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LIVELIHOODS OF COASTAL COMMUNITIES IN KONDO VILLAGE, SOUTH PAPUA, INDONESIA: A STUDY OF AGRICULTURE, HUNTING, AND FISHING PRACTICES

Untari U^{1*}, Heru I², Sendy LM³, Silas TR⁴ and RT Jeremias³



Untari Untari

*Corresponding author email: untari@unmus.ac.id

ORCID: <https://orcid.org/0000-0001-8663-9910>

¹Agricultural Science Study Program, Faculty of Agriculture, Musamus University, Merauke-Indonesia

²Informatics Engineering Study Program, Faculty of Engineering, Musamus University, Merauke-Indonesia

³Water Resources Management Study Program, Faculty of Agriculture, Musamus University, Merauke-Indonesia

⁴Agribusiness Study Program, Faculty of Agriculture, Musamus University, Merauke-Indonesia

ABSTRACT

This study explored the livelihoods of coastal communities. The study was conducted in Kondo Village, Naukenjerai District, Merauke Regency, Indonesia. The study area borders directly with the coastal of Papua New Guinea and has a high level of livelihood vulnerability due to climate change. This study used an exploratory qualitative research approach with a survey method. Primary data sources were obtained using field observation techniques, in-depth interviews, and questionnaires. The number of respondents in this study was 71 people consisting of 56 village community respondents and 15 key informant respondents. The results showed that the community's livelihoods from hunting in the forest (deer and wild boar), and fishing in swamps and coastal areas around the community's residence are carried out traditionally and have not provided a significant economic contribution to improving the welfare of the community in Kondo Village. Cultivation activities such as rice and tubers are produced to meet household consumption needs carried out on narrow land and none are sold as a source of family income. The management of natural resources that have the potential to provide livelihoods and economic value to coastal communities has not been optimally utilized due to limited human resources in their management, as well as limited access to capital, infrastructure, and markets. Fishing activities in swamps and coastal areas and hunting wild animals in the forest are among the sources of livelihood that have economic value if there are traders who are ready to buy. To improve the livelihoods of coastal communities sustainably, the role of various parties is crucial to address the high level of community vulnerability and efforts to diversify livelihood sources for the community by implementing food processing technology from agricultural and aquatic cultivation products. The results of the study recommend cross-sector coordination in the development of basic infrastructure, strengthening capital capacity, and human resources to improve natural resource management and the sustainability of coastal community livelihoods.

Key words: livelihoods, coastal community, coastal resources, sustainability, economic, vulnerability

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INTRODUCTION

The south of Kondo Village is directly adjacent to the coast and along the coast there are mangroves that are rich in ecosystems that have economic value. The benefits of mangrove forests based on their function can be biological, ecological, physical, as well as social, economic and chemical functions [1, 2, 3]. Mangroves serve as spawning grounds, nursery grounds, feeding grounds, and nesting grounds for various species of fish, shrimp, shellfish, birds, and other biota. They also serve as shelter, egg-laying, and breeding grounds for fish [4]. Meanwhile, the ecological function of the mangrove area can function as a coastline protector, a place for assimilating waste materials, as a mud coagulation and land formation, as a habitat for wild animals and several aquatic animals, a place for various human activities such as fish and salt cultivation, mining and a place for waste disposal [5]. Physically, it functions as a land stabilizer, preventing seawater abrasion, and preventing seawater intrusion onto land. Its social function is to meet the community's needs as a source of firewood, charcoal, and roofing materials [7]. Meanwhile, economically, mangrove wood is used as raw material for making charcoal because it has a high calorific value by timber companies and good fish farming areas [4].

Most coastal communities still live on the poverty line, such as the cases in the Coast of Ghana, South Africa, Kenya, India, and Indonesia [1, 2, 3, 4]. This is partly due to the fact that the livelihoods of coastal communities are largely dependent on the availability of natural resources which are very vulnerable to natural pressures as a result of a natural decline in environmental quality or as a result of human activity. The livelihoods of coastal communities largely depend on the availability of natural resources which are very vulnerable to natural pressures resulting from a natural decline in environmental quality or as a result of human activities or as an impact of changes in social behavior [12]. So coastal communities need sustainable natural resources with human development to increase current and future capabilities and capital. In addition, damage to the natural environment will further increase the burden of sustainable development in supporting sustainable sources of community income. For this reason, socio-economic development in coastal countries is very important to involve many donor agencies and financial institutions investing funds in coastal management and cross-institutional cooperation within a country to commit to managing coastal resources and increasing access for small fishermen to realize integrated coastal management (ICM) [14].

Coastal communities need to adapt to extreme environmental changes to reduce the level of vulnerability to poverty in coastal communities. Efforts that can be made include water conservation to protect coastal ecosystems, especially places that have economic resources for the sustainability of people's livelihoods [12].

Bangladesh, Pakistan, Canada, Kenya, Zimbabwe, and Africa have experienced climate change impacts on clean water scarcity, increasing temperatures, decreasing activity and added value in the agricultural sector, increasing the occurrence of droughts and floods in an area which will lead to increased poverty in coastal communities [7, 17]. Meanwhile, Pakistan is one of the countries that has high vulnerability to the impacts of climate change and most of its population lives below the poverty line due to high dependence on natural resources [18]. To reduce the impact of climate change on the vulnerability of poverty in coastal communities, especially in Senya Beraku on the southern coast of Ghana, plans are underway to stop sand mining and carry out restoration along the coast to protect the livelihoods of the community [19] or in Humbo and Abala Abaya Districts to increase the use of agricultural technology and provide timely climate information and implement early warning systems [13]. However, it is recommended that in order to reduce poverty among the population experiencing poverty, scientific innovation should be increased to improve people's livelihoods [20]. The relationship between coastal areas and coastal resource systems in ensuring the sustainability of community livelihoods is very close [21]. Based on the existing phenomenon, this paper aims to qualitatively identify community livelihood sources to support sustainable livelihoods in the coastal area of Kondo Village on the border between Indonesia and Papua New Guinea as one of the impacts of climate change. This paper highlights not only traditional fishing and agricultural activities but also explores other resources that have the potential to reduce community poverty. By examining various livelihood sources, this study advocates for a more integrated understanding of economic activities in coastal villages.

RESEARCH METHOD

The research was conducted in Kondo Village, Naukenjerai District, Merauke Regency, South Papua Province, Indonesia (Fig 1). Kondo village is part of the Naukenjerai District government with an area of 745.60 Km² or 43.93% of the area of Naukenjerai District with a distance to the district capital of 95 km, while the distance to the district capital is 125 Km [22]. To the east, Kondo village directly borders the country of Papua New Guinea and to the south it borders directly on the Arafura Sea [23]. Kondo Village is part of the Wasur Merauke National Park area and most of the population depends on coastal natural resources for their livelihood [28]. Kondo Village is part of the Wasur Merauke National Park area and most of the population depends on coastal natural resources [26].

Based on preliminary field surveys, the characteristics of the research location are
a) one of the coastal villages in Indonesia directly bordering Papua New Guinea [27];
b) in general, the community is a communal society and depends on natural

resources as the main source of livelihood [28]; and d) Kondo Village is one of the villages that has problems of poverty and limited access to basic infrastructure. The poverty rate in Kondo Village based on the results of a study over a certain period shows a figure of 25% of the total population [29].

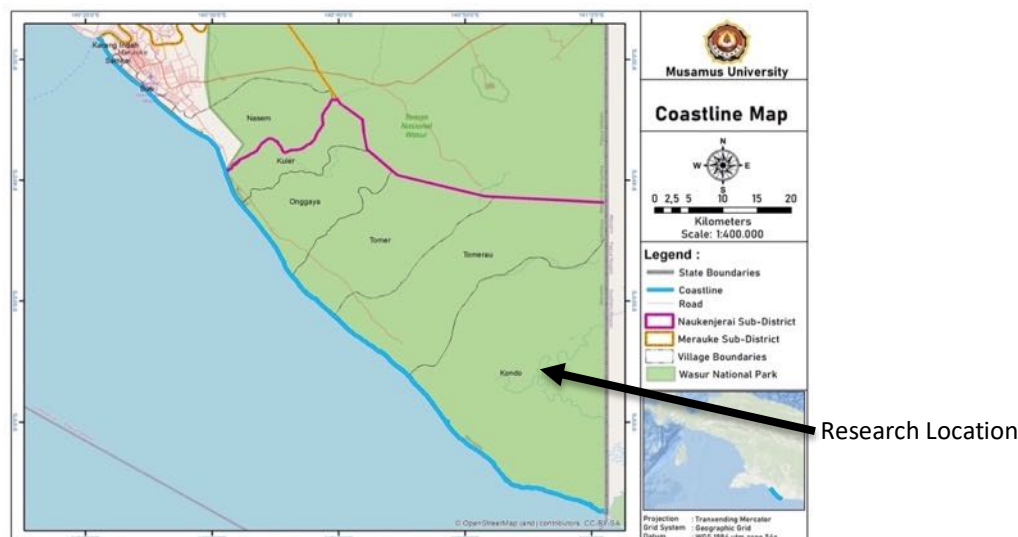


Figure 1: Coastline map at the research location of Kondo Village, Naukenjerai District, South Papua, Indonesia

The research uses a qualitative descriptive research design with a survey method [30]. This research explores the social conditions of the community and potential livelihood sources that have the potential to ensure the sustainability of coastal communities, namely: 1) the community's socio-cultural conditions; and 2) the community's livelihoods from hunting, gathering, farming, and fishing. A qualitative research approach can be used to analyze and explore data regarding empirical facts related to socio-economic conditions and local resources [31].

The research population consisted of 130 heads of families who had lived in Kondo Village for more than 5 years. Respondent sampling using the Slovin formula with an error rate of 10% [32]. The number of respondents was determined by random sampling, with the number of research respondents amounting to 56. This study also used key informant respondents sourced from 15 respondents, so that the total respondents in this study was 71 respondent samples. Key informants for the research came from the Naukenjerai District leaders, traditional leaders, religious leaders, and representatives of housewives. The total and sampling criteria for the research respondents are presented in Table 1. In determining the sample using the Slovin formula with a population of 130 heads of families, the sample that can be used is between 50-60 respondents [32].

The primary research data was directly taken from the object of study, namely the community group domiciled in Kondo Village. Some of the primary research data are 1) direct observation of the socio-economic activities of the Kondo Village community; 2) in-depth interviews with the socio-economic conditions of the Kondo community; and 3) data on potential sources of livelihood for the Kondo community. The data collection method used in-depth interviews and Focus Group Discussions (FGD) involving the District government, village government, traditional leaders, religious leaders, and the community living in Kondo Village, Naukenjerai District, Merauke Regency, South Papua Province, Indonesia. An exploratory study was conducted on all potential sources of livelihood for the community at the research location, namely the utilization of forest resources, water resources, and land resources from crop cultivation activities. Meanwhile, secondary research data was obtained from various data sources such as Naukenjerai District in Figures, Merauke Regency in Figures data, relevant reputable national and international journals.

The research data collection technique used follows Cresswell (2009), which posits that qualitative research data collection techniques can use 3 (three) data collection techniques, namely qualitative observation, interviews, and documentation techniques. Field observations were conducted by directly observing the socio-economic activities of the Kondo Village community in managing natural resources as a source of family livelihood, in addition to conducting direct observations of the conditions of the research area which can provide an overview of the infrastructure, social, economic and ecological conditions of the environment around Kondo Village. Focus Group Discussion (FGD), Focus Group Discussion (FGD) is conducted in qualitative research with a small group of people (6-12 people) to discuss a particular topic and the determination of FGD participants can be done using the purposive sampling method using criteria that are in accordance with the research objectives[36]. FGD was conducted to collect field information by involving the community, religious leaders, traditional leaders, Kondo Village officials, and the Naukenjerai District government. The parameters that became the subject of group discussions were 1) community life patterns in the environment; 2) identification of sources of livelihood that can generally be used as economic potential for the community in Kondo Village. Interviews were conducted to deepen information about the community's sources of livelihood for 56 respondents who were heads of families who were determined by random sampling. Interviews were conducted using a prepared structured questionnaire. The instruments outlined in the questionnaire were related to: 1) Types of businesses undertaken by the community to meet family needs, such as fishing, hunting, and crop cultivation? 2) the resources used in each type of activity, including fishing, hunting, and crop cultivation, are carried out by each family member to determine the contribution of each sector to supporting

household income and meeting family needs. Data collection using documentation techniques was carried out by documenting community activities in managing natural resources for sustainable life, and documenting the environment utilized by the community as a place for farming and a place to take natural resources for consumption or sale to meet life's needs.

Field data and information were analyzed using qualitative descriptive analysis methods on each data and information related to the potential of the forest natural resource sector, water resources and land resources for agricultural cultivation activities. Qualitative research is based on data in the form of words, not numbers. Descriptive research, on the other hand, describes variables one by one [34]. Descriptive analysis can be presented in the form of tables and figures [27]. Qualitative research data is analyzed descriptively to analyze and explore data regarding empirical facts that occur at the research location [33]. The data from the qualitative research results were analyzed descriptively with the steps of analysis, namely data collection, data reduction, data display, verification and conclusion drawing.

RESULTS AND DISCUSSION

General conditions of coastal communities' livelihoods

Coastal communities have high vulnerability indices of livelihood strategies, water, natural hazards, and climate variability, and health [35], so that a sustainable livelihood management strategy is needed [36]. The research results show that Kondo Village, as one of the coastal villages in Indonesia directly bordering Papua New Guinea, has a high level of vulnerability to the threat of climate change. In addition to climate change, limited basic infrastructure such as roads, markets, health care, and education are causing increasing social and economic pressures. Furthermore, the community in Kondo, Indonesia, is highly dependent on natural resources to meet food and family economic needs. Development activities are still very limited. The availability of main road access to the village has not been built, and the only means of transportation is by water, which is expensive and carries the risk of accidents during high seas. This has a significant impact on the community's activities in selling their catch or game to the market. Dependence on buyers from outside the area who cannot come every day to make transactions results in uncertain incomes, and natural resources with economic value are only used for family food consumption.

In general, to realize the goal of sustainable development in coastal areas as an impact of global change, namely 1) conducting a review of governance and assessment of coastal area utilization, 2) forming strategic partnerships, 3) a diagnostic approach supported by science and joint results [37]. Livelihood

strategies carried out in coastal communities in most coastal areas of Southeast Asia as a result of the increasing development of maritime zones and the impact on the sources of income of small fishermen. This causes the income gap from fishing results for local fishing families to be smaller compared to non-local fishermen [26]. Efforts to achieve sustainable, equitable development for the Kondo community, which generally lives below the poverty line, have been undertaken by the local government, but the results have not shown significant changes in welfare. The community's cultural attitude remains reticent about permits for inter-regional road construction, as the land is customary land and prohibits any development. This further slows inter-village connectivity, hampering social and economic activities. Furthermore, this phenomenon limits the community's access to business capital due to limited information and complicated bank requirements.

Geographically, Kondo Village is located in a coastal area. The community depends on limited coastal resources, potentially leading to conflicts over resource use and environmental degradation. This can lead to increased unemployment, hunger, and poverty in coastal communities. The impact of this is the emergence of a culture of debt to finance family life. The role of the government in increasing the role of coastal community institutions in managing coastal areas through community empowerment must be supported by policies to strengthen maritime coastal culture at the village level to face market competition through socialization activities [38]. The Kondo village community is a communal or indigenous community with local wisdom values in natural resource management inherited from their ancestors. Synergy between the community and the government in building sustainable livelihoods for the Kondo village community can utilize this approach.

The Village Administration is run by the Village Head who is elected by the community. The village head will be assisted by an organizational structure, which will be assisted by village officials in running the government and providing administrative services, such as managing village funds for village development and providing population administration services. Administrative services provided by village officials include the issuance of resident identity cards (KID) and family cards. Owning a KID and family card will facilitate access to health and education services. In addition to the social organizations in the Village, there are religious organizations. Kondo has two buildings of worship, namely the Catholic church building and the Protestant Christian church building. Religion is used as the basis of social life in an independent and unpredictable way as a source of social change and challenges, as a source of social order. Implicitly, church activities have an impact on the formation of character and personality of society in living a Christian life [23]. A

different thing is shown in the social behavior of the community that the social stratification of the community is based on income, expenditure and amount of debt.

This condition encourages children of Kondo Village who are still of productive age to marry young. The reason school-age children do not continue their higher education is the high cost of higher education. In addition, the limited knowledge of the community to access information about the cost of higher education for children of Indigenous Papuans (IP). Limited access to education for coastal communities can be caused by the poverty of coastal communities [35]. The quality of human resources is influenced by the level of education which influences the sustainability of coastal communities' livelihoods in terms of their ability to utilize and manage resources to improve the community's livelihoods [11].

Courtney and White think that, opportunities for coastal community training at the local, provincial or national level that are appropriate to the context of local community needs must be a commitment of every leadership in coastal areas [39]. Formal and non-formal education for coastal communities in Bangladesh who are highly vulnerable to pressures from changes in natural resources is carried out by providing health education to improve access to better health facilities, increasing knowledge to access finance. Education on personal and environmental health is important for the community because it can support the sustainability of the community's livelihood sources [7].

Encouraging social development in rural areas can be done by providing access to economic assets and social networks and increasing community motivation to build entrepreneurship. Regional and community development functions as a process based on initiative, creativity, and independence, along with government activities to improve the social, cultural, and economic conditions of the community which can be indicators of successful development. Some indicators that can be parameters are such as community participation to improve their lives based on the strengths and abilities of the community; and services and technical assistance from the government to generate initiatives, along with the determination to help themselves and the willingness to help others. The concept of village community empowerment is one good strategy for building village development [40]. The Kondo Village community relies on several livelihoods to meet their families' economic needs, including hunting, farming, and fishing in inland or coastal waters, often using traditional methods. The traditional leader explained this as follows:

“To meet our daily needs, our community usually farms in gardens and rice fields, hunts, and fishes in swamps or on the coast near the village, and these activities are still carried out with simple tools” (FGD, The Traditional Leader, Men).

Agricultural cultivation

The results of observations and in-depth interviews with the community indicate that the agricultural cultivation currently practiced by the Kondo community consists of rice paddy cultivation and cultivation in fields or gardens using an organic farming system. In the rice paddies, the main commodity cultivated is rice. According to one male farmer, the rice crop program is programmed by the local government by providing assistance in the form of agricultural tools and machinery, such as hand tractors, as well as assistance in the form of 10 kg of rice seeds per head of family. A head of family participant stated:

"The Department of Agriculture supports the village community in their rice cultivation activities by providing agricultural machinery for land preparation, such as hand tractors, and rice seeds. Each year, each family receives 10 kg of rice seeds. This assistance is provided through the farmer groups in Kondo Village" (FGD, Head of Family, Men01).

The local government program has a specific objective of encouraging rice cultivation, namely supporting family food security. In contrast, cultivation in garden land is generally used for the cultivation of tubers, namely cassava, sweet potatoes, and taro. A head of family participant stated:

"In addition to planting rice, the community also gardens. In the gardens, they grow cassava, sweet potatoes, and taro. The produce is used only for food and not for sale. So we only plant on small plots." (FGD, Head of Family, Men02).

Adoption of agricultural technology by coastal communities in addressing livelihood vulnerabilities and improving the living standards of farmers in Khulna District, Bangladesh[41]. In addition, research in Pakistan, that modernization of agricultural techniques is recommended to reduce poverty rates among people living in rural areas who are vulnerable to the impacts of climate change[20].

The cultivation area in Kondo village in its utilization is under the Wasur Merauke National Park Office because Kondo village is included in the National Park area. In the management of land or forests for agricultural activities in the national park area, it is of a subsistence agricultural nature[42]. The results of food crop cultivation production until now are only for family consumption. The production results will be stored and as family food reserves during the long dry season. The area of land managed is also still below 1 ha. The description of the garden land and rice fields in Kondo Village is depicted in Figure 2 and Figure 3.



Kumbili Garden



Red Caladium and Cassava Gardens

Figure 2: Kumbili, Red Caladium and Cassava Gardens In Kondo Village



Figure 3: Rice Plantations in Kondo Village

The results of the study show that the results of observations and in-depth interviews in the field show that farming activities are carried out by the community on customary land that has been designated as agricultural land and has received approval from the landowners. Ownership of garden and rice fields for each family in Kondo Village is based on a use permit from the customary landowners, the Marind tribe. Land designated for cultivation activities requires permission from the Marind customary leader residing in Kondo Village. Land previously cultivated by a family head who is no longer cultivating can be cultivated by another family head, with the condition of obtaining permission from the previous family that cultivated the land and from the Marind customary leader residing in Kondo Village. The land

management system for agriculture in Kondo Village has been established based on mutual agreement, although there is no written agreement. This is done to avoid land management conflicts because the land is not privately owned. Land conflicts mostly occur due to unclear ownership boundaries[43]. Marind tribal leaders said that:

"If people want to cultivate gardens or rice paddies, they must obtain approval from the Marind tribal chief, who owns the customary land in Kondo Village. The location of the land and rice paddies is determined collectively and is outside of sacred areas that are prohibited for any activity. Therefore, anyone can cultivate agricultural land as long as they seek permission from the family who previously cultivated it, and they must also obtain permission from the Marind tribal chief." (In-depth interview, The Marind tribal leaders, Men03).

The social organization in Kondo Village that plays a vital role in community life is the Church, which serves as spiritual capital in village development. Religious social capital is believed to be a unique resource in rural community development due to its network-based nature. Furthermore, cultural capital plays a role in the development of Kondo. The Marind tribe's traditional institutions function to make decisions regarding the natural resource management system utilized by the community. Cultural capital can shape communities to adapt and modify their environment. Communities apply traditional ecological knowledge and form institutions, enabling the government to incorporate sociocultural capital into coastal resource development and management policies. The culture of a region can be one of the causes of cultural poverty. Cultural poverty is caused by a community's lifestyle, cost of living, and the culture of a community feeling content and not lacking [44].

Hunt

Forests play an important role in the sustainability of people's lives in Kondo Village. Forests are one of the sources of people's livelihoods to meet food needs and store economic potential that can be used as a source of family income. Forest resources are utilized for food and non-food sources. Forests are a place for various flora and fauna that have the function of fulfilling food and non-food needs. The forests in the Kondo village area are entirely included in the management of the Wasur National Park Area, Merauke Regency, South Papua Province. Based on its status, the forest resource utilization system is under the supervision of the local National Park Office. In the management of the National Park, opportunities are given to people living in the National Park from before the establishment of the National Park area to utilize forest resources to fulfill food needs, such as taking forest products. Several

commodities in the Wasur National Park area that are utilized by the community as food sources are Sago, freshwater fish, and game animals such as Deer, Wild Boar, and Kangaroos. In addition, several plants or flora that have economic potential and have not been utilized by the community are Turmeric and Candlenut. Activities in utilizing natural resources are called gathering activities [27, 28].

The results of observations and interviews with the community show that the people of Kondo Village can generally hunt in the forest. The types of prey that are often hunted by the community are Wild Boar, Kangaroo, and Deer, which are currently being exploited for economic purposes. The way people hunt is still very simple, namely by using animals, namely Dogs, and simple equipment such as machetes, bows, or spears. The hunting system has rules and local wisdom in managing natural resources, namely hunting can only be done traditionally with arrows/dogs, the number in one hunt is 1-2, hunting with a machete/rifle is not allowed, hunting can only be done in one's own village/customary rights, it can be sold but a maximum of 2, people who want to hunt must contact the village master, but the value of local wisdom is starting to decline as a result of competition in natural resources with the community [33, 56]. One of the community members, during an in-depth interview with the community, stated that:

"People who enter the forest to hunt usually hunt deer, pigs, and kangaroos. Forest hunting is carried out by male family members, either individually or in groups, using bows, machetes, and hunting dog." (In-depth interview, Men04)

Hunting is conducted individually in the forest areas surrounding the village, within customary forest areas where hunting is permitted, as agreed upon by the village community, and not on sacred land. Papuans generally conduct hunting within the boundaries of each clan's territory or based on clear customary land rights recognized by all members of the community living in the Papua region [53]. Individual hunters use capital to enter the forest by purchasing food on credit. The credit for gathering food is repaid upon exiting the forest, and the debt is deducted from the proceeds from the sale of meat to the village collector. This hunting system involves family members who are permitted to enter the forest. People hunt in the forest around the village solely on foot and without any means of transportation. A similar situation occurs in the Maybrat and Mrem tribe of Papua, where hunting is generally carried out individually or in groups.

The results of field research show that the types of game animals caught by the community are deer, wild boar and tree kangaroos. Some literature states that the types of game animals caught by people in Papua are deer, wild boar and

kangaroos. Meanwhile, in the Maybrat area, there are other types of game animals that people try to catch when hunting in the forest, namely cuscus (Phalangeridae), mole rats, soa-soa (Varanidae), maleo (Megepodidae), cassowary (Casuaridae) and mambruk (Columbidae), and hunting locations are determined by the hunting season [48]. Field research results show that people will go into the forest to hunt if there is a request from traders at the village level or from traders who come directly from Merauke City to look for Deer Meat and Pork Jerky. If there is no request from traders, the game will only be consumed by the family, and the rest will be shared with relatives. However, some people process game meat into sweet venison jerky or salty jerky. The processed jerky is usually purchased by traders at the village level. In Kondo village, there are 3 traders. If the traders have not brought jerky to sell to Merauke City and have a lot of stock, they will no longer buy from the community, and ultimately, the community cannot produce jerky.

Hunting activities in the forest are also carried out in groups. This system is carried out by the community with a team of 5 to 6 adult men and has the ability to enter the forest for up to 6 days in nature. This hunting activity is supported by people who have capital or are commonly called Bosses by the community. Bosses are people or individuals who have capital and speedboat transportation. While entering the forest, all food needs are covered by the Boss with a payment system from the proceeds of the sale of deer meat from the catch. The hunting location is a forest area that is close to the border areas between Papua New Guinea and Indonesia.

Hunting is carried out in groups in forest areas far from villages, and the journey to the location is made by private speedboat. One to two deer can be hunted in a single night. However, it is not uncommon for deer, kangaroos, or wild boar to be hunted in a single night without a single catch. Traditional hunting activities are regulated by a protected forest management system, where the forest area falls within the Wasur National Park area. This aims to conserve nature within the national park. Management of Wasur National Park is governed by various regulations, particularly Ministerial Regulation No. 17 of 2022 concerning the Organization and Work Procedures of the Directorate General of Natural Resources and Ecosystems and regulations related to zoning, which refer to Law No. 5 of 1990 concerning the Conservation of Biological Natural Resources and Ecosystems. Management is currently shifting from a special zone to a traditional zone to accommodate local community empowerment while maintaining sustainability, as regulated in the internal policies of the Wasur National Park Office. However, the fishing system, supported by capitalists who finance the importation of food into the forest, and who bring rifles and speedboats, results in higher catches. This contradicts forest

conservation principles within the Wasur National Park area and threatens the biodiversity and sustainability of the park's natural forest resources.

For one deer, the meat weighs 18 to 25 kg per head. The selling price at the Boss for 1 kg of venison ranges from IDR 20,000/kg to IDR 25,000/kg. The selling price applies only to the research location, namely in Kondo Village. Based on the survey results, deer meat sales in Merauke City range from IDR 80,000 to IDR 95,000/kg. The potential income from hunting in a group system for 5 days with a minimum of 5 community members is presented in Table 2. The phenomenon of buying and selling hunted products in the Maybrat Tribe in Papua, especially the Aywat community, is carried out through a barter system for valuables such as bracelets made from snail shells, crocodile and pig fangs, necklaces and belts decorated with beads from special species such as birds of paradise [47].

Table 2 shows that the income of people who enter the forest to hunt in a team has the potential to earn between Rp1,000,000 and Rp3,500,000 in 5 days of hunting. The potential income per person in 5 working days ranges from Rp200,000 to Rp700,000/person. In one month, the community has the potential to hunt in the forest twice. The potential income in one month from hunting animals ranges from Rp400,000 to Rp1,400,000/month/family. The income of the people of Kondo Village is still higher than the income of the people in Rumberpon District, Wondama Bay, which contributes to the family income of IDR 680,000/month [50]. The income from hunting carried out by the community is still below the minimum income of Merauke Regency. The minimum wage for Merauke Regency in 2024 is Rp4,024,270/month.

Social forestry practices are one way to improve community welfare through sustainable forest programs by involving local communities in forest management, providing many benefits such as forest conservation, improving livelihoods, and reducing poverty[51]. This applies in the practice of social forestry management in Kondo Village, Naukenjerai District, and South Papua. The lives of traditional communities are highly dependent on forest resources and the potential of forest resources is used as one of the sources of family income such as unmanaged spice plants, hunted animals, and water resources that are caught and sold to meet family needs. Although in reality, forest resources have not had a significant impact on improving family welfare.

Capture Fisheries

The socio-economic sustainability of coastal communities is influenced by fishery resources to improve long-term financial well-being and socio-cultural well-being. [36]. The potential for fishery resources around Kondo Village is abundant. When the Kondo Village community is not entering the forest to hunt or garden or farm, they engage in fishing activities in the swamps or off the coast using nets. Based on

field observations during the research, fish were mostly consumed by families. This community activity is called subsistence, and the community generally still uses traditional fishing gear. In contrast to several regions in Indonesia, coastal communities who caught fish using fishing technology have an impact on the income and welfare of fishing communities who depend on fishing for their livelihood. Therefore, the economic value of fishing by the Kondo Village community have not yet contributed to family income. This is due to a lack of demand or a lack of consumers purchasing fresh fish. This phenomenon is suspected to be one of the contributing factors to the poverty in coastal areas, which are still identified with coastal communities [52]. Community capacity in fish processing is also still very limited, and capital to purchase raw materials is very limited. Restricted access to capital means that the potential of fisheries resources is not optimally utilized and does not contribute significantly to family income. Illustrations of fishing nets and coastal fishing systems using nets are presented in Figure 4.



Figure 4: Fishing Nets and Net Installation Systems on the Coast

Data shows that the potential for capture fisheries in Merauke Regency's waters is dominated by skipjack tuna, mackerel, tuna, shrimp, and other fish, reaching 222,925 tons in 2019, with a production value in rupiah of 6.4 billion. This capture production increased from 2018, when the total capture fisheries production was 220,929 tons [53]. Fish that have economic value in Kondo village are Fourfinger threadfin (*Eleutheronema tetradactylum*), Barramundi (*Lates calcarifer*), Japanese Meagre (Ikan Gulamah in Bahasa) (*Argyrosomus japonicas*) and Papua Seerfish (*Scomberomorus multiradiatus*). These three types of fish can be caught along the coast during high tide. The fishing community will set nets on the coast during low

tide. When high tide occurs, the potential for fish to be caught in the net and the fishing community will check the net results when the water recedes. The potential for coastal fisheries that have the potential to be a source of family income are mangrove crabs, shellfish, and small pelagic fish. While the types of freshwater fish in Kondo waters and have the potential to be used as a family livelihood are Climbing Perch (*Anabas testudineus*), Tilapia (*Oreochromis niloticus*), Barramundi (*Lates calcarifer*), and Striped Snakehead (*Channa striata*). This condition is different from the conditions in Bangladesh waters which have high fish potential and contribute 16% of total fisheries production, such as Bombay duck (*Harpodon neherius*) compared to pomfret (*Pampus argenteus*), Indian salmon (*Eleutheronematetra dactylum*), Jewfish, catfish [54]. The caught fish, namely pomfret, barramundi, and white snapper, will be inflated and dried. The dried fish bubbles will be sold to traders in Merauke City. The price of bubbles from the three types of fish caught varies depending on the type of fish and the quality of the dried bubbles. In one week, people will catch fish two to three times a week. The sales of fish bubbles in one month can reach IDR 3,000,000 per month during the fishing season. Research results on the income of fishermen in Indonesian waters show that the income of fishermen catching anchovies at the Krakahan Fish Farm, Brebes Regency is IDR 1,583,565/month. Based on the results of the empirical study, it was concluded that the income of fishermen on the coast of Kondo Village is generally still below the income of fishermen in coastal areas of Indonesia. Limited fishing technology can trigger resource conflicts among coastal fishermen.

The fish catch obtained by the community is determined by the season. Empirically, the fishing season is divided into 3 seasons, namely: 1) the abundant fish season, namely in October, November, and December; 2) the less/few fish season occurs during big waves, namely in January, February, and March; 3) the stable fish production season, namely from April to September. Besides fish, coastal waters offer other economic potential through fishing. Previously, shellfish were only caught for family food. The process and results of shellfish catches carried out on the Kondo Village coast are shown in Figure 5.



Figure 5: The process of searching for shells and the results

Fishing techniques are still carried out with simple technology with limited ownership of fishing gear. Fishing gear used to catch fish on the coast generally uses nets and traditional tools, namely machetes and woven bags from coconut leaves (Kamboti in the Marind language) as containers for placing crab and shellfish catches. The same thing is done by fishermen on the Kenya coast when catching fish[55]. Traditional fishermen in coastal areas generally have limited business capital.



Figure 6: Equipment and process for searching for mangrove crabs in Kondo Village

Figure 6 shows that the community still uses simple and very traditional fishing equipment. The results of this study align with the conditions of fishermen in Malambe, Ponelo District, North Gorontalo Regency, who are still traditional fishermen and use simple fishing gear [56]. The Kondo people use Kamboti and

machetes to catch crabs and shellfish in coastal mangrove forests. The Kondo people employ a traditional fishing technique. In theory, certain customs are inherent in a society where a group of individuals reside. Another potential fishery resource in inland fisheries in Kondo village is inland fisheries, namely snakehead fish.

The sustainability of livelihoods in Kondo Village from the water sector is significantly impacted by limited capital and market access. This aligns with the conditions of coastal communities, as studies show that reduced local financial capacity can lead to increased uncertainty in coastal communities' livelihoods [57]. Real efforts are needed from village, district, provincial, and even national governments to focus on facilitating financial access and building market and road infrastructure to reduce transportation costs to and from condominium villages. Ease of transportation access can impact total operating costs and product selling prices, which in turn influence the marketability of products and the economic results achieved by communities in a given area. The Kondo Village community incorporates cultural dimensions into their behavior in utilizing natural resources to meet consumption and economic needs.

Empirically, the theory reveals that social capital and community resource capacity are factors in the implementation of sustainable rural programs. This is proven by the results of research in Java, Indonesia, that poor family groups who have weak translocal social capital ties have very weak adaptation abilities to environmental changes and are vulnerable to poverty. The role of social capital in the Indonesian Kondo Village community has not been optimal. Research shows that people in Kondo Village who still live below the poverty line are unable to contribute to ensuring a sustainable social and economic life for their families due to limited infrastructure, limited capital, low levels of education and skills, and difficult market access. Direct community involvement in any program that supports the creation of alternative livelihoods is a determining factor in the sustainability of community livelihoods, which is expected to reduce poverty in the village [1]. The role of social capital in coastal community development in the form of developing organizational capabilities, building collaborative networks, and participation in society. To increase the role of social capital in contributing to the welfare of coastal communities, it is necessary to have the role of leadership resources who can provide solutions to community problems. However, the involvement of various actors such as authorized government officials, village heads, local academics and non-governmental organizations must be in line in understanding the sustainable management of coastal natural resources to support the sustainability of community livelihoods and the environment [9] and prioritize local cultural context. Based on the phenomena at the research location and empirical theory, the research results

conclude that the sustainability of coastal communities in Kondo village strengthens the role of social capital by not ignoring the local wisdom of the Kondo community, which is generally a traditional fishing community and adheres to traditional culture.

In general, the Kondo village community in utilizing or managing coastal resources with local knowledge has not indicated any environmental damage that can reduce fish catches, threaten mangrove forests, and increase population levels. The mangrove forest ecosystem has 3 main functions, namely physical function, ecological function and economic function [58]. The coastal resource management system, both fisheries and non-fisheries resources, is still traditional. However, based on field observations, there are indications of coastal area damage/degradation, namely the threat to mangrove forests as caused by high sea waves that cause coastal abrasion so that coastal sediments are carried by waves that cause mangrove plants to fall. Coastal land degradation is mostly caused by nature, namely abrasion, high waves, and ebb and flow. However, in some areas this is due to the conversion of mangrove forests for the construction of fish ponds or the construction of public facilities. The condition of mangrove forests in several areas has different economic valuation values and contributes to the level of welfare of coastal communities. The level of economic valuation of mangroves in several regions is influenced by the diversity of biota in them, which is influenced by the quality of mangroves in a particular region. An overview of natural pressures that cause coastal land degradation is presented in Figure 7.



Figure 7: Coastal damage to Kondo Village due to sea waves

Management of coastal areas that are home to various fisheries habitats requires intervention from local and central governments, as well as multi-sectoral collaboration in realizing the sustainability of coastal environments [39].

The diversity of natural resources in the Kondo Village area has not, in fact, provided social and economic improvements for the local community. Control of natural resources, which have the potential to become a valuable source of livelihood for

the community, is actually caused by limited capital, preventing the community from accessing technology that supports marketing or product processing to increase the selling value and distribution of natural products to the market. Research among fishermen in the Naukenjerai and Merauke districts indicates that the community experiences limited capital and difficulty accessing capture fisheries technology, resulting in low catches [25, 26 27]. The same thing is experienced by the communities on the Kenyan coast who are still traditional, that efforts to improve technology projects to increase community catches are hampered by the community's ability to access technology due to limited capital to buy more modern fishing equipment [2]. Low access to capital, especially financial capital, is a cause of poverty. Limited access to financial capital causes some people in coastal areas who work as fishermen to be unable to access physical capital in the form of more modern fishing technology. The economic strategy is carried out by implementing a dual livelihood pattern carried out by the community in Kondo Village, namely the workforce will work as fishermen and hunters. Farming activities are only carried out to provide staple food for the family by growing rice and tubers in the fields and gardens. While the social strategy is carried out by utilizing kinship ties and religious ties because in Kondo Village 99% of the population is Christian.

The livelihoods of the people of Kondo Village that contribute to the economy by meeting family needs are hunting and fishing. Meanwhile, agricultural cultivation activities are carried out only to meet family food consumption needs and nothing is sold. Community activities in the utilization of land, forest, and water resources based on field observations have not had any real implications for global climate change because community activities are generally carried out traditionally. Natural resource management in Kondo is under the management of the Wasur National Park Office because Kondo Village is included in the national park conservation area.

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

The results of the study concluded that the people of Kondo Village in general based on observations at the research location are still living below the poverty line. As indicated by the availability of infrastructure, namely changes obtained from government assistance, school buildings only have elementary schools and for people to access higher schools, they must go to other villages with very long distances and there is no land access. The only transportation in Kondo Village is water transportation, namely Speedboat with expensive costs. Natural resources play an important role in the sustainability of community life. The main source of family livelihoods that can contribute to the family economy are fisheries and hunting which can be sold to village-level traders. So that fishery resources and game animal

management must continue to be improved. However, this depends on the demand from traders, which is still very limited. Cultivation activities carried out by the community, namely cultivating tubers and rice, are only a mainstay for family food reserves and have not been traded, so they have not been able to contribute to the family economy. Potential forest products from flora that can be harvested by the community for sale are Candlenut and Turmeric, but many remain unsold due to lack of demand at the village level and distant market access. The results of the study recommend the importance of increasing openness and ease of market access from and to Kondo village, building road infrastructure, and improving the quality of resources, as well as increasing the role of village, sub-district, and district governments, namely the central government by improving multi-sectoral coordination to make Kondo Village a superior area because it borders directly with Papua New Guinea.

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This research was funded by the Indonesian government, and all raw data and respondents' identities were kept confidential and prevented from public disclosure. The authors herein declare that they have no affiliations or involvement with any organization or entity with a financial interest in the manuscript under review. Competing non-financial interests include political, personal, religious, ideological, academic, and intellectual considerations.

AUTHOR CONTRIBUTIONS

Untari contributed to the preparation of the article writing framework, analysis of socio-cultural conditions, and identification of sources of livelihood for the people of Kondo Village. Heru, I played a role in editing and writing layout. Sendy LM, contributed to editing the manuscript, and analysis of sources of livelihood from the fisheries sector. Meanwhile, Silas TR and Jeremias TT played a role in collecting field data.



Table 1: Total and Criteria of Research Respondents

No.	Respondents	Total	Respondent Criteria
1	Naukenjerai District	1	Leaders or officials make policies and understand the problems of the community in Kondo Village
2	Village officials	5	Communities who are included in the organizational structure of the Kondo Village government
3	Marind traditional figures	2	Communities who have been determined by custom to become traditional leaders by the community in Kondo Village
4	Religious leaders	2	Pastors or priests or people who have difficulty being appointed as part of the management
5	Head of family	56	Respondents understand the social and economic conditions of the community in Kondo Village. Have lived in Kondo Village for more than 5 years. Are directly involved in decision making in the family's livelihood sources.
6	Representative of housewives	5	Housewives/wives who are directly involved in helping their husbands in household income-earning activities
Total respondents		71	

Table 2: Potential Income for The Community from Deer Hunting in 5 Days

No.	Instrument	Unit	Amount
1	Number of catches	Head	5 - 10
2	Potential amount of meat (potential 20 kg/head)	Kg	100 - 200
3	Purchase price	IDR/kg	20.000-25.000
4	Amount of Receipts (100 kg)	IDR	2.000.000-2.500.000
5	Potential Revenue Amount (200 kg)	IDR	4.000.000-5.000.000
6	Food costs (5 days/5 person)	IDR	1.000.000-1.500.000
7	Potential Net Income/team (100 kg)	IDR	1.000.000
8	Potential Net Income/team (200 kg)	IDR	3.000.000-3.500.000
9	Net Income Potential/person (100 kg)	IDR/person	200.000
10	Net Income Potential/person (200 kg)	IDR/person	600.000-700.000

Net Income Potential/person

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