Analysis The Learning Needs of The Paropo Village Community In Tilapia Fish Cultivation

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Abstract: This study aims to identify the community's learning needs in *Paropo I Village, Silahisabungan District*, related to tilapia fish farming. The research employs a descriptive quantitative method, which describes the condition of subjects or objects based on observable facts without seeking correlations, testing hypotheses, or making predictions. The research sample consisted of 28 fish cage owners in *Paropo I Village.* Data collection was conducted through observation and the distribution of questionnaires developed to address the research problem. Data analysis techniques included content validation by three experts, validity testing using Aiken's V, and reliability testing using the Intraclass Correlation Coefficient (ICC). The validity test resulted in a score of 0.89, which is categorized as valid. The reliability test yielded a value of 0.088, which falls into the "good" or reliable category, indicating that the questionnaire is suitable for use. The findings suggest that the community's learning needs are primarily technical. The highest identified need is the skill to utilize technology to simplify the tilapia harvesting process, cited by 78.6% of respondents. This suggests that technical training especially related to harvesting technology is the primary learning need of the *Paropo I Village* community in tilapia farming.
Keywords: aquaculture, farming, learning community, needs analysis

INTRODUCTION

Poverty remains one of the most fundamental and complex problems in global and national development. In many developing countries, including Indonesia, poverty not only reflects economic inability but also serves as an indicator of social inequality, low quality of life, and limited access to fundamental rights. According to the Global Multidimensional Poverty Index released by UNDP (United Nations Development Programme, 2023), poverty must be understood as a multidimensional phenomenon, encompassing aspects of education, health, living standards, and social participation, not just a lack of income or consumption.

Understanding poverty as a multidimensional phenomenon is vital because approaches that focus solely on income often overlook its structural roots and the challenges to long-term prosperity. For example, a person who statistically has an income above the poverty line may still experience an inability to access proper education or health services, as well as experience social and economic marginalization.

In this context, the capabilities approach developed by Amartya Sen has been an essential and influential conceptual framework. In his seminal work Development as Freedom (1999), Sen emphasized that poverty should not be defined simply as the absence of income, but

as the inability of individuals to live a life they value. Capability refers to a person's absolute freedom to choose the kind of life they can lead, including access to education, health, employment, and participation in social and political life (Sen, 1999).

Thus, poverty alleviation efforts should not only be directed at transferring aid or increasing income, but also at strengthening the community's capabilities so that they can make decisions and take actions independently to improve their quality of life. This approach is not only theoretically relevant but also in line with the principles of sustainable and participatory development.

In Indonesia, various poverty alleviation policies have been implemented at both the national and regional levels. Programs such as the Family Hope Program (PKH), Non-Cash Food Assistance (BPNT), and Direct Cash Transfer (BLT) are forms of social protection that help people experiencing poverty meet their basic needs. On the other hand, policies such as the Village Fund, launched in 2015, provide an excellent opportunity for villages to develop and empower themselves by leveraging local potential (Ministry of Villages, PDTT, 2022). However, various evaluations show that the effectiveness of these programs is often constrained by the limited capacity of village institutions, low community participation, and mismatches between programs and local needs (Wijayanti & Suharto, 2021).

Data from the Central Statistics Agency (Badan Pusat Statistik Provinsi Sumatera Utara, 2024) show that the national poverty rate remains 9.03%, with high regional inequality. In North Sumatra Province, the poverty rate is 7.9%, but some regions record higher poverty rates, including Dairi Regency. This district reflects the general condition of many areas in Indonesia, which have excellent potential for natural and economic resources. Still, it has not been fully utilized to improve community welfare.

One area that deserves special attention is Silahisabungan Sub-district, especially Paropo I Village. This village is strategically located around Lake Toba and has strong fisheries potential, primarily through tilapia cultivation using a floating net cage (KJA) system. The majority of the community relies on this sector for their livelihood. However, based on a review of the Paropo I Village Government Work Plan (RKPDes) for Year 2025, no programs were identified that explicitly support or develop the tilapia farming sector, despite it being the primary source of livelihood.

The gap between local potential and the direction of village development policy reflects the weakness of the participatory approach and is rooted in the community's real needs. In fact, according to Law No. 13/2011 on Handling the Poor, one of the main strategies for poverty alleviation is to increase the poor's ability to access economic resources. This is also in line with Permendesa PDTT No. 7 of 2021, which emphasizes that Village Funds must be prioritized to support local economic development based on village superior potential (Village Superior Products/Prudes).

According to Sugiyono, (2015), analysis is the process of systematically searching for and compiling data obtained from interviews, field notes, and other materials, which is done by organizing data, describing it into units, synthesizing, arranging it into patterns, choosing which is essential and which will be studied, and making conclusions so that they can be easily understood. The findings can be communicated to others (p.319). Meanwhile, according to Pajriah & Suryana, (2018), analysis is an activity that involves focusing, abstracting, and organizing data systematically and rationally to provide answers to problems (p. 244).

Needs are things people require across various aspects and fields to survive and achieve better results and goals. (Brown, 1995) explains that needs analysis means systematically collecting and analyzing all relevant information needed to meet learners' language-learning requirements within the context of the institutions involved in the learning activities. In addition, according to (Hutchinson & Waters, 1987), the definition of needs in relation to language teaching is the ability to understand or produce linguistic features of the target situation.

(Nation & Macalister, 2010) added that needs analysis explores what students already know and what they need to know, and ensures that the program includes relevant and valuable content. Needs analysis also ties learning as closely as possible to teaching (Grier, 2005) and directs educators and practitioners to provide better, more accessible learning resources for learners (Long, 2005). Based on expert opinion, needs analysis is a procedure for collecting information about students' needs by examining their goals or targets, deficiencies, and desires or interests. Learning needs analysis needs to involve the community to identify, state, and formulate learning needs, available resources, and the obstacles that may be faced in learning activities to meet them.

The need to learn comes from the existence of needs that are innately owned by individuals from birth. The will to learn has existed in each individual with the will to progress and develop. This need is the driving force behind individuals' need to live, defend themselves from danger, keep up with technological change, and remain sustainable. According to the constructivist view of (Sardiman, 2006), learning is an active process in which the subject constructs meaning through tests, dialogue activities, physical experiences, and other activities. Learning is the process of assimilating and connecting with experiences or parts learned, through the understanding gained, so that the understanding develops. Learning needs basically describe the distance between the desired learning goals and the actual conditions. So the definition of learning needs is an activity or effort made to obtain what is needed for learning, and that can help achieve the learning goals, whether the learning process takes place in the family environment (informal), the school (formal), or society (non-formal).

Several education experts and researchers of learning needs put forward by (Johnstone & Rivera, 1965) in the book "Volunteers Of Learning" namely; a) Learning needs related to work tasks, b) related to hobbies and recreation, c) related to religion, d) related to language mastery and general knowledge, e) related to household, f) related to self-appearance events, g) related to knowledge of new events, h) related to agricultural efforts, i) related to service. The learning needs of each person may differ, and differences in space and time cause differences in human learning needs. The learning needs of someone living in a rural area may vary from those of someone living in an urban area. The learning needs someone felt last year may be different from the ones they feel next year.

Learning needs are divided into two categories: a. Felt needs, namely needs that can be immediately felt and known by the community, both individuals and groups, for example, how to increase income, how to promote MSMEs, or how to cultivate fish. b. Anticipated needs, namely needs that are not felt and known directly by the target but are suspected to be desired by others, for example, by community leaders, local, regional, or national government policies, for instance: eradication of illiteracy, family planning, use of the national language, and others. In general, community learning needs can be grouped into several categories:

1) Basic Learning Needs include fundamental skills such as Reading, writing, and arithmetic, which are very important for daily activities.
2) Life Skills Needs Life skills include the knowledge and abilities needed for daily activities.
3) Economic Learning Needs refers to education and training that aims to improve economic welfare.
4) Social and Civic Learning Needs Related to the ability to play an active role in social and political life
5) Health Education Needs Many people need information about health, nutrition, self-care, and disease prevention.
6) Environmental Learning Needs The community needs to gain knowledge about nature conservation, sustainable use of natural resources
7) Character Education Needs Development of Character Values to Create an Ethical, Moral, and Harmonious Society.

8) Technological Learning Needs In the digital era, mastery of technology is a necessity so that society can keep up with the progress of the times.

Fishery cultivation is one of the strategies for utilizing aquatic resources that involves human intervention to increase the productivity and economic value of fishery commodities (Ministry of Maritime Affairs and Fisheries, (2011)). One of the most widely cultivated freshwater commodities in Indonesia is tilapia (Oreochromis mossambicus). This fish has high adaptability, a fast growth rate, and is easy to breed in various environmental conditions (Directorate General of Aquaculture, (Direktorat Jenderal Perikanan Budidaya, 2020).

Tilapia also has relatively high nutritional value, with 18.7 grams of protein, 89 kcal of energy, and 96 mg of calcium per 100 grams of meat. In addition, the ease of maintenance makes this fish a potential commodity to support food security and improve the economies of rural communities.

Technically, tilapia cultivation includes several stages: pond preparation, spawning, seeding, enlargement, pest and disease control, and harvesting. The cultivation system can be carried out in various media such as earthen ponds, concrete ponds, and floating net cages. Optimal production can be achieved through appropriate feed management, water quality, and stocking density.

Supporting facilities include spawning ponds, nursery ponds, rearing ponds, and pre-harvest rearing ponds. The equipment used includes nets, hapa, seser, scales, and fish transportation equipment. In practice, the success of cultivation depends heavily on technical knowledge, farmers' managerial skills, and local infrastructure and policy support.

Within the framework of the capability approach, economic sector development, such as tilapia aquaculture, should be seen not only as an income-generating endeavor but also as a tool for community empowerment that enables them to expand their life choices and strengthen their economic autonomy. However, effective empowerment requires interventions that are based on communities' learning needs and capacity-building, so that they can manage their businesses productively, efficiently, and sustainably.

Therefore, this research aims to analyze the learning needs of the Paropo I Village community in tilapia farming, as a first step in designing a relevant, participatory, and sustainable local economic empowerment program. This approach is expected to address the challenges of poverty alleviation from a more in-depth perspective and to become a real contribution to realizing village development based on community capabilities and local potential.

RESEARCH METHODS

A. Types of Research

This research is quantitative descriptive, describing the condition of the subject or object of research based on the facts as they appear. Descriptive research only describes the situation or event of the study, does not seek or explain relationships, and does not test hypotheses or make predictions. In addition, this research focuses on observation and a scientific atmosphere. The researcher acts only as an observer, creates only behavioral categories, observes symptoms, and records them in his observation book.

The method used in this study is a survey. The survey method is the process of taking samples from a population and uses a questionnaire as the primary data collection tool.

B. Research Location

The research location was conducted in Paropo I village, Silahisabungan sub-district, Dairi district. This research will be conducted from March to June 2025.

C. Data dan Sumber Data

1. Primary Data

Primary data is data obtained by researchers directly from the original or first source (Narimawati, 2008). Primary data in quantitative research can be obtained by distributing questionnaires containing questions that already have answer choices for respondents. Primary data in this study were obtained by distributing questionnaires to 28 tilapia fish farmers or floating net/cage owners in Paropo Village, Silahisabungan District

2. Secondary Data

Secondary data is a data source that does not directly provide data to data collectors (Sugiyono, 2008). Secondary data in this study were obtained from the internet, books, and journals.

D. Data Collection Technique

Data collection techniques are methods used to obtain information in research, providing concrete evidence about specific phenomena in the surrounding environment. The researcher's data collection techniques in this study are as follows:

1. Observation

Observation is the basis of all science; scientists can only work based on data, namely facts about the real world obtained through observations collected with the help of various tools (Sugiyono, 2020). Observation is a method of collecting data that involves direct observation and is accompanied by records of the research object's conditions or behavior. In this study, the author conducted direct observations on the people of Paropo Village, Silahisabungan District, who cultivate tilapia.

2. Survey

A Survey is a technique for collecting data or information on a large population using a relatively smaller sample. This method is also carried out by conducting direct observations of ongoing processes. The use of this survey method aims to determine the learning needs of the people of Paropo Village I, Silahisabungan District, in cultivating tilapia.

E. Data Analysis

Data analysis is the process of simplifying data into a form that is easier to read and implement. The purpose of the data analysis is to make the information collected clear and explicit. Data obtained from observations and questionnaires, or survey results, on the learning needs of the Paropo I village community, Silahisabungan sub-district, Dairi Regency, in tilapia fish farming. The purpose of the data analysis is to make the information collected clear and explicit.

Data obtained from observations and questionnaires, or survey results, on the learning needs of the Paropo I village community, Silahisabungan sub-district, Dairi Regency, in tilapia fish farming will be tabulated and presented using simple statistics, namely frequency distributions and tables. The results of the data analysis in this study are presented descriptively and comprehensively, based on the data collected during the research. Data analysis was carried out using SPSS (Statistical Product and Service Solutions). All data obtained in the field were recorded, and research notes were compiled for descriptive analysis. The data analysis was carried out using a frequency table, and percentages were based on the respondent's answer category.

The data is then described and analyzed using the formula:
The description of the data is analyzed using the following percentage formula:
$P = f/N \times 100$ (Arikunto, 2021)
Description:
P: Percentage
F: Frequency of answers
N: Number of respondents

After calculating the percentage, the research results are interpreted into five categories.

Table 1. Category Interval

No	Interval	Category
1.	81 % - 100 %	Very High
2.	61 %- 80 %	High
3.	41-60 %	Medium
4.	21- 40 %	Low
5.	0 – 20 %	Very Low

Source: Agus & Fahriqzi, (2020)

The percentage data on the learning needs of the Paropo 1 village community in Silahisabungan district, Dairi district, are then presented as frequency data and bar charts.

RESULTS AND DISCUSSION

A. RESULT

Based on observations and the distribution of questionnaires to the people of Paropo I village, with 28 respondents who own fish cages, data were obtained that describe the community's learning needs in tilapia fish farming activities. The following is a summary of the results of the analysis of the community's learning needs based on several aspects:

Table 2. Frequency Data on Learning Needs Related to Facilities Required in Tilapia Fish Cultivation

Respondents' Answers	Frequency	%
Knowledge about selecting the location of tilapia fish farming cages	1	3.6 %
Knowledge of supporting technology in tilapia fish farming	17	60.7 %
Skills related to supporting technology in tilapia fish farming	10	35.7%
Total	28	100 %

Source: SPSS Data Processing Version 23

Based on Table 2, the frequency data of the results of the data analysis of the learning needs aspect related to the required facilities in tilapia fish farming shows that the primary priority learning needs of the Paropo I village community in tilapia fish farming are knowledge of supporting technology in tilapia fish farming, with the highest percentage of 60.7%. Overall, the distribution of data on the learning needs aspect related to the required facilities in tilapia fish farming is presented in the following diagram:
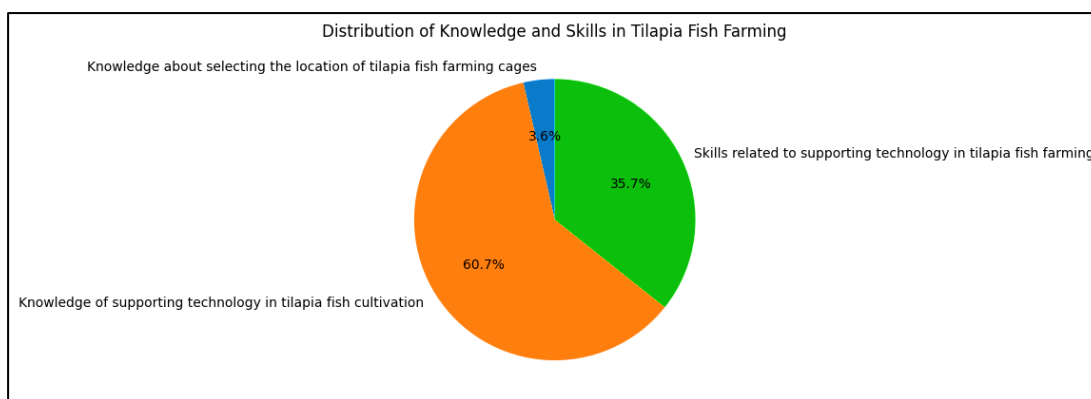

Figure 1 Frequency Data of Learning Needs Related to Facilities Needed in Tilapia Fish Cultivation

Based on the image above, the results of research related to the facilities needed in tilapia fish farming state that the community with learning needs about knowledge about selecting tilapia fish farming cage locations is in the "Very Low" category of 3.6% (1 person), Knowledge of supporting technology in tilapia fish farming is in the "Medium" category of 60.7% (17 people), Skills related to supporting technology in tilapia fish farming are in the "Low" category of 35.7% (10 people).

Table 3 Frequency Data on Learning Needs Related to Equipment Used in Tilapia Fish Cultivation

Respondents' Answers	Frequency	%
Knowledge of equipment for more efficient and effective feed management	11	39.3 %
Skills in using equipment for feed management	2	7.1 %
Knowledge of equipment for monitoring fish health	1	3.6 %
Knowledge of water quality monitoring equipment	7	25.0 %
Skills in using water quality monitoring equipment	7	25.0%
Total	28	100 %

Source: SPSS Data Processing Version 23

Based on Table 3, the frequency data of the results of the data analysis of the learning needs aspect related to the equipment used in tilapia fish farming shows that the primary priority learning needs of the Paropo I village community in tilapia fish farming are knowledge about equipment for more efficient and effective feed management, with the highest percentage of 39.3%. Overall, the distribution of data on the learning needs aspect related to the equipment used in tilapia fish farming is presented in the following diagram:
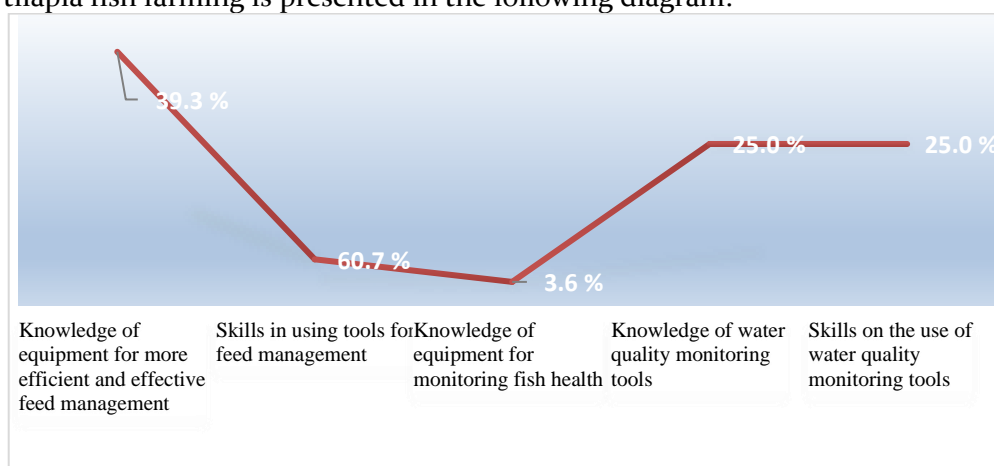

Figure 2 Frequency Data of Learning Needs Related to Equipment Used in Tilapia Fish Cultivation

Based on the image above shows the results of research on the learning needs of the Paropo I village community, Silahisabungan sub-district related to the equipment used in tilapia fish farming, stating that the community with learning needs about knowledge about equipment for more efficient and effective feed management is in the "Low" category of 39.3% (11 people), Skills about the use of tools for feed management are in the "Very Low" category of 7.1% (2 people), Knowledge about equipment for monitoring fish health is in the "Very Low" category of 3.6% (1 person), Knowledge about water quality tools is in the "Low" category of 25.0% (7 people) and Skills about the use of water quality monitoring tools are in the "Low" category of 25.0% (7 people).

Table 4 Frequency Data of Learning Needs Related to Tilapia Fish Breeding Techniques

Respondents' Answers	Frequency	%

Knowledge on how to choose good tilapia broodstock for breeding	5	17.9 %
Skills in the process of selecting good tilapia broodstock for breeding	4	14.3 %
Knowledge on how to care for tilapia eggs so that they can develop well	4	14.3 %
Knowledge on how to reduce the mortality rate of tilapia fry	6	21.4 %
Skills in making the proper feed for tilapia fry from the larval phase to juveniles	9	32.1 %
Total	28	100 %

Source: SPSS Data Processing Version 23

Based on table 4.9, the frequency data of the results of the data analysis of the learning needs aspect related to the breeding technique in tilapia fish cultivation shows that the primary priority learning needs of the Paropo I village community in tilapia fish cultivation are learning needs related to skills in making the proper feed for tilapia fish seeds from the larval phase to juveniles with the highest percentage of 32.1%. Overall, the distribution of data on the learning needs aspect related to tilapia fish breeding techniques is presented in the following diagram:
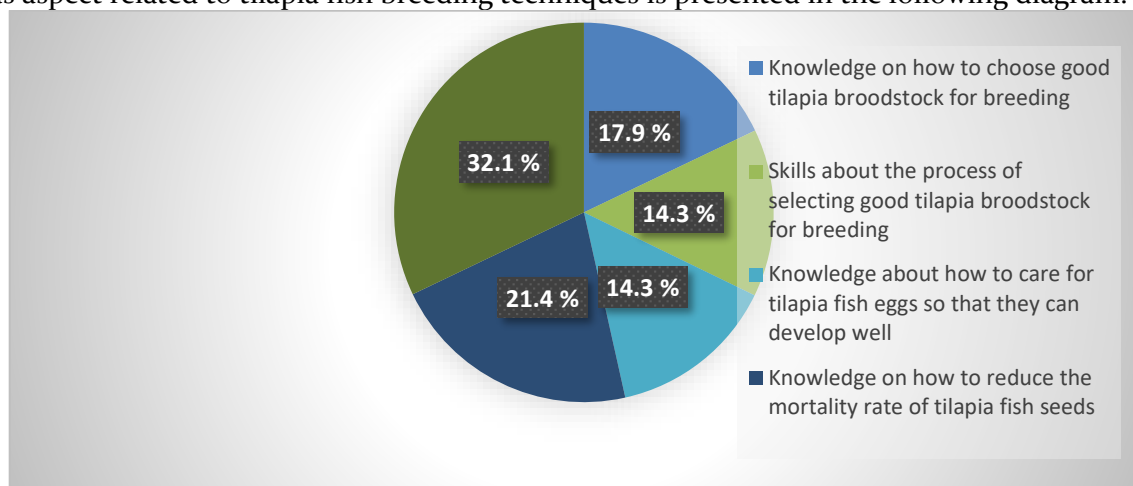

Figure 3 Frequency Data of Learning Needs Related to Tilapia Fish Seeding Techniques

Based on the table and figure above, it shows the results of the study on the learning needs of the Paropo I village community, Silahisabungan sub-district, related to tilapia fish seeding techniques, stating that the community with learning needs in knowledge about how to choose good tilapia broodstock for seeding is in the "Very Low" category of 17.9% (5 people), Skills about the process of selecting good tilapia broodstock for seeding are in the "Very Low" category of 14.3% (4 people), Knowledge about how to care for tilapia eggs so that they can develop well is in the "Very Low" category of 14.3% (4 people), Knowledge about how to reduce the mortality rate of tilapia seeds is in the "Low" category of 21.4% (6 people) and Skills in making the proper feed for tilapia seeds from the larval phase to juveniles are in the "Low" category of 32.1% (9 people).

Table 5 Frequency Data on Learning Needs Related to Fish Maintenance from Seed to Harvest

Respondents' Answers	**Frequency**	**%**
Knowledge on how to maintain tilapia fish seeds until they reach a harvestable size	1	3.6 %
Skills in managing water quality during the tilapia fish maintenance process	2	7.1 %

Knowledge on how to properly feed tilapia fish at each stage of their growth	4	14.3 %
Knowledge on regulating fish density in ponds to ensure optimal growth	5	17.9 %
Skills in regulating fish density in ponds to ensure optimal growth	16	57.1 %
Total	28	100 %

Source: SPSS Data Processing Version 23

Based on Table 5, the frequency data of the results of the data analysis of the learning needs aspect related to fish maintenance from seeds to harvest shows that the primary priority learning needs of the Paropo I village community in tilapia fish cultivation are skills to regulate fish density in ponds to ensure optimal growth, with the highest percentage of 57.1%. Overall, the distribution of data on the learning needs aspect related to tilapia fish maintenance from seeds to harvest is presented in the following diagram:
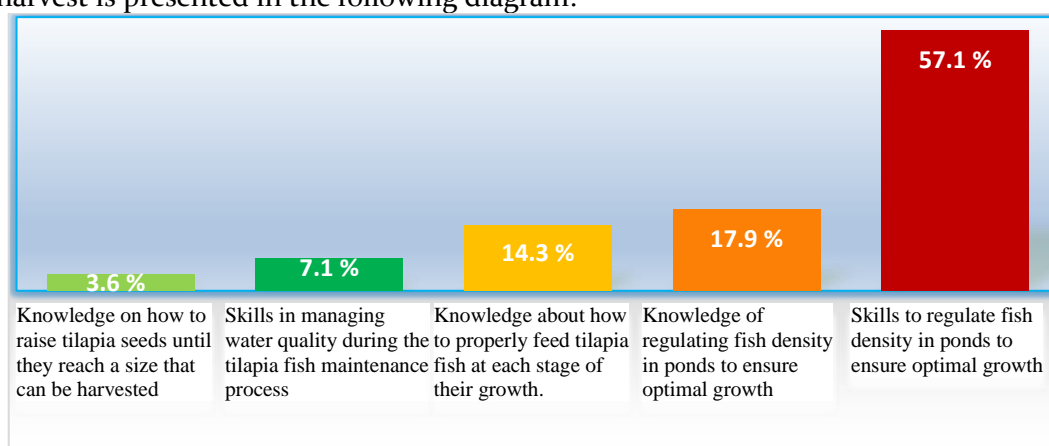

Figure 4 Frequency Data on Learning Needs Related to Fish Maintenance from Seed to Harvest

Based on the image above shows the results of research on the learning needs of the Paeropo I village community, Silahisabungan sub-district related to tilapia fish maintenance from seeds to harvest, stating that the community with the need to learn knowledge about how to maintain tilapia fish seeds until they reach a size that can be harvested is in the "Very Low" category of 3.6% (1 person), Skills in managing water quality during the tilapia fish maintenance process are in the "Very Low" category of 7.1% (2 people), Knowledge about how to feed tilapia fish at each stage of their growth properly is 14.3% (4 people), Knowledge about regulating fish density in ponds to ensure optimal growth is in the "Very Low" category of 17.9% (5 people), Skills to regulate fish density in ponds to ensure optimal growth is in the "Medium" category of 57.1% (16 people).

Table 6 Frequency Data on Learning Needs Related to Tilapia Fish Breeding Techniques

Respondents' Answers	Frequency	%
Skills in managing fish density in cages to ensure optimal growth	4	14.3 %
Knowledge of good rearing techniques in preventing water contamination to maintain cleanliness	1	3.6 %
Knowledge of maintaining tilapia health during the rearing process	9	32.1 %
Skills in monitoring tilapia health during the rearing process	14	50.0 %
Total	28	100 %

Source: SPSS Data Processing Version 23

Based on Table 6, the frequency data of the results of the data analysis of the learning needs aspect related to tilapia fish rearing techniques shows that the primary priority learning needs of the Paropo I village community in tilapia fish cultivation are skills in monitoring the health of tilapia fish during the rearing process, with the highest percentage of 50.0%. Overall, the distribution of data on the learning needs aspect related to tilapia fish rearing techniques is presented in the following diagram:
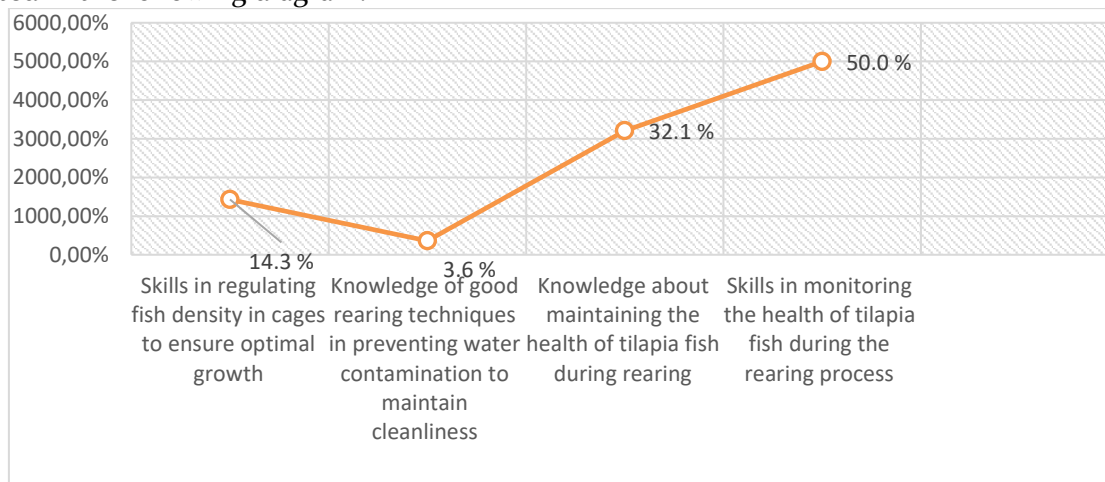

Figure 5 Frequency Data of Learning Needs Related to Tilapia Fish Breeding Techniques

Based on the image above shows the results of research on the learning needs of the Paropo I village community, Silahisabungan sub-district related to tilapia fish rearing techniques, stating that the community with the need to learn skills in regulating fish density in cages to ensure optimal growth is in the "Very Low" category of 14.3% (4 people), Knowledge of good rearing techniques in preventing water contamination to maintain cleanliness is in the "Very Low" category of 3.6% (1 person), Knowledge about maintaining tilapia fish health during the rearing process is in the "Low" category of 32.1% (9 people) and Skills in monitoring tilapia fish health during the rearing process are in the "Medium" category of 50.0% (14 people).

Table 7 Frequency Data on Learning Needs Related to Pest Prevention in Tilapia Fish

Respondents' Answers	Frequency	%
Knowledge of the types of pests that often attack tilapia fish	3	10.7 %
Skills in managing the pond environment to prevent pests from entering tilapia fish farming cages	5	17.9 %
Knowledge of integrated pest control techniques in tilapia fish farming	3	10.7 %
Skills in conducting routine monitoring to detect the presence of pests in tilapia fish farming cages	17	60.7 %
Total	28	100 %

Source: SPSS Data Processing Version 23

Based on table 7, the frequency data of the results of the data analysis of learning needs aspects related to pest prevention in tilapia fish shows that the main priority learning needs of the Paropo I village community in tilapia fish farming are skills in conducting routine monitoring to detect the presence of pests in tilapia fish farming cages with the highest percentage of 60.7%. Overall, the distribution of data on learning needs aspects related to pest prevention in tilapia fish is presented in the following diagram:
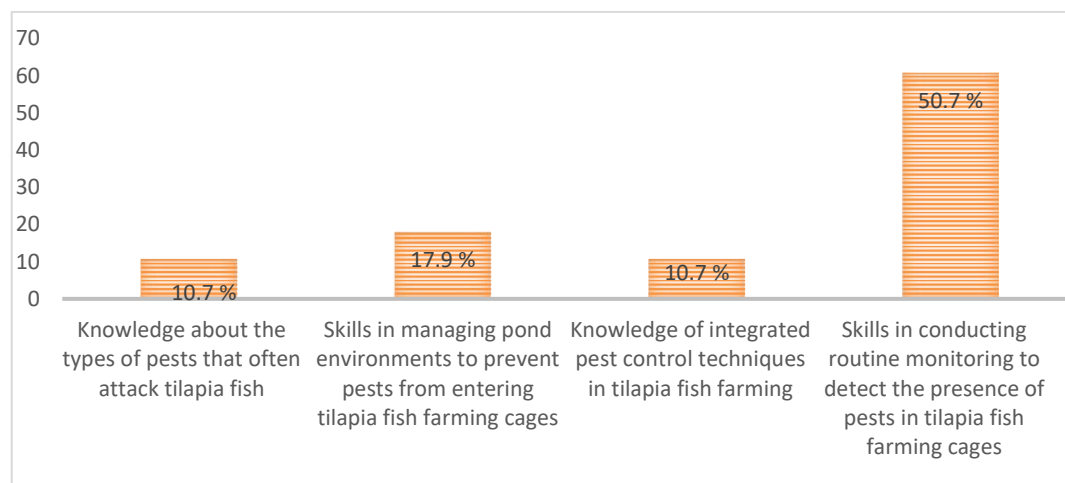
Figure 6 Frequency Data of Learning Needs Related to Pest Prevention in Tilapia Fish

Based on the image above shows the results of research on the learning needs of the Paropo I village community, Silahisabungan sub-district related to pest prevention in tilapia fish, stating that the community with the need to learn knowledge of the types of pests that often attack is in the "Very Low" category of 10.7% (3 people), Skills in managing the pond environment to prevent pests from entering tilapia fish farming cages are in the "Very Low" category of 17.9% (5 people), Knowledge of integrated pest control techniques in tilapia fish farming is in the "Very Low" category of 10.7% (3 people), Skills in conducting routine monitoring to detect the presence of pests in tilapia fish farming cages are in the "Medium" category of 60.7% (17 people).

Table 8 Frequency Data on Learning Needs Related to Disease Prevention in Tilapia Fish

Respondents' Answers	Frequency	%
Knowledge of vaccination or preventive treatment that can be used to prevent disease in tilapia fish	7	25.0 %
Knowledge of how to maintain the cleanliness of ponds and cultivation environments to prevent the spread of disease	4	14.3 %
Skills in conducting routine monitoring of tilapia fish health to detect disease	17	60.7 %
Total	28	100 %

Source: SPSS Data Processing Version 23

Based on table 8, the frequency data of the results of the data analysis of the learning needs aspect related to disease prevention in tilapia fish shows that the main priority learning needs of the Paropo I village community in tilapia fish cultivation are skills in conducting routine monitoring of tilapia fish health to detect disease with the highest percentage of 60.7%. Overall, the distribution of data on the learning needs aspect related to disease prevention in tilapia fish is presented in the following diagram:
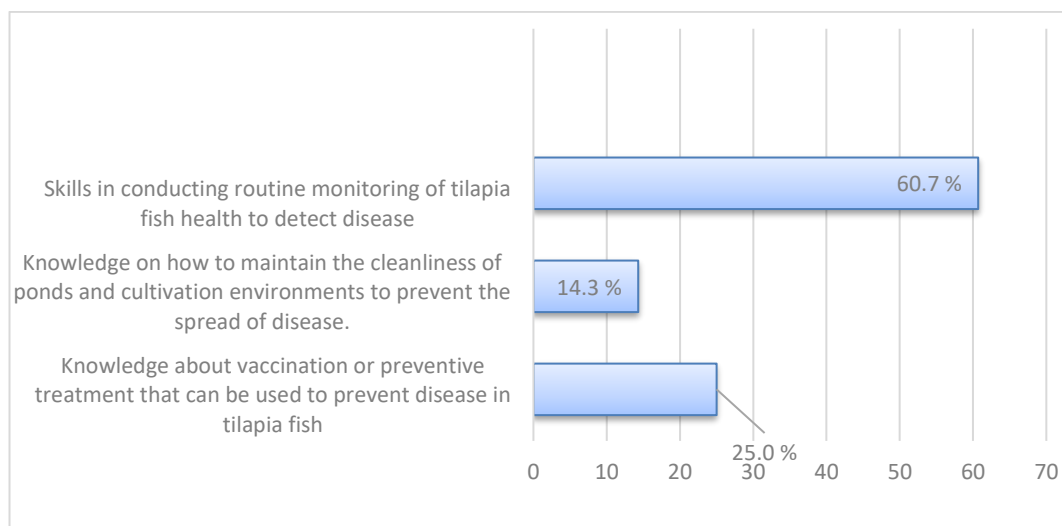
Figure 7 Frequency Data of Learning Needs Related to Disease Prevention in Tilapia Fish

Based on the image above shows the results of research on the learning needs of the Paropo I village community, Silahisabungan sub-district related to preventing diseases in tilapia fish, stating that the community with the need to learn knowledge about vaccination or preventive treatment that can be used to prevent diseases in tilapia fish is in the "Low" category of 25.0% (7 people), knowledge about how to maintain the cleanliness of ponds and cultivation environments to prevent the spread of disease is in the "Very Low" category of 14.3% (4 people), skills in conducting routine monitoring of tilapia fish health to detect disease are in the "Medium" category of 60.7% (17 people).

Table 9 Frequency Data of Learning Needs Related to the Right Time to Harvest Tilapia Fish

Respondents' Answers	Frequency	%
Knowledge of indicators that indicate that tilapia fish are ready to be harvested	4	14.3 %
Knowledge of environmental factors that affect tilapia harvesting time such as temperature and water quality	10	35.7 %
Knowledge of efficient tilapia harvesting techniques to reduce losses when harvesting tilapia fish	14	50.0 %
Total	28	100 %

Source: SPSS Data Processing Version 23

Based on table 9, the frequency data of the results of the data analysis of the learning needs aspect related to the right time to harvest tilapia fish shows that the main priority learning needs of the Paropo I village community in tilapia fish farming are knowledge of efficient tilapia fish harvesting techniques to reduce losses when harvesting tilapia fish with the highest percentage of 50.0%. Overall, the distribution of data on the learning needs aspect related to the right time to harvest tilapia fish is presented in the following diagram:
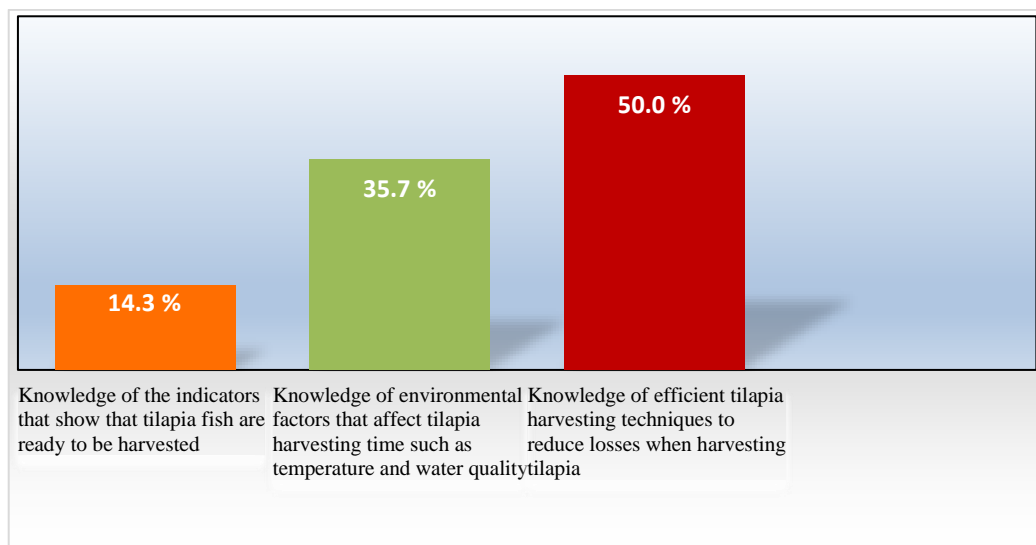
Figure 8 Frequency Data of Learning Needs Related to the Right Time to Harvest Tilapia Fish

Based on the image above shows the results of research on the learning needs of the Paropo I village community, Silahisabungan sub-district related to the right time to harvest tilapia fish, stating that the community with the need to learn knowledge about indicators that indicate that tilapia fish are ready to be harvested is in the "Very Low" category of 14.3% (4 people), knowledge of environmental factors that affect the time of harvesting tilapia fish such as temperature and water quality is in the "Low" category of 35.7% (10 people), knowledge of efficient tilapia fish harvesting techniques that reduce losses when harvesting tilapia fish is in the "Medium" category of 50.0% (14 people).

Table 10 Frequency Data of Learning Needs Related to Tilapia Fish Harvesting Techniques

Respondents' Answers	Frequency	%
Knowledge of how to choose tilapia harvesting methods	1	3.6 %
Skills in choosing efficient and safe permanent equipment for tilapia	1	3.6 %
Knowledge of tilapia harvest processing techniques to maintain quality	4	14.3 %
Skills in utilizing technology to facilitate the tilapia harvesting process	22	78.6 %
Total	28	100 %

Source: SPSS Data Processing Version 23

Based on table 10, the frequency data of the results of the data analysis of the learning needs aspect related to tilapia harvesting techniques shows that the main priority learning needs of the Paropo I village community in tilapia cultivation are skills in utilizing technology to facilitate the tilapia harvesting process with the highest percentage of 78.6%. Overall, the distribution of data on the learning needs aspect related to tilapia harvesting techniques is presented in the following diagram:
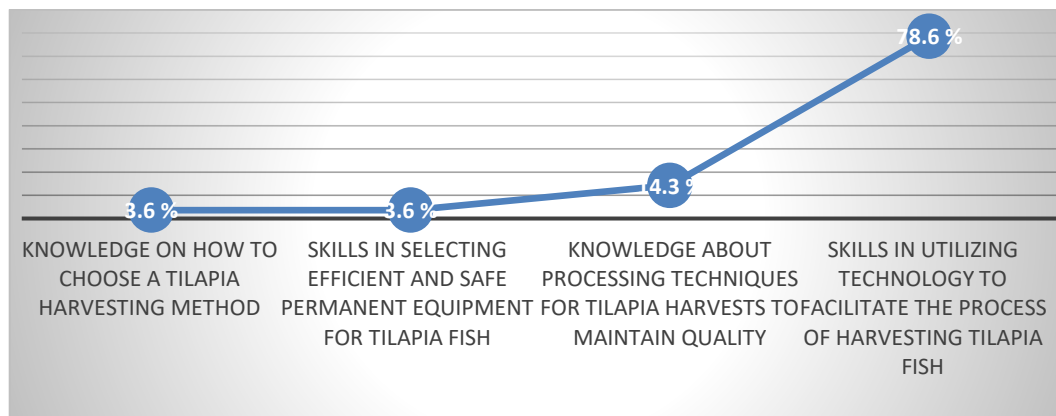
Figure 9 Frequency Data of Learning Needs Related to Tilapia Fish Harvesting Techniques

Based on the image above shows the results of research on the learning needs of the Paropo I village community, Silahisabungan sub-district related to tilapia harvesting techniques, stating that the community with the need to learn knowledge on how to choose tilapia harvesting methods is in the "Very Low" category of 3.6% (1 person), skills in choosing efficient and safe harvesting equipment for tilapia are in the "Very Low" category of 3.6% (1 person), knowledge of tilapia harvest processing techniques to maintain quality is in the "Very Low" category of 14.3% (4 people), skills in utilizing technology to facilitate the tilapia harvesting process are in the "High" category of 78.6% (22 people).

B. DISCUSSION
1. **Analysis of Learning Needs of the Paropo I Village Community in Tilapia Fish Cultivation**

Based on the results of data analysis, it shows that the level of learning needs of the Paropo I village community, Silahisabungan sub-district has different variations in each aspect of tilapia fish cultivation:

a. Learning needs related to facilities needed in tilapia fish farming

Based on the results of the study, it is known that the highest learning needs in this aspect are in knowledge of supporting technology in tilapia fish farming of (60.7%) which shows that the community is aware of the importance of technology in increasing the productivity of tilapia fish farming. This is in line with research by (Dwi Yulianti et al., 2025) concerning the Utilization of IOT technology in fish farming in Limus Nunggal Village, Cileungsi, Bogor which stated that the lack of knowledge of fish farmers in the application of technology can damage the ecosystem and reduce the productivity of fish farming itself, one of which is the limited knowledge of technology in maintaining water quality where water quality is one of the crucial factors in fish farming because it affects the growth, health and productivity of fish.

The main parameters such as temperature, pH, dissolved oxygen (DO), nitrate and phosphate must be maintained within optimal limits to create an environment that supports fish metabolism and immunity, limited knowledge in controlling water quality is done manually and without standard conditions can inhibit fish growth and cause suboptimal production. The solution provided is the use of Internet of Things (IoT) technology in the aquaculture sector, which is one of the digital transformation efforts in line with the development of the industrial revolution 4.0. IoT allows the process of monitoring and managing ponds to be carried out automatically and in real time. In the context of tilapia fish farming, technology is applied to monitor water quality such as temperature, pH and dissolved oxygen levels continuously so as to minimize the risk of fish death due to suboptimal environmental conditions.

The use of this technology contributes to increasing the productivity and efficiency of fish farmers' work which can ultimately increase the income and welfare of tilapia fish farming communities. Continuous monitoring of ponds that have been equipped with IoT also needs to be carried out to evaluate the effectiveness of this technology in the long term and identify the need for adjustments to tilapia fish farming and become a modern and sustainable fish farming model.

Currently, tilapia fish farming in Paropo I Village, Silahisabungan District is carried out manually and without the support of modern technology. This causes the process of monitoring water quality, feeding and detecting fish diseases to require more time and energy, resulting in less than optimal productivity and efficiency of tilapia fish farmers' work. Therefore, strategic steps are needed to introduce and implement IoT technology in tilapia fish farming in Paropo I village, which is expected to increase productivity, work efficiency, as well as income and welfare of tilapia fish farming communities in Paropo I village, Silahisabungan District.

b.   Learning needs related to equipment used in tilapia fish farming

The highest learning need in this aspect is knowledge about equipment for more efficient and effective feed management of (39%) although it is still included in the "low" category which shows that the community needs training on the efficiency of tools and their use in tilapia fish farming. This is in line with research by Saputra et al., (2024) concerning the Application of alternative fish feed manufacturing machines in the "Makmur Berkah" women's farmer group in Kutasari Village, Baturraden District, which stated that tilapia fish farmers need training on the efficiency of tools in processing fish feed.

Lack of community knowledge about knowing fish nutrition, inefficient financial management because feed prices are expensive, and inadequate management of fish farming businesses. The main problem in intensive fish farming is the cost of providing commercial feed, feed is the main obstacle in fish production and the efficiency of its use can have a significant impact on farmer groups. To overcome this problem, the development of alternative feed that is more economical and easily obtained locally is carried out by utilizing local raw materials such as fish meal, corn meal, rice bran, tapioca flour and water.

Intensive assistance to tilapia fish farmers in implementing this new technology is expected to reduce dependence on commercial feed and increase productivity and the welfare of their families through more efficient and sustainable fish farming. With the availability of equipment to manage feed that is more efficient and effective, it is hoped that the community will be able to produce feed independently that has high economic value and nutrition, with access to quality feed and independent production, fish farmers can increase harvest yields and production efficiency.

Currently, tilapia fish farmers in Paropo I Village, Silahisabungan District are still dependent on expensive commercial feed that burdens operational costs. For this reason, assistance is needed for tilapia fish farmers in producing fish feed independently with the introduction and practice of making fish feed equipment and the ingredients used in making fish feed so that this step is expected to help tilapia fish farmers in reducing feed costs and can increase the efficiency of tilapia fish production.

c.   Learning needs related to tilapia fish seeding techniques

The highest learning needs in this aspect are about skills in making the right feed for tilapia fish seeds from the larval phase to juveniles by (32.1%) although it is categorized as "low" which shows that the community still lacks technical skills in making feed in tilapia fish farming. This is in line with research by (Effendie, 2002) on Fisheries Biology which states that feed is the main factor determining the success of tilapia fish farming, especially in the early stages of growth from the larval phase to juveniles. In this phase, fish require proper and balanced nutrition in order to grow optimally and have resistance to disease.

Therefore, farmers are required to master the skills in making feed that is in accordance with the biological needs of fish seeds.

The skills needed in this aspect include an understanding of nutrient composition, feed formulation methods, and feed making techniques that maintain nutritional quality during storage and administration. Properly prepared feed will increase feed conversion efficiency and accelerate the growth of fish seeds.

Skills in making feed also include the ability to select economical but high-quality local raw materials, as well as understanding processing processes such as grinding, mixing, pelletizing, and drying. In addition, knowledge of the size of feed particles that are appropriate for the size of the fish's mouth at each growth phase is very important to ensure that the feed can be consumed optimally.

Mastery of these skills requires a systematic learning process that includes direct practice of making feed and testing the quality of the feed. Thus, farmers can produce feed that is appropriate, efficient, and able to support the optimal growth of tilapia fish seeds from the larval phase to juveniles.

Currently in Paropo I village, Silahisabungan District, there are no independent fish feed production activities, especially to support the growth of tilapia fish seeds from the larval phase to juveniles. In fact, the implementation of fish feed production in this village is highly recommended. With adequate training and facilities, the community can produce their own fish feed which not only reduces dependence on commercial feed, but can also reduce production costs and increase the sustainability of fish farming businesses in this village.

d. Learning needs related to fish maintenance from seed to harvest

Learning needs in this aspect are in the skills in regulating fish density in cages to ensure optimal growth of (57.1%) which is included in the "moderate" category which shows that the community needs technical skills in controlling fish density that affects the growth and health of tilapia fish. This is in line with research by Mulyani, S., & Wahyudi, A in 2018 on the Effect of stocking density on the growth and survival of tilapia fish (Oreochromis Mossambicus) in tarpaulin ponds, which states that regulating fish density in cages is the main factor influencing the success of tilapia fish cultivation. The right fish density can ensure sufficient space for fish to move, optimize nutrient use, and maintain water quality in the cultivation environment. Conversely, density that is too high can cause a decrease in water quality, increase stress and aggressiveness of fish, and increase the risk of disease, thus negatively impacting the growth and survival rate of fish.

Skills in regulating fish density in cages include the ability to determine the number of fish that is in accordance with the capacity of the cage volume and the size of the fish at a certain growth phase. In addition, these skills also include the ability to periodically sort fish to adjust the density as the fish grow, as well as routine monitoring of water quality to ensure parameters such as dissolved oxygen levels, temperature, pH, and ammonia concentrations are at optimal conditions. This process requires technical understanding and experience in managing the cultivation environment in order to make the right decisions in regulating fish density. Currently in Paropo I village, Silahisabungan District, there has been no socialization or training to regulate fish density. Therefore, training is needed to improve skills in regulating good density, farmers can increase production efficiency, optimize tilapia growth, and reduce mortality rates that can result in expected economic losses. Therefore, it is hoped that training in skills in regulating fish density in the community of Paropo I village, Silahisabungan District will increase productivity and community welfare.

e. Learning needs related to tilapia fish rearing techniques

The community's learning needs in this aspect are the skills to monitor the health of tilapia fish during the rearing process of (50%) which is included in the "moderate" category

which shows that the community needs technical skills in monitoring health during the tilapia fish rearing process. This is in line with research by the Kulon Progo Regency Marine and Fisheries Service in (2023) concerning Monitoring fish health and the environment in Pengasih Sub-district which states that routine monitoring of tilapia fish health during the rearing process is an important aspect in cultivation that directly affects the success of production.

Skills in monitoring fish health include the ability to recognize physical signs and fish behavior that indicate health problems, such as changes in body color, the appearance of wounds or spots, abnormal swimming behavior, and decreased appetite. In addition, these skills also include monitoring the quality of the cultivation environment, especially key parameters such as water temperature, dissolved oxygen levels, pH, and ammonia levels that have the potential to affect fish health. The learning needs of the community in this aspect are focused on developing accurate and systematic observation skills of the physical condition and behavior of fish, the ability to use water quality measuring instruments simply and accurately, and an understanding of the types of fish diseases commonly encountered and how to treat them. Through these skills, farmers can detect potential fish health problems early, so that preventive and treatment measures can be taken quickly and effectively to reduce the risk of mass mortality and economic losses.

Currently in Paropo I village, Silahisabungan sub-district, there is no practice-based training and technical counseling on tilapia fish health management. In fact, this skill is very important to increase fish farming productivity and reduce mortality rates due to disease. Therefore, training and assistance are needed for tilapia fish farmers in Paropo I village, Silahisabungan sub-district to equip the community with adequate skills in managing fish health independently and sustainably.

f. Learning needs related to pest prevention in tilapia fish

The community's learning needs in this aspect are skills in conducting routine monitoring to detect the presence of pests in tilapia fish farming cages of (60.7%) which is included in the "moderate" category, indicating that the community is experiencing obstacles from pest threats and needs an effective strategy to prevent pests in tilapia fish farming. This is in line with research by Lubis & Kusuma, (2024) concerning Counseling on handling freshwater fish diseases using herbal plants at SMK 3 Pariaman which stated that tilapia fish farming in floating net cages is one of the fisheries businesses that is quite potential, but is susceptible to disturbances caused by pests and other pests.

The presence of pests in cages can cause physical damage to cultivation facilities, reduce water quality, and cause stress and disease in fish, thus negatively affecting growth and production. Therefore, skills in conducting routine monitoring to detect the presence of pests are very important for fish farmers.

Pest monitoring includes the ability to recognize various types of pests that often attack fish farming tilapia, such as small fish predators, external parasites (eg fish lice and parasitic worms), and other pests that can disrupt the cage environment. These skills also include the ability to conduct systematic and scheduled inspections on cage conditions, observe signs of pest attacks, and record monitoring data in a structured manner for further evaluation.

Currently in Paropo I Village, Silahisabungan District, there has been no practice-based training and technical counseling on routine pest monitoring in cages for tilapia fish farmers, even though this skill is very important to increase fish farming productivity. It is hoped that the people of Paropo I Village, Silahisabungan District, will receive assistance because it is very necessary to equip the community in conducting independent and sustainable pest monitoring.

g. Learning needs related to preventing diseases in tilapia fish

The community's learning needs in this aspect are skills in carrying out skills in carrying out routine monitoring of tilapia fish health to detect diseases of (60.7%) which is included in the "moderate" category which shows that the community is already aware of the existence of diseases that attack tilapia fish but still needs in-depth education and strategies in preventing tilapia fish diseases. This is in line with the research of the Kulon Progo Regency Marine and Fisheries Service in (2021) regarding Increasing the success of aquaculture production through fish health management which states that routine monitoring of tilapia fish health is a fundamental aspect in aquaculture to maintain the survival and optimal growth of fish. These skills include the ability to carefully observe the physical signs of fish, such as changes in skin color, the appearance of wounds or white spots, abnormal behavior, and decreased appetite which can be an indication of disease.

Currently in Paropo I village, Silahisabungan sub-district, there has been no training and technical counseling regarding monitoring the health of tilapia fish in detecting diseases, even though this skill is very important to increase the productivity of fish farming and reduce the mortality rate due to disease in tilapia fish, and it is hoped that mentoring or training carried out in the community of Paropo I village, Silahisabungan sub-district can equip the community with adequate skills in managing fish health independently and sustainably.

h. Learning needs related to the right time to harvest tilapia

The community's learning needs in this aspect are knowledge about efficient tilapia harvesting techniques so as to reduce losses when harvesting tilapia by (50.0%) which is included in the "moderate" category indicating that the community still needs an efficient strategy to reduce losses in the harvesting process. This is in line with the research of Larasati et al., (2020) on the Economy of the Sipak Village Community, Bogor Regency through assistance in cultivating tilapia and tilapia seeds which stated that harvesting is one of the crucial stages in tilapia cultivation which greatly influences the success of production and the quality of the harvest. Improper harvesting techniques can cause various losses, such as stress and physical injury to fish, death during the harvest process, and loss of harvest due to fish that are released or damaged. Therefore, mastering knowledge and skills about efficient harvesting techniques is the main learning need for tilapia fish farming communities. Efficient harvesting skills include several aspects, namely: (1) Determining the Right Harvest Time Understanding the harvest time based on optimal fish size and weight is very important to get maximum results. Harvesting too early will result in small fish sizes and low economic value, while harvesting too late can cause overpopulation and decreased water quality.

(2) Selecting the Right Harvesting Method. Harvesting methods must be adjusted to the conditions of the cage and the size of the fish. Using the right net, such as a scoop net with the right mesh size, can minimize injury to the fish and make it easier to remove fish from the cage. (3) Fish Handling Techniques During Harvesting. Careful and systematic handling is essential to reduce stress and injury to the fish. This includes how to hold the fish, avoid collisions, and transport the fish from the cage to a temporary storage area in good condition.

(4) Post-Harvest Management Post-harvest activities such as sorting, cleaning, cooling, and storing fish must be carried out properly so that the quality of the fish is maintained until it reaches consumers. Currently in Paropo I village, Silahisabungan sub-district, there is no technical training on tilapia harvesting techniques, while this skill is very important to increase production results, reduce losses due to fish damage and damage during harvesting, and increase the economic value of tilapia. Therefore, tilapia fish farming communities need training and assistance to equip the community with adequate skills in carrying out fish harvesting efficiently and sustainably.

i.   **Learning needs related to tilapia harvesting techniques**

The community's learning needs in this aspect are skills in utilizing technology to facilitate the tilapia harvesting process of (78.6%) which is included in the "high" category, indicating that the community is aware of the need for technical skills in using technology to help facilitate the harvesting process. This is in line with research by Bioakuatik Artia Teknologi in (2023) on Fisheries and aquaculture equipment, digital counter fish harvesting machines, stating that technological developments in the field of fisheries cultivation provide great opportunities to increase the efficiency and effectiveness of the tilapia harvesting process.

Utilizing the right technology can help reduce labor, speed up the harvesting process, and minimize fish damage during harvesting. Therefore, skills in using technology are an important learning need for tilapia fish farming communities. The development of these technological skills can be done through training that combines theory and practice of using tools and technology applications in the context of tilapia fish farming. Technical assistance by experts also plays a major role in accelerating the adoption of technology by farming communities. Currently, the tilapia fish farming community in Paropo I Village, Silahisabungan District does not yet have the skills to utilize technology to facilitate the tilapia fish harvesting process and the harvesting process is still done manually. So that training and assistance are needed for the skills to utilize technology for the harvesting process, it is hoped that farmers will be able to increase productivity, reduce crop losses, and improve the quality of fish from cultivation. This will also encourage the progress of tilapia fish farming efforts in a more modern and sustainable manner.

2.   **Priority Learning Needs of the Paropo I Village Community in Tilapia Fish Cultivation**

Based on the results of the analysis of various aspects of the learning needs of the Paropo I Village community in tilapia fish farming, it can be concluded that there are several aspects that occupy priority positions for further training or assistance. These aspects are determined based on the highest percentage of each learning needs indicator and are categorized into three levels, namely high, medium, and low.

The aspect with the highest level of learning needs is the skill in utilizing technology to facilitate the tilapia fish harvesting process, with a percentage of 78.6%. These results indicate that the community has realized the importance of using technology in the harvesting process which is expected to increase efficiency and reduce potential losses. Therefore, technical skills related to the use of technology-based harvesting aids need to be a top priority in the training or extension program that will be implemented.

Furthermore, there are several aspects with a moderate learning needs category that also require special attention. First, knowledge of supporting technology in tilapia fish farming (60.7%) shows that the community needs further understanding of the application of technology that can support cultivation productivity. Second, the skill aspect in conducting routine monitoring to detect the presence of pests in tilapia fish farming cages (60.7%) and the skill of routine monitoring of tilapia fish health to detect diseases (60.7%) indicates that the community faces obstacles in controlling pests that have an impact on production results. In addition, the skill in regulating fish density in cages to ensure optimal growth (57.1%) and the skill in monitoring fish health during the rearing process (50.0%) are also included in the medium priority that needs attention. Both are closely related to effective maintenance management, so that fish growth and health can be maintained optimally. Other aspects such as knowledge of efficient harvesting techniques to reduce losses when harvesting tilapia fish (50.0%) are also important, indicating that the community still needs to learn more about the correct way to harvest so that losses during harvest can be reduced. Meanwhile, aspects of learning needs that are included in the low category, such as equipment for more efficient and effective feed management (39.0%) and

skills in making the right feed for tilapia seeds from the larval phase to juveniles (32.1%), still need to be considered but with a lower priority compared to other aspects. The learning needs of the Paropo I village community, Silahisabungan District, are arranged in a pyramid based on priority levels from the most important to the least urgent as follows:
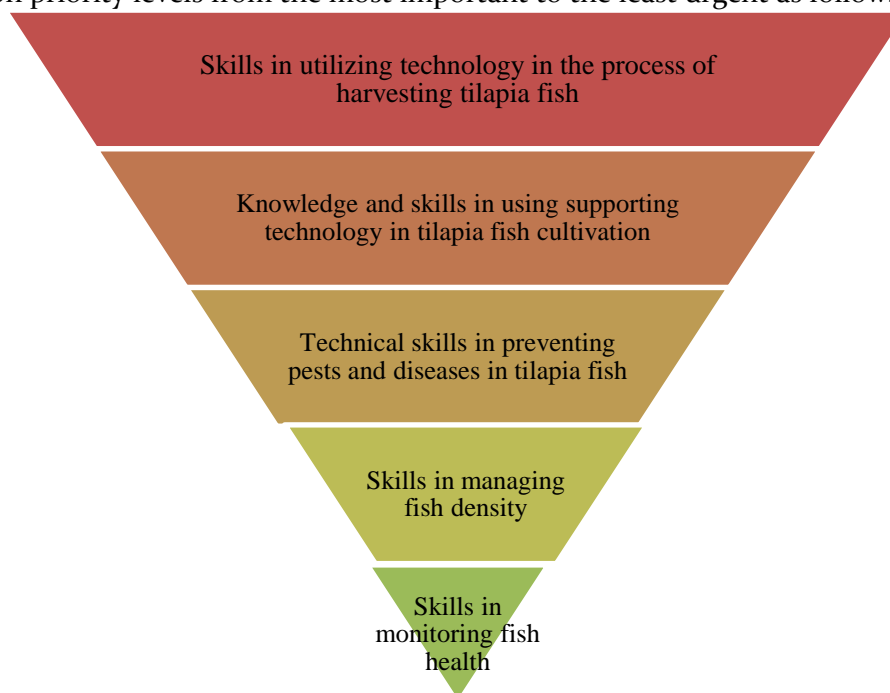

Figure 10 Priority Learning Needs of the Paropo I Village Community in Tilapia Fish Cultivation

The results of this learning needs analysis are expected to be the basis for designing extension, training, and mentoring programs that are more focused and based on the real needs of the community. In the design process, close collaboration with the Paropo I Village Government is expected to ensure that the programs prepared will be more targeted, effective, and able to improve the abilities and skills of the Paropo I Village community in sustainable tilapia fish farming activities.

CONCLUSION

Based on the results of research conducted on 28 cage owners in Paropo I village, Silahisabungan sub-district, Dairi district, the researcher drew the following conclusions:

1. The priority learning needs of the Paropo I village community, Silahisabungan sub-district in tilapia fish cultivation include skills in utilizing technology to support the efficient tilapia fish harvesting process, as well as knowledge and skills in using relevant supporting technology in the cultivation process. In addition, technical skills in preventing pests and diseases in fish are important needs to maintain sustainable production. The ability in fish maintenance management, including regulating fish density and monitoring fish health during the rearing period, is also a priority aspect in development for the tilapia fish farming community in Paropo 1 village, Silahisabungan sub-district.

2. Overall, the learning needs of the community are dominated by the need to learn technical skills, especially in the aspects of maintenance, enlargement, disease prevention, harvest time and harvesting techniques to increase the efficiency and success of tilapia fish cultivation and in the aspect of harvesting techniques where skills in utilizing technology to facilitate the process of harvesting tilapia fish (78.6%) are the learning needs in technical skills that are most needed by the people of Paropo I village, Silahisabungan sub-district in tilapia fish cultivation.

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