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Research Paper

Farmers' Interest and Economics Model of Agrosilvofishery Restoration on Degraded Peatland in OKI Regency South Sumatra Indonesia

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Abstract
Restoration of degraded peatlands requires sustainable efforts to protect the existing ecosystem. One of the restoration efforts was the application agrosilvofishery model with 3R (Rewetting, Revegetation and Revitalization) on peatlands. The research objective was to examine the economic value of application agrosilvofishery model on peatlands with a combination of jelutong, chilies and catfish. The research method used purposive sampling method where research location was selected in OKI Regency, South Sumatra. The sample of research was 10 who has their own degraded peatlands, then empowerment them to cultivate peatlands, to obtain the optimal benefits. It was selected based on quota in action research. Farmers selected forest and fruit plants to plant on peat based on their interests. In economic study, the acceptance value was obtained from the agrosilvofishery model, namely jelutong Rp. 716,473,469/m^3/30 years, jelutong sap 2,782,080,000/kg/30 years, chilies received Rp. 40,000,000/year, and the average income for catfish was Rp. 1,836,000,000/year. Sensitivity analysis of jelutong-chili-catfish agrosilvofishery obtained an NPV of Rp. 13,413,797,049, IRR (+) 60%, Net B/C 7.1, Gross B/C 3.7, and PP 0.01/year. From the results of this study, farming on peatland with the agrosilvofishery model was feasible. The development strategy by using the business canvas model agrosilvofishery provided an overview of peatlands sustainability in future. Further, this research provided an illustration that to provide for a decent life, farmers need to think about short-, medium- and long-term businesses.

Keywords
Agrosilvofishery, Chili, Jelutung, Catfish, Canvas Business

1. INTRODUCTION

Indonesia has made several important commitments to the protection and restoration of peatlands (Dockendorff et al., 2022; Harrison et al., 2020; Wicaksono and Zainal, 2022). Such as peatland protection regulations in ecosystem management (Schaafsma et al., 2017) flora and fauna (Wasis et al., 2019). Peatland was defined as organic material that forms naturally from decomposed plant remains (Łachacz et al., 2023; Wachendorf et al., 2023). Peat was very fragile, so if it was damaged, it was very difficult to return it to its original state, while the rate of destruction of forests and peatlands continues to increase (Temmink et al., 2023; Triadi, 2020). Almost all of the peatlands managed to became agricultural land were degraded due to drainage channels that cause drought, flammability, flooding when it rains, increased CO2 and the selection of commodities that were not suitable for peatland conditions (Fatimah et al., 2023; Kamal and Dwi, 2023; Makrickas et al., 2023; Triadi, 2020). Efforts must be made to restore degraded peatlands to restore their ecosystem function, one of which is through a peatland restoration program (Hidayat et al., 2023; Humpenöder et al., 2020; Ikkala et al., 2021; Łachacz et al., 2023; Uda et al., 2020; Wilcove et al., 2013). Accelerating the restoration of areas and the restoration of hydrological use of peat due to forest and land fires in an appropriate, systematic, planned, Integrated and equitable manner (Indrajaya et al., 2022; Yuwati et al., 2021). The peat restoration activity was carried out using the 3R approach, namely rewetting peatlands, revegetating areas of burnt and abandoned peatlands and the principle of revitalizing the livelihoods of local communities (Giesen et al., 2018; Triraganon, 2023; Yuliani, 2023). This program aims to strengthen law enforcement at the community level and empower communities by diversifying economic businesses, according to the potential of each village area (Budiman et al., 2020; Terzano et al., 20

C.E.; Yanuarti et al., 2019; Sofiyuddin et al., 2021). Recognizing the importance of peatlands at the global, regional and national levels can overcome climate change, protect biodiversity, the environment, and contribute to the socio-economic welfare of the community (Suwarno et al., 2018; Indrajaya et al., 2022).

Sustainable management of peatlands in order to strengthen social and economic aspects of communities on peatlands. Knowledge and low of community participation about the concept of sustainable peatland development, so that social activities and jelutong on peatland to community need to be an important concern. Sustainable peatland development according to a study by Masganti et al., stated that on this land farmers cultivate food crops and horticulture with relatively low productivity. Even though, dormant peatlands can still add to the finances of farmers who had their own peatlands if they managed it properly. Peatlands in Ogan Komering Ilir (OKI) Regency, South Sumatra Province are degraded peatlands that have experienced a decline in hydrological, production and ecological functions. Peatland damage was caused by the activities of farmers who clear land by burning land. This results in the worsening condition of peatlands with physical, chemical and biological properties that are flammable, can reduce productivity and cause the surrounding area to be unproductive (Yang et al., 2023). The people in OKI Regency had long time used wood from trees covering peatlands and had practiced 'sonor' shifting cultivation in planting jelutong, chillies and catfish. However, OKI Regency was one of locations in South Sumatra Province which was suspected of being a source of hotspots which caused peatland fires.

The number of land and forest fires In South Sumatra reached 128,314 hectares (Nurhayati et al., 2020). The burned lands were spread over three districts, namely Ogan Komering Ilir, Musi Banyuasin and Ogan Ilir. For humans, forest and peatland fires have a direct effect, such as reduced land for the livelihood of farmers who still rely on income from nature (farming, livestock farming, hunting, fishing and so on) (Harrison et al., 2020; Ulya et al., 2021; Wildayana, 2017; Yeny et al., 2022). Furthermore, various studies on degraded peatlands in OKI District had carried out looking at opportunities and challenges (Lestari et al., 2021), alternative livelihoods for the community (Ulya et al., 2021), stabilizing the global climate with net ecosystem exchange (Sencaki et al., 2020), carbon stocks (Martono and Gandharum, 2018), economic valuation of fire losses on peatlands (Franzisca, 2023), the severity of ecosystem fires on peatlands (Syaufina et al., 2022) farmers' interest in agricultural systems and the sustainability of peatlands (Surahman et al., 2018). Peatland degradation needs proper handling, one of which was the Agrosilvofishery model and a combination of adaptive commodities on peatlands (Ekawati et al., 2021; Kristiadi and Y., 2015; Winarno et al., 2022; Yuwati et al., 2021). There were many studies that had carried out but those that examine the interest of farmers and the economic model of agrosilvofishery with a combination of commodities were still lacking. Therefore, this study aims to measure the interest of farmers and study the economics of the agrosilvofishery model of a combination of forest plants, fruit trees and fish so that it could support the economy of the community cultivating on peatlands. Farmers' interests are seen from the commodities selected from a combination of short, medium and long term prospects. The types of commodities such as a combination of jelutong plants which were forest plants with a harvest period of more than 10 years which was a long term prospect, and chilli plants with a production of approximately 1 year which is a medium term and catfish can be harvested in 3-4 months and catfish livestock is a short term prospect.

2. EXPERIMENTAL SECTION

This research was conducted in Ogan Komering Ilir (OKI) Regency, South Sumatra. Determining the location of this research was carried out purposively, with the consideration that OKI Regency had the largest degraded peatland, namely 1,687,348 ha. The village that was carrying out peatland restoration by developing the Agrosilvofishery model was Perigi Village, Pangkalan Lampam District, Ogan Komering Ilir Regency. The method used in this research is survey method. According to Abdelrahman et al. (2023); Zhou et al. (2023) the survey method is a research method carried out by taking samples from the population using questionnaires as a tool to obtain data in the form of a list of questions for data completeness in the research process and direct interviews with farmers and stakeholders who have implemented the Agrosilvofishery model.

The sampling method used in this study used a purposive sampling method. Based on the LoA from CIFOR, since 2018 CoE Place UNSRI has been conducting action research on degraded peatland restoration using a climate-smart agrosilvofishery approach in Perigi Village, Pangkalan Lampam District, Ogan Komering Ilir District, South Sumatra. The activities carried out had shown a positive impact. From previous project activities it can be concluded that the application of the agrosilvofishery system has a positive impact not only on improving land agro-ecosystems but also being able to avoid fires and increase income and increase people's food sources. UNSRI and CIFOR had agreed to continue the collaboration by monitoring and improving the existing plots and expanding an additional 10 ha around the peatland. This research is related to the establishment of a new agrosylvofishery plot of 10 ha based on the design/model chosen by the farmer. Eleven cultivators had shown interest in utilizing their land (total 11 hectares) for use in implementing agrosilvofishery systems. Several models of agrosilvofishery had been designed on the land of farmers who were willing to cooperate. The 11 farmers involved have shown their seriousness by choosing

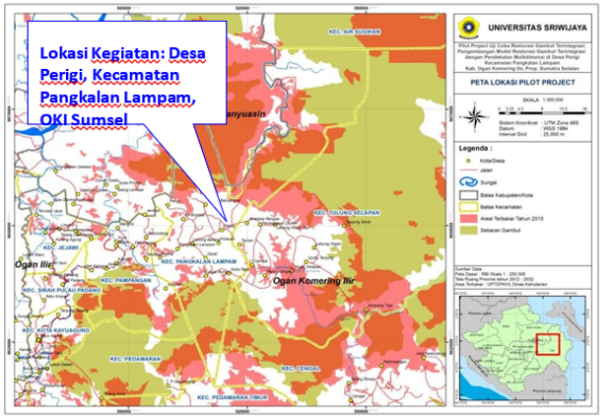


Figure 1. Map of the location of restoration activities in Perigi Village, Pangkalan Lampam District, Ogan Komering Ilir District, South Sumatra Province. Source: Suwignyo et al., (2017)

Figure 2. Plants and Fisheries at the Pilot Project Location of Trying Agrosilvofishery-based Integration Restoration in OKI District

forest trees and fruit trees to plant on their land.

In obtaining information about farmers' perceptions, namely by conducting FGDs (Focus Group Discussions) with involved farmers, the results obtained in the field were processed in tabulations and descriptions in a descriptive manner, namely presenting the results in the form of systematic descriptions in the discussion. According to Rozaki et al. (2022); Yang et al. (2020), the results of the study were made into averages and percentages and also formulated using descriptive analysis used to provide strategic input in managing the risk of forest and peatland fires according to the farmers' interests. As for responding to the efforts made by the Peat Restoration Agency (BRG) for activities, namely economic studies and peatland restoration in Ogan Komering Ilir Regency with a qualitative description. To be able to calculate the Net Present Value (NPV), the difference

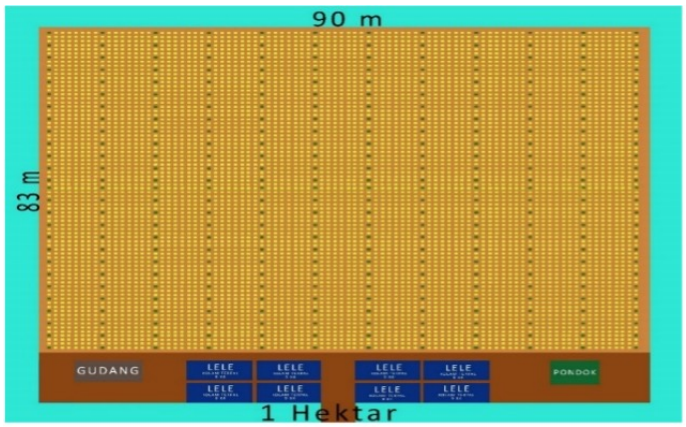


Figure 3. Agrosilvofishery Land in OKI Regency

between income and costs is required.

$$NPV = \sum_{t=1}^{n} \frac{B_t - C_t}{(1+i)^t}$$

Information:
- B_t = benefits in year t
- C_t = costs in the year t
- t = year of business activity
- i = discount rate

According to de Jong et al. (2021); Glenk and Martin-Ortega (2018); Juutinen et al. (2021), NPV can also be referred to as the accumulated discount rate present value (PV) of net profits or the amount of present value of net profits resulting from the project year running.

To find out the size of the IRR, experiments were carried out using several different discount rates to produce an NPV close to zero. If the experimental results show a negative NPV, it means that the discount rate (i) was too high, so that in the future to get the benefit value was too long because PV Cost to be greater than the PV Benefit. If the experimental results produce a positive NPV, it means that the value of the discount rate (i) was too low, so that in the future the benefits are too heavy to be equated with the PV costs. Then the experimental results were entered into the IRR formula as follows:

$$IRR = i_1 + \left(\frac{NPV_1}{NPV_1 - NPV_2} \right) \times (i_2 - i_1)$$

Information:
- i_1 = discount rate which results in a positive NPV
- i_2 = discount rate which results in negative NPV
- NPV_1 = positive NPV value
- NPV_2 = negative NPV value

Net benefit-cost ratio is a comparison of benefits divided by costs with the following formula:

$$\text{Net}\frac{B}{C} = \frac{\sum_{t=1}^{n} \frac{B_t - C_t}{(1+i)^t}}{\sum_{t=1}^{n} \frac{B_t}{(1+i)^t} - \sum_{t=1}^{n} \frac{C_t}{(1+i)^t}}$$

Information:
- B_t = benefits in year t
- C_t = costs in the year t
- t = year of business activity
- i = discount rate

Gross B/C was the comparison between the gross benefits that had been discounted and the overall costs that had been discounted, with the following formula:

$$\text{Gross}\frac{B}{C} = \frac{\sum_{t=1}^{n} \frac{B_t}{(1+i)^t}}{\sum_{t=1}^{n} \frac{C_t}{(1+i)^t}}$$

Information:
- B_t = benefits in year t
- C_t = costs in the year t
- t = year of business activity
- i = discount rate

Payback Period (PP) was the length of time to generate total revenue or to find out when the project can return investment funds. The formula could be written as follows:

$$PP = \frac{I}{Ab}$$

where:
- I = the amount of investment costs
- Ab = net benefits earned each year

Sensitivity analysis aims to see what happens to the results of project analysis if there is a change in the basis for calculating costs or benefits (Doelman et al., 2023; Liu et al., 2023). With this sensitivity analysis, it can be determined whether a project is feasible or not. It also looks at the strategies that need to be implemented for the progress of peatland restoration using the canvas business model strategy (Djaenudin et al., 2021; Utari, 2023; Widyastutik et al., 2021).

3. RESULT

This study described the existing action research in Perigi Village, Lampan District, OKI Regency. Community behaviour that caused peatlands to burn included clearing land by burning, fishing and hunting animals without cultivating, conflicts with related companies, conflicts between gelam wood seekers, burning garbage and throwing cigarette butts indiscriminately (Nurhayati et al., 2020; Tan et al., 2023). Community Empowerment needed to be done, as the first thing that must be known was the perception of farmers regarding the interest in cultivating forest plants and fruit on peatlands. Calculating the economic value of the agrosilvofishery model which described of the results to be achieved by farmers. As well as for the progress and development of peatlands, it was necessary to make a strategic overview of the business model canvas.

3.1 Characteristics of the Perigi Village Community, Lampam District, OKI Regency

The characteristics of the people in Perigi Village, Lampam District, OKI Regency include livelihoods, formal education and non-formal education.

Ninety-eight point seven percent of the people were farmers. Most of them rice and rubber farmers. Less of them were growing vegetables and fruit crops (Nurhayati et al., 2020; Wildayana, 2017). The community's highest formal education was elementary school education. Rural communities were more inclined to become farm laborers than were interested in going to school. Non-formal education was less interesting to be followed by the community; around 92.1 percent of the community does not take part in training or counseling held by extension services or academics (Africa et al., 2023; Mano, 2022).

3.2 Farmers' Interest in Cultivating Forest and Fruit Plants in Peatlands

Around 2022, 10 selected farmers were involved in action research and agreed to cooperate in expanding the development of clearing peat land, namely 1 ha per person for a total of 10 ha from 10 farmers involved in this activity so that the total sample is 11 farmers. Smallholders involved in this activity had been selected in 2021, and meet several criteria: land adjacent to or close to the ongoing agrosilvofishery project land, approximately 1 ha of land from each farmer, selected farmers have shown their seriousness to join the project and they were committed to maintain crops and protect the plot especially from fire hazard, there was no land lease. The project only provides assistance with the costs of land preparation, seeds/nursery, planting and maintenance. The layout of the land in the field can be seen in Figure 4. There are 11 landowners who involved in further agrosilvofishery activities, namely: 1) M, 2) S, 3) MC, 4) Ag, 5) MA, 6) JS, 7) H. J + D, 8) Mt, 9) Ty, 10) Rn, 11) Nk.

Discussions with landowners were held at Pak Haji Nk's house (Figure 4). They have agreed to the criteria mentioned above and actively involved in the activities to be carried out. To select the types of plants to be planted as mixed fruit crops on each farmer's land, deliberations were held with all the farmers involved. Each farmer had different wishes regarding the type of forest and fruit trees they choose to plant on his land. The results of the agreement on the selection of trees and fruit trees with the farmers involved can be seen in Table 2 and Figure 5. We used tree plants selected by each farmer as an important part of the formula for developing an agrosilvofishery system that had be implemented (Silvianingsih et al., 2020; Sundawati et al.,

Table 1. Community Characteristics in Perigi Village, Lampam District, OKI Regency Source: (Nurhayati et al., 2020)

Variable	Category	Amount	Percentage
Livelihood	Farmer	148	98,7
	Non Farmer	2	1,3
	Total	**150**	**100**
Formal education	SD	72	85,0
	SMP	5	5,9
	SMA-PT	8	9,1
	Total	**85**	**100**
Non Formal education	Did not attend training/counseling	60	92,1
	Attend training/counseling	5	7,9
	Total	**65**	**100**

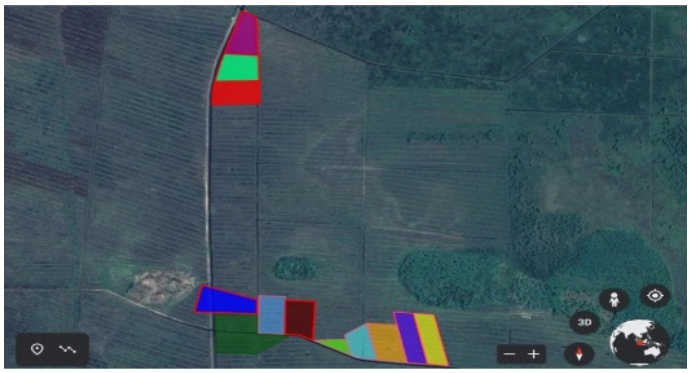


Figure 4. Location of land involved in agrosilvofishery activities. The X mark indicates the current demonstration plot location (Mr H, Nk). Numbers 1-10 are the locations of new farmers involved

Figure 5. Discussion by the Unsri Team with land-owning farmers in Perigi Village

2020).

(Graphs 1 to 11). Farmers' Interest in Choosing Types of Forest Plants and Peatland Restoration Fruits

To select the types of plants to be planted as mixed fruit crops on each farmer's land, deliberations were held with all the farmers involved. Farmer had different wishes regarding the type of forest and fruit trees they choose to plant on their land. The results of agreements on the selection of trees and fruit plants with the farmers involved (Graphs 1 to 11 and Figure 5). The tree plants chosen by farmers were used as an important part of the agrosilvofishery system development formula that was implemented. An example of a study of the agrosilvofishery model of the combination of jelutong-chilli-catfish plants was an illustration that needed to be given if implementing the right agrosilvofishery, so farmer maximum benefits.

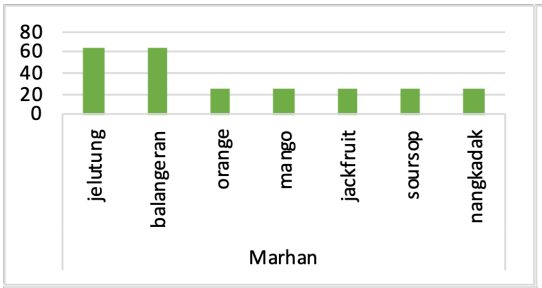
3.3 Study of the Economic Model of Agrosilvofishery (Jelutung-Chilli-Catfish) in Peatlands

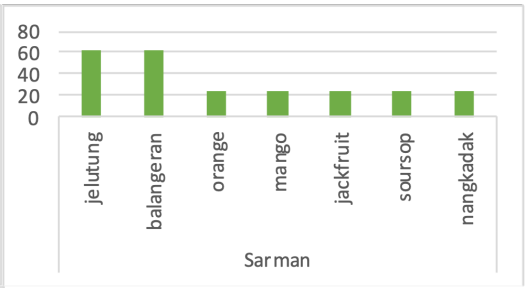
The agrosilvofishery economic model with the jelutung-chili-catfish combination required costs to implement. The costs needed in analyzing economic studies included investment costs, operational costs and revenue from production as well as sensitivity analysis.

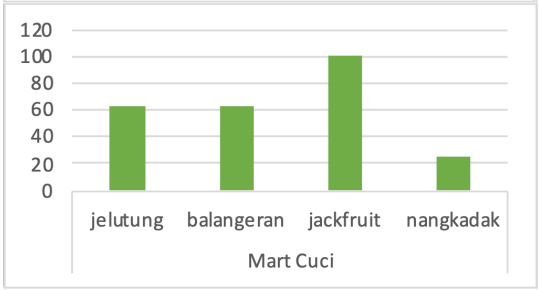
3.4 Agrosilvofishery Investment Costs (Jelutung-Chilli-Catfish)

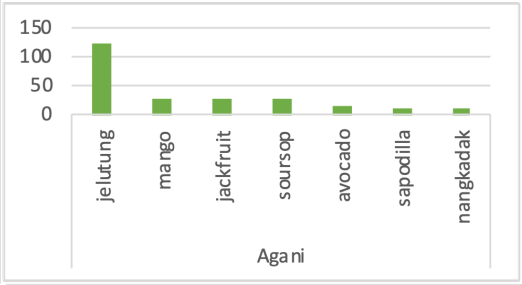
Investment Costs were costs incurred before the project runs (Puspitaloka et al., 2021). Usually, the time for investment costs was set for more than one year. Generally, investment costs are costs incurred at the start of project activities in quite large amounts. The one-year limit was set on the basis of the habit of planning and realizing the budget for a period of one year. This investment cost was usually associated with the construction or development of physical infrastructure and production capacity (production tools). Investment costs were costs used to start and run Agrosilvofishery.

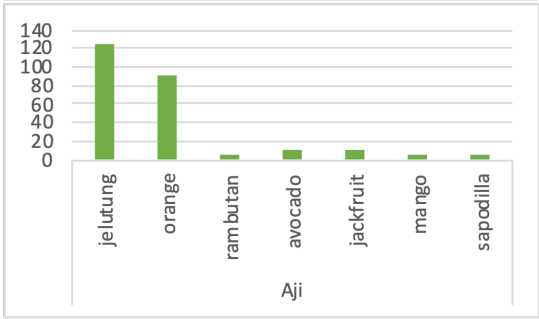
The investment costs for the jelutung, chili and catfish plants used were the cost of jelutung, chili and catfish seeds, the cost of equipment, the cost of working huts, the cost of making canal blocking and canal channels, and the cost of installing netting for fences. For separate equipment costs, it had a depreciation value in 3 years with a total value of Rp. 35.410.000 for handsprayer equipment, hoes, grass

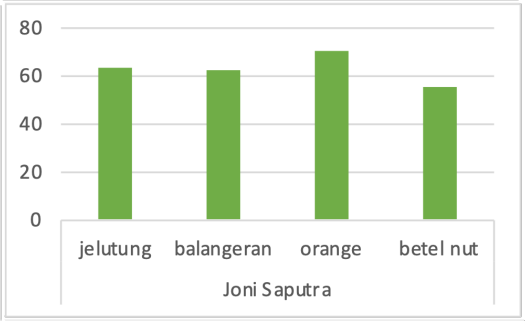


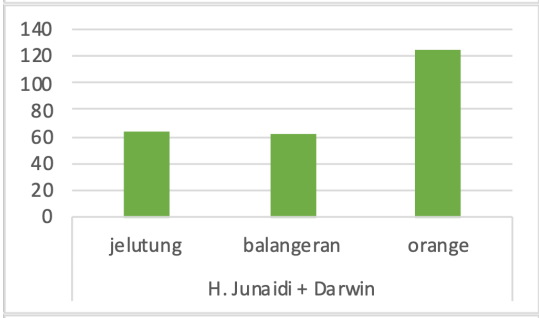


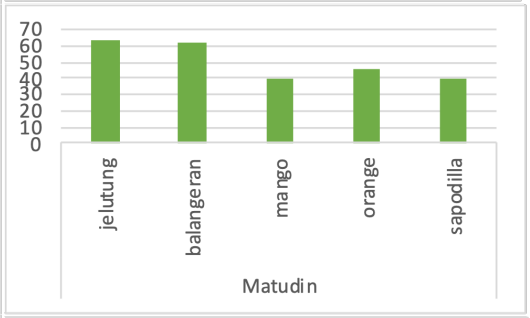


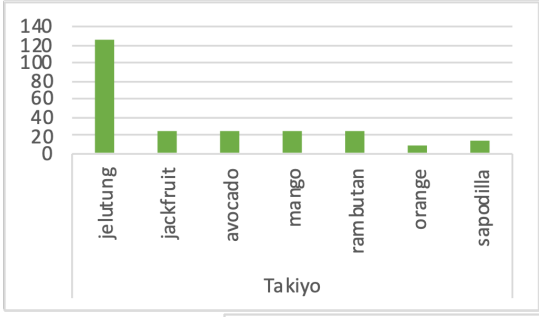


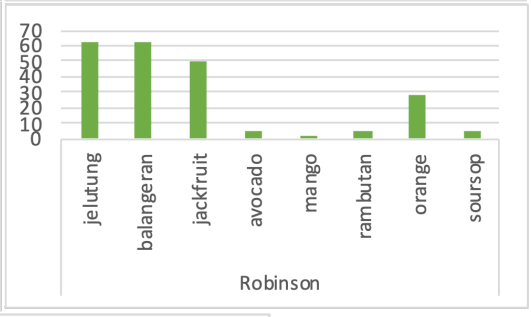












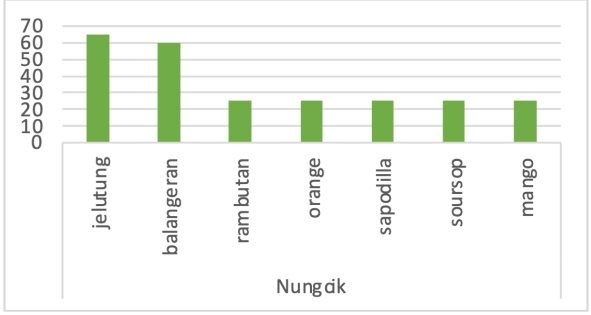


Table 2. Investment Cost of Agrosilvofishery scale 1 Ha

No	Component	Cost (IDR)
1	Labor	5.100.000
2	Ingredients	19.636.000
3	Equipment	35.410.000
4	Jelutung Seeds	3.200.000
5	Chili Seeds	1.215.000
6	Catfish Seeds	72.000.000
7	blocking channel	20.000.000
8	Channel channel	1.800.000
9	Bamboo Fence	200.000.000
10	Warehouse	5.000.000
11	Cottage	5.000.000
	Total	368.361.000

cutters and machetes.

Tarpaulin catfish ponds had investment costs that were used, namely the cost of tarpaulin ponds consisting of tarpaulin ponds, electrical installations, water installations, oxygen water installations, warehouses, huts and drum equipment costs consisting of manual scales, water tanks, water pumps, and large buckets . The cost of tarpaulin pools and cage equipment has a depreciation value in 5 years with a total of Rp. 13.100,00 with each piece of equipment having a different year of depreciation. The investment costs for Agrosilvofishery Jelutung, Chilli and Tarpaulin Catfish Ponds (Table. 2).

3.5 Operating costs

Operational costs were costs incurred by the jelutong-chilli-catfish Agrosilvofishery project for the continuity of the production process. Operational costs incurred for years 1 to 3 year that were used they were labor costs for processing jelutung and chili fields, pesticide and fertilizer materials, costs for harvesting chilies and tarpaulin ponds with a total cost of Rp. 1.468.073.000.

Operational costs (Table 3) require a lot of money. The total cost of more than 1 billion requires precise calculations to analyze whether this combination of agrosilvofishery was feasible or not. It was necessary to analyze the acceptance to be obtained (Table 4).

Table 4.

(Table 4) the acceptance of the agrosilvofishery model on peatlands was analytically very high. There were 4 products that were produced, namely wood and sap from jelutung trees, chilies and catfish. The information showed that when accumulated over 30 years, the acceptance of catfish was the highest. Meanwhile, jelutung wood produces the lowest revenue.

3.6 Sensitivity Analysis Criteria

This study was assessed based on the eligibility criteria for Net Present Value (NPV), Internal Rate of Return (IRR),

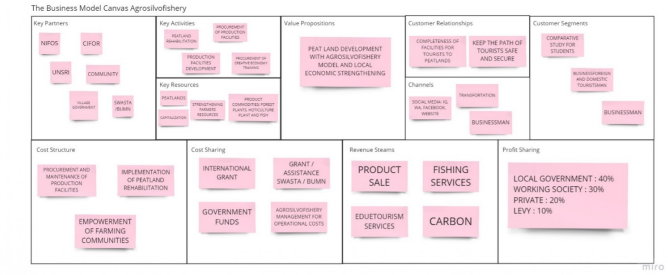


Figure 6. The Business Canvas Model Agrosilvofishery in OKI Regency, South Sumatra Indonesia

Net B/C, Gross B/C, Payback Period. The discount rate used was 7 percent according to the Bank Negara Indonesia (BNI) interest rate. A business was said to be feasible if it had an NPV value of more than 0, an IRR value was greater than the interest rate used, a Net B/C was greater or equal to 1, and a Payback Period that is smaller than the business period (Kalangi et al., 2022; Rasolofoharitseheno et al., 2015). The results of the sensitivity analysis of Peat Restoration based on Agrosilvofishery (Table 5).

Table 5 shows a very high NPV, this reflects that the jelutung-chilli-catfish agrosilvofishery model was very feasible to run. The IRR value was greater than the interest rate (60% > 7%). The Net B/C value is more than 1 and the Payback Period was less than the longest period of farming, which is 30 years. The results of this study take a long time, with feasible results requiring difficult efforts because peatlands had risks in their management which were highly flammable during the dry season. So it was necessary to implement research (Sencaki et al., 2020) to stabilize the global climate on peatlands using a net ecosystem exchange. After knowing the economic study of the agrosilvofishery model, it is necessary to know what kind of development is appropriate to be corrected so that it covers all aspects.

3.7 Agrosilvofishery Canvas Model Business Strategy in Peatlands

After knowing the economic study of the agrosilvofishery model, it was necessary to describe the development of a strategy to conserve peatlands that can be utilized by the local community, local and foreign tourists and as a place for ecotourism for students (Suwarno et al., 2018; Yu et al., 2018). The business model canvas provides a complete picture of the process to the output obtained as a strategy for developing an agrosilvofishery model on peatlands.

The business model canvas was a strategy in developing agrosilvofishery businesses that had widely implemented in OKI Regency. The area of degraded peatland was the reason that peatland must be preserved. For this reason, an in-depth study was needed to find out the business concept of the canvas model so that the benefits of peatlands can be felt by the whole community. For example, peatlands not

Table 3. Agrosilvofishery Operational Costs

No	Description	Annual Rotation	Total	Unit	Price/Unit (Rp/unit)	Total Cost (Rp/year)
A.	**Labor**		12			**54.600.000**
	Jelutung					
	Fertilization	2	4	HOK	60	480
	Disease pest control	2	4	HOK	60	480
	Weeding	2	4	HOK	60	480
	Stitching	1	1	HOK	60	60
	Chili					
	Creation of Bundles	1	10	HOK	60	600
	Rise/hole	1	6	HOK	60	360
	Catfish					
	Pool Employee Wages	OK/month	4	12	1.000.000	48.000.000
	Care and Maintenance Costs	IDR/Month	1	12	250	3.000.000
B	**Mulch Installation**	1	6	HOK	60	360
	Nurseries	1	6	HOK	60	360
	Planting chili seeds	1	6	HOK	60	360
	Stitching	1	1	HOK	60	60
C	**Fixed cost**					**11.000.000**
	Land lease	IDR/yr	1	1	5.000.000	5.000.000
	Electricity cost	IDR/Month	1	12	300	3.600.000
	Water Fee	IDR/Month	1	12	200	2.400.000
D.	**Ingredients**					**1.408.046.950**
	a. Herbicide	2	4	kg	100	800
	b. Biofunctionsida	2	2	Liter	110	440
	c. Phosphoric Acid	1	6,7	Liter	60	402
	d. Dolomites	1	30	Liter	6	180
	e. Manure	2	30	kg	10	600
	f. NPK or SP 36	2	5	Kg	11	110
	g. Urea	2	10	Kg	15	300
	h. Chili Seeds	1	12150	seeds	100	1.214.950
	Fish Seeds	Tail	288	3	250	216.000.000
	Fish feed	kg	39.6	3	10	1.188.000.000
	Drugs	Package	4	3	200	2.400.000
F	**Equipment**					**4.211.100**
	a. Seeding Tray	1	243	fruit	13.500,00	3.280.500
	g. Mulching	1	310	Meter	3.000,00	930.6
	Total					**1.468.073.000**

Table 4. Agrosilvofishery Revenue 1 Ha/ 30 years

Component	Productions	Description	Price	Time Scale	Acceptance for year	Acceptance (30 year)
Jelutung						
a. Wood Harvest	159	m3/ha	4.500.000	30 years	716.473.469	716.473.469
b. Sap Harvest	13.246	Kg/ha	6	8 years	2.782.080.000	2.782.080.000
Chili	2000	Kg/ha	20	1 year	40.000.000	920.000.000
Catfish	108	kg	17	1 year	1.836.000.000	42.228.000.000

Table 5. Results of Agrosilvofishery Sensitivity Analysis

No	Assessment Criteria	Results	Remarks
1	NPV	13.413.797.049	IDR
2	IRR	60	%
3	Net B/C	7,1	Year
4	Gross B/C	3,7	Year
5	PP	0,01	Year

only enjoy nature, but were effective in cultivating them, being places of recreation as well as education for students, as well as the presence of local and foreign tourists, as well as a sustainable relationship with the results of the peatlands themselves. The description in the business model strategy canvas would explained as follows:

Value Proposition

The development of peatlands with the agrosilvofishery model and the strength of the local economy provides optimal benefits of peatlands. The benefits can be felt by farmers, the environment and students. Peatlands were extensive and contain many ecosystems, namely plants, fish and water which need to be managed properly so that they do not become diseases for the surroundings (Horgan et al., 2018; Octavia et al., 2022).

Key Partners

Partners for agrisilvofishery development activities involved as fund investors are CIFOR, NIFOS and private/BUMN. UNSRI provided knowledge related to information on implementing agrosilvofishery with the right and profitable product combinations, provided land use design tutorials to how to calculate the feasibility analysis of the project being implemented. The village government itself became the intermediary and control in the agrosilvofishery project. Involved communities who own peatlands choose product interests to be cultivated as peatland restoration (Kusumaningtyas Perwitasari et al., 2020; Udoh, 2016).

Key Activities

The activities carried out in peatland restoration include the rehabilitation of degraded peatlands. One of the accelerations of recovery was cultivating plants that were adaptive to peatlands (Asmaliyah et al., 2020). Terrestrial peatlands store the most carbon and provide eco-tourism services. Control was needed in exploitation and rehabilitation of land and water management management in peatlands (Suwarno et al., 2018). Processing needed completeness in production facilities and development of production facilities in land and water management. Most importantly, the role of the people involved must be equipped with the will and ability so that creative economy training was needed in peatland products (Ziegler, 2020).

Key Resources

Peatland resources were an important potential that must be preserved and maintained (Syahza et al., 2020; Zulkarnain et al., 2021). Now peatland was important land as an expansion of cultivated land besides dry land. For this reason, it needed to be managed with care. Farmers as cultivators need to be equipped with expertise not to clear peat land haphazardly (Dhandapani et al., 2023; Hidayat et al., 2023; Rizva et al., 2023).

Customer Relationships

Complete facilities for tourists to go to the peatlands and keep the peatland paths safe and secure. This security facility needed attention because the peat soil conditions were soft and watery. Complete facilities such as boat kettles, life jackets and also boots.

Customer Segments

Agrosilvofishery tourism on peatlands had market segments including tourists, students and entrepreneurs as channels to take products from peatlands. This target market provides information that promotions need to be carried out in the community, schools or campuses as well as traders as agents.

Channel

Marketing channels that a place for promotion besides directly can be through social media such as: Facebook, WhatsApp, Instagram, website and others. Online marketing was very effective for reaching the world. With advanced technology, people quickly find out information from the outside world. This was appropriate for promoting peatland tourism (Dohong et al., 2018; Nath et al., 2017).

Cost Structure

Funding used for peatland rehabilitation, development of production facilities and provision and training for farmers to prepare skills and knowledge in managing peatlands (Tanneberger et al., 2021; Ziegler, 2020; Ziegler et al., 2021). This financing structure must be appropriate so that the costs invested were beneficial.

Cost Sharing

Funding for agrosilvofishery projects was obtained from international grants, the private sector / BUMN, financing from local governments and operational costs for agrosilvofishery. Related parties provide funding contributions and evaluate projects carried out by agrosilvofishery on peatlands (Afentina et al., 2023; Alam et al., 2023).

Revenue Steams

The sources of revenue that were obtained from the production of products, namely wood, forest plant sap, hor-

ticultural plant products and fish. In addition, there was acceptance from eco-education, socially benefiting from the abundant absorption of carbon from peatlands (Deng and Jiang, 2023).

Profit Sharing

Peatland businesses that were said to be feasible, those were able to suffice, the live needed. Just like profit sharing where there were related parties as investors and contributors, it was necessary to share the profit sharing percentage of projects that had been carried out (Ardhana et al., 2023; Regina et al., 2016). So that the sustainability of development was maintained and continues to progress so that its utilization can be felt on all fronts.

4. CONCLUSION

Peatland farmers choose forest and fruit plants, for forest plants, jelutung and balangeran plants were fixed. As for fruit crops, farmers prefer citrus, jackfruit and mango plants. Based on the study of business analysis, an overview of the economic value was given in the application of agrosilvofishery which was a combination of jelutung, chili and catfish plants. The calculated results showed the sensitivity of the business is feasible. Then, in business development, long-term thinking was needed that looks at how the agrosilvofishery canvas model business strategy was viewed from all activities. Starting from partners, resources, activities carried out, involvement with consumers, market segmentation, promotion facilities, financing structures, profit sharing. This was very useful for increasing the selling value of peatlands.

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