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# Impact of trainings on knowledge, skill, behaviour and income of farmers living around peatlands: case study in Riau Province

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**Abstract.** Peatlands in Indonesia have been objected to draining, burning and converting into agriculture lands causing huge greenhouse gas emissions and triggering climate change. To reduce emissions on peatland but still keep maintaining community livelihoods, farmers need to be trained with best practices on peatland uses and management. Under the Haze Free Sustainable Livelihoods Project, three trainings have been conducted, namely training on nursery and land preparation without burning, training on post harvests processing of fish and corn, and training on honeybee cultivation. The training participants are community who live in and around the Peatland Hydrological Unit of Kampar-Indragiri Rivers, Riau. An impact assessment of the completed trainings has been conducted which employ four-level evaluation model as proposed by Kirkpatrick (1994). The results indicate that all of the trainings improve participants' knowledge and skill. Moreover, the honeybee cultivation training has also transformed participants' behaviour to be more preserve and maintain nectar pollen and resin producing trees, pollen and sap. The trainings, however, are yet to affect household income although an increase of profit has been recorded on some champion participants.

## 1. Introduction

Peatlands in Indonesia have been objected to draining, burning and converting into agriculture lands causing huge greenhouse gas emissions and triggering climate change. High carbon emissions are reported by many studies from degraded peatlands. Carbon emission from peatland caused by peatland draining and subsidence [1–3], peatland deforestation [4] and peat combustion by fire [3].

Beside promoting land use policy and governance reforms on peatland management as suggested by researchers [5], reducing greenhouse gas emissions from peatland could simultaneously be conducted by maintaining community livelihoods. Community need to be trained with best practices on peatland uses and management.



Under the Haze Free Sustainable Livelihoods Project (HFSLP), five trainings have been conducted. The project is designed to identify and promote alternative livelihood for the communities live in and around peatlands in Riau Province. HFSLP aims to promote an innovation model of on-farm and off-farm livelihoods development that integrates peatland ecosystem and local market opportunities. Those five trainings which have been implemented are: training on nursery and land preparation without burning, training on social forestry, training of fish cultivation, training on post harvests processing of fish and corn, and training on honeybee cultivation. The training participants are community who live in and around the Peatland Hydrological Unit of Kampar-Indragiri Rivers, Riau.

The objective of this study is to find out the impacts of training on knowledge and skills, behavior and income of training participants.

## **2. Research method**

### *2.1. Conceptual Framework*

An assessment of the trainings has been conducted which employ four-level evaluation model[6]. This evaluation model was first published in 1959 by Donald Kirkpatrick[7], a professor at the University of Wisconsin, and president of the American Society for Training and Development (ASTD). Since its emergence, this model underwent development twice, respectively in 1975 and 1994. The four levels in the question are: Reaction, Learning, Behavior, and Results.

Assessment can be interpreted as an attempt to obtain various information periodically, continuously, and thoroughly about the process and results of learning, growth and the development of attitudes and behaviors achieved by participants. An explanation of the four assessment levels in Kirkpatrick's model is described as it follows:

#### Level 1: Reaction

This level measures how trainees react to the training process. What is expected at this level is that trainees feel that:

- Topics or training materials are useful and relevant to their needs;
- Training can improve understanding and skills;
- Participants are comfortable with the instructors and facilitators;
- Participants are comfortable with the place, accommodation, logistics during the training.

The reaction needs to be measured for reference in the future so that the training program could be done in more effective and constantly developed. It will also be useful for detecting any training materials that are needed by participants but has not been delivered.

#### Level 2: Learning

This level measures what the participants have learned. The important question to address is how far they have learnt, or captured as their new knowledge and insights. The best initial to perform before starting a training session is to list all of the learning objectives, which will be used for the training evaluation. The outcomes can be measured in various ways, through changes in knowledge, skills, attitudes and behavior of the participants. This level is also important to improve the effectiveness of a training program. Tools to assess the participants at this level are pre and post-tests.

#### Level 3: Behaviour

At this level, what can be evaluated is how far the attitudes and behavior of participants are developed after the training. This can be more specifically seen on how the participants apply the information and material they have got. Attitudes and behavior will change in line with changes in environmental conditions. It is very likely to happen that the change does not appear if, for example, the previous two levels are not applied and measured correctly.

#### Level 4: Result

At the last level, the final results of the training can be analyzed by measuring the achieved outputs of participants by applying the techniques and skills that are obtained from the training. This measurement includes the final results that are useful for the continuity of community livelihood.

## 2.2. Data collection

Based on the level of measurement as described in Kirkpatrick's chart model, data is collected through the following stages:

### a. Reaction

All training participants are to complete training evaluation sheet after the training are executed. There are nine questions in the evaluation sheet. The first to fifth questions are agreement statements with Likert scale starting from the category of strongly agree; agree; neutral; disagree; and strongly disagree[8]. The questions six to nine are open ended so the participants are free to express their own ideas or opinions.

The Likert scale questions consist of:

- 1) Training objectives (clarity, content and activities, suitability for work)
- 2) Training material (clarity and usefulness of training materials)
- 3) Trainers/facilitators (mastery, delivery techniques, interactions, and responses to participants' questions)
- 4) Training atmosphere (room, accommodation, and logistics)
- 5) General assessment that illustrates the level of satisfaction of participant with the overall training

The open-ended questions consist of:

- 1) Inputs to improve the training program
- 2) Balance of gender participation in training activities
- 3) The most preferred material in training activities
- 4) Willingness to be contacted again for the training impact evaluation phase.

### b. Learning Phase

Evaluation at this stage is carried out by testing the trainees' understanding before and after the training program. The question sheet is called self-assessment form, filled in by each participant by choosing one of the values from the rating scale from 1 to 5. The explanation of each value is as it follows:

1 = very low; 2 = low; 3 = medium; 4 = high; 5 = very high.

Participants are demanded to assess their own abilities for the aspects that will be delivered in the training activities. The assessment sheet which has the same questions are given back to the participants after the completion of the training. By following this process, each participant can measure whether or not they experience an increased understanding of a particular training material. Analysis is carried out on the changes in the value of each participant.

### c. Stage of Behavior Change

Evaluation at this stage is carried out by filling out the questionnaire sheets by the trainees at three until six months after the training implementation. The evaluation team come to sample villages of the analysis to gather the training participants, and then conduct individual interviews with the trainees. Key questions that are addressed are:

- 1) Do they practice the results of the training?
- 2) Do they disseminate information, knowledge obtained from the training to others?

The level of information dissemination consists of 3 stages, namely:

- 1) Telling about training experience to others
- 2) Sharing science or skills obtained from the training to others
- 3) Discussing the training materials in group meetings for joint activities programs.

The response to the question that has been assessed bases on the binary scale, 1 for the yes answers and 0 for the no answers.

#### d. Stage of Result

At the last level, the final results of the training are analyzed by measuring the participants' achievement in their livelihood outputs (such as income) due to the application of techniques and skills obtained from the training.

Questions on individual questionnaires and FGDs to collect information relate to the impacts of the training results; this consists of:

- 1) For the purpose of productive economic training activities: how many products have been made and successfully sold resulting in additional income?
- 2) For the purpose of honeybee cultivation training activities:
  - How many bees / honeycombs that have been cultivated?
  - How much honey production has been harvested?

Data collection for the first and second levels are carried out for all participants in the training activities. But for the 3rd and 4th level, data are collected by choosing village samplings that represent the overall state of the participants. In addition, considering the limited time, cost, and other resources, data analysis collected in the 3rd and 4th level is not applied to all trainees. Respondents for the 3rd and 4th level in Kirkpatrick model data collection are presented in Table 1.

Table 1. Amount of training impact assessment respondent

No.	Training	Village	Number of Respondent
1	Food product processing	Teluk Meranti	8 persons
		Pulau Muda	4 persons
		Teluk Binjai	3 persons
		Total	15 persons
2	Honey bee management and cultivation	Teluk Meranti	4 persons
		Redang	3 persons
		Sialang Dua Dahan	3 persons
		Gembira	1 person
		Simpang Gaung	5 persons
		Teluk Kabung	7 persons
Total	23 persons		
3	Nursery training	Bayas Jaya	7 persons
		Tanjungsari	24 persons
		Total	31 persons
		<b>Grand Total</b>	<b>69 persons</b>

In percentage terms, the training impact analysis is conducted on 60% of fish and corn processing training participants. The sample of honeybee cultivation training is 48% of the total training participants. The nursery training evaluation is conducted on 62% of the total training participants. Thus the average percentage of sample in the impact assessment training is 57%.

### 3. Result and discussion

#### 3.1. Level 1: Reaction to training

The reaction of participants to the training activities can be seen in Table 2. The objectives and contents of the training are aspects that have been obtained highest rank by the participants. The results show that the training activities are in line with the participant's needs, namely providing

alternative sources of livelihood for peatland management community. The second highest scored factor is training material. Participants consider that the presented materials are clear and easy to be applied. The facilitators and trainers are the next factors with high scores. In general, participants respond positively to the instructor's style: clear, systematic, easy to understand, and interactive in answering questions from participants. The presence of a training facilitator is also appreciated by the trainees, because it has made the training atmosphere more comfortable and enjoyable. In general, the assessment of training is rated high by participants with a score of 4.4 on a scale of 1 to 5. A parallel comparison of each training activity is presented in Table 2.

Table 2. Assessment of participants on Haze Free Sustainable Livelihood training activities

Indicators	Trainings type						Averages
	A	B	C	D	E	F	
Trainings objectives and contents	4,36	4,57	4,88	4,33	4,40	4,88	4,57
Training materials	4,28	4,43	4,83	4,20	4,38	4,50	4,44
Training facilitators and instructors	4,33	4,61	4,62	3,90	4,25	4,53	4,37
Training logistics	4,33	4,61	4,54	3,90	4,25	4,53	4,36
General training evaluation	4,14	4,61	4,58	3,83	4,47	4,75	4,40
Averages	4,29	4,57	4,69	4,03	4,35	4,64	4,43

Abbreviation:

- A. Training on Social Forestry in Simpang Gaung village
- B. Training on Honeybee cultivation in Simpang Gaung village
- C. Training on Honeybee cultivation in Bukit Lembah Subur village
- D. Training on Nursery at Tanjung Sari village
- E. Training on Fish cultivation in Bayas Jaya village
- F. Training on Fish and corn processing in Teluk Meranti village

The objectives and content of training activities for honeybee cultivation and fish processing are ranked high by the participants and there are aligned with their interest in developing alternative livelihoods in addition to managing peatlands. The honeybee cultivation training materials are also ranked high by the training participants. The facilitator and coach receive best response to the beekeeping training held in Bukit Lembah Subur and in Simpang Gaung villages. logistics in the training of beecultivation in Simpang Gaung village is also best responded high. Nursery training in Tanjung Sari village has the lowest rating on the logistics aspects. This is understandable because the training was held in a not too large village office meeting room, the field practice was in open peat areas that was very hot. This condition makes the participants feel uncomfortable with the room facilities and the location of plant nursery practices.

### 3.2. Level 2: Learning process

The level of the learning process in the training activities is assessed by the level of participants' understanding improvement of each training material. The measurement bases on the score of learning indicator before and after the training implementation. The participants conduct independent assessment of their own abilities and skills before and after the training. The calculated score is a change in value between before and after the training. This Delta value is a measure of absorption of knowledge of each participant, as it is presented in Table 3.

Table 3 shows the highest rank of knowledge that increases 3.09 points and the lowest that reaches 1.18 points. The average score of the increasing knowledge is 1.90 points. The highest increasing score is 3.60 this occur in the training of social forestry in Simpang Gaung village. The increasing score in the training on nursery in Tanjung Sari village is ranked the lowest (the score is 0.50 points).

These results appear due to the daily activities of participants as farmers. For them, nursery is not a new practice both in terms of knowledge/understanding, and in terms of skills.

Table 3. Scores increasing in various trainings

Scores increase	A	B	C	D	E	F	Averages
Lest increase	1,20	1,20	1,40	0,50	1,20	1,57	1,18
Most increase	3,60	3,10	2,80	2,20	3,10	3,71	3,09
Averages	2,00	2,05	2,00	1,06	2,05	2,23	1,90

Abbreviation:

- A. Training on Social Forestry in Simpang Gaung village
- B. Training on Honeybee cultivation in Simpang Gaung village
- C. Training on Honeybee cultivationin Bukit Lembah Subur village
- D. Training on Nurseryat Tanjung Sari village
- E. Training on Fish cultivation in Bayas Jaya village
- F. Training on Fish and corn Processing in Teluk Meranti village

In collecting the training impacts data on alternative livelihoods, participants obtain approval of the following statement: "The training that I have participated in has increased my knowledge and or skills in processing fishery products, making fish crackers and corn chips" (1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree) ". It can be stated that 100 percent of the participants agree with the statement, even 20 percent of them state that they strongly agree with the statement (Figure 1).

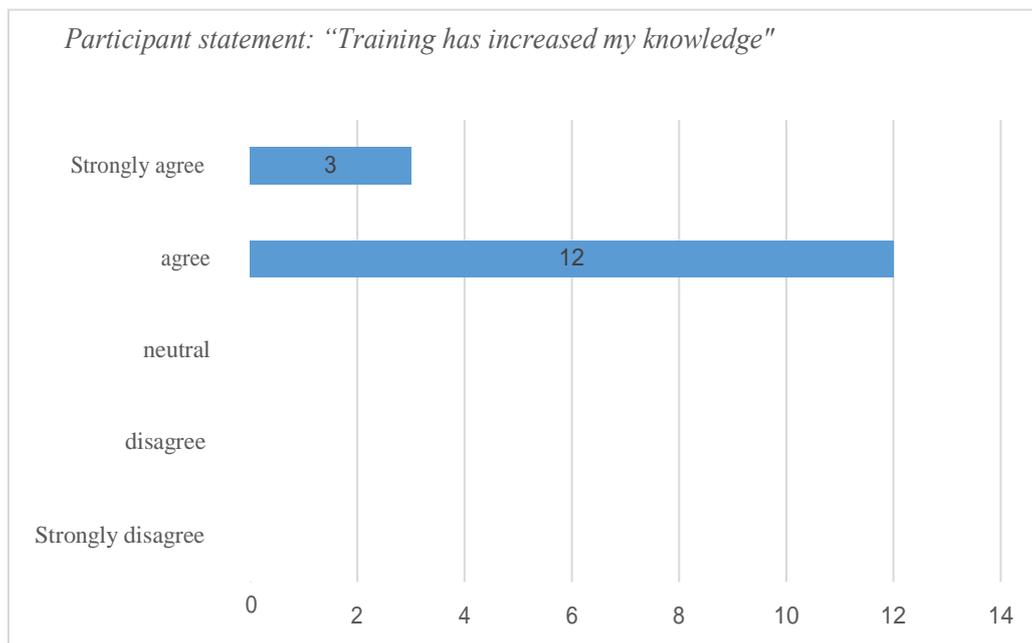


Figure 1. Impacts of nursery training activities on improving participant skills

The evaluation of training on honeybee cultivation shows that 65% of total participants state strongly agree that the training could improve their skills on managing and cultivating natural honeybees. The skills are obtained through the delivered materials of bee boxes construction, *Trigona* bee hives transfer, honeycomb separation, *Trigona* honeybee harvest, *Apis cerana* honeybee harvest, rope access skills, and safety of *sialang* trees climb.

The training on nursery in Tanjung Sari village increase the participants' skills and knowledge. These agree statements are 52% of total participants and those who state strongly agree are 45% of total participants. The skills which are trained in the training on nursery are: 1) providing seedling media; 2) Propagation technique with shoot cuttings; 3) Plant nursery techniques starting from seeds; and 4) Seedling maintenance techniques in seedling beds, sowing beds, and ready planting beds.

### 3.3. Level 3: Behavior Change

Kirckpatrick's analysis at level 3 explains the impact of training on changes in behavior of training participants. The evaluation analyse data which are gained by the questions below:

- a. Have participants practice the results of the training?
- b. 2. Have participants tried to disseminate information and knowledge which are obtained in the training?

There are three levels in disseminating information on the results of training, namely:

- a. Describe the experience of training;
- b. Teach the knowledge and skills obtained from the training to others; and
- c. Discuss further activities to develop the results of the training in group or plenary meetings.

#### 3.3.1. Behavior changed by the training on fish and corn processing

The practice of making fish meatballs is skills which is widely applied by 93% of the total participants. Then, the rank is followed by the practice of making fish nuggets and "batagor"(fried tofu-meatballs). These results show that participants' interest on fish processing is high. It is supported by the availability of sufficient fish as raw materials around the village and the processing fish into cracker is practiced by the participants. However, the corn processing is not practiced yet by the participants due to the burning prohibition in land preparation, and corn production around the peatland areas in Teluk Meranti continues to decrease. Without burning the land, farmers need more cost to prepare land but crop production will be less optimal. Land preparation with burning is still needed by farmer to cultivate the peatlands. They argue that burning the land before planting could increase plants growth.

The dissemination information evaluation result shows that all participants share their experiences of training to others. It is 67% of total participants share their experience to their family and other people. Even, 60% of the total participants discusse the plans for developing skills of fish processing products in more formal community group meetings.

#### 3.3.2. Behavior change on honeybee cultivation

The impact evaluation of training on honeybee cultivation is carried out around three until five months after the training implementation. In the evaluation, participants are questioned whether or not they have practiced honeybee cultivation, both *Apis cerana* and *Trigona sp.*, and whether or not they have practiced harvesting natural honeybee in a sustainable manner.

The impact of training on the practice of wild honeybee harvesting activities do not appear. The fourteen respondents who have practiced harvesting of wild honeybee have restarted their their activities since a long time before they participate in the training. There are not any participants who have performed harvesting of natural honeybee after attending the training. Harvesting wild honey bee is a special profession, because not everyone has the expertise to harvest wild honeybee. Therefore, in the case of wild honeybee harvesting, the training activities could not change the participants to become a harvester. However, the impact of training can be found in the form of increasing participants' understanding of the practice on harvesting wild honeybee in a sustainable manner. They understand how the techniques of cutting bee hives, so that the productivity of the bees in the next harvest would not decrease. The participants also explain that the training increases safety aspects in harvesting of wild honeybee. After the completion of the training, some groups of wild honeybee harvester demand to be facilitated to get climbing safety devices.

The 65% of the total training participants practice honeybee cultivation after the training. Even, 4% of the total participants have practiced honeybee cultivation before they participate in the training. However, 31% of total participants do not practice honeybee cultivation yet, due to some constraints of cultivation facilities and they still rely on harvesting of wild honeybees.

Some of activities of honeybee cultivation that has been practiced by participants after attending the training are making honeybee stools. Totaling of 30% of the participants do not practice honeybee cultivation activities, it happens due to their professions as harvesters of wild honeybee which are focused on improving skills of *sialang* tree climbers.

All of the training participants share their experiences of participating in training to their families, neighbors and community groups. Totaling of 91% of the participants transfer their knowledge of honeybee cultivation to other community members (non-training participants). Furthermore, 41% of total participants discuss the potentials of honeybee cultivation development skills in formal group activities.

The transfer of knowledge and skills of honeybee cultivation is indicated by the number of other people (non-training participants) who practice honeybee cultivation after the training is conducted. Totaling of 74% of the participants state that knowledge and skills have been transferred to their neighbor and it is followed with honeybee cultivation activities.

### 3.3.3. *Changes in behavior and results of nursery training*

Participants of nursery training are questioned by this question: "Have you practiced the knowledge you have obtain in the nursery training in your own nursery activities?" Totalling of 65% of the participants state that they perform those activities, even 16% of the total participants have practiced nursery activities long time before participating in this training. Totalling 19% of the participants confess that they do not practice nursery activities. The participants who do not practice nursery activities are female participants, due to their focus on domestic activities in their household.

Moreover, the questionnaires of training impact assessment also question whether or not participants have had their own nursery facilities, such as: sowing beds, nursery tools, and simple hood houses for seeds. As responses to the question, there are 48% of total participants said that they have nursery equipments since their involvement in the training, even 13% of the total participants have had nursery equipments at time before participating in the training. Nevertheless, 39% of the total participants do not have nursery equipments.

The changes in behavior of training participants are indicated by the dissemination activities which are carried out by the participants to their neighbor. Totalling of 84% of the total participants share their experience obtained in the nursery training to their neighbor. Moreover, 39% of the total participants discuss further about the materials of training in formal meetings.

### 3.4. *Level 4: Training Results*

The last step in the Kirkpatrick Evaluation Model is analyzing the results of training. The results of training is defined based on the training activities as it follows:

- a. Training on fish and corn processing; the results of training indicate the impacts of training on food product processing activities and business activities that are implemented by the participants and community.
- b. Training on honeybee cultivation; the training results are indicated by the total number of honeybee harvesting which is obtained by people who has practiced honeybee cultivation and the impacts of knowledge of honeybee cultivation to people care to plant and preserve trees of nectar, pollen and resin/sap sources.
- c. Training on nursery; the training results are performed by nursery practices which are conducted by community, as well as the availability of more sustainable peatland management practices.

### 3.4.1. Results of training on fish and corn processing

Totalling of 54% of the participants agree that training on fish and corn processing affect people to practice fish processing. Nevertheless, 33% of the participants do not agree that training affects the development of productive economic activities performed by community. Some respondents interviewed in Pulau Muda village state that they are unable to develop skills learned by the training due to limited support for producing these food, such as availability of some basic ingredients. These ingredients could be obtained in the city center, but the location of Pulau Muda village is very far and isolated from the city's trade center. Therefore, to buy the basic ingredients for meatballs or batagor must be obtained from the capital of Teluk Meranti district, even from Pekanbaru.

The participants response to the question of “Did training activities affect to community business activities?”, the participants react that, in general, community have open their mind to the new knowledge and information of business activities. It is not only to the business learned in the training but also other businesses types. Thus, the business motivation session provided by the instructors and facilitators in the training activities have risen their interest and enthusiasm to develop business alternatives.

### 3.4.2. Results of training on honeybee cultivation

Training on honeybee cultivation activities has affected the participants' skills in honeybee cultivation activities. Totalling of 26% of the participants succeed to harvest honey in their own cultivation, while 74% of total the participants do otherwise. The volume of honey harvested from the activities itself range from 50 ml to 300 ml.

The results of the training activities are not only measured by honey production which are performed by participants, it is also measured by the increasing participants' awareness in growing plants of nectar, pollen and resin sources (bee feed). Honeybee cultivation training has encouraged participants to grow trees and crops of nectar, pollen and resin/sap sources. Totalling of 61% of the total participants have conducted planting activities of these plants, while 39% of total participants do otherwise.

### 3.4.3. Results of training on nursery

Nursery training has encouraged participants and other communities to practice nursery activities as it is claimed by 45% of the total participants, while totaling of 55% of the participants do not agree with this statement. However, 61% of the total participants agree that nursery training increase people awareness on sustainable management of peatlands. Totalling of 39% of the total participants disagree. These results could be understood, due to the training material that provides new knowledge of peatlands management. As it has been understood that peatland areas are fragile ecosystem[9]and easy to damage by drained and fire[10–12].

## 3.5. Improved Training Program

Based on the evaluation, the implementation of training obtain positive responses and it is claimed by participants that the materials of the training improve their knowledge and skills. However, training activities do not changed their behavior and do not increase the participants' income on a large scale. Only half of the participants claim that trainings change their behavior and the training activities provide results. Therefore, to obtain a broader training impact, the following points need to be conducted:

- a. Involving more participants to increase knowledge more broadly.
- b. Providing equipments to facilitate participants to practice after participating in the training.
- c. Linking training activities with village, district and provincial government program to be a priority in community development program.
- d. Proposing the utilization of village funds (*Dana Desa*) to support similar training activities, in order to get positive impacts of training in wider community.

#### 4. Conclusion and recommendation

Impacts of trainings which are conducted under Haze Free Sustainable Livelihood Project in Riau could be concluded:

- a. At reaction level, trainings are responded positive by participants. Participants offer score of 4.43 point (from the maximum score 5) for the purpose and content of trainings, training materials, facilitators and trainers, training logistics, and general assessment of trainings.
- b. At learning level, trainings participants claim that the trainings could increase their knowledge, insights, and skills. The knowledge changes, it is indicated by the filled in self-assessment before and after the trainings are conducted. The increasing score ranks from 1.18 points until 3.09 points (maximum score is 4 points). The average increasing score of all trainees is 1.90.
- c. At behaviour change level, totalling of 64% of the participants state that trainings have changed their behaviour, especially on the aspects of fish processing practices, sustainable and safe wild honeybee harvesting, honeybee cultivation practices, increase awareness of participants to grow nectar, pollen and resin crops sources, and nursery training practices.
- d. At the results level, totalling of 52.5% of the participants claim that trainings bring results such as: increase awareness and could encourage people to practice fish processing, honeybee cultivation, practices on harvesting honeybee from their own cultivation, encourage people to practice honeybee cultivation, encourage people to manage peatlands in more sustainable manner, and encourage people to practice nursery activities.

Thus, this training evaluation shows that livelihood training could increase community awareness on the importance of trees and peatland conservation. The training could increase knowledge, skill, and could change the behaviour of participants to obtain alternative sources of livelihood. Alternative livelihood that is offered should be able to provide an income quickly and simultaneously linked with planting and conserving of peatlands activities. Managing wild honeybee in sustainable way and honeybee cultivation are useful as alternatives for achieving this goal.

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