The effect of extension on community knowledge in peatland management: Case study in Rasau Jaya Village, Kubu Raya, West Kalimantan

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Abstract. Since 1974, farmers in the Rasau Jaya Dua Village have interacted with peatlands. Agricultural yields on peatlands have not reached maximal yields. Farmers’ knowledge on plant pest and disease controls, post-harvest processing and marketing and utilization of peat water for fish farming is still limited, so that extension and assistance are needed. The objective of this study was to analyze the effect of extension on community knowledge in peatland management. The study was conducted in the Rasau Jaya Village, Kubu Raya District, West Kalimantan Province from October to November 2018. This research used a survey method by randomly sampling 32 farmers from five farmers’ groups. This research implemented pre-test and post-test group design. The result showed that extension with the lecture and discussion method had a significant effect on increasing farmers' knowledge in peatland management. To increase farmers' knowledge in peatland management, it is necessary for intervention through extension by encouraging and involving institutions related to peatland management, such as community assistance organizations, agencies such as office of the agriculture, cooperative, small and medium enterprises, and trade and industry, and other institutions.

1. Introduction
Many farmers in developing countries have not fully developed their skills and cannot process information for use in the different agricultural value chains they are involved in. Agricultural extension plays a key role in supporting farmers to access timely and relevant information which can help them improve their production and productivity [1,2], increasing food security, and improving rural livelihoods [1-3].

Agricultural extension is defined by the World Bank as a process that helps farmers become aware of improved technologies and adopt them in order to improve their efficiency, income and welfare [4]. Agricultural extension features play strongly role in international development as a means to catalyze the reform of the agriculture sector [3,5] in which up to 75% of the rural poverty relies on agriculture for their livelihoods in developing countries [6].

Peatland farmers in Kubu Raya Districts of West Kalimantan rely on future agricultural development on this environmentally fragile peatland. Kubu Raya has 408,369 ha (58%) of the total respective land area of 698,520 ha [7]. Most smallholder farmers live in rural communities and rely on public extension services for information on modern production practices and technologies. The provision of agricultural extension is made to enhance farmers’ knowledge and skills toward improved
yield. Since 1974, farmers in the Rasau Jaya Dua Village have interacted with peatlands. Farmers have already understood crop cultivation on peatlands. However, based on field observations, agricultural yields on peatlands have not maximal. This is presumably because farmers’ knowledge on plant pest and disease control, post-harvest processing and marketing and utilization of peat water for fish farming is still limited. So that extension and assistance are needed. The objective of this study was to analyze the effect of extension on community knowledge in peatland management.

2. Materials and methods

2.1. Time and research location
The research was conducted in Rasau Jaya Dua Village, Kubu Raya District of West Kalimantan, from August to October 2018. The research location is presented in figure 1.

![Figure 1](image.png)

Figure 1. The research location in Rasau Jaya Dua Village Kubu Raya District.

2.2. Data collection and analysis
This study used an experimental design with a pre-test/post-test design and provided interventions in the form of extension with the lecture method (a face-to-face interview) and discussions on peatland management. Extension with the lecture and discussion method has succeeded in increasing farmers' knowledge related to cardamom cultivation in Ciamis Regency [8] and related to Dengue Hemorrhagic Fever in Bayah District, Banten Province [9].

This extension activity was facilitated by Agroforestry Technology Research and Development Institute, Ciamis through inviting extension agents from several agencies, namely the Agroforestry Technology Research and Development Institute Ciamis, the Office of Cooperatives and Small and Medium Enterprises of Kubu Raya Regency, and the Office of Fisheries of Kubu Raya Regency for specialists in plant pests and disease control, post-harvest processing and marketing, and fish farming in peat water.

The knowledge level survey was conducted by interviewing 32 randomly selected household heads. The survey used a set of questionnaires containing questions about the characteristics of respondents and statements of knowledge. The respondents were also asked as many as 45 questions
in relation to plant pest and disease control, post-harvest processing, and fish farming in peat water. There were two options (know and don’t know) scoring 1 and 0 in each question. The total score ranged between 0-45. The decision was set in 3 criteria being low knowledge (total scores of 0-15), moderate knowledge (total scores of 16-30), and good knowledge (total scores of >31).

Pre- and post-test were carried out in August 2018 and October 2018. The propose of pre-test was to measure the level of farmers’ knowledge before the intervention through extension, and post-test was to measure the level of farmers’ knowledge after the intervention through extension. Several research results related to the extension and knowledge measurement using the pre- and post-tests design have a time lag differences among pre-test, post-test, and interventions, such as [10] using the time lag for only 30 minutes, [11] for four months, and [8] and [12] for five months. This shows there was no minimum limit of time needed in research in relation to the extension and knowledge measurement using a pre- and post-tests design. This is a difference from research related to extension interventions and community behavior measurement. To find out changes in farmers’ knowledge before and after the extensions by looking at the gap between the pre-test and post-test scores on peatland management, then with Paired sample T-Test at the level of confidence 95%. The results of data analysis were displayed in narrative and tabular forms. The scale method used in measuring knowledge was the interval.

3. Results and discussion

3.1. Respondent characteristics

The characteristics of the extension participants, which will be referred to as respondents, are presented in table 1.

| No | Characteristics                  | Number |
|----|----------------------------------|--------|
| 1. | Age (years)                      |        |
|    | Minimum                          | 22     |
|    | Maximum                          | 56     |
|    | Average                          | 42.79  |
| 2. | Long live in the village (years) |        |
|    | Minimum                          | 8      |
|    | Maximum                          | 46     |
|    | Average                          | 34.88  |
| 3. | Peatland ownership (ha)          |        |
|    | Minimum                          | 0.25   |
|    | Maximum                          | 10     |
|    | Average                          | 1.54   |
| 4. | Education (years)                |        |
|    | Minimum                          | 6      |
|    | Maximum                          | 17     |
|    | Average                          | 8.76   |
| 5. | Number of family members (person)|        |
|    | Minimum                          | 0      |
|    | Maximum                          | 5      |
|    | Average                          | 2.76   |
| 6. | Farming experience (years)       |        |
|    | Minimum                          | 2      |
|    | Maximum                          | 42     |
|    | Average                          | 19.45  |
The extension was attended by 66.67 and 33.33% men and women, respectively. The involvement of women in peatland management and their existence as members in farmer groups is caused by several things/conditions, such as husbands who work off farm or outside the village such as in construction workers, timber industry, and even overseas workers. So that to increase family income, the wife manages the peatland as owner and or labor.

Age is one of the most important factors in supporting one's performance, especially related to working productivity. Peatland management generally requires strength physically and strongly influenced by age. Under certain conditions including age, a person's physical strength will decrease. The average age of the respondents was 42.79 years old, in the range of 22 to 56 years. This shows that the respondent's age included in the productive age category. There were several respondents under 30 years. They had no other alternative jobs and believe that under the serious management, peatland farming is very promising.

Average age of respondents from living in the Rasau Jaya II Village was about 34.88 years (in the range 8 to 45 years) and they were generally the second generation of the transmigration program beginning in 1974. Each participant in the transmigration program initially received a share from the government to manage two ha land, most of peatland. During its development, land ownership areas had changed (either increasing or decreasing) according to the work ethic of each person. This can be seen from respondents' land ownership ranging from 0.25 to 10 ha with an average of 1.54 ha.

The level of education is related to the means/media in forming opinions and courage in making the right decisions, as well as the ability to adopt and implement the information and technology. The average level of respondents’ education was Junior High School graduate and was in the medium category. This can be understood because as transmigration people coming from Java had a strong desire/motivation to get a better life through education and access to facilities and infrastructures.

The greater the number of family members cased the greater the burden as the head of the family. The average number of respondent dependents was 2.76 people in the range of 0-5 persons. Experience in farming has a real and important effect and can direct attention to the interests, needs and problems faced in managing peatland farming. The average experience in farming peatland was 19.45 years in the range of 2 to 42 years.

3.2. Learning material
Not all farmers have access to information [13]. Agricultural extension is a system that focuses on empowering and equipping the farmers with the abilities to help them making sound decisions, solving their problems themselves and managing their farming business [14]. Extension activities convey the latest technologies to the clients and educate them on alternative practices, thus reducing the information irregularity often related to the latest technologies [15].

As many as 25.7% of the respondents in the research location have never attended any training/extension related to peatland management. This was caused by limited opportunities and not being able to take part in the existing training due to scheduling conflicts with other jobs.

Extension service delivery in most developing countries associated with challenges such as improper design of extension programs and messages. Even where agricultural extension services are available, however many smallholders may not make use of them because the services have not been designed to meet their specific needs. As a result, many smallholders do not make the effort to seek extension services [16,17]. According to Benyamin [18], the low use of technologies and extension services is not the result of farmers’ unwillingness to use them, but the result of poor extension service delivery methods, inadequate personnel and lack of logistics and materials.

Christoplos [19] conceptualized an efficient agricultural extension service as comprising all the different activities that provide the information and advisory services that are required, and demanded, by farmers and other actors in the agri-food systems and rural development. Agricultural extension strengthens a farmers’ capacity to innovate by providing access to knowledge and information. Farmers also advocate that the development of agriculture depends largely on access to new technologies and information [20].
Similarly, the infrequent use of advanced technologies and extension services is not only the farmers’ unwillingness or objected to those services, but due to erratic and poor service delivery, insufficient number of extension officers and workers, and a lack of equipment. Poor transportation facilities and infrastructure (e.g. road system and office buildings), and poverty are understood to further aggravate the dissatisfaction of farmers with agricultural extension services [21]. Even though extension services are offered to farmers, regardless of the size of their farmland, they thought them to be inadequate because of not meeting their specific needs. The inadequacy of the provided services accounted for the reluctance of farmers to seek extension services [14,15,19].

While the public extension system can improve productivity, it generally experiences numerous challenges which include inadequate delivery of relevant information, poor farmer reach, low staff morale and financial stress [1]. The technology and management gaps embedded in the public agricultural extension system call for a broader lens beyond the provision of technical information [20,21].

The learning material presented consisted of three materials, namely management of pest and plant diseases; post-harvest processing and marketing, and fish farming in peat water. The selection of the three materials was based on the results of interviews with respondents when primary data were collected prior to this research.

The learning material of plant pest and disease control consists of the causes of the explosion of pests and diseases in agriculture and efforts to overcome them. Some of the causes of plant pest and disease outbreaks are monocultures and continuous planting, too tight spacing, excessive use of pesticides, and many natural enemies who die. Some efforts to solve them through knowing the causes of damage to plants, recognizing the types of pests and their ecology, and recognizing the types of diseases and their ecology.

In this training, the practice of making Bordeaux slurry was also carried out with materials consisting of CuSO\(_4\), quicklime and water. Making Bordeaux slurry is an inexpensive, but effective effort to control pests and plant diseases. This material succeeded in attracting the interest and attention of respondents because of the ease of obtaining the material and the method of making it.

The learning material of post-harvest processing and marketing consists of the benefits of post-harvest processing and marketing facilitation from The Office of Cooperatives and Small and Medium Enterprises of Kubu Raya Regency. So far, respondents sell agricultural products from peatland such as corn, pineapple and so on in raw form. In order to increase the added values of these products and their income, more efforts are needed to process these agricultural products into derivative products.

Some respondents had started processing products from peatland such as pineapple into candy/lunkhead/syrup, corn is processed into sticks, crackers, candy, and brownies. Some of the accesses to marketing facilitated by The Office of Cooperatives and Small and Medium Enterprises of Kubu Raya Regency are the outlets at Supadio Airport, Dekrasda (Regional Craft Council), and Transmart which displays SME products from farmers and their groups.

Some materials presented in fish farming of peat water include: fish cultivation systems with high acidity (pH <6) and cultivated fish types. Catfish is a type of fish relatively resistant to peat water and easy to market. Its cultivation must be done by making a pond covered with tarpaulin by applying a kind of lime or papaya leaves to the pond to reduce the acidity level of the peat water.

This extension is carried out by providing examples/practices and/or providing input on experiences/practices that had been carried out by farmers to find out their strengths and weaknesses. The extension with plant pests and diseases materials was carried out by practicing to make Bordeaux porridge by mixing consisting ingredients of 100 g CuSO\(_4\), 100 g of quicklime/wall lime, and 10 L water. Bordeaux porridge is a cheap and effective way to control plant pests and diseases. This practice is very attractive to farmers because of the ease of obtaining the ingredients and the way in making.

The extension with post-harvest processing and marketing and fish farming in peat water materials was carried out by discussions. It was aimed to provide advice/input on farmers who had started processing agricultural products and or practiced fish farming in peat water.
In particular, this research was part of a pilot project for implementing agroforestry on peatlands. Agroforestry practices were carried out by making four ha demonstration plot. The plant types were a combination of originally grown on peatland, such as jelutung (*Dyera polyphylla*), gerunggang (*Cratoxylum glaucum* Korth), and pulai (*Alstonia pneumatophora*) with agricultural crops such as corn, chili, peanut and etc.

### 3.3. Level of community knowledge

The frequency distribution of respondents by knowledge before and after extension is presented at table 2.

#### Table 2. The frequency distribution of respondents by knowledge before and after extension.

| No | Category of knowledge | Extension Before | Extension After |
|----|-----------------------|------------------|-----------------|
|    |                       | Number | Percentage | Number | Percentage |
| 1  | Good                  | 3      | 9.38       | 29     | 90.63      |
| 2  | Moderate              | 23     | 71.88      | 2      | 6.25       |
| 3  | Low                   | 6      | 18.75      | 1      | 3.13       |
|    | Total                 | 32     | 100        | 32     | 100        |

Table 2 showed the level of respondent's knowledge of the combination of materials covering pest and plant disease control, post-harvest processing and fish cultivation in peat water, that after the extension it increased significantly from 9.38 to 90.63%. Respondents received a lot of information and the latest technology in controlling pests and plant diseases. So far, the problem of plant pests and diseases had been overcome by respondents using simple methods. They tended to take practical steps such as using chemicals that were widely available in the market. Whereas the control of pests and plant diseases could also be done by means of technical, biological, and physical mechanical methods.

Information related to small and micro business licensing, post-harvest processing and marketing was something new to the participants, although 1-2 respondents already knew that there was an activity in the home industry, namely the cassava cracker business requiring interaction with the processing unit of the business license. The limited budget for the Office of Cooperatives, Micro Small Enterprise of Kubu Raya Regency to conduct socialization and assistance to the community (farmer groups) caused the community to be proactive in interacting with these agencies.

Respondent’s knowledge of fish farming peat water before the extension was relatively better. This knowledge coming from information from friends/neighbors/relatives or seeing first hand people who had started to cultivate peat water fish, some respondents even practiced it themselves, but it did not continue. However, this knowledge was not put into practice by respondents due to several reasons, such as the perception that fish farming in peat water requiring a large amount of capital and time constraints to manage it. Farmers’ knowledge becomes more comprehensive after extension.

To find out the extension materials mostly needed by respondents, it used a comparison matrix in which each respondent compared the three extension materials being plant pest and disease control, post-harvest processing and marketing, and fish farming on peatland. The learning materials mostly needed by the extension participants were related to the management of plant pests and diseases, licensing, post-harvest and marketing, and peat water fish cultivation needed by 54.48, 30.24, and 15.09% participants, respectively. This showed that plant pests and diseases were among the problems faced by farmers in managing farming on peatlands. So that this can be an input from related stakeholders, especially extension workers, to always update information, science and technology related to plant pest and disease.
3.4. The results of the paired sample t-test and changes in people's knowledge

The scores of pre-test and post-test were examined using paired sample t-test at the 95% confident level are presented in Table 3.

Table 3. The results of the paired sample t-test.

| No. | Learning materials                          | Standard deviation | Standard error mean | t  | t table | df | N   | Sig. (2-tailed) |
|-----|--------------------------------------------|--------------------|---------------------|----|---------|----|-----|----------------|
| 1.  | Plant pest and disease control             | 3.749              | 0.663               | 8.157 | 1.696   | 31 | 32  | 0.01           |
| 2.  | Post-harvest processing and marketing      | 3.893              | 0.668               | 12.260 | 1.696   | 31 | 32  | 0.00           |
| 3.  | Fish farming in peat water                | 4.642              | 0.821               | 3.047 | 1.696   | 31 | 32  | 0.00           |
| 4.  | Compiled data of 1, 2, and 3              | 8.827              | 1.560               | 10.474 | 1.696   | 31 | 32  | 0.00           |

Table 3 shows that all extension materials have t-values that is greater than the t-table values (1.696) with a significance value of p = 0.00 (<0.05), so there is a very real difference between the mean pre-test and post-test scores test at the 0.05 significance level. This means there is a very real increase in respondents' knowledge about sustainable peatland management after participating in extension activities using a face-to-face interview and a discussion method as presented in Table 4.

Table 4. Changes in knowledge of respondent before and after extension.

| No. | Learning materials                          | Knowledge Extension before | Knowledge Extension after |
|-----|--------------------------------------------|-----------------------------|---------------------------|
| 1.  | Pest and plant disease control             | 47.08                       | 83.13                     |
| 2.  | Post-harvest processing and marketing      | 35.42                       | 91.67                     |
| 3.  | Fish farming in peat water                | 66.46                       | 83.13                     |
| 4.  | Compiled data of 1, 2, and 3              | 49.65                       | 85.97                     |

This table showed that the effect of extension towards community knowledge level in peatland management was evidently effective. This was proven by the score of post-tests were higher compared to the pre-test scores, from 47 to 83.13%, 35.8 to 91.67%, and 66.47 to 83.13% on plant pest and disease, facilitation of product marketing, and peatland fish farming, a total of learning from 49.65 to 85.97%.

Until now, farmers have not applied technology in peatland management. The extension that has been routinely carried out by extension workers every month faces several problems, coming from the extension workers and community sides, as well as budget constraints, the problems were limitations to increasing extension workers’ capacity to adapt and follow developments in science and technology in peatland management, extension communication media being less attractive monotonous, even though important to attract farmers to participate in extension services, and budget constraints of related institutions such as Agriculture Office, Cooperatives, Small and Medium Enterprises Office and Trade and Industry Office to conduct socialization and assistance to the community.

Based on the above problems, coordination between related institutions is required. Extension workers can be a bridge/liaison to communicate the field (farmers) problems to related institutions.
4. Conclusions
The extension with the lecture and discussion methods had a significant effect on increasing farmers’ knowledge in peatland management. To increase farmers’ knowledge in peat management, it is necessary for intervention through extension services using lectures and discussions by encouraging and involving related institutions related to peatland management. Assistance in extension program depends not only extension workers, but also community assistance organizations, agencies related to peat management such as the office of agriculture, cooperative, small and medium enterprises offices, trade and industry office and other institutions.

Appendixes

Appendix 1. The level of knowledge of farmers on plant pest and disease control.

| No. | Description                                                                                                                                  | Extension before % know | Extension after % know |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------------|
| 1.  | Determine the causes of pest and disease outbreaks (monoculture and continuous planting, too tight spacing, excessive use of pesticides, and many natural enemies dying) | 48.48                   | 65.63                  |
| 2.  | Know the advantages of planting various types of plants in one land (different plants, not abundant in one species, not the same host of plant pest and disease, forming a physical barrier, forming a micro climate, and forming a habitat for natural enemies of plant pest and disease) | 60.61                   | 75.00                  |
| 3.  | Know the types of pests that attack plants                                                                                                | 90.91                   | 96.88                  |
| 4.  | Know the types of deseases that attack plants                                                                                             | 87.88                   | 100                    |
| 5.  | Know how to control pests that attack plants (use of resistant/tolerant varieties, technical culture control, biological control, physical mechanical control, and chemical control) | 75.76                   | 87.50                  |
| 6.  | Know how to control deseases that attack plants                                                                                           | 87.88                   | 90.63                  |
| 7.  | Recognizing that plant pest and disease control is not the same as using synthetic chemical pesticides                                      | 39.39                   | 59.38                  |
| 8.  | Know that excessive use of chemical pesticides can lead to resistance, resurgence and explosion of secondary pests, environmental pollution and health problems | 84.85                   | 96.88                  |
| 9.  | Know how to make vegetable pesticides using mindi leaves and neem leaves (1 kg of mindi leaves or 1 kg of neem leaves, 10 L of water, 10 g of detergent) | 6.06                    | 78.13                  |
| 10. | Know how to make vegetable pesticides using papaya leaves (1 kg of fresh, crushed papaya leaves, soaked in 10 L of water plus 10 g of detergent and let stand for 24 hours) | 21.21                   | 93.75                  |
| 11. | Know how to make vegetable pesticides using soursop leaves (50-100 crushed soursop leaves, soak in 5 L of water and 10 g of detergent, let stand overnight then filter) | 18.18                   | 93.75                  |
| 12. | Know how to make vegetable pesticides using tobacco (Rajang 250 g of tobacco leaves and soak in 8 L of water overnight)                     | 36.36                   | 90.63                  |
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![Image](1st International Conference on Sustainable Tropical Land Management IOP Conf. Series: Earth and Environmental Science 648 (2021) 012170 doi:10.1088/1755-1315/648/1/012170)

| No. | Description                                                                 | Extension before | Extension after |
|-----|-----------------------------------------------------------------------------|------------------|-----------------|
| 13. | Know how to make vegetable pesticides using garlic (crush 100 of garlic mixed with 0.5 L of water and 10 g of detergent, let stand for 24 hours) | 15.15            | 71.88           |
| 14. | Know how to prevent disease using resistant/tolerant varieties (pepper, stem rot tolerant: natar, petaling) | 21.21            | 75              |
| 15. | Know how to make chemical fungicides using Bordeaux porridge                 | 36.36            | 87.5            |

**Appendix 2.** The level of farmers' knowledge on post-harvest processing and marketing.

| No. | Description                                                                 | Extension before | Extension after |
|-----|-----------------------------------------------------------------------------|------------------|-----------------|
| 1.  | Empowerment needs to be done for Small and Medium Enterprises (SMEs) to improve and develop community businesses | 9.09             | 90.63           |
| 2.  | The SMEs permit aims to obtain certainty and protection in doing business   | 12.12            | 90.63           |
| 3.  | Know the procedures for registering to get an The SMEs permit (application, examination, issuance and revocation) | 9.09             | 90.63           |
| 4.  | Know the requirements for the SMEs permit application (KTP, KK, passport photo, NPWP) | 12.12            | 90.63           |
| 5.  | Know the rights of The SMEs permit (getting information / socialization / coaching / easy access to financial institutions) | 9.09             | 84.38           |
| 6.  | Know the obligations of The SMEs permit (complying with regulations regarding The SMEs according to The SMEs permit) | 9.09             | 87.50           |
| 7.  | Know the prohibitions related to The SMEs (trading illegal goods / services) | 9.09             | 81.25           |
| 8.  | To get added value, agricultural products must be processed                  | 69.70            | 90.63           |
| 9.  | Know how to process agricultural products                                    | 54.55            | 90.63           |
| 10. | So far, selling agricultural products through middlemen                       | 84.85            | 100             |
| 11. | Obtain market information (prices) from middlemen                            | 90.91            | 96.88           |
| 12. | Get market information (prices) from friends in the market                   | 87.88            | 100             |
| 13. | Get market information (prices) from neighbors                                | 87.88            | 100             |
| 14. | Get market information (prices) from middlemen                               | 87.88            | 100             |
| 15. | Know information to get guidance from related agencies for marketing and packaging of agricultural products | 54.55            | 96.88           |
Appendix 3. The level of knowledge of farmers on fish farming in peat water.

| No. | Description                                                                 | Extension before % Know | Extension after % Know |
|-----|-------------------------------------------------------------------------------|--------------------------|-------------------------|
| 1.  | Peat water can be used for fish farming                                        | 84.85                    | 100                     |
| 2.  | Types of fish that can be cultivated in peat water                            | 81.82                    | 100                     |
| 3.  | Cultivation of fish using tarpaulin ponds                                      | 87.88                    | 100                     |
| 4.  | Making a tarp pool you have to dig the ground first                           | 84.85                    | 90.63                   |
| 5.  | Water management / Liming / Salting (for 5-7 days)                            | 72.73                    | 90.63                   |
| 6.  | Selection of healthy fish (catfish) seeds                                      | 42.42                    | 87.50                   |
| 7.  | Sowing seeds done in the morning for temperature adaptation?                  | 54.55                    | 96.88                   |
| 8.  | Feed                                                                         |                          |                         |
|     | a. Performed 3 times a day (morning, afternoon, evening)                      | 69.70                    | 96.88                   |
|     | b. Type of feed? Pellets                                                     | 66.67                    | 96.88                   |
| 10. | Water treatment                                                               |                          |                         |
|     | a. Sewage is done every day                                                   | 60.61                    | 96.88                   |
|     | b. Water changes are carried out every 6-7 days as much as 30% of the volume of water | 60.61 | 96.88 |
| 11. | How to prevent disease                                                        |                          |                         |
|     | a. Maintain water quality                                                     | 42.42                    | 84.38                   |
|     | b. Feeding according to fish needs                                            | 48.48                    | 87.50                   |
| 12. | Harvesting                                                                    |                          |                         |
|     | a. Performed in the afternoon / morning and fasted                           | 69.70                    | 96.88                   |
|     | b. Harvest sort fish by selecting fish which are suitable for harvesting according to market demand 7-10 fish per kg | 78.79 | 100 |

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