

Community livelihood assets of forest village management in Nanga Lauk Village, Kapuas Hulu District, West Kalimantan, Indonesia

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Abstract. Roslinda E, Sabathino P, Pratama YA, Supriadi, Eva J. 2024. *Community livelihood assets of forest village management in Nanga Lauk Village, Kapuas Hulu District, West Kalimantan, Indonesia. Biodiversitas 25: 664-672.* Village forest is a community-based forest management scheme in the social forestry program. At the same time, the management of village forest is local village communities that fulfill their daily needs by utilizing existing natural resources. Nanga Lauk Village Forest Management has successfully carried out activities on the social forestry program. This study aims to explain the livelihood system of the Nanga Lauk Village community to meet the family's living needs in managing the village forest. The study was conducted using a survey method in Nanga Lauk Village, Kapuas Hulu District, West Kalimantan, Indonesia, and the community was used as informants. Data were collected through observation, in-depth interviews guided by a list of questions, documentation, and a review of supporting literature. Data analysis was carried out descriptively, qualitatively and by Pentagon asset analysis. The assets owned by the people of the Nanga Lauk Village are resources of human, natural, financial, social, and physical. Natural and physical resources are the main assets used by society to meet life's needs, followed by social, human, and financial. So, the strategy that can be implemented is a consolidation based on socio-economic status. Meanwhile, based on activities to increase income, the community can apply livelihood strategies in agricultural sectors because of abundant natural resources. Skill training is needed for the community because a low level of human assets will shape the mindset of farmers regarding their inability to do other work on the side which should be able to improve their standard of living.

Keywords: Agriculture, consolidation strategy, livelihood, sustainability, village forest

INTRODUCTION

The forest is one of the ecosystems with an essential function for development and human life, both ecologically, socially, and economically for the surrounding population. Forests form a vital source of life for ensuring the flow of a wide range of ecosystem services, and they provide raw timber material, non-timber products, and wild food (Grammatikopoulou and Vačkářová 2021). The role of forests in economic development is a critical concern (Hogarth et al. 2013). Many rural households rely on forest resources to provide food and services, i.e., food, medicine, and building materials (Angelsen et al. 2014; Hong and Saizen 2019). Rasmussen et al. (2017) found that forests have a significant role in people's livelihoods because forests are a source of livelihood for local communities. Ali and Rahut (2018) found that communities around forests that apply the livelihood concept have higher income and welfare.

Livelihood is the primary resource that must be owned by every head of family and individual in meeting the needs of daily life and is the most critical indicator in realizing community welfare. Livelihood is an individual's effort to earn income by utilizing existing resources to meet their life needs. It is a combination of various resources consisting of assets, i.e., human, natural, social, financial, and physical, owned by individuals or households as activities and resource accessibility in filling life and

earning a living (Angelsen et al. 2014; Waqid et al. 2014; Hansen et al. 2015; Scoones 2015). Efforts are made in various business activities to earn income as a community strategy for survival. In line with developments and needs, a person's or community's livelihood often changes according to the available natural resources.

Survival strategies are a series of behaviors chosen by individuals and households that are socio-economically in the middle and lower classes. A person's livelihood strategy can increase income through various sources or reduce reductions in the quantity and quality of goods and services used. The pattern of multiple livelihoods or diversification of livelihoods is a survival strategy. Each individual can have a different livelihood strategy, depending on the available livelihood assets and vulnerabilities. Based on the strategy used, some experts: Scoones (2015) mentioned groups strategies based on activities to increase income, namely agriculture (intensification and extensification), diversification of non-agricultural livelihoods and migration; and White (1991) who mentioned strategies based on household socio-economic status, including survival, consolidation, and accumulation.

Hutan Desa (village forest) is one of the schemes of the social forestry program, which aims to preserve forest resources and improve community welfare. Village forests provide access (the right to enter a certain area) to local communities through village institutions for utilizing forest resources with the hope to improve the welfare of local

communities sustainably. Village forests are in line with government programs to increase people's income (pro-poor), create jobs (pro-jobs), and grow investment in smallholder wood-based industries (pro-growth), as well as being able to accelerate critical land rehabilitation and improve environmental quality (pro-environment). Giving forest management rights to village communities will provide a sense of security in forest management. Generally, more secure forest property rights result in high forest income (Miller et al. 2021). An improvement in livelihoods is facilitated by granting access and extraction rights to communities enabling households to increase their natural, physical, and human assets through participation in community-based forest management (Kaskoyo et al. 2017)

Communities that manage village forests are generally people whose livelihoods are sourced or based solely on their land (claiming to be farmers), needing more to survive. For reasons of survival (as individuals and as a family), generally, village farming families make a living by creating a diverse portfolio of livelihood activities and sources of income, where harvesting from the land, garden, or forest is only one of the many choices of activities that support welfare level. How farmer families create and choose livelihood activities and sources of income when managing village forests is an interesting problem to study. So, this study aims to explain the livelihood system of village communities in fulfilling their needs in managing village forests.

MATERIALS AND METHODS

Study area

The study was conducted in Nanga Lauk Village, Embaloh Hilir Sub-district, Kapuas Hulu District, West Kalimantan, Indonesia. Village selection was based on the

uniqueness of the community's livelihood. The livelihoods of Nanga Lauk residents are quite diverse and varied; in general, the people in Nanga Lauk Village make their living as farmers. Several lakes, including a dead lake and a single lake, surround Nanga Lauk Village. The average temperature in Nanga Lauk is 30°C, humidity is 80%, and rainfall is 145 mm/year. The study was conducted for five months, from June to October 2023. Geographically, Nanga Lauk Village is located between 9°-9.14°N and 101°-101.27°E with an area of 2,984.200 Ha (Figure 1).

Based on Indonesia Ministerial Decree of Environment and Forestry Number: SK.685/MENLHK-PSKL/PKPS/PSL.0/2/2017 dated 23 February 2017 concerning Granting Rights Management of Village Forest Rights to the Lauk Bersatu Village Forest Management Agency (LPHD) in a Protected Forest Area of $\pm 1,430$ Ha in Kapuas Hulu District, West Kalimantan Province, the Nanga Lauk Village was granted as Village Forest Management Rights (HPHD). The land cover of Nanga Lauk Village Forest consists of primary forest covering an area of 429.9 Ha, secondary forest of 139.6 Ha, plantation forest of 401.9 Ha, and water bodies covering an area of 458.6 Ha with a flat slope class. The forest in Nanga Lauk is a mixture of peat swamp and riverine forest, used by the Nanga Lauk community for fishing, honey production, and timber harvest to construct their houses.

The forests of Nanga Lauk Village are dominated by *Taun* (*Carallia bractiata*), and several other types of wood, such as *Putat* (*Barringtonia acutangular*), *Emasung* (*Syzygium attenuatum* (Miq) Merr & L.M Perry, and *Syzygium cauliflorum*, and other species. There are various types of biodiversity in the form of orangutans, sun bears, proboscis monkeys (*rancong*), orchids, lemurs (flying fox), monitor lizards, crocodiles, snakes, sailors (*pikah*), squirrels, otters (*pusuh*), and bee food trees (*taun*, *rengas*).

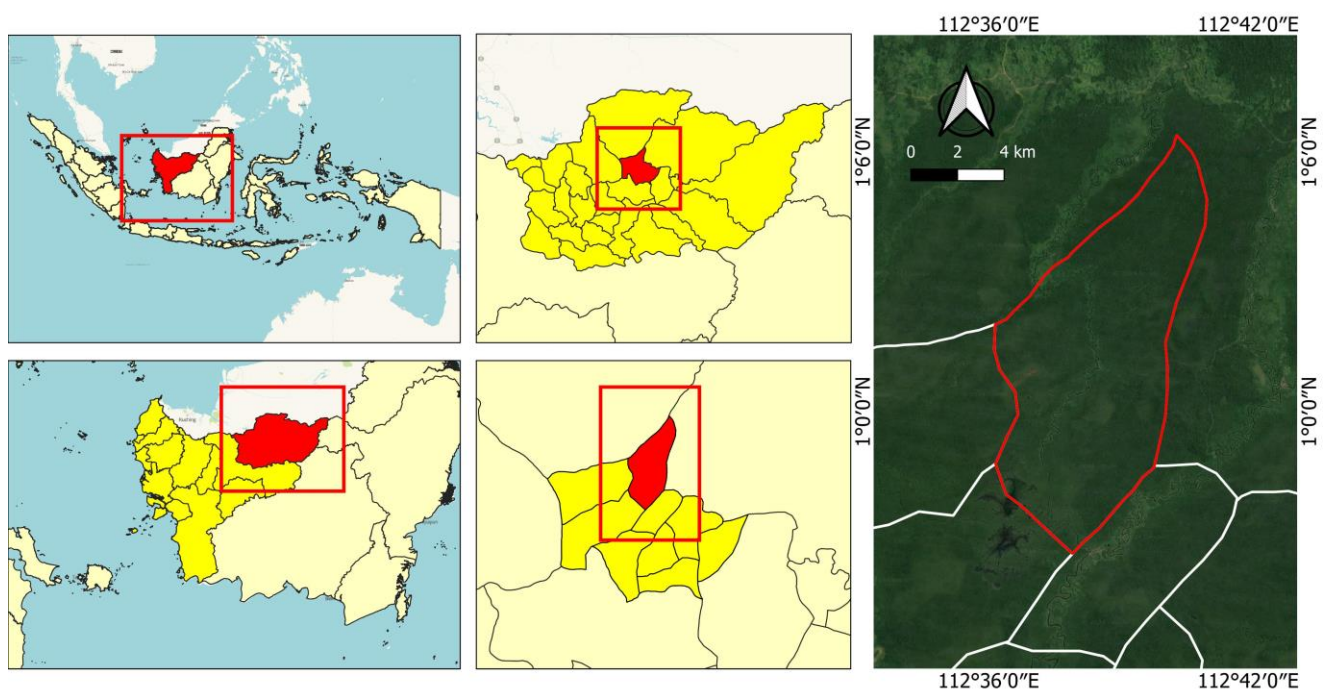


Figure 1. Location of Nanga Lauk Village, Embaloh Hilir Sub-district, Kapuas Hulu District, Indonesia

Table 1. Variables, operational definitions, indicators, and types of data

Variables	Operational Definitions	Indicators	Data types
Human	The ability of a person to gain better access to their living condition (Wijayanti et al. 2016)	Health Education Training in work Skills	Nominal Ordinal Nominal Nominal
Natural	Natural resources obtained from nature or the environment, either renewable or non-renewable resources (DFID 2001)	Agriculture productivity Land tenure Water sources	Nominal Ordinal Nominal
Social	Social resources that are useful and used by the community to achieve their livelihood goals (DFID 2001)	Side job Kinship relations Participation Networking	Ordinal
Financial	Financial sources that can be used and utilized by the community in achieving their livelihood goals, which include reserves or supplies, either owned by themselves or financial institutions (DFID 2001)	Income Savings Investments Debt	Ratio Nominal Nominal Nominal
Physical	Basic infrastructure and other facilities owned and built to support community livelihood processes (Wijayanti et al. 2016)	Homeownership Vehicle ownership Accessibility Facilities and infrastructure	Ordinal

Data collection

The basic method in this study was the survey. It employed a three-stage procedure for data collection (Do et al. 2019). First, we selected Nanga Lauk Forest Village to represent the forest. Second, we proposed a sample of Nanga Lauk Village within the location of a forest village. Lastly, we randomly selected 100 people from 233 heads of families in Nanga Lauk Village. The study used a mixed-method approach, i.e., quantitative and qualitative. This approach used the triangulation principle for the data collection, unit, and analysis. The triangulation approach allows analysis from various points of view and improves analysis accuracy.

The data collected were primary and secondary data. Primary data were obtained from distributing questionnaires, in-depth interviews, and participant observation by following community activities to meet their daily needs. Quantitative data were conducted through a household survey using a questionnaire with 100 respondents. Qualitative data were collected through in-depth interviews with village heads and officials, community leaders, and traditional leaders. Secondary data were collected by reading existing documents from the village, government, and other related institutions.

Data analysis

The data obtained were analyzed qualitatively and quantitatively. Tables, diagrams, and frequency distributions are used to present the data. Quantitative data analysis were carried out by giving a score of 1 to 5, assuming that the more supportive an element is, the greater the score. Qualitative analysis techniques were used to interpret data following research objectives, whether from questionnaires, interviews, or observations. Next, the data were interpreted and explained descriptively so that it can be more meaningful. The scoring technique measures the community's most dominant assets, which are then visualized using a Pentagon radar diagram. Each variable

was then weighted, and the weights were verified with the community to match the actual conditions at the study area. Each answer in the questionnaire was then given a score. Pentagon assets describe the relationship of the five assets, i.e., human, natural, social, financial, and physical, to their accessibility. Each asset was measured based on asset-measuring variables based on available literature. The measuring variables for each asset are presented in Table 1. The Pentagon asset calculation used the average value of each community's livelihood asset value.

Data analysis was carried out based on Multi-Criteria Analysis (MCA), a tool for decision-making built on complex multi-criteria both quantitatively and qualitatively. The results of measuring the assets used by farmers and communities in managing village forests are presented in a Pentagon diagram so that the most dominant assets used by farmers are observed, and comparisons between assets are made. These results will show what strategies should be implemented to fulfill sustainable living needs and what forms of intervention can be carried out to increase the role of village forests in sustainable livelihoods.

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

The characteristics of respondents are seen from age, education, length of residence, and occupation. Briefly, the characteristics of the respondents can be seen in Table 2. The average age of respondents is in the range of 35-44 years (31%) and 45-54 years (29%), which is included in middle age and pre-retirement (BKKBN 2014). This age range is included in the productive age, where humans have more physical abilities and excellent thinking patterns, so it will be easier to absorb all the information and then apply it.

The level of education can influence an individual's behavior, thought patterns, and ability to understand things.

Most of the respondents only had elementary school education (58%), the rest had junior and senior high school education, and only 1% had achieved higher education (diploma program), and there were 9% who had not finished school. The level of education can influence a society's ability to accept innovation. The higher a person's level of education, the easier it will be to accept innovation. Even though most respondents have an elementary school education, people can manage the available natural resources to meet their living needs.

The respondent's occupation is one of the characteristics that can influence the assessment or perception of an object or situation. Respondents' occupations vary, with most respondents as farmers (45%), which is related to livelihoods based on natural resources or forests. It is followed by earning a living as a fisherman (21%) because of the location of Nanga Lauk Village, which is cut by a river and surrounded by lakes. The rest are traders, housewives, and others (government officers, self-employed), while those who do not work are the elderly.

Livelihood assets in Nanga Lauk Village

Livelihood assets are anything of value or a collection of capital used to maintain a livelihood. The sources of life that an individual or social unit has in developing its life are composed of, among other things, human, natural, financial, physical, and social assets. The success of people's livelihoods relies on the value of services that flow from the total asset stock. Every asset does not have the same characteristics. Various relationships and interrelationships that the components of livelihood resources have in common are described in the form of a Pentagon asset. Pentagon shape and lines that connect each other with the center point in the middle of the Pentagon describe variations in ownership levels and community access to resources (DFID 2001).

Human asset

Human assets in the livelihood approach have first and foremost been an important subject. Human asset shows a person's ability to access better living conditions as the most important capital in livelihood that allows someone to carry out livelihood strategies and achieve their livelihood goals. Human assets are needed to process four other livelihood assets (Wijayanti et al. 2016). Human asset in this study is seen from the variables of education, health, experience, training, and skills. Human quality must always be improved to manage, utilize, and sustain other assets. The results of the human resources score in Nanga Lauk Village can be seen in Table 3.

The average level of education in Nanga Lauk Village is elementary school, resulting in knowledge and awareness of forest and land management not being optimal. The level and quality of education determine the quality of human resources. Education influences people's knowledge and ability to accept innovation, while knowledge can influence people's perceptions of household livelihood strategies.

The health condition of the people of Nanga Lauk Village is classified very good, with the majority of people stating that they are in good health, have not had any

infectious diseases in the last years and no family members are indicated to be stunting. This condition was also confirmed by health workers in the village.

For training activities in Nanga Lauk Village related to village forest management, only members of LPHD participated on a limited basis. While training for farmers and fishermen is still minimal, the special skills possessed by the community in resource management are also limited. Most of them are farmers and fishermen who do not have special skills to process the abundant natural resources in the village. Skills for processing available for fish products that many people use, such as fish processed into crackers (dry and wet), salted fish, and smoked fish, thereby increasing the added value of fish products produced and cultivated by the community.

Human assets can generally be seen as education and skills, where low education and skills cause economic pressure or barriers to access to financial assets. Barriers to access financial assets have implications for access to human and physical assets, just as barriers to access physical assets have implications for human and financial assets. Human assets (people center) in the livelihoods approach is an important subject; this shows a person's ability to gain better access to their living conditions.

Table 2. Respondent characteristics

Respondent Characteristic	Frequency	Percentage (%)
Age		
15-24 (Young age)	5	5
25-34 (Early worker age)	17	17
35-44 (Middle age)	31	31
45-54 (Pre-retirement age)	29	29
55-64 (Retirement age)	14	14
>65 (Senior age)	4	4
Education		
No School	9	9
Elementary	58	58
Junior High School	17	17
Senior High School	15	15
Diploma	1	1
Length of residence		
0-25 years	25	25
26-50 years	52	52
>50 years	23	23
Occupation		
Farmers	45	45
Fishermen	21	21
Traders	4	4
Housewives	27	27
Others	3	3

Table 3. Value for human asset

Parameter	Value
Education	1.52
Health	2.99
Experience/training	1.67
Skills	1.37
Total	1.55
Average	1.86

Table 4. Value for natural asset

Parameter	Value
Land utilization	2.52
Land productivity	2.12
Diversification	1.56
Water	2.87
Total	9.07
Average	2.25

Natural asset

DFID (2001) states that a natural asset is a stock that produces carrying capacity and beneficial value for human livelihoods. Natural assets include land resources consisting of agricultural productivity and cultivated agricultural land, land ownership, water resources, and other facilities that support households' survivability. As usual, agricultural activities in Nanga Lauk Village do not take the form of rice fields or farming. The farmers of Nanga Lauk Village carry out extensive agricultural activities, namely using existing land to plant *purik* (*Mitragyna speciosa*), rubber (*Hevea brasiliensis*), cultivating *tikung* for honey farming in the forest, making cages in rivers to raise fish, and making wallet houses to produce wallet bird nests. The results of the score for natural resources in Nanga Lauk Village can be seen in Table 4.

Households in Nanga Lauk Village have a natural asset value of 9.07. This is because Nanga Lauk Village has abundant natural resources in the form of forests and water resources. Water from the river is used for various purposes, such as bathing, toilets, fisheries, transportation, and tourism. Meanwhile, rainwater is generally still used for drinking water; even though Nanga Lauk Village does not have high rainfall (145 mm/year), every household has provided a water reservoir for drinking water availability.

The land cultivation system in Nanga Lauk utilizes forest land around the village. The designation of a village forest provides legality for the community to manage land, but that does not mean it becomes private property. So, if viewed from the aspect of land tenure, the land is controlled based on mutual agreement with natural barriers as proof of ownership for one individual. Agricultural land is generally cultivated to grow paddy or fields for growing rice (Wijayanti et al. 2016; Izzati et al. 2020; Fitri et al. 2021). This condition is different in Nanga Lauk Village because only 39% of respondents are still cultivating their fields to plant rice; recently, the community's rice has failed to harvest. The farmers of Nanga Lauk are currently using their land more to plant *purik* or *kratom* because it has a distinct market, and is not too difficult to maintain as part of their farming activities. *Purik* production is sold for IDR 6,000/kg (wet leaves) and IDR 23,000 to IDR 24,000/kg (powder). This condition is in line with the opinion of Abbassi et al. (2020), who state that natural assets are closely related and farmers use much nature.

The community uses village forest land to place *tikung* (artificial branches attached to trees for bees to nest). *Tikung* is installed on the edge of a lake or river in the forest or on a river path above a shady tree. It is a form of

local knowledge of the Nanga Lauk community in cultivating semi-natural bees, which produce honey as a source of income for the community to meet their living needs. Apart from *tikung*, honey is also produced from *lalau* trees (*Koompassia malaccensis*, *Gluta reinghas*, *Alstonia scholaris* and *Connarus monocarpus*), where honey bees nest in tall trees in the forest. Nanga Lauk honey production is always sold out, especially after forming the Honey Social Forestry Business Group (KUPS) within the Nanga Lauk village forest agency. This provides greater certainty in the honey-produced price. Honey- production managed through a sustainable system can produce 10-15 tons per year.

Moreover, 80% of the residents of Nanga Lauk Village claim to be fishermen, and 50% of the residents have cages in the Nanga Lauk river. Fish in cages are usually harvested once a year. Another fishing method is to go to the lake using traps (*jermal*), seine (*warin*), done at least four times a week during the dry season. Another way to catch fish is by *rabai* or *najur*, leaving the fishing rod overnight to catch fish the next day. The fish that are often produced in Nanga Lauk are *toman* (*Channa micropeltes*), *baung* (*Mystus nemurus*), *tapah* (*Wallago leerii*), *lais* (*Kryptopterus bicirrhis*), catfish (*Pangasianodon hypophthalmus*), and *biawan* (*Helostoma temminckii*). Some fish produced are sold directly wet; some are processed into wet and dry crackers. This fish product supports the village economy, and the relationship between fish products and village forest management is formed in fish KUPS.

The land is also used to plant rubber; it was the community's preference because it has been planted for generations, is easy to maintain, and has relatively fast production (Nurlia et al. 2021). The tapped latex is sold for IDR 5,000/kg to a collector in Nanga Lauk Village. In the management of the LPHD, a rubber KUPS was also formed to maintain the competitive selling price. Rattan, which is a non-timber forest product, is also another natural asset that is widely used by the community. Rattan is made into various types of wicker for household items to meet market demand. All of the activity proves the high dependence of the Nanga Lauk community on farming; this situation is similar to Yahya and Yahya's research (2020) about livelihood in rural communities.

Financial asset

Financial sources that can be used and utilized by the community in achieving community livelihood goals are included in financial assets. This study measures a financial asset from income, saving, investment, and ease of borrowing or debt parameters (Table 5).

Household income in Nanga Lauk Village is quite varied but generally depends on the proceeds from catching and keeping fish in cages, followed by selling *kratom* leaves, rubber, honey, swallow nests, and rattan. Several sources of income are also obtained from tangible and intangible forest ecosystems (ecosystem services). These conditions were aligned with the studies of Roslinda et al. (2017), Dutta and Guchhait (2018), Roslinda (2019), and Wale et al. (2022). Fish yields are usually greater during

the dry season when the lake dries up, and fish are easier to catch. However, the results obtained are not always steadily higher following natural conditions. The income generated by each household is different, so its use and expenditure also vary. The interviews with respondents show that the income they earned could only meet their daily needs. However, if they get a greater income, the community will be aware of saving, which will later be used when the lean season follows or to prepare their children's tuition fees for school outside the village. Apart from saving, some invest this excess income. The type of investment they chose was to buy equipment to support economic activities, such as outboard motors for catching fish and tools for processing honey and *kratom* leaves. Another important financial capital is the ease of getting loans among fellow citizens by themselves. Loans are made to some people who have their requirements, especially to support children's education, while it is rarely done to meet food needs.

Social asset

DFID (2001) defines social assets as social resources that are useful and used by people to achieve their livelihood goals. High social capital can support the management of an area (Roslinda et al. 2017; Roslinda 2018). In contrast to other assets, which are tangible (measurable and real), social resources are intangible (not easily measured and abstract). Even though it is difficult to measure, social capital is very necessary and beneficial for society. In this study, the social asset is measured from having side jobs, kinship relationships, participation in organizations, and sources of information as a form of community social network parameters, as listed in Table 6.

Side jobs manifest people's desire to achieve prosperity for their households. Almost all respondents have side jobs, and no one only does one job for a living. This is possible because natural resources are still available. Kinship relationships are still quite high in rural areas (Wijayanti et al. 2016; Fitri et al. 2021), and help from family, neighbors, and friends can still be relied on when food shortages occur; therefore, according to respondents, it has never happened when village residents are left unable to meet their food needs alone.

Participation in organizations is an important and dominant social asset in village forest management. Indeed, not all respondents in this study participated in the LPHD organization. LPHD is a forum for village communities to organize, where institutions are a collection of values, norms, and regulations within a group of people that are used to achieve certain goals. Village forest management aims to preserve forest resources as a source of community livelihood, so these social assets are important to community livelihoods.

Sources of information are also used to measure social capital. This study evaluates how community households can obtain information. The public's sources of information are mainly mobile phones (HP), television, and radio. At this time, cell phones are useful for communicating between individuals and crucial to improving their livelihoods. For example, purchasing orders for natural

resource products can be done online. The problem with using cell phones in Nanga Lauk Village is that the internet service is not stable yet, only certain spots are available for messaging. In addition, not all elderly residents can use cell phones; hence, they can ask their children to communicate with outside parties if necessary. Communication tools and networks can help the community and farmers obtain recent information, especially regarding commodity prices, marketing methods, production methods, and more. Therefore, of all respondents, only 31% said they benefited from social networks to improve their livelihoods.

Physics asset

Physical assets are basic infrastructure and other facilities built to support the community's livelihood. This infrastructure includes the development of a physical environment to help people carry out their daily lives more productively. Infrastructure is generally a public facility used without direct costs (DFID 2001). In addition, physical capital includes facilities, infrastructure, work or production equipment, and technology (Table 7).

Moreover, asset ownership and public infrastructure are physical assets in Nanga Lauk Village. The assets owned by community households are houses, motorbikes, canoes, and motorized boats to support fulfilling life activities. Infrastructure in land roads is very limited in Nanga Lauk Village; therefore, the transportation used is a motorized canoe or longboat to mobilize the villagers. People also use motorized boats of various sizes for fishing activities, according to people's abilities. Apart from that, the value of existing sanitation access in the form of bathing and washing toilets was also calculated. In general, the community already has a toilet, so Nanga Lauk Village is kept clean, especially the river. The river in Nanga Lauk must be well protected because it is the lifeblood of economic activity.

Table 5. Value for financial asset

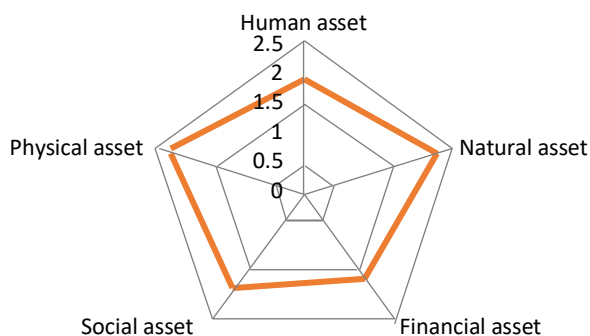
Parameter	Value
Income	1.33
Saving	2.17
Investment	1.06
Ease of borrowing or debt	2.25
Total	6.81
Average	1.70

Table 6. Value for social asset

Parameter	Value
Having side jobs	2.99
Kinship relationships	2.01
Participation in organizations	1.58
Source of information	1.02
Total	7.60
Average	1.90

Table 7. Value for physical asset

Parameter	Value
Settlement ownership	2.85
Vehicle ownership	2.23
Accessibility	1.38
Sanitation	2.55
Total	9.01
Average	2.25

**Figure 2.** Pentagon asset in Nanga Lauk Village, Embaloh Hilir Sub-district, Kapuas Hulu District, Indonesia

Livelihood assets

Livelihood assets in Nanga Lauk Village are human assets, natural assets, financial assets, social assets, and physical assets. The various relationships and links between those assets can be depicted in the form of an asset Pentagon. The shape of the Pentagon and the lines connected to the central point in the middle of the Pentagon illustrate variations in the community ownership and access to resources levels (DFID 2001).

Based on the value of livelihood assets listed in Tables 4 to 7, an asset Pentagon can be formed in Nanga Lauk village, as shown in Figure 2.

Figure 2 shows that the natural and physical assets of Nanga Lauk village have the highest position, with a value of 2.25, while financial assets have the lowest value, i.e., 1.7. The asset Pentagon image emphasizes the importance of understanding the various conditions of household life and the types of assets that support them. The five assets studied are the main assets for the population in their lives as a livelihood source because the availability of assets supports various livelihood strategies.

Discussion

The main uses of assets in Nanga Lauk are natural resource and physical assets. Nature is the main component of the Nanga Lauk community in carrying out farming activities. Abbassi et al. (2020) argue that natural assets are closely related and widely used in farming. The higher use of natural resource assets is because the availability of natural resources is still quite abundant. Farmers can utilize the natural resources that are still available. This condition is proven by the variety of farming businesses that farmers run simultaneously. Farming is a business that depends on the natural conditions that constantly change, and natural

conditions like the environment, climate, and policies affect the natural asset condition. Besides that, social and ecological changes more rapidly occur; therefore, rural farming is often faced with uncertainties. The uncertainties can lead to vulnerability if the natural asset is not managed properly. Uncertainties can be caused by anthropogenic and non-anthropogenic factors, such as humans, price fluctuations, and government policies. Human activities' degraded ecosystems, such as forest villages, can seriously threaten a community's livelihoods locally or in surrounding ecosystems (van Dam et al. 2013).

Physical assets relate to basic facilities and infrastructure built to support the community's livelihood (Barela et al. 2018). Physical assets in Nanga Lauk Village are quite high and dominantly used by farmers because many activities are carried out in their own homes and they generally have personal fishing equipment as an income source.

The next asset that is crucial to sustainable livelihoods is social assets, this means that Nanga Lauk Village still has the characteristic of prioritizing common interests. Being a member of the forest user group, in this study, LPHD members positively influenced forest utilization; the group members could learn about household livelihood opportunities (Langat et al. 2016; Masoodi and Sundriyal 2020). Yego et al. (2021) stated that institutional aspects such as access to agricultural markets, credit, extension or additional services, and membership in forest groups increased the livelihood of extracting higher-value products.

The next use of assets in managing village forests is empowering human resource assets or human capital because human resource development is very important to manage. It is necessary because the adoption of technology and knowledge in village forest management is very dependent on the capacity of the manager. Several factors that influence the adoption of technology in village forest management are human resources related to age and education. Yego et al. (2021) found that older household heads engaged in forest-based livelihood at a lower level of participation because they had accumulated assets over time, allowing them to engage in other alternative livelihood activities. The age of the head of the family greatly influences his behavior towards technology adoption. Younger farmers will be more innovative and more open to new technology. Age is an individual characteristic that greatly determines workability and productivity. Likewise, with the level of education, farmers with higher education tend to be more open to adopting new technology.

Livelihood assets owned by the community influenced their livelihood strategies, and the households in Nanga Lauk Village relied more on natural and physical assets. White (1991) summarizes livelihood strategies by dividing them based on household socio-economic status: first, the survival strategy, which is a strategy to meet living needs at a minimum level in order to survive; second, the consolidation strategy is a strategy to meet life's needs which is reflected in the fulfillment of basic and social needs; third, the accumulation strategy, which is a strategy

for fulfilling life's needs to achieve basic, social and capital accumulations. Therefore, the Pentagon asset value of Nanga Lauk Village is a consolidation strategy carried out by the Nanga Lauk Community. Andriyan (2013) states that households implementing a consolidation strategy can fulfill primary, secondary and tertiary needs. This is proven by owning a house and vehicle to meet living needs and having savings for urgent needs in the Nanga Lauk community.

Moreover, based on the natural assets that Nanga Lauk Village owned, the livelihood strategies for households can use the theory-based grouping by Scoones (2015): agriculture (on-farm), which is a strategy that involves the community agricultural sector; diversification (off-farm), which is another alternative to agricultural activities as a means of fulfilling needs when the main livelihood is hampered to be able to fulfill household livelihoods; and migration, which is leaving the village to work to fulfill their household livelihood. In Nanga Lauk Village, people still apply agricultural strategies to meet their daily needs because natural resource assets are abundant. Rice and vegetable planting activities remain, although the results are limited to meeting subsistence needs. The subsistence needs reflect the monetary value of harvested forest or agricultural products consumed by households. Cutting rubber latex and cultivating *purik* are quite fruitful. Meanwhile, to diversify through fishing activities, cultivating honey bees with *tikung* and some as swallow nest collectors and traders. Diverse forest products were collected by households for home consumption and sold (Langat et al. 2016). Those income source diversities have attracted widespread attention from scholars and policymakers because they are critical for lowering livelihood threats and vulnerability, stabilizing household incomes, and reducing poverty (Nguyen et al. 2015). Migration is only carried out by a few people, especially young people who work in gold mines around the village.

There is a demand to increase livelihood assets, especially human assets. Skill training is crucial to the community because a low level of education will shape the mindset of farmers regarding their inability to do other work that could improve their living standards. It is important to investigate because the technology and knowledge adoption in village forest management is very dependent on the capacity of the manager. Besides that, strengthening farmer groups and institutions is vital to improve the community's welfare. Many farmer's group institutions have been formed, especially KUPS in forest village management, which is not followed by active member participation. KUPS and other farmer groups should use these institutions to improve performance and increase communities' welfare. At the same time, the institution has a significant role and function in driving agricultural development efforts (Ibrahim 2021).

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