

## Indigenous Knowledge on Shifting Cultivation and Sustainable Agriculture

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Indigenous knowledge on shifting mountainous farm management of Arfak farmers is the original culture of Arfak people, held firm passed down to generations. This can be seen in the agricultural activities of Arfak farmers who are still applying indigenous knowledge to this day. Modernization can affect the existence and can also be a threat to the indigenous knowledge of Arfak farmers. The low level of education of farmers, the oral transfer of indigenous knowledge and the absence of written documentation of indigenous knowledge are the causes of indigenous knowledge being swept away in the flow of modernization. Apart from that, the existence of indigenous knowledge is increasingly threatened by the development of plantations and urban areas. Especially the increasing demand for land for plantations, infrastructure, settlements and mining. Based on data from the West Papua Agriculture Service, in 2017 plantation development reached 53,806 ha and mining reached 89,256 ha in the Arfak Mountains. Agricultural modernization and industrialization will certainly reduce shifting cultivation and the value of indigenous knowledge. The high biodiversity makes Arfak Mountains a conservation area and makes this region a center of highland vegetable production in West Papua. In 2021, agricultural sector contributed 33.61% to growth Arfak Mountains Gross Regional Domestic Product. This study aims to describe how Arfak farmers apply their indigenous knowledge, namely the concept of *igya ser hanjob* in managing land to support sustainable agricultural activities. This research uses qualitative approach with inductive methods and case study techniques to document the knowledge and experience Arfak farmers selected with the snowball technique. Data was collected through interviews and observations. This study found that sustainable land management in agricultural activities is based on the ecological concept of the Arfak people, namely *igya ser hanjob*. This concept regulates appropriate management areas for agriculture and ensures environment sustainability and family food. This ecological concept was socialized for generations Arfak farming family. However, in reality there is a threat of landslides in agricultural areas due to socio-economic and ecological changes in mountainous farming are of Arfak community. **Keywords:** Indigenous knowledge, local wisdom of '*igya ser hanjob*', sustainable agriculture, shifting cultivation, agricultural activities.

### INTRODUCTION

Arfak Mountains has an area of 2,773.74 km<sup>2</sup>, located at an altitude of 2,950 meters above sea level with a topography dominated by hilly and mountainous areas (flat areas less than 2%) with a slope of 1-25% (Toansba *et al.*, 2021). The Arfak Mountains are dominated by high mountains, have unique flora and fauna, so the Arfak Mountains region is designated as a conservation area. The area of conservation area is 68,325 hectares and most of the area is forest area. The grounds consist of high mountains, slopes and valley (Salosa *et al.*, 2014). The establishment of West Papua Province as a conservation province in 2015, then changed to a sustainable

development province in 2019 became the basis for the development of West Papua as a conservation province through the development of sustainable agriculture (Fatem *et al.*, 2023). This is emphasized in one of the missions of West Papua Province, namely equitable and sustainable management of the environment and natural resources. One of the steps in realizing this mission is to increase the role of the community in natural resource management and preservation of environmental functions based on customs and local wisdom.

The agricultural sector still contributes greatly to the economic development of the region in the Arfak Mountains, which is 33.61% of the growth of Gross Regional Domestic

Product. The large contribution from the agricultural sector, in addition to being supported by land resources, is also supported by the role of farming families in pursuing superior agricultural commodities including the sub-sectors of food crops, horticulture and plantations (Sagrim *et al.*, 2016). However, the results of the current study show that the use of garden land by Arfak farmers is limited in terms of space and land resource utilization. The condition of agricultural land is steep >60%, prone to landslides (Iyai *et al.*, 2019)

Arfak people have long lived from a sedentary agricultural system and shifting cultivation. Arfak farmers adhere to ecological concept in their agricultural activities. The concept of *igya ser hanjob* as local wisdom in sustainable environmental management with a shifting cultivation farming system practiced for generations by Arfak farmers. Local wisdom is knowledge or habits that are passed down from generation to generation and have values that are characteristic of certain communities (Ruhana dan Furqan, 2023). The form of local wisdom of the Arfak people, namely *igya ser hanjob*, is a characteristic of the Arfak people (Asmuruf *et al.*, 2017). Local wisdom provides a picture related to the life of humans who live with their natural and social environment (Mazid *et al.*, 2020). As local wisdom that lives in the Arfak people comes from the interaction of human existence with culture, customs, nature and social communities in the Arfak Mountains region (Ungirwalu *et al.*, 2019).

Previous research conducted on Arfak people (Tapi *et al.*, 2020) and (Ataribaba *et al.*, 2020) explained that Arfak people around lowland rainforests carry out the concept of *igya ser hanjob* in their agricultural activities, especially gardening. Another study explained that ecosystem zoning and agricultural land use of the Arfak people are based on local wisdom "*igya ser hanjob*" for agricultural activities. *Igya ser hanjob* is an ecological concept of territorial division or zoning of land conservation area boundaries and a way of gardening rotationally to maintain biological sustainability (Purbokurniawan *et al.*, 2019a)

*Igya ser hanjob* is empirically known for four areas or zoning, namely: *Bahamti*, *Nimahamti*, *Susti* and *Situmsi* (Purbokurniawan *et al.*, 2021b). These four areas are based on environmental changes and natural signs. The *Bahamti* area is also called primary forest, which is an area that is tightly guarded by the Arfak people. In the *Bahamti* zone it is forbidden to carry out various activities such as gardening, hunting, cutting wood and settlement. The *Nimahamti* area is also called secondary forest, which is a former field or garden that is rested or cultivated for 10-20 years so that soil fertility and soil nutrients can be used again for farming or gardening by the Arfak people. *Nimahamti* is an area that is under restoration after being used by the Arfak people. In *Nimahamti* area it is allowed to take bark, rattan, leaves, hunt and garden, but not build settlements. The *Susti* and *Situmsi* areas are areas that are actively used for agricultural activities

until now by the Arfak people. The *Susti* area is usually used for shifting cultivation farming. The *Situmsi* area is an area close to the Arfak people settlement, used to grow vegetables and other horticultural crops in the yard of the Arfak people (Sonbait *et al.*, 2018).

Arfak Mountains have the status of a conservation area and are the center of highland vegetable crop production, of course, require demands for economic sustainability for the Arfak people in the Arfak Mountains and must be supported by a sustainable agricultural system. The concept of *igya ser hanjob* is important to preserve because in *igya ser hanjob* there are regulations, regulations, and warnings for the Arfak people which are arranged informally and aim to maintain and not cross the boundaries of the area determined when utilizing (Indrawati *et al.*, 2022). An important aspect of zoning in the *igya ser hanjob* concept is the classification of ecological zones based on indigenous knowledge of the Arfak people which refers to soil and topographic conditions along with their designation in agricultural activities. The development of agriculture in the Arfak Mountains region does not detach itself from the local cultural context and appreciates the order of values, spirits and indigenous knowledge, able to adapt to ever-changing conditions, such as population growth, new policy challenges and changes in market constellations.

The information above confirms that the challenges that can affect the existence of indigenous knowledge of Arfak farmers are modernization, agricultural industrialization and natural disasters. The pattern of shifting cultivation is closely related to the indigenous knowledge values that apply in the Arfak community. The knowledge value in question is the ecological value (*igya ser hanjob*; to keep the forest sustainable for humans to live together in harmony with the forest according to the rules, customs and norms); social value (collective social values at the family and Arfak community level in the use of forest products and processing land for agriculture) and economic value (protecting resources that are obtained free of charge in the form of exchange of goods and services). According to (Akca *et al.*, 2005) and (Leakey, 2020) multifunctional agriculture is the identity of dry land farmers. This pattern is maintained, because it maintains social, economic and ecological sustainability.

The Arfak community adherence to indigenous knowledge values in carrying out garden agriculture activities should continue to be maintained, guarded and obeyed. However, the existence of these indigenous knowledge resources and values is increasingly threatened by the development of plantations and urban areas (Hujairin *et al.*, 2017). Especially the increasing demand for plantation land, infrastructure, illegal mining and transmigrant settlements. For the record, in 2017 plantation development reached 53,806 ha, mining area 89,256 ha (Dinas Pertanian West Papua, 2017). Agricultural modernization and industrialization will certainly reduce shifting cultivation and the values that surround it, including the value of indigenous knowledge. Hujairin (2017)



emphasized that the need for land for infrastructure, mining and plantations is quite large, which is thought to have had a negative impact on the sustainability of Arfak farmers shifting cultivation. If left uncontrolled, it could threaten the sustainability of farming culture that has been institutionalized and passed down from generation to generation, including indigenous knowledge because indigenous knowledge exists if the Arfak people garden agriculture. This will threaten sustainable agriculture. As previously explained by previous research (Toansiba *et al.*, 2021) shifting cultivation is based on local knowledge which has been carried out by artifact farmers in accordance with sustainable agriculture.

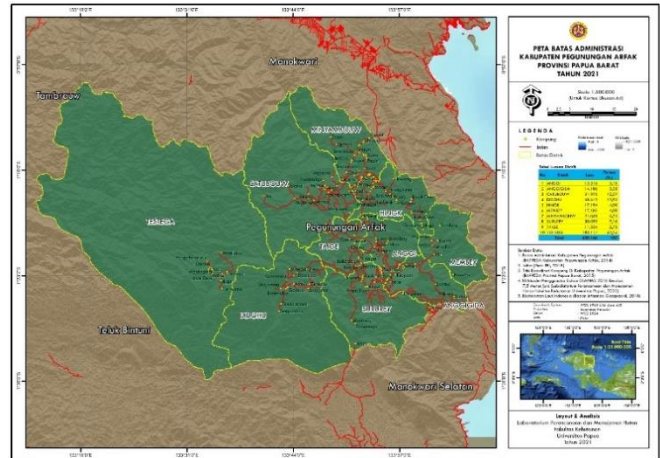
## MATERIALS AND METHODS

**Types of research:** This research is qualitative research using an inductive approach with case study technique because it explores the experiences of Arfak farmers regarding indigenous knowledge and ways of knowing. This research method is based on the philosophy of post-positivism, used to research the conditions of natural objects, (as opposed to experiments) where the author is the key instrument and the research results place more emphasis on the meaning of generalizations. The inductive approach in this research describes the facts that occur in the field, then the researcher analyzes the facts found then makes questions and links them to theories based on appropriate laws and conclusions.

**Data Collection Techniques:** The sample data or information sources in this research were selected purposively using the snowball sampling technique. According to (Neuman, 2014) purposive sampling is used to identify types of cases in in-depth investigations to gain a deeper understanding, in this case the researcher chooses informants who are deemed to have adequate information so that the choice of informants can develop according to the needs and stability of the researcher in obtaining data.

**Research Subjects:** The research location in the Arfak mountain district, West Papua Province, Indonesia (Figure 1). The subjects or respondents of this study were selected purposively with the snowball technique, namely: (1) 2 elders, (2) 15 Arfak farmers, (3) 2 agricultural extension workers, (4) 2 community leaders (teachers), (5) 1 village head, (6) 1 village secretary, (7) staff of the Agriculture and Plantation Office of Arfak Mountain Regency 1 person, (8) Non-Governmental Organizations 1 person and (9) academics (lecturers) as many as 2 people. Informants were determined starting from groups of elders then continued to male and female farmers, then agricultural extension workers, community leaders, village heads, village secretaries, staff of the Pertanian and Arfak Mountains Plantation office, NGOs and finally academic groups that had conducted research on sustainable agriculture, local wisdom and indigenous knowledge in the Arfak Mountains. Secondary research data

through searching archives and related documents in the Arfak Mountains Regency (related agencies), such as the Central Statistics Agency (BPS) of the Arfak Mountains Regency. Data collection techniques in this research are in depth interviews, observation, documentation, FGD (Focus Group Discussion).



Source: Author, 2023

**Figure 1. Map of Arfak mountain regency**

**Analisis data:** the analysis used is the 2014 Miles, Huberman and Saldana model data analysis, that activities in qualitative data analysis are carried out interactively and continue continuously until completion, so that the data is saturated. Saturated data means that whenever and wherever the informant is asked (data triangulation), and whoever the same question is asked, the results of the answers given remain consistently the same. Activities in data analysis, namely: data condensation, data display, conclusion drawing/verification.

**Data validity:** in qualitative research, to ensure and develop the validity of the data, triangulation techniques are used. There are 2 triangulation techniques, namely: (1) triangulation of data (sources) is collecting similar data from several different data sources, namely comparing and cross checking the level of confidence of the information obtained; (2) triangulation technique, namely comparing the results of in-depth interviews with the results of observations and Focus Group Discussions (FGD).

**Ethical Considerations:** Researcher use ethical considerations in the research process. Ethical considerations are used to protect informants from various ethical problems that may arise during the research. The ethical considerations used in this research are based on the research ethics guidelines put forward by Arikunto (2010):

### (a) Self Determination

Researchers give freedom to informants. Full rights are given to informants. The explanation will be presented verbally in written form so that it can be understood clearly, then if the



informant agrees, then as a form of agreement, the informant is asked to sign the informed consent provided by the researcher.

**(b) Privacy dan Dignity**

The researcher collected data at the time agreed by the informants. Researcher will only show the results of data collection to academic supervisors as a report preparation process.

**(c) Anonymity**

Confidentiality includes the name of the informants. Researcher include the name of the informant if they have received approval from the informant.

**(d) Confidentiality**

Guarantee of confidentiality of data or information submitted by informants and only use it for research purposes.

**(e) Protection from Discomfort**

Protecting informants from discomfort during research in the form of an informed consent statement. This statement is used to evaluate informants willingness to participate in research.

## RESULTS

Arfak farmers have their particular uniqueness, one of their characteristics is that they still maintain indigenous knowledge practices and shifting cultivation. Shifting cultivation as a subsistence farming system for Arfak farmers is applied based on local knowledge on the land of local wisdom areas which by local community widely recognized as tradition of *igya ser hanjob* system.

**General condition of the Arfak mountain region:** Arfak Mountain Regency is located in West Papua Province, Indonesia. The area of the Arfak Mountains in 2022 is 2,774.75 km<sup>2</sup>, has 10 districts and 166 villages, 20% of the area of Mountains Arfak Regency has a slope of 0-25° (flat), the remaining 80% has a slope of more than 25° (wavy/hilly), the altitude of the area is 300 – 1,800 meters above sea level. The topographic conditions of such areas require development planning based on good and sustainable land use and soil and water conservation to avoid the danger of landslides and floods. Most (80%) of the Arfak Mountains region has steep to very steep areas. This condition is the main obstacle to land use both for agricultural development and physical facilities and infrastructure. The condition of the area that has mountainous characteristics causes most areas in the Arfak Mountain Regency to be located in a relatively high area.

**Arfak mountain farming:** the agriculture, forestry and fisheries sectors contributed 33.61% to the growth of the Gross Domestic Product of Arfak Mountain Regency. The large contribution from the agricultural sector, in addition to being supported by land resources, is also supported by the role of farming families in pursuing agricultural commodities. Agriculture is the main livelihood of most of the inhabitants of the Arfak Mountains. The featured commodities are

vegetable commodities, such as shallots, mustard greens, potatoes and cabbage.

Arfak people still apply a shifting cultivation system with a slash and burn method and a simple sedentary farming system. Both of these agricultural activities are carried out with a mixed planting pattern (Figure 2). Shifting cultivation are supported by the geographical conditions of hilly slopes and the obligation to use inherited land so that land ownership disputes do not occur. In addition to having fields in the forest as the main agricultural activity of the Arfak people (shifting cultivation), they also use their yards to plant vegetables that are consumed by themselves and sold such as carrots, leeks, cabbage, potatoes, tomatoes, chilli.

The pattern of shifting field farming is a traditional agricultural pattern applied by the Arfak people and has been carried out for generations. Each family has 3-5 land with a land area of 500 m<sup>2</sup> to 1 hectare for each land. The farm moved from Arfak's farmhouse. The mixed garden practiced by Arfak farmers is still relatively simple using a home garden.



Source: Author, 2023

**Figure 2. Mixed planting pattern**



Source: Author, 2023

**Figure 3. Arfak farmer's garden .**



**Local wisdom (igya ser hanjob):** The concept of local wisdom *igya ser hanjob* is the division of forest areas in the Arfak Mountains. Literally *igya ser hanjob* means "we stand guarding the boundaries". This concept is a regulation and warning for the Arfak community which is regulated informally and aims to maintain and not exceed specified territorial boundaries when utilizing forest products such as agricultural activities. The concept of *igya ser hanjob* is interpreted broadly by the Arfak community with the motto "let us protect the forest for the common good" is part of interaction and adaptation to the forest environment of the Arfak Mountains. The concept of *igya ser hanjob* is not only

the main process in utilizing areas such as agricultural activities, but also protecting natural resources, then this concept began to be preserved as part of the way to protect nature and each other.

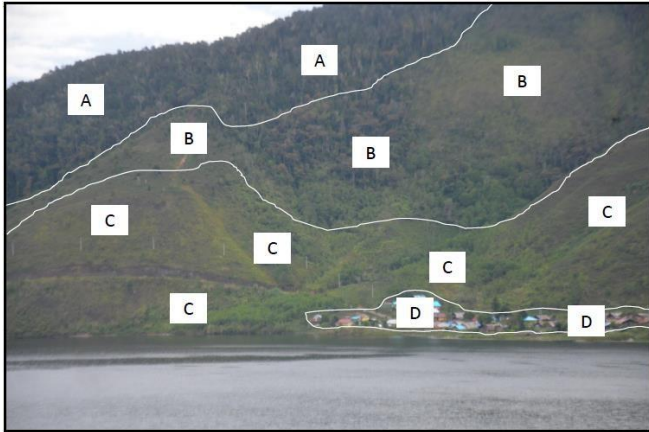
**Indigenous Knowledge in Arfak Farmer Farming Activities:** the agricultural activities of the Arfak people adhere to the concept of *Igya Ser Hanjob* as local wisdom in sustainable environmental management with a shifting cultivation farming system that is practiced for generations by the local community. *Igya ser hanjob* is an ecological zone classification based on indigenous knowledge of the Arfak people which refers to soil and topographic conditions along

**Table 1. Application of indigenous knowledge in Arfak farmer agricultural activities**

Stages of agricultural activity	Types of Local Knowledge	Application
1. Garden site selection	Selection of <i>igya ser hanjob</i>	According to the customary rules of the Arfak people, the areas allowed for agricultural activities are the <i>Susti</i> area (for shifting cultivation) and <i>Situmsi</i> (settled agriculture in the yard of the house).
	The colour of the soil is black or red, a lot of grass and pebbly	The chosen garden has fertile soil that is black or red, overgrown with a lot of grass and gravel
2. Land / Garden Clearing	Small trees are allowed to dry out	Small trees are not all cut down, some are pruned part of the twigs and then skinned and let dry. This is done for firewood reserves.
	Twigs and trunks of small sizes are placed on <i>para-para (bale-bale)</i> [*para-para=the storage area is hung above the floor]	The results of cleaning grass, shrubs, twigs and trees of small size are collected on <i>para-para (bale-bale)</i> made of cross-shaped wooden branches. This is done so that it dries quickly and avoids rat pests.
3. Planting	Burning	Burning is carried out in 2 ways: (a) when the weather is hot, burning is carried out from the bottom of the slope then the top of the slope; (b) when weather conditions are ordinary, combustion by means of stacking.
	Planting is carried out on the basis of the onset of the dry season and natural phenomena	According to the beliefs of the Arfak people, the beginning of the dry season (May) is a good time for planting. Plants will thrive.  Natural phenomena: at night stars are seen clustering and the sound of crickets is heard.
	On the land square plots are made using <i>Biwesen tugal</i> wood tugal [tugal: a pierce]	Before planting, square plots are made on the land using <i>Biwesen tugal</i> wood. Mapping aims so that farmers do not determine the wrong place that has or has not been planted seeds and as a barrier to family land ownership
4. Maintenance	Making planting holes using <i>Mbrap tugal</i> wood or <i>Arwob</i> wood [tugal: a pierce]	At the end of the tugal wood is tapered using a machete or knife. After the pointing can be used to make planting holes.
	Fertilizing using leaves and fruits of <i>Bnep</i> , <i>Bakebei</i> wood, <i>paniki</i> bird droppings and swallows.	Fertilizing using <i>Bnep</i> leaves and fruits that have fallen to the ground and have rotted are taken and placed around the plant. Fertilization from <i>Bakebei</i> wood is potted into small pieces or shaved then mixed with water and placed around the plant Fertilizer from <i>paniki</i> bird droppings and swallows is laid around the plant.
	Disease pest control from <i>Desnebei</i> leaves, tree trunks of <i>Bijeo</i> ( <i>Vitex sp.</i> ), <i>Nning</i> , <i>Buai</i> ( <i>Aglaia sp.</i> ), and <i>Bitai</i> ( <i>Ernodia eliryama</i> ), burning a piece of cloth.	Disease pest control with <i>Desnebei</i> leaves laid around the plant. The inside of the trunks of <i>Bijeo</i> ( <i>Vitex sp.</i> ), <i>Nning</i> , <i>Buai</i> ( <i>Aglaia sp.</i> ), and <i>Bitai</i> ( <i>Ernodia eliryama</i> ) trees are scraped and produce fine shavings and then mixed with water and kneaded to produce a green liquid. The squeezed water is watered on the leaves or on the soil around the plant that is attacked by caterpillars
5. Harvesting	Harvesting is carried out in stages based on the age of the plant and the needs of the farmer.	Harvesting by plant age: vegetables (cabbage, pumpkin leaves, spinach) are harvested at 1-2 months of age; chickpeas, pumpkin, cucumbers harvested 3 months of age; Corn, leeks, potatoes are harvested after 4 months from planted



with their designation in agricultural activities (Purbokurniawan *et al.*, 2019a). The *igya ser hanjob* zone is divided into four areas: *Bahamti*, *Nimahamti*, *Susti* and *Situmsi* zoning (Figure 4).



Source: Purbokurniawan *et al.*, 2019a

**Figure 4.** *Bahamti* (A), *Nimahamti* (B), *Susti* (C), *Situmsi* (D).

The first is the *Bahamti* area, which is the original (primary) forest. In this zone it is strictly forbidden gardening, logging, hunting and settlement. However, at certain limits, it is allowed to take bark, leaves for the roof of houses, medicinal plants and rattan. The second area of *Nimahamti*, which is a former abandoned garden (the period of land rested or granted) for 10-20 years. In this area it is allowed to take bark, rattan, leaves, hunt and open fields (gardening), but not allowed to build houses. Third, the *Susti* area, which is a management area whose land can be used as a garden. Fourth, the *Situmsi* area, which is a former garden located close to the village or yard of the house. This is an open area planted with tubers, vegetables and others (Ataribaba *et al.*, 2020). Arfak farmers have traditionally applied indigenous knowledge in their agricultural activities starting from the stages of choosing garden sites, land clearing, planting, maintenance and harvesting.

Farm farming activities moved by Arfak farmers begin with the selection of gardens or garden areas that will be used as new gardens, usually determined by the head of the family with the approval of the wife who is also the owner of the land. The selection of new gardens is based on soil color and soil type and is overgrown with a lot of grass. Soil that is black or red and gravel is suitable for cultivation. New gardens were opened on customary land owned by the head of the family or wife in the *Susti* and *Situmsi* areas. After determining the location of the new garden, the head of the family gathers other family members and relatives to agree on the time of land preparation and jointly prepare the opening of the new garden (Figure 3).

After the location of the new garden is determined, land clearing is carried out which begins with cutting down bushes and cutting down small trees and leaving large trees. The task of cutting down large trees is carried out by the head of the family assisted by relatives or brothers because it is a task that is considered quite heavy and risky. Tree trunks that are large enough in diameter are processed into boards for houses, while those with smaller diameters are dried to be used as garden fence material or for firewood supplies. Pruning smaller trees is done gradually so that they can still provide shade when farm mothers and their children clean the garden floor (land). For the task of clearing grass or shrubs is usually done by women assisted by children. Grass and small tree branches are collected not left lying on the ground, but are collected and placed on tree trunks or *para-para* (*bale-bale*) (Figure 5) made from cross-shaped wooden branches. Grass and small tree branches are placed on *para-para* or *bale-bale*, intended to dry faster and prevent grass from growing back quickly and avoid nesting rodents. Next is the combustion process. Arfak farmers burn in two ways, namely: (1) if the weather conditions are hot, then burning starts from the bottom of the slope and then will spread to the top of the slope; (2) If the weather conditions are ordinary, burning is carried out by stacking.



Source: (Matualage, 2011)

**Figure 5.** Small twigs and tree trunks are kept on top of the *bale-bale* to dry quickly and avoid rodent pests.

Planting time is usually at the beginning of the dry season (May). In addition, Arfak farmers also determine the growing season, namely by paying attention to natural phenomena such as: at night there are stars in the sky clustering and the sound of crickets. Arfak farmers have a habit before planting, the expanse of land is divided into square plots using *tugal* wood (*Biwesen*) and making planting holes using *Mbrap* *tugal* wood or *Arwob* wood. According to the beliefs of Arfak farmers, the choice of *Biwesen*, *Mbrap*, *Arwob* *tugal* wood species also affects the growth and yield process, plants will thrive. Example of a wood *tugal* in figure 6.





Source: Authors 2023

**Figure 5. Wood tugal**

Next the stages of maintenance are weeding (cleaning of weeds), fertilizing and pest control. Arfak farmers use natural fertilizers that they make for generations, namely *Bnep* leaves or *Bakebei* wood (they can get it in the forests around the Arfak Mountains). *Bnep* leaves that fall on the ground and have rotted make it as fertilizer. *Bakebei* wood is used as fertilizer by cutting into small pieces or shredding and then placed around the plant. Arfak farmers also use droppings from swallows and Paniki birds as fertilizer (panicked birds and swallows eat *Bnep* fruit, the droppings are used as fertilizer). Pest control there are plants using natural ingredients for generations made from *Desnebei* leaves placed next to plants (Figure 7).



**Figure 7. Desnebei leaves by Arfak farmers are used to repel caterpillar pests by placing Desnebei leaves next to plants.**

Harvesting carried out by Arfak farmers is usually done in stages according to daily material food needs and some parts of harvested farming products are also sold as household income to meet living needs. Technically the harvesting

activities are not carried out all at once, set aside for the needs of the following days. The order of harvesting plants in mixed gardens is: (1) vegetables such as: cabbage, pumpkin leaves, spinach aged 1-2 months, picked every day; (2) beans, pumpkins, cucumbers are harvested when they are 3 months old; (3) corn, leeks, potatoes harvested after 4 months of age; (4) sweet potatoes, taro harvested aged 3-4 months and finally (5) bananas and sugarcane.

**Sustainable Agriculture of the Arfak Mountains:** *Igya ser hanjob* is a term for local wisdom of the Arfak people, in the form of zoning agricultural areas and their use to preserve nature. The principle comes from the language of the *Hatam* tribe (one of the tribes of the Arfak people), *igya* means we stand on our own feet, *ser* means guarding, and *hanjob* means limit. It literally means: we stand to keep boundaries. Boundaries in all aspects of the lives of indigenous people of the Arfak people, be it regional boundaries, cultural boundaries or applicable social norms. *Igya ser hanjob* has four zones: *bahamti*, *nimahamti*, *susti*, and *situmti* zones. Arfak farmers in carrying out agricultural activities have implemented a sustainable farming system based on their indigenous knowledge. *Igya ser hanjob*, an ecological concept in the indigenous knowledge system of the Arfak people is still applied by Arfak farmers in agricultural activities to this day.

Ocholla & Akullo in (Matualage, 2011) states that indigenous knowledge is a set of knowledge and technology stored in memory and practiced in people's lives and developed by indigenous people under certain conditions. To measure sustainable agriculture, indicators are needed which are divided into three parts, namely economic, social, and ecological indicators (Fajar, 2019).

The Arfak people agricultural activities still use traditional equipment and methods both in land clearing and other stages of agricultural activities. The labor used in agricultural activities is human labor, men and women both adults and children, sourced from inside and outside the family. There is no use of machines. Arfak farmers adhere to the concept of *igya ser hanjob* by dividing the managed area into four zones (*Bahamti*, *Nimahamti*, *Susti*, *Situmsi*). The results of this study show that the *Bahamti* zone is an ecological zone that is not managed by both agricultural and other activities because of its function to maintain the ecosystem, which is to prevent landslides. In addition, soil conditions in the *Bahamti* zone are considered infertile for agricultural activities. The use of the *bahamti* zone is as a source of firewood, especially dry trees that have fallen and also for house materials other than hunting, as a source of raw materials for houses and medicinal plants for the Arfak people.

Shifting cultivation and simple farming activities are in the *Susti* and *Situmsi* areas. Good soil conditions in the *Susti* and *Situmsi* areas based on indigenous knowledge of the Arfak people are black soil. Arfak farmers' agricultural activities that have been carried out for generations are in accordance



with ecological agriculture in sustainable agriculture. At the time of soil management, farmers give certain treatments to secure soil conditions before planting by processing organic matter and improving the life of soil organisms. For example, farmers rotate by fallow and provide organic inputs in the form of leaf litter and grass to improve soil biological and chemical conditions. Indigenous knowledge is also used for the determination of the location of the garden, that the selection of new gardens is based on the color of the soil that is black and overgrown with a lot of grass. Black or red gravel soil is suitable for cultivation. The selection of garden location is based on the concept of

by leaving the land for approximately two to three months, then fertilized using natural fertilizers processed by Arfak farmers themselves to increase soil fertility. This shows that agricultural cultivation by Arfak farmers is carried out based on the indigenous knowledge they have. Fertilization is one part of processing land fertility and is done before planting.

**DISCUSSION**

**Shifting Cultivation as Local Knowledge of Arfak Farmers:**  
The main livelihood of the Arfak people is farming shifting cultivation carried out using the slash and burn method and

**Table 2. Analysis of the implementation of sustainable agriculture of the Arfak Mountains**

Sustainable agriculture Indicators	Strategic Issues	Process
Economy	Economic growth, resource use, food security	<ul style="list-style-type: none"> <li>a) The agricultural sector contributed 33.61% to Arfak GDP growth.</li> <li>b) Agricultural land is available, each family head has 4-5 plots of farmland.</li> <li>c) Labor comes from within the family.</li> <li>d) The shifting farm system and mixed pattern ensure round-the-clock food availability.</li> <li>e) Harvesting is carried out in stages according to the age of harvest and the needs of farmers, able to ensure food availability</li> </ul>
Ecology	Local wisdom <i>Igya ser hanjob</i> , agricultural cultivation, indigenous knowledge in agricultural activities	<ul style="list-style-type: none"> <li>a) The local wisdom of <i>igya ser hanjob</i> guides the community in protecting the environment. This is in line with West Papua's conservation program and the development of Arfak Mountains tourism.</li> <li>b) The division of the <i>Igya ser hanjob</i> area in agricultural activities, there are areas that are allowed and not for agricultural activities, especially shifting cultivation agriculture.</li> <li>c) Arfak farmers in the cultivation of <i>pertanain</i> use simple tools, simple farming techniques.</li> <li>d) Indigenous knowledge has been practiced for generations by Arfak farmers uses materials that exist in nature and are proven not to damage the environment.</li> </ul>
Social	Social change	Increase in the population of the Arfak Mountains, the influx of new innovations in agriculture, Easy transportation, Local Government Empowerment Program, Changes in customary institutions and values and norms that have a positive and negative impact on the lives of the Arfak people.

*igya ser hanjob*. The implementation of this concept, in terms of soil fertility is used as the basis for determining areas managed for agricultural activities. Soil fertility is a major aspect in determining the location of the garden. In this study, it was found that fertile soil is in the *susti* and *situmti* regions indicated by the color of black and gravel soil. Based on the knowledge of Arfak farmers, soil fertility in the *situmsi* zone will decrease after two planting seasons, farmers will give treatment to increase soil fertility in the *situmsi* area, namely

simple sedentary farming carried out around the yard where the farmer lives. These two agricultural activities are carried out with a mixed cropping pattern. The shifting cultivation system is a form of adaptation of the Arfak people to their environment in an effort to maintain their survival while preserving the ecological environment in which they live. The shifting cultivation system can be said to be the local knowledge of the Arfak community (Hidayat, 2013). The indigenous knowledge of the Arfak people was built by the





Arfak people itself through the lives of generations in close contact with nature so that the shifting cultivation system can be said to be indigenous knowledge of the Arfak people.

The Arfak farmers shifting cultivation system, as an indigenous knowledge, was able to survive and still exists today. However, forest damage due to landslides and floods has cornered the shifting cultivation system as one of the causes of this damage. This problem occurs because the plantation rotation time is getting shorter because the land transfer distance is getting closer, the shifting fields are still in the Susti area, but are getting narrower due to the massive conversion process, both due to plantation development, migrant settlements, infrastructure and illegal mining. This is in line with research (Ataribaba *et al.*, 2020) which states that shifting cultivation patterns have experienced a shift influenced by population pressure, oil palm plantations, family plantations, plantations of other clans, transmigrants and infrastructure expansion.

#### ***Implications of Arfak Farmers Indigenous Knowledge in Sustainable Agriculture***

**Ecological Value:** The ecological value contained in indigenous knowledge based on the *Igya Ser Hanjob* concept is to consider forests as a source of life. This indigenous knowledge also contains an invitation and command for the Arfak people to work together to protect the forest and maintain forest management boundaries and protect the land for shared life. This ecological value not only has meaning as an area that has boundaries, but covers all aspects of the life of the Arfak community, including agricultural aspects.

The Arfak people consider the forest and land as '*mother*' or '*mama*' who provides milk to their children. The Arfak people expressed the phrase "*if mothers continue to process them, their milk will run out, mothers could die.*" This is what makes the Arfak people believe that forests and land must be protected, like protecting and protecting a mother.

Indigenous knowledge is based on the concept of *igya ser hanjob* as a guide for the Arfak people to ensure that forests remain sustainable for humans to live together with nature and forests in harmony. This indigenous knowledge has been integrated into the life and culture of the Arfak people, continuing to be maintained along with rules known as customs, norms and various prohibitions.

**Social value:** The social values contained in indigenous knowledge in shifting cultivation activities starting from the stage of choosing a garden location to harvesting are reflected in collective social values at the level of the nuclear family and relatives of Arfak farmers as well as the use of forest products and land cultivation for gardening. The social values contained in indigenous knowledge are reflected in deliberation, cooperation, responsibility, togetherness and kinship (family).

**Economic value:** The practice of indigenous knowledge in shifting cultivation, starting from the stage of choosing the location of the garden to harvesting in the *Susti* area, has been

carried out from generation to generation and is a cultural heritage that is still maintained today, namely maintaining capital ownership of the land and other resources found in the *Igya Ser Hanjob* area that has economic value. Apart from that, it can also protect other freely obtained resources provided by nature, and support social values in the form of exchange of goods and services.

The land ownership status of Arfak farmers is indigenous lands (*hak ulayat*) or family collective land. Each head of family has 4-5 agricultural plots with a land area of 500 meters-1.5 ha each. The workforce comes from within the Arfak farming family

#### ***Social Learning Processes in Local Knowledge Practices:***

Indigenous knowledge in shifting cultivation activities from the past until now has been proven not to damage nature. Indigenous knowledge and sustainable agricultural practices are disseminated through the learning process of cultivating and managing gardens on agricultural land around houses. This research found that children or the younger generation of the Arfak people know how to plant and manage agricultural crops according to ecological principles based on indigenous knowledge and practices because they often follow and are involved in their parent activities in the yard or so to speak. That the learning process occurs through the practice of farming directly in the home yard, meaning that the transfer of indigenous knowledge occurs in the home yard. The transfer of indigenous knowledge is currently still in oral form and has the potential to be lost because it is not stored in other forms such as writing.

**Conclusion:** the application of indigenous knowledge agricultural activities, especially shifting cultivation by Arfak farmers that has been carried out for generations and is still maintained today based on the ecological concept of *igya ser hanjob*. This concept is a term for local wisdom of the Arfak people, in the form of region agricultural areas and their use to preserve nature and ensure the sustainability of the environment and family food. However, in reality Arfak mountains is a threat of landslides and floods in agricultural areas because of the increasing number of immigrant settlements, infrastructure and illegal mining. Based on these findings, it is aware of the importance of indigenous knowledge and sustainable agricultural systems. Therefore, indigenous knowledge that has been embraced by the Arfak people for a long time needs to be preserved continuously and consistently. The transfer of indigenous knowledge on agriculture is currently still in a simple mechanism and not well managed or documented, which is only oral and has a high risk of extinction.

This research has limitations regarding the involvement of parties in the management of local knowledge and sustainable agriculture with notice the culture of the Arfak people in the Arfak Mountain Regency.



**Address Limitations:** the researcher is aware of the shortcomings and limitations of this research, such as: limited literature on previous research results. Research on indigenous knowledge in the Arfak mountains has not been carried out much because the location of the Arfak Mountains is quite far and requires a lot of money and time. Apart from that, researchers also have difficulty obtaining secondary data so supporting data is still minimal. This research is not perfect, so it is hoped that future research will examine the impact of socio-economic changes on local knowledge practices, etc.

**Acknowledgment:** The authors would like to thank the Ministry of Finance of the Republic of Indonesia for the opportunity to continue the Doctoral Education Program with the help of the Education Fund Management Institute (LPDP) scholarship fund and to the Rector of the University of Papua and his staff who have provided recommendations to the author. The author also expresses his deepest gratitude to the two mentors, informants and the Arfak community in the Arfak Mountains who have provided valuable information for this research.

**Author contribution statement:** Krisnawati, Alia Bihrajihant Raya, Subejo conceived the idea, designed the research, carried out the analysis and wrote the article; Krisnawati, collected data and carried out analysis. Krisnawati, Alia Bihrajihant Raya, Subejo reviewed and completed the draft.

**Conflict of interest:** The authors declared no conflict of interest.

**Funding:** The author thanks LPDP, Indonesia Endowment Fund for Education Agency.

**Availability of data:** All data used are within the manuscript.

**Informed consent:** Written informed consent was obtained from all participants regarding publishing their data and photographs.

**Consent for publication:** All authors are giving their consent to publish this research article in JGIAS.

**SDG's Addressed:** Zero Hunger, Good health and Well-being, Climate Action

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