Strategies of the village community to survive in a changing environment: survive or change

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Abstract. Traditional ecological knowledge becomes difficult to apply in areas where natural resources have been degraded. This is experienced by people living on degraded peatlands in Tumbang Nusa, Central Kalimantan Province. They are confused to determine the appropriate livelihood. This paper aims to analyse the community's understanding of peatlands and the causes of their destruction, as well as livelihood options to survive on degraded peatlands. Data are collected from 24 randomly selected families and analysed descriptively qualitatively. The analysis shows that the respondents are aware that their peatlands have been degraded and the reason is the unsuitable program that is applied on peatlands. Options for survival can be grouped into two. Around 58% of respondents remain on their ancestral livelihoods and do not cultivate on the peatland, and 42% of respondents chose to occupy the peatlands. They farm on peatlands with considerable risk, raise livestock and do business. Some are still catching fish in the river. Respondents' choice of livelihood bases on their knowledge of peatland, calculation of potential failure, family's economic capacity, and outside assistance. The study recommends the importance of providing communities with knowledge about social and environmental safeguards to help them determine their livelihoods with minimal risk.

1. Introduction

Indonesia has 75,000 villages [1]. Some of the villages are inhabited by local residents, migrants, or mixed. Many of them still depend on the natural surrounding resources, including peatlands. In the utilization of these natural resources, there are still many habitants who apply traditional ecological knowledge in order to preserve natural resources and—to fulfil their needs [2], as well as to preserve the environmental services, such as clean water. Some of the natural resource management practices that are carried out by the local communities are applying ecological knowledge, including:
   a. Residents of Kasepuhan Karang indigenous community on the island of Java, Indonesia, have customary rules that allocate their natural resources for the purposes of protecting springs, flora and fauna, food availability, and resident villages. Customary rules are strictly enforced, and sanctions will be applied to those who violate them [3]
   b. Aboriginal people in Australia have traditional knowledge that soil could be used as an early warning system about environmental ecological changes [4]
   c. Dayak community on the island of Kalimantan, Indonesia, considers various aspects of agricultural land preparation activities. They make fire barriers so that the fire does not spread out of the fields, pay attention to the direction of the wind, do burning during the day when the
sun is hot so that the burning process can run well; the burning is done little by little, and involve the community who owns the land around the land that will be burned to help keep the fire under control [5].

d. Kadhung Prayoga [6] notes that the local wisdom of Dayak community, in managing peatlands, includes land management, soil fertility, hydrology, water conservation, and silviculture.

The results of research on the traditional ecological knowledge of indigenous peoples in various countries show that there is a positive influence of traditional ecological knowledge on forest conservation activities [7]. Traditional ecological knowledge is obtained from the process of accumulation of knowledge of previous generations, which is the historical experience of community groups that continue to be adapted to various local natural resource conditions and still consider local culture, and as a complement to scientific ecology [8]. Thus, traditional ecological knowledge is used as the basis that binds them in utilizing natural resources [9]. However, applying traditional ecological knowledge is a challenge in a region where people depend on degraded natural resources and their numbers are increasing.

In Indonesia, the increase in population has an impact on increasing the need for food, clean water, housing, clothing, cash, educational, health, and transportation facilities, etc. Peatlands that were previously untouched because they were always flooded, it now has an important role for development and could meet the needs of the population. Peatlands are now used for many purposes, such as oil palm plantations, rubber, industrial forest plantations, and settlements [10]. Even in peatlands spread across 7 provinces (Jambi, Riau, South Sumatra, West Kalimantan, Central Kalimantan, South Kalimantan, and Papua), BRG noted that there are already around 2,945 villages. Communities in these villages also manage peatland areas.

There are still many peat-land utilization in Indonesia that do not apply the principles of sustainable peat land use. Conversion still occurs on thin as well as on thick peat layer, and protected peat domes [11]. This practice causes peatland degradation which is characterized by the deterioration of the chemical, physical and biological properties of peat, so that the hydrological, production and ecological functions decrease [12]. Degraded peatlands due to land use change will have a significant (direct and indirect) impact, among others is that the peatlands become vulnerable to fires. Data from Sipongi, the Ministry of Environment and Forestry, notes that peatland fires occurred every year from 2015 to 2019 which were quite significantly big in size. Clearing and drainage of peatlands results in land subsidence [11,13]. Other impacts caused by peat damage include greenhouse gas emissions, economic loss, loss of biodiversity [14,15]. To protect the remaining peat forest, prevent peat damage, and repair damaged peatlands, the government has issued various policies and programs but at the same time also still consider the economic benefits, especially for the local community.

These policies include, among others, the prohibition of burning, the determination of cultivation areas and protected areas on peatlands. The policy bases on the fact that peatland ecosystems are very fragile, so care is needed in managing peatlands. Mismanagement of peatlands can lead to major disasters for the lives of local people and life on earth.

The area of tropical peatlands in the world is estimated around 40 million hectares, of which 47% are in Indonesia [9]. Although the area is not large, peatlands have a very strategic role to ensure the sustainability of life on earth. The following are the coverage of the roles.

a. It is a very large carbon stock with a capacity of up to 10 times higher to the carbon stored by soil and plants on mineral soils [16]. Thus peatlands can play a role in reducing greenhouse gas emissions, especially CO2 gas which is closely related to global climate change.

b. The ability to absorb water with a very large capacity, so that it acts as a water reserve, and is able to regulate water discharge during the rainy season and dry season so as to minimize fires in the dry season and flooding in the rainy season [17].

c. As a community food barn, building materials, and a place to protect various types of wild plants and animals, including protected species.

The important role of peat is real, so the existence of peat needs to be maintained. However, there are still many people who do not realize it. This lack of knowledge results in unsustainable use and
damage to the peat ecosystem, thus threatening the lives of local communities. For local communities/indigenous people, the knowledge they gained from their predecessors in managing natural resources (including peat) is faced with a reality that they have never experienced before, a drastically changing environment. Various government policies related to peat management and development programs provided to the community make the communities even more confused in determining their livelihood choices because they are not always in accordance with their knowledge or culture. This paper will discuss: 1. community understanding of changes in peat natural resources in their villages and the causes of the changes, 2. village communities’ choices to survive on the changed/degraded peatlands, linking knowledge with the actions they choose, and the ability to utilize opportunities to support their lives. This information is useful for outsiders who will help improve the welfare of the community.

2. Methods
Data was collected from 2020 to early 2021 in Tumbang Nusa village, Pulang Pisau Regency, Central Kalimantan Province. Respondents are 24 families who are randomly selected. Data collected includes primary data and secondary data. Primary data includes:

a. History of peatland use in the village of Tumbang Nusa
b. Respondent's knowledge about environmental change and the causes
c. Respondents' concerns about their lives
d. Development program in the village of Tumbang Nusa
e. Respondent's livelihood
f. Strategies chosen by the respondent to survive.

Data is collected by means of in-depth interviews and field observations. Secondary data is collected from Tumbang Nusa Village Medium Term Development Plan, PRA report conducted by BRG and ACIAR activities. Data are analysed qualitatively descriptively by using traditional ecological knowledge to investigate the causes of environmental damage and the choice of community strategies in fulfilling the family needs in the changing environmental conditions.

3. Results and discussion
3.1. Overview of the village of Tumbang Nusa
Tumbang Nusa Village, Pulang Pisau Regency, has an area of 200 km². Of this area, 10%, is in the form of mineral land located along the Kahayan river. Mineral land is used for residents’ villages as well as for rubber/rattan plantations.

Kahayan River is the second largest river in Central Kalimantan province. This river has always played an important role from time to time in supporting the lives and activities of residents. Kahayan River is a place where people look for fish for their own consumption and/or to get cash from selling the fish. Residents also mine sand and gold in Kahayan river. In addition to the economic benefits, the villagers of Tumbang Nusa also use Kahayan river to wash various household utensils, bathe, clean the harvested purun grass (*Lepironia articulata*) before they are sold, as well as a transportation route to reach their gardens, and carry out their garden products. Prior to the construction of Trans-Kalimantan road connecting Palangkaraya and Banjarmasin, Kahayan River was the only connector of many villages and the two big cities. The role of Kahayan River in Tumbang Nusa as a transportation route began to diminish after the construction of the Trans-Kalimantan Road was established.

About 90% of Tumbang Nusa village area is peatland with a depth ranging from 4 m to 8 m. Of this area, only 20% has been utilized [18], for various purposes such as residential houses, food stalls, agricultural land. Residents began to move from the old village along Kahayan River and occupied and utilized peatlands during the construction of the Trans- Kalimantan Road and bridge in the village of Tumbang Nusa. Now around 40% of the villagers of Tumbang Nusa occupy peatlands along the road. Migration of residents base on the desire to find new sources of income, to get easier access to big cities for the smooth running of their business, to make easier ways to get various household needs, and to get better access to education for their children.
Tumbang Nusa village had 268 households in 2020 [19], which were dominated by indigenous Dayak tribes. Their income is generally obtained from various livelihoods that can be classified into income in the agricultural and non-agricultural sectors (traders, craftsmen, civil servants, etc.). Income from the agricultural sector is carried out on mineral lands, on peatlands, and in rivers (Table 1).

Table 1. The location of the livelihoods of the Tumbang Nusa village community in the agricultural sector.

| Source of Income             | Mineral soil | Peatland/swamp | River/Tidal land |
|------------------------------|--------------|----------------|------------------|
| River fish                   | ✓            | ✓              | ✓                |
| Purun grass                  | ✓            | ✓              |                  |
| Rubber                       | ✓            | ✓              |                  |
| Rattan                       | ✓            |                |                  |
| Palm oil                     | ✓            |                |                  |
| Fruits                       | ✓            |                |                  |
| Vegetables                   | ✓            |                |                  |
| Nursery                      | ✓            |                |                  |
| Cattle, goats, ducks, chickens| ✓            |                |                  |
| Swallow (for harvesting the nest) | ✓        |                |                  |
| Stingless honey bee          |              |                | ✓                |

Table 1 shows that many types of community livelihoods are carried out on peatlands and have the potential to continue to increase in variety and volume.

From these various sources of livelihood, fishing in the river is carried out by around 80% of the villagers. Other commodities that have been the mainstay of the community are rubber and rattan, which are planted by residents on mineral lands, on former community rice fields. These two commodities are increasingly being planted by the community, replacing rice plants, because the prices are good. However, the price of rubber latex and rattan has dropped dramatically in the last 5 years, so that this livelihood is abandoned by many people.

3.2. History of peatland management

The predecessors of Tumbang Nusa village community do not cultivate peat land for several reasons: 1. the location is considered far from the villagers' village, 2. Access to peatland is relatively heavy (peatland is waterlogged and not dense so it is difficult to walk on foot), 3. infertile, 4. Not many species could grow on peatlands. The community only can catch fish and cut timber for their own needs or for sale. This utilization is not exploitative, so it do not damage the peatlands.

In its development, peatlands in the village of Tumbang Nusa and the surroundings have begun to show the potentials and used for economic development, as well as being considered as a source of knowledge (Table 2)

Table 2. The history of peatland used in Tumbang Nusa village and its impact on the environment and society.

| Year    | Activities                                      | Direct/indirect impacts on peatland and Communities |
|---------|-------------------------------------------------|---------------------------------------------------|
| 1965 and 1976 | Timber concession  
  a. Many trees on peat land were cut down  
  b. Many canals were built on peatlands to make it easier to transport timber | a. Drain the peatlands  
  b. Degraded peat forest  
  c. Subsidence |
| 1975 and 2018 | Village heads distributed peatlands located along the trans-Kalimantan road | Communities have rights to peatlands, and peatland sales occur between |
(1975) and peatlands along the road connecting the trans Kalimantan road with people's houses located along the river (2018)

1995 to 1998

Mega rice project (1.5 m ha, located within 1 peat hydrological area with Tumbang Nusa village)
  a. Many trees on peat land were cut down
  b. Many canals were built on peatlands to drain the peatland dan to transport timber and drain the peatlands

1999 to present

Peat Research Center, 5000 ha
  Several activities at the Peat Research Center:
  a. Research
  b. Replanting activities
  c. Fire prevention

2000 to 2006; 2011 to 2014

Bridge construction (10 km) in peatland
 a. Village community moved from the village along the river and settled on the side of the road.
 b. Some families start cultivating peatlands

2013 to 2019

Bore well (400 units)
 Intended as a source of water for wetting peatlands in the dry season, or extinguishing fires in the event of a fire

2014

Plant nursery, Ministry of Environment and Forestry
 a. Employment opportunities for the villagers of Tumbang Nus
 b. Provide knowledge to the community to build nursery businesses

2015 to 2020

Canal block constructions
 Intended to make peatlands wet again (the impact needs to be evaluated)

2020

Palm oil plantations (owned by farmer groups)
 a. Many canals were built on peatlands to drain the peatland
 b. Horticultural demo-plot, Ministry of Environment and Forestry

2021

Social Forestry permit (935 ha) to farmer group

Table 2 shows the various uses of peatlands in Tumbang Nusa village and their impacts on peatlands and the community, both directly and indirectly. The use of the peatlands is for commercial purposes, fulfilling national and local food needs, improving the economy of local communities, increasing
knowledge and restoring the peat ecosystem. The use of peatland for commercial purposes began in 1965 with the presence of timber companies. This company builds canals and employs some villagers as the laborers to transport logs out through the canals.

Nusa, especially in the peatland area, is the construction of 1.5 million hectares of rice fields or the mega rice project. The location of this program is in the same Peat Hydrological Unit with the village of Tumbang Nusa. In this project, many canals are built to transport timber out of the peat forest. This rice field development program is intended to replace rice fields in Java that have been lost due to land conversion and replace rice imports of 2 million tons a year. The consideration in choosing peatland to be used as rice fields is to save the cost of rice field construction and irrigation because the availability of water in peatlands is naturally abundant. Furthermore, Pulang Pisau Regency, Central Kalimantan Province, is deemed worthy of being the project locus because 1. The availability of peatlands is extensive and idle, 2. The population is very sparse [20]. However, this program end in failure and it was terminated in 1998. This program receive a lot of criticism.

These two programs, in the end, cause a lot of trouble. A lot of peat swamp forest in Tumbang Nusa to be deforested and the number of canals cause the peatlands to dry up, so that in the dry season it is very easy to burn [21]. Until the year of 2019, the village of Tumbang Nusa had experienced fires almost every year. The biggest fire occurred in 2015 which engulfed half of the village. The peat fire disturbed the residents of Tumbang Nusa village because the fire easily destroyed the plants which were the community's investment. As it happened in 2019, where fires wiped out rambutan plants planted by residents on peatlands that were ready to be harvested.

The distribution of peatlands along the trans-Kalimantan road by the Village Head in 1975 was of little interest to the villagers of Tumbang Nusa. Many of them are not interested in possessing the peatlands because the location are far away, difficult to access, always wet, and do not provide much economic benefit. Villagers prefer to live near the rivers to facilitate their mobility and leave peatlands.

Their interest in occupying peatlands arose when a trans-Kalimantan road and a 10 km bridge were built across the village of Tumbang Nusa. Many people get additional income from food and drink stalls, as well as services for crossing vehicles and individuals passing through the peatlands to Palangkaraya or Banjarmasin. They begin to realize the potential income that can be achieved once at the time when the roads and bridges are completed. Those who dared to try a new life began to move into peatland after the construction of the trans-Kalimantan road and tried several types of work, some of which were cultivating peat land for planting crops. However, not everyone who owns peatlands is now able to manage their land, because they do not master agricultural technology on peatlands, the cost of growing crops on peatlands is expensive, the dangers of floods and fires that regularly hit their villages. This results in about 40% to 50% of peatland being sold to neighbours or to other people outside the village. To prevent peatlands from being traded with outsiders, around 150 farmers formed groups and with the facilitation of several parties they proposed a Social Forestry program on 935 ha of peatland. This proposal was approved by MoEF in 2021.

Because peat fires happens relatively routine in Pulang Pisau Regency, the government has allocated funds to construct bore wells and canal blocks. In Tumbang Nusa village, around 400 units of bore wells are built for the purpose of wetting peatlands in the dry season, and canal blocks for rewetting peatlands. Their hope is that if peatland is wet/flooded, it will not be burnt. The effectiveness of bore wells and canal blocks related to peat fires still needs to be evaluated.

Tumbang Nusa village also has a Peat Research Center with an area of about 5,000 ha. A lot of research has been implemented here to gain knowledge about peat. In the 2015 dry season, peat fires burned around 50% of the Peat Research Center area. In addition to research activities, the Banjarbaru Environmental and Forestry Research and Development Institution, as the manager of the Peat Research Center, also carries out planting with related parties to accelerate the succession process, including through the RePeat (Rehabilitation of Peatland) program. In the same area, in 2014, Kahayan Protection Forest Watershed Management Institution, the Ministry of Environment and Forestry, built a nursery to support a rehabilitation program for degraded land. This program provides employment opportunities for local residents, men and women, as nursery workers. They carry out various activities such as
making/reparing nursery beds, mixing planting media, filling polybags, sowing seeds, watering plant seeds, cleaning nursery areas, etc. Apart from getting paid work, the workers also learn how to make good nurseries. These seedlings are distributed free of charge to those in need for rehabilitation purposes.

The local government of Pulang Pisau district has a program to establish an oil palm plantation in Tumbang Nusa. One of these programs is located on peat land in Tumbang Nusa Village. Canals are built to drain peatlands. In 2020, the Ministry of Environment and Forestry created a horticulture demonstration plot to provide an example of another pattern of using peatlands without burning and without building canals.

3.3. Development program in Tumbang Nusa Village

Desa Tumbang Nusa receives various programs to improve the community’s economy. The target groups of the program include women and men, in the form of groups and individuals. The program is funded by NGOs, local governments, central government, and international donors. The program can be in the form of empowerment, livestock provision, production tools provision, comparative studies, agricultural demonstration plots, or a combination of them. Some of them are in the form of training and assistance in making purun straws, training and providing tools to process fish into shredded fish, providing cattle and goats for breeding, etc.

As an illustration, the program for making purun straws. This program, funded by Kemitraan, provided training to 20 residents of Tumbang Nusa village on how to make purun straws. The training covers the selection of materials, process of making purun straws, do packaging and make ready-to-sell products. The equipment needed to produce purun straws is provided, the tools are given to the village, and loaned to those who will carry on their business. Furthermore, village facilitators from Kemitraan continue to accompany them, encourage them to continue to produce quality products, select purun straw products that are suitable for sale, find markets, connect purun sellers with buyers, open online stores, train young people to handle purun straw marketing, and link purun producer farmers with the Village-Owned Enterprises of Tumbang Nusa so that this business also provides income for the village. The demand for this product is not only from within the country but also from abroad. Making purun straws can be done anytime, taking advantage of free time. The economic benefits of this training are already being felt. However, out of 20 farmers who are trained, it is only 1 or 2 people who remain and many requests could not be fulfilled [22].

Many demonstration plot programs are carried out by research institutions that provide assistance with plant seeds, fertilizers, and involve farmers participating in demonstration plots in the research activities. They take care of the plants and report on the development of the plants in the demonstration plots, including accidents if there are pests and diseases that attack the plants. Researchers will regularly come to the demonstration plots to collect data, and the yields from the crops are fully provided to the farmers.

These various development programs are expected to help increase people's income, but the adoption of these programs is low and many programs are not sustainable. The low adoption is probably due to the program provided to the community designed by outsiders, not in accordance with the knowledge, abilities, readiness, and culture of the local community.

3.4. Concern, knowledge, and actions

This section discusses the concerns of the respondents, their knowledge of village resources, their ability to take advantage of opportunities to increase their income, and their actions to find solutions to their concerns and the risks they must take. This information will make it easier for us to understand the decisions made by respondents and answer some of the questions why many programs given to villages are not widely adopted by the community.

Research respondents have their concerns about the sustainability of their income to meet the needs of their families. This can be understood because many of them depend on nature for their income with considerable risks, in the form of floods, fires, uncertain results, etc. On the other hand, family needs continue to increase. Their needs are not only for food, shelter, and clothing, but many other needs such as medical expenses, school fees, cell phones, buying gasoline, cigarettes, electricity bills, even to buy
drinking water. To finance the needs of the family, the actions of the people of Tumbang Nusa village can be broadly grouped into 2, choosing the life of their predecessors or trying a new life on peatlands. Their choice is at least related to the understanding/knowledge that they believe about the natural resources around them (Table 3)

Table 3. Concern, knowledge, and action of the respondents.

| Concern | Family income          | Family income                                      |
|---------|------------------------|---------------------------------------------------|
| Knowledge | Peat soil is infertile, acidic, not suitable for agricultural crops, high risk (flood, fire) | Agricultural crops, fruit trees can be grown on peatlands by applying certain technologies and agricultural inputs |
|         | Land preparation and farming on peatlands takes longer, requires a lot of agricultural inputs, is expensive, and does not necessarily produce good yields | Aware that the cost of farming on peatlands is expensive and risky, but there is no harm in trying it because there is limited mineral land in their village and agricultural crops on peat land belonging to neighbouring villagers thrive |
|         | Their predecessors did not cultivate peatlands |          |
| Actions | Leaving peatlands as they are, not managing them for agriculture, as their predecessors did | Application of mound technology, use of polybags, dolomite lime, fertilizers, herbicides, construction of canals, etc. |
|         | In certain seasons mining for gold or river sand, or leaving the village in search of work | Non-agricultural livelihood |

The community considers that in the past their village was cool, often foggy in the morning, but now it feels hot after the peat is damaged by the mega rice project. Peatlands become dry and are easily burnt, subsidence occurs everywhere and it leaves many difficulties for villagers. Respondents react to these conditions in different ways. Those who live on the banks of the river generally maintain their lives as what their predecessors did. Income is obtained from fish in the river, rubber latex, purun grass, agarwood, food stalls, or from other sources of income such as mining for gold or sand in the river, even outside the village if there is a good offer. They still believe that peatlands are unfit for cultivation, that the cost of cultivating peatlands will be large, the risk of failure is quite large, and cultivating peatlands can further aggravate the condition.

On the other hand, for residents who move to occupy peatlands, they are already intending to find new sources of income because there is not much that can be done from mineral lands which are limited in size. Villages along the river are often flooded and the road to the village is often flooded when it rains heavily in the upstream area. Although the peatlands have been degraded and there has been a subsidence, they see that now rubber can grow there (although the yield is not as much as if it grow on mineral lands), as well as fruit crops such as mango, rambutan, etc. Even the neighbouring village has succeeded in growing vegetables to meet the vegetable needs in the city of Palangkaraya. They believe that peatlands can be a potential source of family income.

They realize that cultivating peatlands is quite expensive, and must apply the government regulations, including the regulation of no burning. This regulation makes it difficult for them to cultivate peatlands. However, they see that many people in other villages are able to work on peatlands without burning and apply various technologies and agricultural inputs. They also see that there are other potentials that can support the success of their business, namely the location of the land on the side of the main road so it is good for doing business, there is a Wi-Fi signal, as well as many programs from outside that are intended for the village of Tumbang Nusa. These all provide more diverse sources of income.
3.5. Changing of respondent’s livelihood

Respondents cover 24 families, 58% of them chose to live on the riverbanks, while the other 42% chose to move, occupying peatlands along the Trans-Kalimantan road. They have 1 to 4 different sources of income. This is because part of their income depends on the seasons, in addition to many threats to the continuity of their source of income. From the interviews, it is found that 9 highest percentages of community livelihood, namely river fishermen, are opening food and beverage stalls along the trans road, becoming purun farmers, mining for gold in the Kahayan river, doing nurseries, becoming nursery workers, raising goats, raising swallow's nests, and farming on peatlands (Figure 1).

Figure 1 shows that there are 9 types of livelihoods with the highest percentage. Fisherman (67%), food and drink stalls (33%), selling purun grass (25%), panning for gold in rivers (21%), selling seeds (17%), goats, swallow nests, nursery workers, and agriculture on peatland which covers 13% of the respondents respectively. Fishing for river fish, doing business in food and beverage stalls, selling purun grass, and looking for gold in the river have been done by the locals for a long time. Nurseries, goats and waller birds, farming on peatlands are relatively new livelihoods.

They usually do gold mining in rivers. In its development, gold mining currently uses extraction tools and mercury. The business of selling nurseries only emerged after the nursery was built by the Watershed Management Institutions in 2014. This business is supported by the existence of roads that facilitate the transportation of seedlings and cell phones to facilitate communication with buyers.

Goats are a type of livelihood whose capital is assisted by outsiders. However, this business do not develop well. Goat livestock assistance is given to groups and respondents do not have enough experience to work in groups, share tasks and responsibilities among group members. Swallow livestock was a type of livelihood that residents began to cultivate in 2009. Now there are around 50 swallow houses possessed by about 40 families. Although this business requires very expensive capital up to hundreds of millions of rupiah, they believe this business is very promising.

Farming on peatlands is a relatively new activity. Respondents consider that in neighbouring villages there are many transmigrants who cultivate various types of vegetables on peatlands to supply vegetables in the city of Palangkaraya. Respondents want to try and grow vegetables, fruit trees, rubber and oil palm. They apply various agricultural inputs such as dolomite lime, fertilizers, so that the peat soil can be planted with various mineral land crops. In addition to agricultural inputs, they use polybags, make mounds, or make canals which are basically to keep the roots of the plants from getting waterlogged.
Until now, respondents are still looking for suitable forms of agriculture on peatlands that are relatively cheap in cost, easy to work with, but provide good results.

If the respondents who persisted in living along the river and those who chose to live on peat are analysed separately, it could be described that there are dynamics of changes in their livelihoods (Figure 2). It can be seen that there are 4 types of livelihoods which are dominated by respondents living on the riverbank, namely fishing in the river, collecting and selling purun grass, mining for gold in the river, and becoming labourers in the nursery. Of these 4 types of livelihoods, collecting and selling purun grass is entirely done by respondents who live by the river.

Respondents who choose to live on peatlands dominate 4 types of livelihoods, namely nursery business, goat farming, swallow nest cultivation, and farming on peat land. Of the four types of activities, two of them, namely goat farming and farming on peatlands, are carried out entirely by those who live on peatlands. Further explanations related to the respondents' livelihoods are as it follows:

a. River fishing is still carried out by 30% of respondents who already live on peatlands. This livelihood is still the focus of the respondents, at least for family consumption during famine. In the flood season, they can catch more than 50 kg of fish once they go fishing, while in the dry season they can catch at least 3 kg to 5 kg once down.

b. Food and beverage stalls are run by 50% of respondents who live on peatlands. The food stalls built along the road are relatively larger and the goods they sell are also more diverse. They generally serve buyers who are traveling from Banjarmasin to Palangkaraya, or vice versa. Some of these stalls are open 24 hours.

c. Searching for purun grass is entirely done by respondents who live along the river. This activity is carried out by boat. They need 2 hours to get to the location of purun grass. This activity is only carried out by respondents who live on the banks of the river.

d. Gold mining is mostly done by respondents who live along the river and they work as laborers.

e. The nursery business is mostly carried out by respondents who live on peatlands, on the side of major roads. They learn from the nursery developed by Kahayan Protection Forest Watershed Management Institution and put it into practice as one of their businesses. Nurseries are set up in their yard and visible from the street. The existence of a large road makes it easier for them to promote and transport seedlings. They sell several kinds of seedlings, such as Shorea balangeran, Paraserianthes falcataria, Dyera costulata.

f. Goats are donations from the government and are given to farmer groups. They are released on peatlands to find food, except during floods. Cages are provided for these goats.

g. Swallow's nest livestock are mostly carried out by those who live on peatlands. This activity is relatively new to respondents, it started around the year of 2009. Although the capital for this business is very expensive (US$10,256 to US$28,070), but depending on the area and building materials) the amount, this business tends to increase. Currently there are about 50 swallow houses in the village of Tumbang Nusa.

h. Nursery labour is mostly done by respondents who live on the banks of the river. Respondents who live on the sides of the highway choose to start developing their own nursery business.

i. Farming on peatlands is carried out by respondents living on peatlands. They see the success of farmers from neighbouring villages in planting peatlands with various types of agricultural crops that are usually cultivated on mineral lands. This activity is carried out by a few respondents because cultivating peat is considered to be quite heavy, expensive, many challenges, and full of risks.

4. Conclusion

The journey of using peatlands in Tumbang Nusa village which does not pay attention to the sustainability aspect greatly contributes to the destruction of peatlands. The destruction of peatlands has regular impacts such as fires, floods and subsidence, as well as on the lives of rural communities. The peatland rewetting program needs to be evaluated for its effectiveness in reducing fires.
People whose lives are very dependent on nature must choose to face very difficult situations, must be able to survive in a changing environment or adapt to find other sources of life. Their livelihood choices are mostly based on knowledge/understanding of peatlands, practices carried out by their parents/predecessors, success of neighbours/trusted persons in managing peatlands, potential risks, and family capacity.

Respondents, around 58%, still choose to stay by the river, and tend to inherit the life of their ancestors, look for new sources of income such as mining labour, but do not cultivate peat land because they still believe in the practice of their ancestors who tend not to cultivate peat. Around 42% of respondents choose to change, occupy peatlands and look for new sources of life, constantly experiment with potential risks that are quite large. They put their new knowledge into practice to cultivate peatlands, take advantage of road access and outside assistance. A lot of outside assistance go to Tumbang Nusa village, but adoption of the program is relatively low for various reasons.

With various peatland management activities and programs offered by external parties, the community needs to be equipped with knowledge about social and environmental protection to help choose the type of livelihood with the minimum possible risk.

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