore, potential of the province as well as knowledge and experience of fish farmers there can develop and create value of freshwater fish. Thus, the researchers are interested in a study on needs for a training course on freshwater fish processing for value added creation of fresh fish farmers in Nakhon Sawan Province.

Materials and methods

Population and sample group

The population were 1,538 farmers rearing fish in earthen ponds (Registered with Nakhon Sawan Provincial Fisheries Office). The sample group consisted of 306 farmers rearing fish in earthen ponds and processing in Nakhon Sawan Province. They were obtained by purposive sampling and the method of Krejcie & Morgan.

Research instrument

Questionnaire was designed as a basic data of the respondents, needs for knowledge about fish processing, and characteristics of the training course.

Preparation and quality control of the instrument

Review of related literatures were needed for freshwater fish farmers. The questionnaire was inspected by specialists to find IOC (Index of Item-Objective Congruence). It was found that all of the question items had a value of more than 0.50. Then, the questionnaire was tried out with 30 farmers rearing freshwater fish in earthen ponds, Tak Province (α -Coefficient of Cronbach= 0.94).

Data collection

The questionnaire was used for data collection by the researchers and 3 assistants from October 2023-May 2024.

Data analysis

The obtained data were analyzed by using descriptive statistics (percentage, frequency, mean, and standard deviation). Also, t-test and F-test were conducted by using the statistical package.

Results

Needed for knowledge

It was found that the respondents needed for knowledge about fish processing to be fish crackers, pickled fish, dried fish, fish sausage, and fermented fish, respectively (Table 1 and Figure 1).

Table 1. Knowledge about fish processing based on needs of the respondents (n=306)

| Course | Frequency | % | Rank |
|------------------------------|-----------|-------|------|
| Dried fish strips/dried fish | 57 | 18.63 | 3 |
| Salted fish | 17 | 5.56 | 7 |
| Smoked fish | 25 | 8.17 | 6 |
| Fermented fish | 26 | 8.50 | 5 |
| Pickled fish | 45 | 14.71 | 2 |
| Fish ball | 17 | 5.56 | 8 |
| Fish sausage | 27 | 8.82 | 4 |
| Herbal fish sausage | 10 | 3.27 | 10 |
| Fish crackers | 65 | 21.24 | 1 |
| Sweet fish | 13 | 4.25 | 9 |
| Fish floss | 4 | 1.31 | 11 |

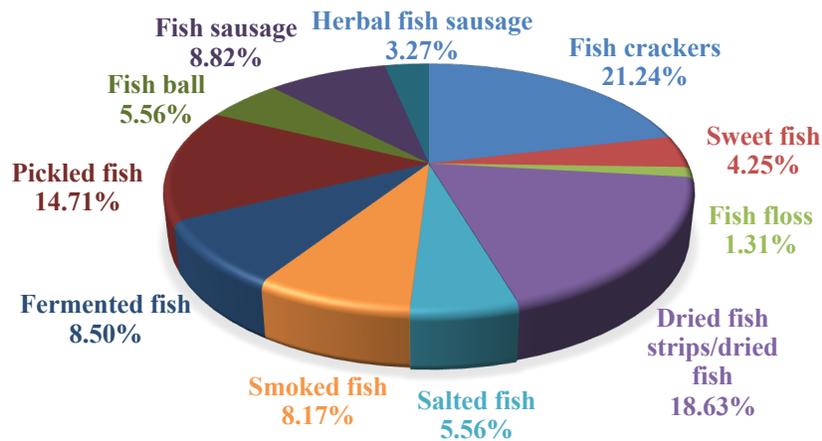


Figure 1. Percentage of knowledge about fish processing required by the respondents

Need for course model

The respondents needed for a 1-2 days training course (87.25%) only once (49.35%) as seen in Table 2. There were more than one-half of the respondents (58.50%) wanted to attend the training in the village having a processing plant and during off-season rice cultivation (46.08%). The participants should be around 21-30 persons (42.81%) and the training program should be informed at least one week in advance. Most of the respondents (91.50%) preferred actual practice in the training and without expenses (99.02%).

Table 2. Need of the respondents for the training course style

| Item | Frequency | % | Item | Frequency | % |
|---|-----------|-------|---|-----------|-------|
| 1) Training time span | | | 5) Days of training | | |
| 1-2 days | 267 | 87.25 | Monday to Friday | 11 | 5.56 |
| 3-4 days | 39 | 12.75 | Saturday to Sunday | 110 | 35.95 |
| 2) Number of training times | | | Any day | 179 | 58.50 |
| Once | 151 | 49.35 | 6) Appropriate number of people for training | | |
| Twice | 118 | 38.56 | Less than 11 | 46 | 15.03 |
| More than twice | 37 | 12.69 | 11-20 | 107 | 34.97 |
| 3) Training place preferred | | | 21-30 | 131 | 42.81 |
| Hotel conference room | 10 | 3.27 | 31 and above | 22 | 7.19 |
| Conference room of government office | 22 | 7.19 | 7) Advance notification of training schedule | | |
| Group office | 23 | 7.52 | 3 days | 59 | 19.28 |
| The village hall office | 226 | 73.86 | 1 week | 147 | 48.04 |
| University | 25 | 8.17 | 2 weeks | 30 | 9.80 |
| 4) Months available for training | | | 1 month | 70 | 22.88 |
| January | 18 | 5.88 | 8) Proportion of training activities | | |
| February | 7 | 2.29 | Less lecture, more practice | 280 | 91.50 |
| March | 18 | 5.88 | Lecture and practice equally | 26 | 8.50 |
| April | 60 | 19.61 | More lecture, less practice | 0 | 0.00 |
| May | 45 | 14.71 | 9) Person responsible for training expenses | | |
| July | 3 | 0.98 | Training organizer | 303 | 99.02 |
| November | 5 | 1.63 | Training attendant | 1 | 0.33 |
| December | 9 | 2.94 | Find a source of support | 2 | 0.65 |
| Any month | 141 | 46.0 | | | |

The respondents needed of training activities most in the following aspects of training course-one topic each time (\bar{x} =3.55; S.D.= 1.08); 2) assessment after the training (\bar{x} =3.75; S.D.= 0.79); and 3) assessment through observation during the training (\bar{x} =3.77; S.D.= 0.85) as seen in Table 3. For training methods, almost all of the items gained at a highest level, i.e. needed for demonstration (\bar{x} =4.23; S.D.= 0.67), actual practice (\bar{x} =4.40; S.D.= 0.61), the resource person teaches and advises in groups (\bar{x} =3.60; S.D.= 0.82), educational trip (\bar{x} =3.87; S.D.= 0.65), and training equipment and media (\bar{x} =4.29; S.D.= 0.68).

Table 3. Needs for training activities

| Item | \bar{x} | S.D. | Description |
|--|-----------|------|-------------|
| 1. Training course | | | |
| 1.1 Pre-training needs survey | 3.53 | 0.74 | High |
| 1.2 Only one topic for each training | 3.55 | 1.08 | High |
| 1.3 Many topics for each training | 3.27 | 0.95 | Moderate |
| 2. Assessment | | | |
| 2.1 Assessment period | | | |
| 2.1.1 Before training | 3.45 | 0.82 | High |
| 2.1.2 During training | 3.08 | 0.97 | Moderate |
| 2.1.3 After training | 3.75 | 0.79 | High |
| 2.2 Assessment method during training | | | |
| 2.2.1 Taking the exam | 2.53 | 0.92 | Moderate |
| 2.2.2 Answering questions | 2.98 | 0.87 | Moderate |
| 2.2.3 Performance review | 3.46 | 0.79 | High |
| 2.2.4 Observation by the resource person | 3.77 | 0.85 | High |
| 3. Training methods | | | |
| 3.1 Lecture | 3.10 | 0.79 | Moderate |
| 3.2 Demonstration | 4.23 | 0.67 | High |
| 3.3 Actual practice | 4.40 | 0.61 | High |
| 3.4 Teaching/giving advices | 3.60 | 0.82 | High |
| 3.5 Educational trip | 3.87 | 0.65 | High |
| 4. Equipment and media | | | |
| 4.1 Documents and manuals | 3.74 | 0.65 | High |
| 4.2 Video | 3.50 | 0.74 | Moderate |
| 4.3 Overhead projector | 3.22 | 0.73 | Moderate |
| 4.4 Illustration | 3.58 | 0.78 | High |
| 4.5 Real examples | 4.06 | 0.66 | High |
| 4.6 A combination of many things | 4.29 | 0.68 | High |

Note: 4.51-5.00 = Very high; 3.51-4.50 = High; 2.51-3.50 = Moderate; 1.51-2.50 = Low; 1.00-1.50 = Very low.

The needs for support after the training was at a high level (\bar{x} =4.19; S.D.= 0.81) as seen in Table 4. The following needs were also found at a high level: input (loan source) (\bar{x} =3.92; S.D.= 0.65); fair price of food source, chemicals and fertilizers (\bar{x} =4.11; S.D.= 0.75); support for fish species from concerned government agencies (\bar{x} =4.39; S.D.= 0.71); support for processing equipment (\bar{x} =4.32; S.D.= 0.74); marketing/public relations (\bar{x} =4.19; S.D.= 0.71); group forming for product distribution (\bar{x} =4.18; S.D.= 0.76); and adding online distribution channel (\bar{x} =4.24; S.D.= 0.77).

Table 4. Needs for support after the training

| Needs | \bar{x} | S.D. | Description |
|--|-----------|------|-------------|
| 1. Inputs | | | |
| 1.1 Suggestions about use of loan sources | 3.92 | 0.76 | High |
| 1.2 Coordination with food sources and fair price of fertilizers/chemicals | 4.11 | 0.75 | High |
| 1.3 Support for fish species from concerned government agencies | 4.39 | 0.71 | High |
| 1.4 Processing equipment | 4.32 | 0.74 | High |
| 2. Marketing | | | |
| 2.1 Public relations | 4.19 | 0.71 | High |
| 2.2 Group forming for product distribution | 4.18 | 0.76 | High |
| 2.3 Adding online distribution channels | 4.24 | 0.77 | High |
| Mean | 4.19 | 0.81 | High |

Note: 4.51-5.00 = Very high; 3.51-4.50 = High; 2.51-3.50 = Moderate; 1.51-2.50 = Low; 1.00-1.50 = Very low.

A comparison of needs during the training and socio-economic attributes of the respondents

The comparison was on the basis of 4 aspects of training course, assessment, training methods and equipment/media. Results of the study showed that the difference in socio-economic attributes of the respondents resulted in the difference on some aspects of the needs (Table 5). The difference in sex of the freshwater fish farmer respondents resulted in the difference in needs for a number of topics required in each time of the training. That was, male respondents preferred only one topic for each training (Statistically significant difference at 0.05). Besides, female respondents preferred overhead projector whereas male ones did not as much (Statistically significant level at 0.05).

The difference in educational attainment of the freshwater fish farmer respondents had an effect on needs for the training course. That was, those who were bachelor's degree holders and above needed for only one topic in each training whereas those who were primary school graduated did not as much. This was similar to the case of needs for assessment which those who were bachelor's degree holders and above needed for only one topic in each training. Regarding training methods, those who had lower educational attainment preferred demonstration whereas those having higher educational attainment preferred attainment preferred actual practice. Besides, those having higher educational attainment preferred illustration and real examples (Statistically significant level at 0.05 and 0.001, respectively).

Regarding agricultural group membership, those who were group members preferred only one topic for each training whereas those who were not group members did not as much. For assessment during/after training, those who were group members preferred the assessment during and after training those who

were not group members did not as much. For performance assessment and observation by the resource person, those who were group members preferred it whereas those were not group members did not as much (Statistically significant level at 0.001 and 0.01, respectively).

Based on household workforce, those having 1-2 household workforce preferred assessment during/after training with a statistical significance level at .05. For actual practice, teaching and advices to groups, those having 1-2 household workforce would like to have the assessment during and after the training. They also preferred actual practice, teaching and giving advices to groups whereas those having 3 household workforce and above did not as much (Statistically significant level at 0.001 and 0.01, respectively).

Table 5. A comparison of needs between the facilitation of a training course and socio-economic attributes of the freshwater fish farmer respondents

| Needs | Sex | Edu cation | Group membership | Household workforce | Loans |
|--|-----|---------------|---------------------|------------------------|-------|
| 1. A survey on needs before training | | | | | |
| 1.1 A survey on needs before training | NS | NS | NS | NS | NS |
| 1.2 Only one topic for each training | * | *** | *** | NS | ** |
| 1.3 Many topics for each training | NS | NS | NS | NS | * |
| 2. Assessment | | | | | |
| 2.1 Assessment period | | | | | |
| 2.1.1 Before training | NS | NS | NS | NS | NS |
| 2.1.2 During training | NS | NS | *** | * | NS |
| 2.1.3 After training | NS | * | ** | * | ** |
| 2.2 Assessment methods | | | | | |
| 2.2.1 Taking exam | NS | NS | * | NS | NS |
| 2.2.2 Answer questions | NS | NS | NS | NS | NS |
| 2.2.3 Performance review | NS | NS | *** | NS | NS |
| 2.2.4 observation by the resource person/training organizer | NS | NS | *** | NS | * |
| 3. Training methods | | | | | |
| 3.1 Lecture | NS | NS | NS | NS | ** |
| 3.2 Demonstration | NS | *** | ** | NS | ** |
| 3.3 Actual practice | NS | ** | NS | *** | NS |
| 3.4 Teaching and giving advices to group | NS | NS | NS | ** | ** |
| 3.5 Educational trip | NS | NS | NS | NS | *** |
| 4. Equipment/media | | | | | |
| 4.1 Documents/manuals | NS | NS | NS | NS | NS |
| 4.2 Video | NS | NS | NS | NS | NS |
| 4.3 Overhead projector | * | NS | NS | NS | *** |
| 4.4 Illustration | NS | * | NS | NS | NS |
| 4.5 Real examples | NS | *** | ** | NS | ** |
| 4.6 Combination of many things | NS | NS | NS | NS | NS |

Note: * Mean p-value is less than 0.05; ** Mean p-value is less than 0.01
*** Mean p-value is less than 0.001, NS Mean p-value is higher than 0.05

Based on debt burden and loan sources, those having debts needed for only one topic for each training whereas those having no debts did not as much. Those having debts needed for the assessment through observation by the resource person/training organizer. However, those having no debts preferred lecture and educational trip whereas those having debts did not as much. Besides those having no debts needed for overhead projector and real examples whereas those having debts did not as much (Statistically significant level at 0.001 and 0.01, respectively).

The training course on processing to add value to freshwater fish

After reviewing needs assessment of the freshwater fish farmers, the training course was designed to transfer knowledge and promote processing career to them. The training course consisted of the training course and freshwater fish processing for value added creation. This would help to generate supplementary income to the participants. Objectives of the training course were perceived principles about freshwater fish processing, packaging, price setting and accounting, created skills in freshwater fish processing based on appropriate technology, and realized value and benefits of freshwater fish processing. The target group consisted of 30 farmers rearing fish in Nakhon Sawan Province. The learning content consisted of 2 parts of lecture (6 hours) and actual practice (24 hours). It consisted of 8 units as follows:

Unit 1: General knowledge about freshwater fish processing and use of equipment (Theory-2 hours), Unit 2-6: Practicing freshwater fish processing, i.e. making fish cracker, dried fish strips, pickled fish, fish sausage and fermented fish (Practice-4 hours), and Unit 7-8 Knowledge about packaging, pricing and accounting (2hours/Practice 2 hours).

PTSPPS training steps were obtained and it consisted of pre-test, training, assessment of skills and products, post-test and satisfaction assessment (Figure 2).

Discussion

According to results of the study, the freshwater fish farmer respondents needed for the training course on freshwater fish processing. The training course should last one or two days (Only once) and take place in their village. The respondents preferred to attend the training during off-season rice cultivation. This conforms to a study of Piamsomboon *et al.* (2004) which found that entrepreneurs had a limitation to attend a training since they did not have available time. Likewise, the assessment of project implementation of the Office of Permanent Secretary, Ministry of Agriculture and Cooperatives (Fiscal year

2019) revealed that determination of training period should be consistent with the farmer participants' way of life such as during off-season rice cultivation. It also conforms to the Department of Agricultural Extension (2013) which stated that the schedule of training activities should fit available time of participants, not training personnel.

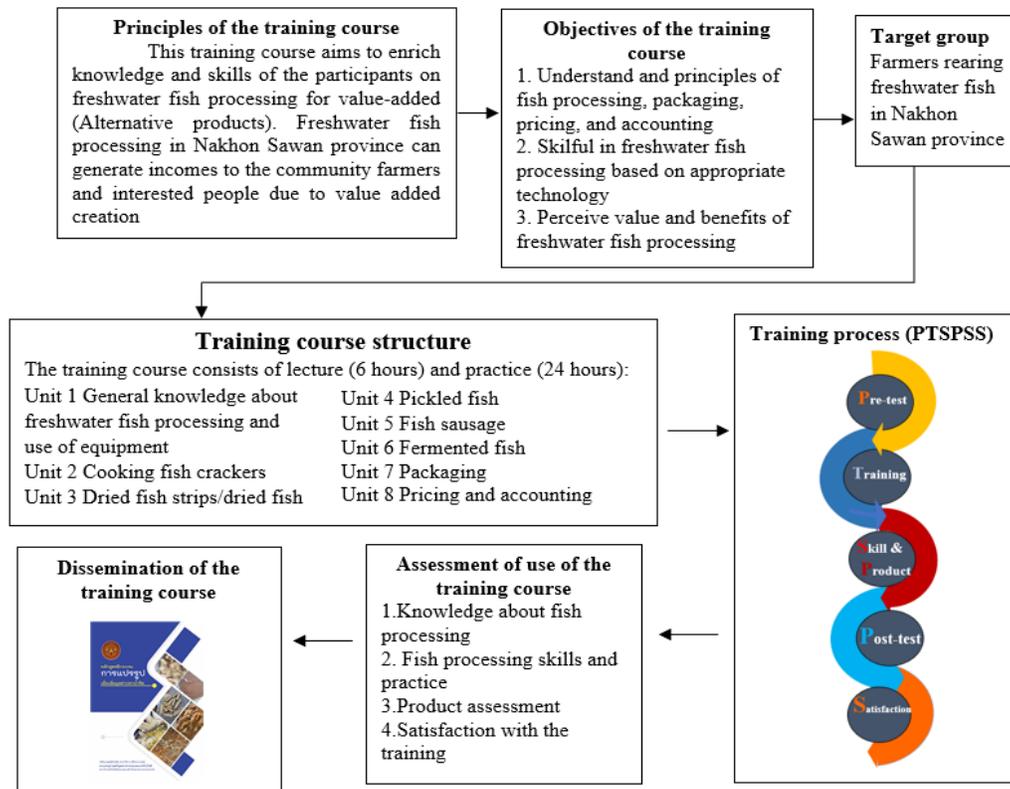


Figure 2. Training course on freshwater fish processing

The following knowledge were found at a highest level based on needs of the freshwater fish respondents Of fish cracker, pickled fish, dried fish strip/dried fish, fish sausage, and fermented fish, respectively. It conformed to a study of Pooplub (2009) which found that fish cracker ranked number one. This must have equipment/media, document/manuals, illustration, real examples, and combination of many things. Likewise, Saecheong and Wanapa (2007) cited that the training course should have learning content and media which were easy to understand. Regarding needs for support after the training, it included suggestions about loan sources, coordination with food sources, fair price of fertilizers/chemicals and fish species. For marketing, it included public relations, group forming for product distribution and adding online distribution channels.

A lot of freshwater fish farmers in Nakhon Sawan wish to attend the training on freshwater fish processing since the province had many water sources such as Bueng Boraphet lake and rivers. This conforms to a study of Pooplub (2009) which showed that the housewife group of Songkhla Province was interested in aquatic animal processing held by the Tin Suranont Fisheries College which it was close to Songkhla lake. It was believed that this would help alleviate poverty and result in the country development.

Regarding the comparison of socio-economic attributes of the freshwater fish farmer respondents and needs for the training course, it was found that sex, educational attainment, group membership, debt burden and loan sources had the difference in needs for the training course in some aspects. That was, male respondents preferred only one topic for each training. This might be because males may have more responsibilities than females and did not waste time for many times of training. Those having higher education attainment preferred illustration and real examples which it might be because they could acquire knowledge easily. However, processing skills needed actual practice. Those having no debt burden preferred the training for many times with many topics. This might be because they were flexible in training for many times or they had available times to attend the training. Pitchawong (2017) cited that farmer had different needs for a short-course agricultural training. Due to the difference in sex, educational attainment, a number of household numbers, land holding type, and incomes (Statistical significance level). This conforms to a study of Srakaew and Wongsamun (2013) which found that group members had a statistical difference level of needs for training on animal meat processing (Pickled fish and fermented fish). Therefore, designing a training course on freshwater fish processing must be on the basis of schedule, place, training course, assessment, media and needs of the target group or participants. In other words, it aims to suit the target group.

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