FISH FARMING FOR PEATLAND ECOSYSTEMS RESTORATION AND COMMUNITY LIVELIHOOD IMPROVEMENT

DIRECTORATE OF PEATLAND DEGRADATION CONTROL
DIRECTORATE GENERAL OF POLLUTION AND ENVIRONMENTAL DEGRADATION CONTROL
MINISTRY OF ENVIRONMENT AND FORESTRY OF THE REPUBLIC OF INDONESIA

FISH FARMING FOR PEATLAND ECOSYSTEMS RESTORATION AND COMMUNITY LIVELIHOOD IMPROVEMENT

DIRECTORATE OF PEATLAND DEGRADATION CONTROL
DIRECTORATE GENERAL OF POLLUTION AND ENVIRONMENTAL DEGRADATION CONTROL
MINISTRY OF ENVIRONMENT AND FORESTRY OF THE REPUBLIC OF INDONESIA

Fish Farming for Peatland Ecosystems Restoration and Community Livelihood Improvement

Editor in Chief:
Sigit Reliantoro

Managing Editor:
SPM Budisusanti

Writer:
Muhammad Askary
Heni Puji Astuti

Editor:
Haris Gunawan
Agus Suwendar
Delvano Haryad Akbar

Contributors:
Abul Haitsam, Budhi Anwar, Debby Yulfira, Makhruf Siregar, Asraf, Adina Dwi Rezanti, Yuli Purnamawati, Arum Kusumastuti, Tiara Nadhira Prasaja, Community group in Kerumutan Village, Sialang Dua Dahan Village, Rambaian Village, and Teluk Kabung Village.

Layout:
Arian Wicaksana

Published by:
Directorate of Peatland Degradation Control
Jl. DI. Panjaitan No. Kav. 24, Jakarta 13410 Indonesia
Phone : 021-8520886
Fax : 021-8580105
www.pkgppkl.menlhk.go.id

Appreciation and dedication:
Directorate of Peatland Degradation Control
Directorate General of Pollution and Environmental Degradation Control
Ministry of Environment and Forestry of The Republic of Indonesia

First edition: Jakarta, 2022

TABLE OF CONTENTS

GLOSSARY

Diversitas	The diversity of organisms showing several variations of species
Fire-spot	Fire-spot
GRDP	Gross Regional Domestic Product
Pemijahan	The process of releasing the eggs and sperm
Revitalization	Improving community's economy
SMPEI	Sustainable Management of Peatland Ecosystem in Indonesia
TK-PPEG	Peat Ecosystem Protection and Management Work Team
PFSU/UPR	People's Fish Seeds Unit
PED	People's Economy Development
PCADP	Production Central Area Development Program

PREFACE

Alhamdulillahi Rabbil 'Alamiin.

(Praise be to Allah, the Lord of the Universe). We thank Allah Subhaanahu wa Ta'ala (May He be praised and exalted) for His grace and mercy that the writing process of a book with the title: **Fish Farming for Peatland Ecosystemsa Restoration and Community Livelihood Improvement** was completed on time.

This book is part of the the Publication Series: **Sustainable Peat - Peatlands Survive, People Thrives**, which is a collection of best best practices in the implementation of Peatland Ecosystem Protection and Management activities. This book was compiled based on empirical experience in the field during the implementation of the Sustainable Management of Peatland Ecosystems in Indonesia (SMPEI) - Global Environment Facility- 5 (GEF 5) Project, Located in 14 villages in the Peatland Ecosystem Unit in the Peat Hydrological Unit (PHU) of the Kampar River - Gaung River and Gaung River- Batang Tuaka River, located in three district of Indragiri Hulu, Pelalawan, and Indragiri Hilir, Riau Province. References to various related publications have been included in this book to enrich the information provided.

Fish farming development program is one of the efforts to promote sustainable peatland management for enhancing community livelihood through community business activities. The challenge of fish farming has often been hampered by acidic water quality conditions, underdeveloped fish seed technology, and the community's lack of knowledge in selecting suitable species. Fish farming development will be part of the local community's income-generating activities as it will further develop into a new economic aspect. we hope this experience can be a lesson learned for the development of independent peatland villages in enhancing the welfare of local communities.

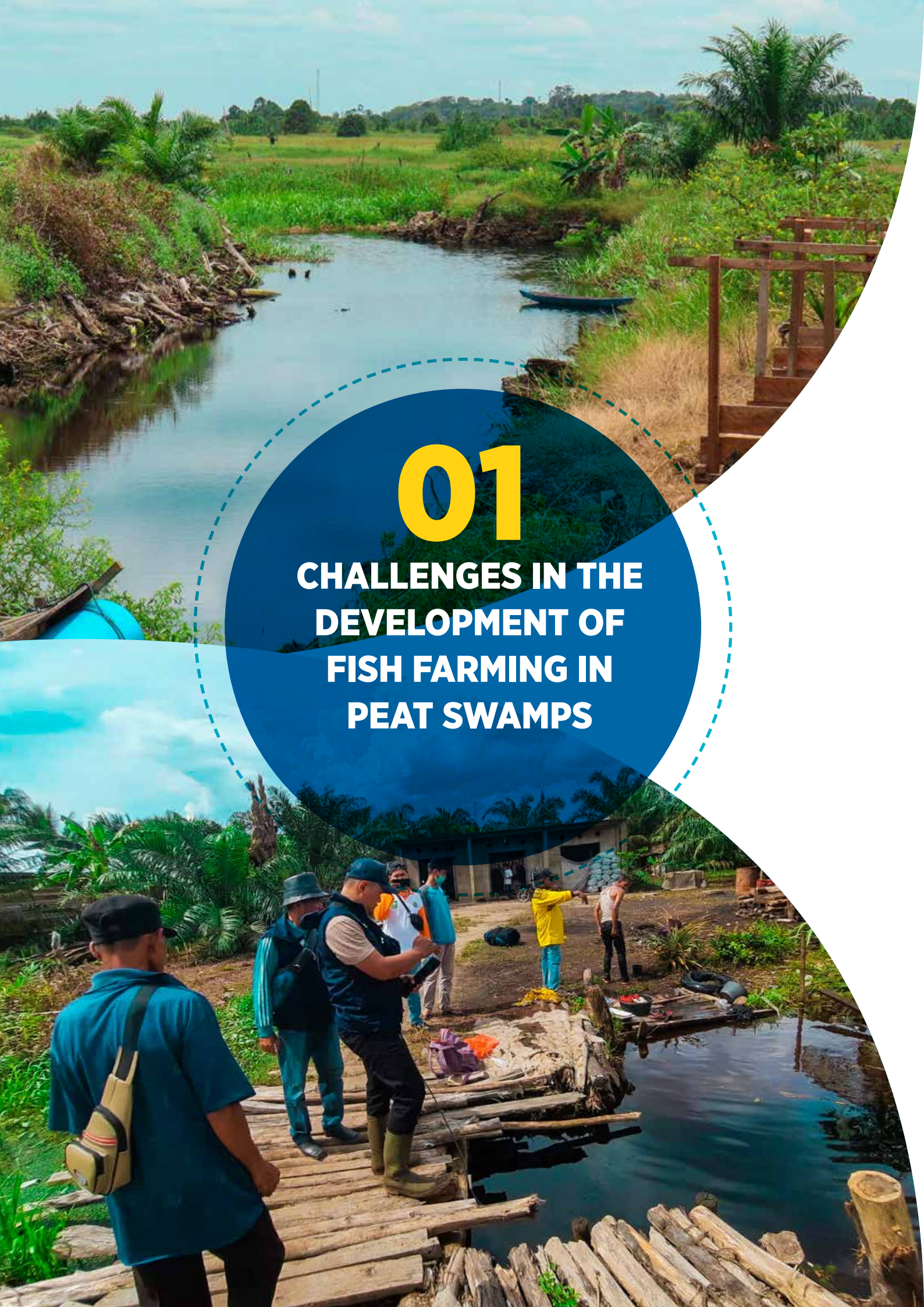
The Directorate of Peatland Degradation Control Directorate General of Pollution and Environmental Degradation Control, the Ministry of Environment and Forestry as the executing Agency and the International Fund for Agricultural Development (IFAD) as the Implementing Agency have established good cooperation and collaboration with various agencies and work units of the Regional Government (Environment and Forestry Service of Riau Province, Environment Agency (DLH) of Indragiri Hulu District, Pelalawan District, Indragiri Hilir District, Forest Management Unit-KPH, and other related agencies).

We thank all those who have provided suggestions, feedback and positive contributions during the preparation of this book, either directly or indirectly. This book is still open for suggestions and constructive input for further improvement.

Finally, we hope this book will provide benefits and insight for readers in protecting and managing peat ecosystems. **Caring for Peat – Growing Hope, Preserving Peat – Safeguarding Civilization**.
Jakarta, 2022

Ir. SPM Budisusanti, M.Sc.
Directorate of Peatland Degradation Control
Project Director SMPEI-GEF 5

LOCATION OF SMPEI PROJECT FISH FARMING



01

CHALLENGES IN THE DEVELOPMENT OF FISH FARMING IN PEAT SWAMPS

Indonesia is known to have high potential and opportunities in the fisheries sector because of its high biodiversity of fish species. Nearly ±8,500 fish species live in Indonesian waters. Indonesia has the third highest level of marine biodiversity in the world. In several regions, fisheries sector such as aquaculture has been a contributor to the GRDP (Gross Regional Domestic Product) in regional economic growth.

Some people opt to leave their fish ponds because of their limited knowledge and skills. They have not found appropriate strategy to optimize peat waters, such as hatchery process and fish growing system.

SMPEI Project Intervention began to respond to the challenges and constraints in fish farming that have been experienced by most of peat communities. The SMPEI Project's fish farming were developed in several villages in three districts, namely Pelalawan, Indragiri Hilir, and Indragiri Hulu.

Peat water ecosystems have the same prospects for the development of aquaculture as other waters. Unfortunately, this quite extensive peat water has not been utilized optimally, which become the biggest challenge for people living in peat areas.

Fish farming development often face some constrains such as acidic water quality, undeveloped seed technology, and lack of public knowledge in selecting suitable species for fish farming. The majority of people who have been in aquaculture activities are still dealing with these constraints.

This aquaculture development program is one of the efforts to promote sustainable peatland management for the life and welfare of local community through community business activities. One of the strategies introduced to the community to optimize peatland waters is to select local fish species that can adapt to the characteristics of peat waters.

Selecting the right and strategic farming location might have an impact in the success of developing aquaculture. The selection of locations should consider the following:

01

The location should be more than two meters deep with the aim that water would still be available during the dry season;

02

The location should be free from drought during dry season, and free from floods during rainy season;

03

The location should be close to burnt areas, this is related to monitoring efforts as well as patrol activity for fish farming cages and fire-spots;

04

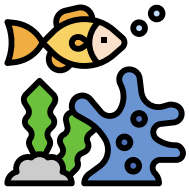
The location should be as close as possible to activities center that support fish farming operations, such as close to road infrastructure, close to access to markets so that harvested fish can be smoothly distributed to markets at good prices;

05

The location should be a place that is frequently visited to facilitate monitoring.

02

COMMUNITY CAPACITY BUILDING



Supporting the development of sustainable aquaculture on peatlands requires the transfer of knowledge and technology to the community as an initial effort to enhance the potential of peat fisheries. SMPEI Project provided opportunity for local communities to take part in fish farming development training. This technical training provides basic knowledge as an initial foundation to improve the community capacity in fish farming activities.

The target of this training is the TK-PPEG group (Work Team – Peat Ecosystem Protection and Management) and the community around peat area. Technical lessons include hatchery techniques, fish rearing, feeding, water quality maintenance, harvest and post-harvest processes. Collaborative management with the community through community empowerment and capacity building programs is important in achieving the success of peat ecosystem restoration program.

The empowerment approach to peat ecosystem restoration program carried out by the Directorate of Peat Degradation Control (PKG) through the SMPEI project has given a positive indication towards the peat community's self-sufficiency process. The aim of this fish farming program is in line with a revitalization program to improve people's welfare.

Hopefully, with fish farming peat community could optimize the use of peat water and gain additional economic benefits.

POTENTIAL FISH SPECIES IN PEAT ECOSYSTEM WATER

Generally, local fish in peat waters are dominated by fish species such as Gourami (*Osphronemus goramy*), Baung (*Mystus nemurus*), Tuakang (*Helostoma teminckii)*, Snakehead (*Channa striata*), Toman (*Channa micropeltes*), Betok/Papuyu (*Anabas testudineus*), lais (*Kryptopterus lais*) and Sepat siam (*Trichogaster pectolaris*) (Center for Research and Development of Freshwater Aquaculture, 2013). Other species, such as silver catfish (*Pangasianodon hypophthalmus*), gourami (*Osphronemus goramy*), tilapia (*Oreochromis niloticus*), catfish (*Clarias batrachus)* could also be introduced into peat waters provided they have high economic value for the community, are able to adapt to acidic water pH conditions, are easy to maintain and market, and have high market demand. The fish species most commonly selected by the TK-PPEG group in the SMPEI Project intervention villages were gourami, silver catfish, tilapia, toman, and catfish.

Carp species or often called giant gourami can indeed live and breed in all environmental conditions with an acidic pH ranging from 3-4 and with low oxygen conditions (dissolved O2 in water 3-5 mg/L). In terms of its economic value, this fish is one of the most widely consumed with a selling price can reach IDR 35,000/kg.

Silver Catfish is a production target from the Ministry of Maritime Affairs and Fisheries to increase fishery production. This species has the potential to be raised in peat waters because it is also resistant to acidic pH and has high body resistance to ammonia and other nitrogenous wastes. The price of this fish in the market can reach IDR 30,000/kg.

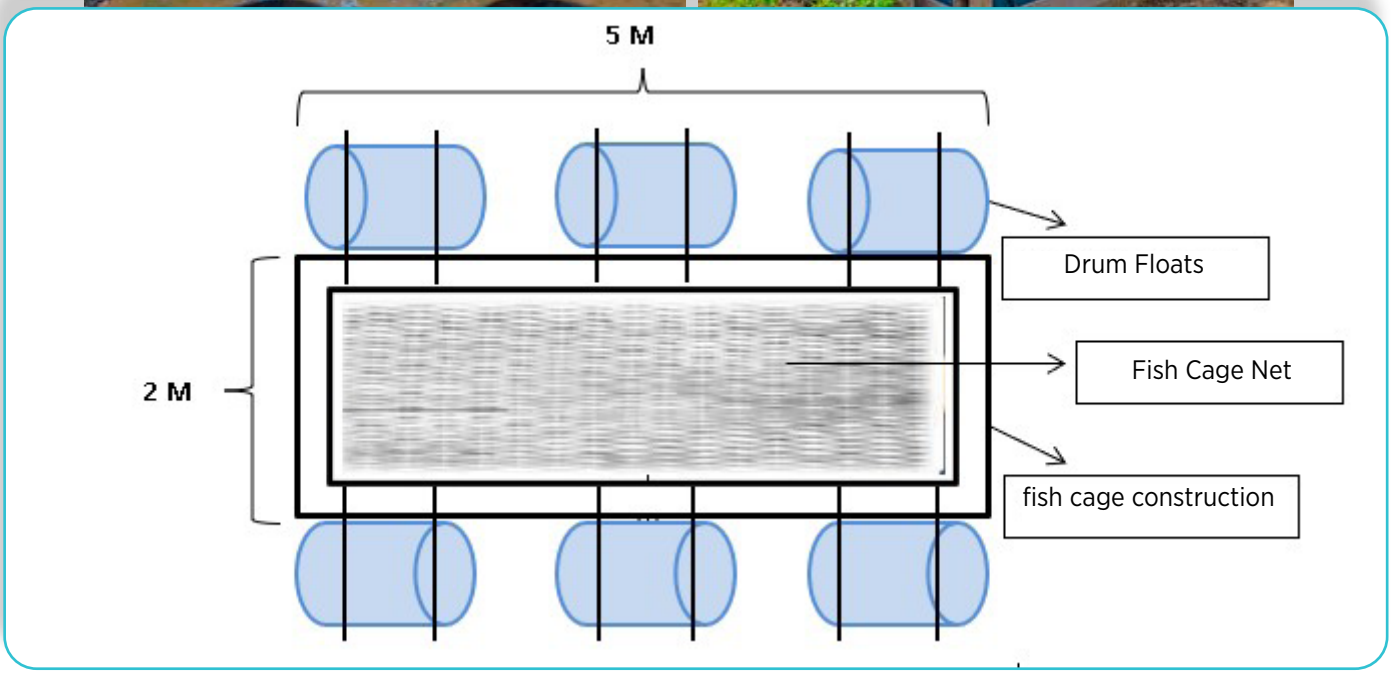
Tilapia has good prospects to be introduced and farmed in peat waters. The Tilapia is also one of the commodities of the Ministry of Maritime Affairs and Fisheries. The most recommended species of Tilapia is called BEST which is a result of breeding and it has been proven to be able to live and grow well and quickly even in a bad environment. The selling price of this fish in market ranges from IDR 18,000 – IDR 22,000/kg.

POTENTIAL FISH SPECIES IN PEAT ECOSYSTEM WATER

Toman or giant snakehead is a popular fish because of its soft texture, and is usually cooked in curry, soup or cured with salt. The body shape of this fish is similar to Cork species, except that the toman can grow larger, reaching a length of more than 1 meter. This fish can live in pH 3 and dissolved O2 of 3 mg/L water condition. The market price ranges from IDR 30,000/kg. Likewise, Cork is also popular because it has a high source of albumin which is good for healing post-surgical wounds or burns. Market prices can reach IDR 35,000/kg.

Catfish is another species that can be raised in peat water. In fish grow out process, this fish can grow to 100-150 gr in 2-3 months. Farming of this species in peat waters is very promising. It can live and grow at low pH (3-4) and at high ammonia levels (0.5-1 mg/L)

DEVELOPMENT MODEL OF SMPEI PROJECT FISH FARMING



As an effort to support fish farming activities, it requires fish rearing facilities for hatchery and grow out processes.

Floating net cages, earthen ponds and tarpaulin ponds are the types of facilities used by the SMPEI TK-PPEG Group for the development of fish farming businesses.

The floating net cage is an example of innovation in peat water fish farming, while the earthen and tarpaulin ponds were selected to utilize abandoned ponds which were left unutilized due to insufficient community management.

The frame for floating nets can be made of wooden board, bamboo or iron planks covered with nets and buoy (drums, Styrofoam, fiberglass). The frame and buoy work to hold the net open on water, while the net is used as a container for fish rearing.

The design and size of the cages in each region will usually be different because they are adjusted based on the seeds, the water area, and fish farmers' ability to provide floating net cages.

03

FLOATING NET CAGES IN GAJAH CANAL, KERUMUTAN VILLAGE, PELALAWAN

Fish farming in Kerumutan Village started to be developed and managed by the Lubuk Bungkuk Api Fishermen Group. Since joining the TK-PPEG group at the end of 2019, they are increasingly excited to revitalize their livelihoods in aquaculture sector. Not only that, as the name suggests, that this group is also active in protecting the area and will always be on alert from the danger of fire.

The location selected for the development of fish farming was a natural river adjacent to the Paludiculture Agroforestry demonstration plot. People often call it Gajah (Elephant) Canal. This canal has a depth of ± 3 meters, and never experience drought even in the dry season.

Floating net cages are the model selected by the Group for the development of fish farming in Kerumutan Village, Pelalawan District.

The cage construction is made using broti wooden board, drums, and two layers of nets on the inside of the cage. One floating cage is usually made with a size of 2 x 5 meters or other sizes according to needs. The nets used are made of polyethylene or trawl. The wooden frame was used because it is widely available locally and the price is quite affordable when compared to iron.

Pak Firman and TK-PPEG members are monitoring cages and fish growth

Since the initiation of fish farming activities with the support from SMPEI project, TK-PPEG has succeeded in developing 7 (seven) units of floating net cages with one of them being a cage made independently by the community.
Tk-PPEG group always saves some money from the harvest for operational and maintenance costs to make the activities sustainable. The cost for buying feed is quite high because in 1 month the group has to provide ± 60 kg of feed or approximately IDR 900,000/month.

The high price of feed became the Group's consideration to learn how to make supplementary feed from what was learned during the training. This way, hopefully it may reduce the operational cost for feed.

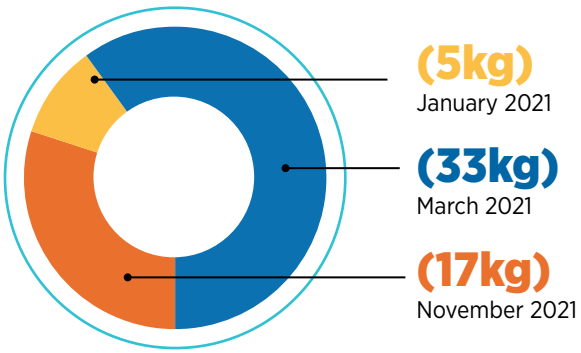
In order not to be washed away, cages are equipped with anchors attached to each corner or add hook ropes.

Initially, TK-PPEG group farmed many species of fish such as carp, silver catfish, and tilapia. Over time, TK-PPEG learned that carp was more suitable for farming in the conditions of their peat waters. Carp is a fast-growing fish, while tilapia and silver catfish are the opposite.

Based on monitoring of fish growth, tilapia and silver catfish species are more slowly growing fish. Many seeds of these species were found dead at the beginning of farming activities. According to local fish farmers, the pH of the waters was not suitable for these two species. For further trials, TK-PPEG started to raise Toman species.

Since the beginning of 2021, TK-PPEG Group has started harvesting Carp which reaches 53 kg, and 3 kg of Toman. Local community is very keen to buy fish directly from the floating cages.

Gourami Fish Harvest Results in 2020-2021 in Kerumutan Village



Total Gourami Fish sold in 2021
Rp. 3,445,000.00

The community continuously submits requests for assistance to several companies adjacent to Kerumutan Village. The effort started to show result as recently they received assistance of 1,500 kg of feed from companies around the fish farming location.

Firman, a fishermen's group concerned with fire

"We took care of the fish and protect the area from fire day and night. Our area was once on fire, and almost 250 ha were completely burned. For that reason, we are now here day and night to prevent our land from fire."

"At the beginning, we tried to put around 500 fish in one cage, and turned out to be too dense. We then split the fish into another cage. At that time, we were still beginners and tried to observe carefully. We found out that if we put large amount of fish, they will not grow well and can cause stunted growth. We then put only 350 fish in one cage and this worked better. After we practiced cage division, in 1 year we can harvest carp with 3 ounces weight."

"Carp like to consume leaves. Once a week we routinely give vegetables to the fish as supplementary feed. Usually we pick up leftover cabbage from market, and we managed to collect 5 sacks of cabbage. Apart from cabbage, we also collected water spinach, taro leave, and spinach for feed. Even though the vegetables will rot quickly, it will not make the fish sick"

"Fish weighing 5 ounces or more can be sold directly to community. Normally, we sold at IDR. 60,000/kg, and IDR 70,000/kg with delivery service. There are 6 people in our team who look after fish cages from morning to evening. If buyer called to buy fish, we could respond to it immediately."

"Until now we don't know about good quality seeds. Hopefully there will be more training on good seeds for fish farming in peat swamps. Next year we want to try Pomfret and Baung fish, and add more Carp and Toman seeds. All of these species consumed vegetables. Even though the price is a bit expensive, IDR 3,500/head which is only the size of 2 fingers, we are interested to try. It doesn't matter if only few fish in one cage. The fewer fish, probably can grow bigger in size. As for Baung, the seed are not available locally and need to buy in Pekanbaru or in Rengat because local breeders here only sell carp, catfish and tilapia seeds."

"In running this type of fish farming, do not give up easily. Even though it's not completely a failure, but we have succeeded in managing 60% of our cages. If in the future we are successful in raising more fish, we will be grateful, but if it fails, we will keep trying"

04

THE POTENTIAL OF SUNGAI RABIT VILLAGE TOWARDS FISH VILLAGE

In contrast to Kerumutan Village which develop fish farming directly on peat waters, the TK-PPEG group of Sungai Rabit – Indragiri Hilir District raise fish in earthen ponds which had existed prior to the SMPEI project intervention.

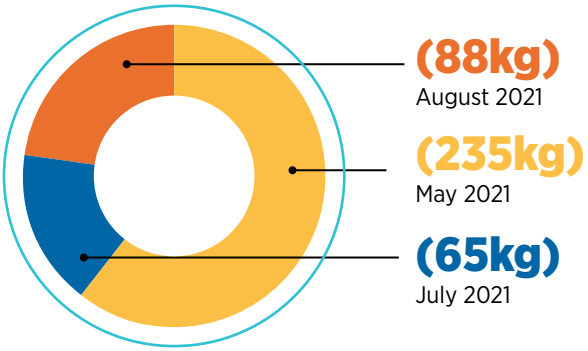
Actually, Sungai Rabit Village has the potential to become a Fish Village because of its conditions which is suitable for aquaculture development. In 2007, the Maritime and Fisheries Service Local Office provided a stimulant fish farming development program. Through this program, many people built fish ponds. Unfortunately, the program discontinued because the community felt their understanding of fish farming techniques was not adequate. Since then, many community fish ponds were left behind and abandoned.

SMPEI project succeeded in reviving community enthusiasm to reactivate fish farming in the Village. About 12 villagers who are members of TK-PPEG group started to refill the ponds with fish species of their choice.

"Pustina silver catfish" as they call this fish species. They have good reason why they prefer to farm this species. According to TK-PPEG in one year this species can grow up to 1 kg in weight. It suggests that this Pustina is superior comparing to other fish species. This consideration motivated the TK-PPEG group to make Sungai Rabit as a "Fish Village".
TK-PPEG has thought far ahead to achieve this goal. When they become suppliers, they also have plans to do sustainable harvests and maintain the availability of fish.

Silver Catfish can be harvested from the age of 7-8 months. In Sungai Rabit Village, this fish has been harvested since May 2022 with a total harvest of 388 kg. The marketing system is done based on needs. This means that regardless of consumer needs, TK-PPEG will continue to serve consumers. In the market, the price for Silver Catfish is cheaper, around IDR 18,000/kg. Somehow, people prefer to buy from the TK-PPEG group rather than having to go to the market. By spending IDR 25,000/kg, people can enjoy the delicious Pustina.

Silver catfish) Harvest Results in 2020-2021 in Sungai Rabit Village



The total Silver catfish *(Pangasianodon hypophthalmus)* sold in 2021 if converted to rupiah is around IDR 11,100,000.00". From these results, the group has not been able to calculate net profit because it is still used for operational costs such as buying feed and seeds, and a small portion is allocated to fill the group's cash.

According to TK-PPEG, this system is considered very profitable. Apart from being able to sell fish to consumers at a good price, on the other hand they can continue trials of harvesting Pustina until they reach 1 year old.

Fish consumption of people around this village is very high. Since TK-PPEG group sells fish, nowadays people are no longer worried if they want to consume fish. They can directly visit the Group basecamp to buy fish.

Based on previous experience, TK-PPEG continues to learn through trials in raising fish. Before releasing silver catfish into the main pond, the fish are allowed to adapt on a small net pond for approx. 1,5 to 2 months. This time duration they found out after conducting several trials. During this adaptation period, the fish can grow to the size of 3-5 human fingers, before being transferred to the large main pond.

The Group bought fish feed from Rengat-Indragiri Hulu at a higher price which can reach IDR 250,000/sack. In one month, they have to provide feed at least 4 sacks of pellets with a size of 25 kg/pellet. This high price of fish feed does not discourage the Group's enthusiasm to carry on farming activities.

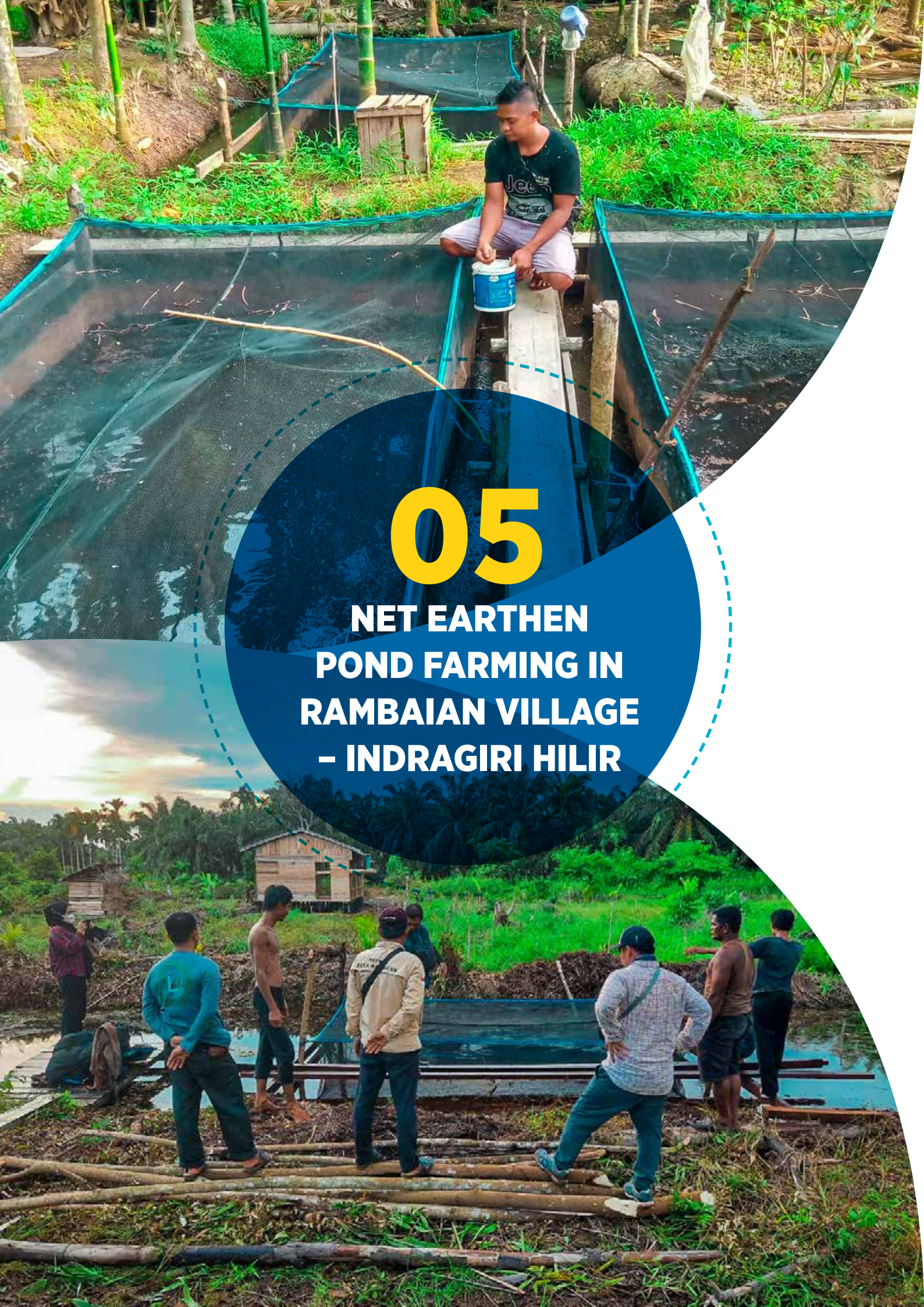
The high operational costs for feed are indeed one of the biggest challenges for TK-PPEG group. When feed prices are soaring, they always think of how to produce supplementary feed.

They already have feed producing equipment, but raw materials such as rice bran are very difficult to get. The Group is then motivated to look for alternative supplementary feeds to maintain the continuity of farming activity.

“We are testing to give supplementary feeds to catfish such as leftovers, rice and vegetables. The fish eat them, so from then on we continue doing it”.

“We don’t want to stop and give up just like that. We want to keep trying until we succeed to make our village a Fish Village. In the future we want to try other species such as carp and tilapia.”

Stated Mr. Sugito (TK-PPEG Member)



05

NET EARTHEN POND FARMING IN RAMBAIAN VILLAGE – INDRAGIRI HILIR

An interesting story of fish farming in Rambaian Village is when TK-PPEG group struggled to try out farming locations. Before finally deciding to use the net pond model, the group installed nets in the waters of Dusun Maju Jaya canal. Around 1,500 catfish seeds were spread in the canal with the hope that the fish would grow well.

This species was selected because they had farmed it previously in earthen ponds. The seeds are bought from the market which are then transferred to the canal as a farming location.

The group's expectations have yet to bear fruit. Most of the fish they spread died in the canal waters after 3 days. In contrast to the success farming in canal waters in Kerumutan Village, the Rambaian TK-PPEG group had to face the failure.

Apart from acidic canal water quality and the unstable pH of the water, the catfish selected does not come from local swamp. TK-PPEG also said that pre-cultivation handling such as preparation of fish seeds had not been done optimally.

The time duration to transfer fish to farming location would probably have an impact on the availability of oxygen for fish to survive. The longer the transferring time, the more vulnerable and weaker the fish will be when released into the main pond. The worst condition that may occur is mass death. Another constraint faced by communities and groups is the availability of fish seeds. Seed technology in the People's Seed Unit (UPR) has also not been optimally developed. Such conditions did not discourage the TK-PPEG group from trying their luck further.

The location of farming activities was then moved from canal to an earthen pond equipped with a net. The fish seeds used are not catfish, but silver catfish which have better resistance. Fish seeds are bought from fish wholesaler or from local village market.

Mulyadi, Rambaian Village Group (TK-PPEG)

"One of our motivations for farming fish is that we want to buy fish, not from wholesaler. The wholesaler get the fish from the district, sold in our village, and the price is obviously higher. Finally, we are motivated to build fish ponds in our own village so we don't buy from the wholesaler anymore."

"We made experiment farming in two locations, in canals and in community ponds. From the beginning we really eager to do a trial of fish farming in the canal. At first many doubted our idea, but ever since SMPEI program came to our village, they finally accepted our idea."

"In the initial stage, we carried out experiments in the canal by sowing catfish seeds. Apparently, the species of catfish that we bought in the market was not suitable to live in canal water. Many died. Currently, we continue the fish farming in the earthen pond in our yard which was equipped with fixed net cage."

"Although it has not been successful, we are sure that it will succeed in the future. The plan is after harvest, we will sell the fish to people around here, if there are buyers from outside the village, we are very open to serve. Next year we plan to add more silver catfish seeds, and will also be testing other species such as pomfret."

06

TARPAULIN FISH POND, TELUK KABUNG VILLAGE – INDRAGIRI HILIR

Similar to Sungai Rabit and Rambaian, TK-PPEG Group of Teluk Kabung Village also received training in fish farming.

Initially, fish farming activities in this Village were designed for canals, however, the location of the canals was quite far from community settlements, and TK-PPEG finally decided to farm in ponds instead.

The farming model used in addition to earthen ponds and fixed nets is a tarpaulin pond. The principle is almost the same as other ponds, the Group simply innovate by using tarpaulin as a substitute for fixed nets.

Tarpaulin ponds can be made wholly above the ground, or partially or wholly underground. If it is on the ground, then all or part of the tarpaulin pool wall is supported by a series of wood shaped like a fence. Conversely, if it is in the ground, then the tarpaulin pond wall will be supported by the excavated soil and by the excavated soil which functions as a dyke.

Make sure the tarpaulin is installed properly and neatly to avoid leaks. At each corner the tarpaulin can be folded to make it tighter. Outlet holes must also be made to control water level, ease routine maintenance and to remove water from the bottom of the dirty pond.

Silver catfish is the fish species selected by the TK-PPEG group. Although it has not yet been fully harvested, some fish have grown well, weighing up to 2.5 – 3 ounces per fish.

There are at least 7 (seven) tarpaulin ponds developed by SMPEI project for the TK-PPEG group. Nearly 6,000 fish seeds were spread evenly for the seven ponds. The group routinely monitors the weight and length of the fish.

07

ECONOMIC REVITALIZATION THROUGH FLOATING CAGES SIALANG DUA DAHAN VILLAGE – INDRAGIRI HULU

Fish cages in Sialang Dua Dahan Village are placed on the river for easy monitoring by TK-PPEG group as it is close to people settlements.

The first trial cage construction was a floating cage unit with a cube-like design. The construction was done on land, when it's done TK-PPEG transferred it to river waters. In one cage unit, the group starts the farming process from sowing the seeds to raising silver catfish. The first seed sowing was carried out at the end of 2019 with approximately 200 seeds.

The group then added tilapia as the next trial. After 8 (eight) months since the sowing of the seeds, the group has started to see the result.

River tides is another constraint faced by the TK-PPEG group in fish farming. If the water is high, the group will pull the cages closer to river bank to prevent the cages from being washed away by the swift current.

According to the group, the cage construction in the first trial was complicated and not practical. It requires the group to move from land to river waters.

In early 2022, the group developed and modified the construction of fish cages with an elongated design. For the community, this kind of cage model is more practical because all construction is done directly at the river including the installation of nets.

Local people who need to buy fish will usually come to visit the cages. From nursery to harvest, around 80 seeds or the equivalent of 40 kg have been sold. The selling price offered by the group for silver catfish is IDR 18,000. Fish that have not been sold are then reared back into the cages.

TK-PPEG group that manages fish farming both in Sialang Dua Dahan Village and in other villages has joined the Collective Business Group (KUB). This group attempted to obtain KUSUKA (Marine and Fisheries Business Actor Card). KUSUKA is the professional identity of fishery business actors that can provide easy access to People's Business Credit (KUR) financing, insurance for business actors, as well as online transactions.

This fish farming business activity is slowly starting to have a positive impact from an economic perspective, such as increasing income. The hope is that in future not only the TK-PPEG group, but also the whole community can contribute to PPEG and gradually become an economically independent society.

Irhas, Sialang Dua Dahan Village Group (TK-PPEG)

"The fishery potential in our area is very promising. In the past, the community used to raise fish." "We chose to farm fish such as silver catfish and tilapia, as they are easy to care for and grow fast. In 1 cage measuring 2x3 meters we fill it with 200 fish seeds. We observed and it turned out that tilapia are much better raised in the river than silver catfish. However, we still maintain both species to this day. Tilapia can be harvested starting at the age of 4 months, for silver catfish it can be harvested at least after 6 months. We always provide pelleted feed and have never tried feeding the fish with vegetables"

"As for marketing it is very easy, local residents who know that we will harvest fish, they will come to the cage location. Apart from local residents, fish collectors also come to buy. Fish price during harvest, will be adjusted to market price. The average price for tilapia is IDR 35,000/kg and for silver catfish is IDR 20,000. We plan to collaborate with BUMDes to invite more people to participate in fish farming activities, to help and also to increase the community's economy."

07

ALTERNATIVE FOR FISH FEED PRODUCTION BY TK-PPEG GROUP

Feed is an important part in the development of fish farming activities. Fish feed provision takes around 70% of production costs.

Fish need feed in sufficient quantities, continuously available, and of a good quality that can support fish growth and development.

Less feed stock is often experienced by the TK-PPEG group so they have to think hard to be sustainable.

Even though they already have equipment for producing feed provided by other agency, the problem lies in the group's limitations in operating the equipment and the availability of raw materials which usually expensive. The introduction of alternative supplementary feed is urgently needed to overcome this problem.

The community capacity building program through training in producing feed is one of the efforts to increase group knowledge.

Any raw material can be used as fish feed ingredient, provided it has sufficient nutritional content.

During the training, the group was taught to make supplementary feed using raw materials of anchovies' head, bran, tofu dregs and flour with a ratio of 3:3:3:1 respectively. The results of the mixture with this ratio can produce around 10-11 kg of fish pellets which can be used for 3 days of feeding.

Artificial feed is made from various kinds of raw materials, both vegetable and animal, by taking into account the nutritional content, nature and size of the fish. The nutritional composition of raw materials contained in feed will vary depending on nutritional needs, as well as the ease in obtaining raw materials (relatively affordable prices, easy to process, and easy to get). The size of these self-made pellets will be adjusted to the size of fish's mouth opening.

The nutritional content of the mixed ingredients should at least contain carbohydrates, proteins, fats, vitamins and mineral sources. These ingredients will affect the growth of fish. Sources of carbohydrates and vitamins include bran, corn flour, soybean meal/soy sauce dregs, tofu dregs, sago flour, and wheat flour. Sources of protein and minerals include fish meal, shrimp head meal, snail meal, and crushed bones.

The TK-PPEG group of Sialang Dua Dahan Village, Indragiri Hulu District is currently making supplementary fish feed using feed tools. This way, they have slowly been able to reduce feed operational costs which often soar.

Steps in making fish feed by using specialized tools:

- Refining raw materials into flour
- In order for the raw materials to be mixed evenly in the milling process, materials that have a hard texture must first be refined. Refining can use milling tools, filters, or mashed process.
- Mixing raw materials into dough and adding water
- After mixing, a dough is formed into different shapes by using a grinder
- Drying wet pellets for ± 2-3 days depending on the weather to prevent pellets from getting moldy.

If the main raw materials mentioned above are difficult to get, research suggests that instant noodles can also be used. The content in it already contains wheat flour, oil, tapioca and also sago; the content of amino acids, carbohydrates, and protein is also not much different from the amino acids in wheat flour. Apart from instant noodles, cassava leaves flour and bread waste, can also substitute for other main ingredients.

KOTO MASJID VILLAGE ACHIEVES SUCCESS IN FISH FARMING: LESSON LEARNED

Kampar District, Riau Province is an example of a success story in the development of fish farming in Riau.

In this one district there are at least three villages that are “crowned” as fishing villages. Starting from Kampung Jelawat in Ranah Village, Kampar District, followed by Koto Mesjid Village, XIII Koto Kampar District, was recognized as Silver Catfish Village, and lastly Hang Tuah Village, Kampar is now being called Catfish Village. Of the three villages, Koto Mesjid Village is worthy of being a model for other villages.

Starting from a desperation and waning of life expectancy because their rubber plantation did not grow as expected.

The Riau Fisheries Service, together with the support of BAPPEDA and other stakeholders, succeeded in engaging the community in activities to develop fish farming in Koto Mesjid Village.

The initial step at that time was to provide knowledge and encourage the community to farm fish. Around 30-40 residents of Koto Masjid participated in a learning process through visits to several locations that have successfully developed aquaculture in West Sumatra Province.

They gained direct experience regarding fish rearing techniques in Payakumbuh; and regarding fish spawning and fish farming in irrigation canals in Sariban, Solok.

By observing the locations they visited, they were determined to make a rain-fed pond in their yard as a location for fish farming.

Their motto is no house without a pond, no pond without silver catfish. Nowadays, they have reached their success and independence, through several gradual process. Continuous coaching and mentoring are the formula for achieving the success of Koto Masjid Village.

The village community also implemented Community Economic Development (PEK), as well as the Production Central Area (KSP) Development Program. Currently, Koto Mesjid Village has been producing 6-7 tons of silver catfish per day and 3 tons of smoked fish every week. In terms of marketing, they are able to get and develop markets, through the "rotating harvest" method. In early 2000, fresh silver catfish and smoked fish have penetrated markets in all provinces of Sumatra. An extraordinary achievement, which deserves to be recognized as a pilot project with possible expansion. There is also a possibility to open an export market in the future.

The community's commitment has produced glorious results. In addition to become skilled at upstream fish farming, they have also been able to develop post-harvest products and other innovations. Nowadays, Riau Province is starting to become independent in terms of meeting the needs for fish, which were previously imported from neighboring provinces. Koto Masjid Village continues to improve, develop, and open up the widest possible collaborations. Collaborations that have been carried out such as capital SKIM, Digital Villages, and Tourism Villages. To achieve success, collaboration and mutual cooperation with various parties are essential, however, the most important thing is strong determination of the local community. Providing as many opportunities as possible to the community, will create extraordinary local figures who were able to become drivers of change in their village.

Suhaimi and other driving figures, through the support of the Riau Fisheries Service, the Kampar District Government, and the Ministry of Marine Affairs and Fisheries (KKP) were able to transform Koto Masjid into a center for fostering fish cultivators. Their simple concept is that farmers learn from farmers. This learning method will be able to help groups of enthusiastic fish farmer who have strong determination to continue learning.

Koto Masjid is now used as a place for Increasing the Capability and Capacity of Marine and Fisheries Human Resources (PSDMKKP). Their rubber plantation area has now turned into fish ponds that is no longer just a rain-fed pond. They are determined and excited to jointly achieve success in fish farming business. Learning the success of the Koto Masjid community, will certainly be a learning experience for communities in the SMPEI intervention village.

The key to successful economic development in a region, especially peat areas, is being able to take advantage of all available potential natural resources and with the applied technology can utilize this potential to improve the welfare of the people. Its implementation should involve and embrace all elements of society and invite other community institutions to contribute. Limited Human Resources knowledge can be continuously improved through mentoring and interactive communication to change attitudes and behavior to be more encouraging and contributive.

In the future it is hoped that the SMPEI intervention villages will become pilot projects for the development of aquaculture and can also be known as Fish villages. Provision of seeds is very important in facilitating fish rearing, thus the founding of People's Seeds Unit (UPR) would be essential. The fish village will be a place for the integration of fish farming businesses at the SMPEI Project site.

The development of a fish village in SMPEI village is expected to have a positive impact on people's income. The concept of development is not only focused on fisheries, but the tourism sector such as Edu tourism or learning/training facilities for many people. This will certainly be a business opportunity for the TK-PPEG group in the intervention villages.

An important learning point from fish farming in peat areas is that the community indirectly contributes to PPEG by not encroaching on forest areas in peat ecosystems. Fish farming in peat areas is carried out as an effort to revitalize people's livelihoods and also to reduce forest and land fires.

TESTIMONY

Testimonial on the Development of Fish Farming in the GEF-5 SMPEI Project by the Department of Fisheries and the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia.

Fish farming, especially in peatland ecosystems, has been a long-standing concern of the Marine and Fisheries Agency in Indragiri Hilir Regency. Sungai Rabit Village is one of the villages that have the potential for the development of fish farming. This village had previously received a program for the development of fish farming, but at that time it was still constrained by the availability of development funds. The evidence that Sungai Rabit Village has the potential to develop fish farming can be seen from the high enthusiasm of the community, and the feed-making machines that are already available.

In the future, Sungai Rabit Village will be pursued by the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia to become a Fish Village characterized by silver catfish.

The Marine and Fisheries Agency-Indragiri Hilir Regency, 2021

The development of fisheries in inland waters in Pelalawan Regency is time to be developed. Many potential inland water fisheries have not been handled, especially local fish such as Tuakang (*Helostoma teminckii*), sepat (*Trichogaster*), gabus *(Channa striata)*, and other ornamental fish. So far, pesut fish *(Orcaella brevirostris),* which lives in the freshwater of the Mahakam River, has also been found in the Kampar River and Kampar Kiri River. this means that Pesut fish also has the potential to be developed here.

Fisheries Agency-Pelalawan Regency, 2021

Indragiri Hulu Regency has a high potential for the development of silver catfish farming. The development will continue to be carried out by utilizing the flow of the Indragiri River. Currently, the community through the SMPEI GEF-5 project has successfully developed silver catfish *(Pangasianodon hypophthalmus)* and tilapia *(Oreochromis niloticus)* in floating net cages. We hope this fish farming can be sustainable in the future.

Agriculture and Fisheries Service-Indragiri Hulu Regency, 2021

Director General of Aquaculture, Dr. TB. Haeru Rahayu, A.Pi., M.Sc (wearing a white shirt) gave encouragement to the Environment and Forestry Agency of Riau Province to develop fish farming. The encouragement to develop fisheries in Riau is in line with their priority program for fish farming, namely “Development of Fishery Villages”.

The Ministry of Marine Affairs and Fisheries of the Republic of Indonesia, 2022

BIBLIOGRAPHY

Balai Penelitian dan Pengembangan Budidaya Air Tawar. 2013. *Peningkatan Produktivitas Budidaya Ikan Di Lahan Gambut*. Media Akuakultur. Vol. 8. No. 1

Balai Penelitian Pertanian Lahan Rawa. 2020. *Budidaya Ikan Di Lahan Rawa Pasang Surut.* Balai Penelitian dan Pengembangan Pertanian Kalimantan Selatan. ISBN: 978-623-95970-0-9

Badan Riset dan Sumber Daya Manusia, Kementerian Kelautan dan Perikanan. 2021. *Telaah Akademik Model Pengembangan Kampung Ikan dalam Mendukung Kesejahteraan Di Pedesaan".* AMaFRaD Press. ISBN : 978-623-7651-76-5

Balai Riset Budidaya Ikan Hias. *2011. Berbagai Alternatif Bahan Baku Lokasl Untuk Pakan Ikan.* Media Akuakultur. Volume 6. No 1

Badan Restorasi Gambut dan Pusat Studi Bencana LPPM. 2018. *Pengembangan Model Penggunaan Lahan Gambut Ramah Lingkungan dan Layak Secara Ekonomi Di KHG Pulau Tebing Tinggi, Kabupaten Kepulauan Meranti, Provinsi Riau (Laporan Pilot Restorasi Gambut Terintegrasi).* Universitas Riau. Riau

Direktorat Jenderal Pengendalian Pencemaran dan Kerusakan Lingkungan. 2018. *Rencana Perlindungan dan Pengelolaan Ekosistem Gambut Nasional (RPPEGN) Tahun 2018-2047.* Kementerian Lingkungan Hidup dan Kehutanan

Direktorat Jenderal Perikanan Budidaya. 2018. *Pembuatan Pakan Ikan Mandiri.* Kementerian Kelautan dan Perikanan. Jakarta Pusat

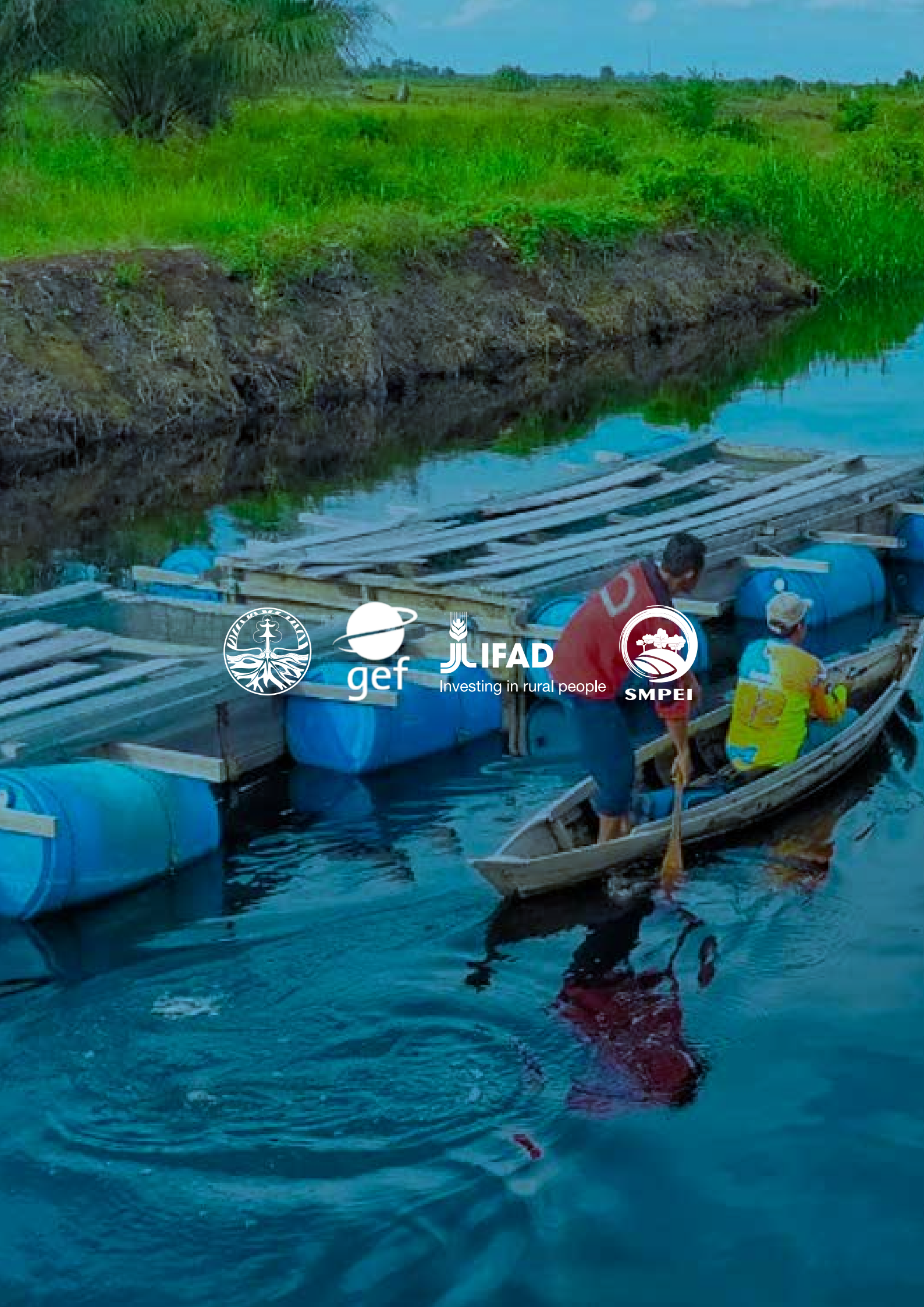
I. R. Sary dan L. Lisnawati. 2019. *Modul: Membuat Pakan Buatan PRK.CF.02.013.01. Direktorat Jenderal Guru dan Tenaga Kependidikan.* Kementerian Pendidikan dan Kebudayaan

Junius Akbar. 2014. *Potensi dan Tantangan Budidaya Ikan Rawa (Ikan Hitaman dan Ikan Putihan) Di Kalimantan Selatan.* Unlam Press Banjarmasin. ISBN 978-979-7314-01-4

Kedeputian Penelitian dan Pengembangan. 2020. *Jelajah Kerja Riset dan Pengembangan Restorasi Gambut.* Badan Restorasi Gambut Republik Indonesia. Jakarta

Peraturan Menteri Kelautan dan Perikanan Republik Indonesia Nomor 6/PERMEN-KP/2020 Tentang Penyelenggaraan Kesejahteraan Ikan Pada Ikan Budidaya

Trijoko dan Pranoto, F.S. 2006. Keanekaragaman jenis ikan di sepanjang aliran Sungai Opak Daerah Istimewa Yogyakarta. Prosiding Seminar Nasional Ikan IV. 293-300


gef
IFAD
Investing in rural people
SMPEI


gef
IFAD
Investing in rural people
SMPEI

DIRECTORATE OF PEATLAND DEGRADATION CONTROL
DIRECTORATE GENERAL OF POLLUTION AND ENVIRONMENTAL DEGRADATION CONTROL
MINISTRY OF ENVIRONMENT AND FORESTRY OF THE REPUBLIC OF INDONESIA

Jalan D.I. Panjaitan Kav. 24, Kebon Nanas, Jakarta Timur
Gedung B, Lantai 3 – Indonesia 13410

Phone & Fax
Phone : 021-8520886
Fax : 021-8580105

Online
Website : pkgppkl.menlhk.go.id
Email : ditgambut.klhk@gmail.com