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The Subsistence Agriculture Knowledge of the Arfak Community in the Arfak Mountains, District of West Papua, Indonesia

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Abstract:

The subsistence agriculture knowledge system is sourced from local knowledge that has been practiced and developed by farming communities for a long time. This study aims to explain the subsistence agriculture knowledge system practices in the Arfak community in Anggi District, Arfak Mountains Regency, West Papua Province. The practice of subsistence agriculture carried out by the Arfak community is based on local wisdom *igya ser hanjob*, a valuable stock of knowledge that has not been widely studied and utilized. This study uses a qualitative approach to elicit this knowledge. The data was collected through in-depth interviews, observations, and focus group discussions, from 65 informants in 13 villages. Five informants from each village were chosen purposively and using the snowball technique. The results showed that the subsistence agriculture knowledge system in the Arfak community was based on local knowledge *igya ser hanjob* or *mastogow hanjob*, which means "standing up to guard the boundaries." This local knowledge is believed and becomes a way of life that serves as a standard for decision-making and behavior in carrying out shifting cultivation, including determining the location, planting season, planting material processing, planting, and harvesting. The local knowledge *igya ser hanjob* includes the arrangement of space, time, and the division of labor that are interrelated in activities utilizing nature. The forest area is used as a place for farming. Farming is carried out in the *Susti* area, which is the clan area fenced off from the existing garden plots. The results of this study can be used by academics and practitioners in enriching technical knowledge of agriculture in accordance with local conditions to support sustainable agriculture.

Keywords: subsistence agriculture, local knowledge, *igya ser hanjob*, Arfak community.

印度尼西亚西巴布亚区阿尔法克山脉阿尔法克社区的自给农业知识

摘要:

自给农业知识体系来源于农业社区长期实践和发展的当地知识。本研究旨在解释西巴布亚省阿尔法克山脉摄政区安吉区阿尔法克社区的自给农业知识体系实践。阿尔法克社区开展的自给农业实践基于当地智慧伊格亚ser汉作业，这是一种尚未被广泛研究和利用的宝贵知识库。本研究使用定性方法来获取这些知识。这些数据是通过深入访谈、观察和焦点小组讨论收集的，来自13个村庄的65名线人。有目的地选择每个村庄的五名线人，并使用滚雪球技术。结果表明，阿尔法克社区的自给农业知识体系是基于当地知识伊格亚ser汉作业或马斯托戈手淫，意思是“站起来守住边界”。这种当地知识被相信并成为一种生活方式，作为进行轮垦的决策和行为的标准，包括确定地点、种植季节、种植材料加工、种植和收获。地方知识伊格亚ser汉作业包括在利用自然的活动中相互关联的空间、时间和分工的安排。森林地区被用作耕作的地方。农业在苏斯蒂地区进行，该地区是与现有花园地块隔开的氏族地区。本研究结果可供学者和从业人员根据当地情况丰富农业技术知识，以支持可持续农业。

关键词: 自给农业、地方知识、伊格亚ser汉作业、阿尔法克社区。

1. Introduction

Subsistence agriculture knowledge is a local knowledge developed and practiced by a community, passed down from generation to generation. This knowledge has been a subject of interest for scholars and practitioners (Franco, 2021) and is increasingly recognized as a valuable asset in sustainability science (Loch & Riechers, 2021). It often confronts and transforms powerful interests and the embedded Newtonian professional paradigm (Chambers, 2021). According to Geertz (1992), local knowledge is a concept that comes from social laws that are culturally inherited and shape behavior. Local knowledge becomes part of the cultural values of the people who practice it (Al Amin et al., 2021). Indigenous farmer knowledge is functional knowledge based on practical needs related to social and cultural systems, then developed contextually (Ali, 2000).

Cultural values become guidelines in acting or dealing with various problems of people's lives (Geertz, 1992). Hindaryatiningsih (2016) reports that cultural values are community traditions maintained and inherited by all its members through socialization. Cultural values in people's lives are very important because they can be used as beliefs in influencing the attitudes and behavior of a person or group.

The area of the Arfak Mountains Regency is dominantly primary and secondary forests that stretch from high mountains to slopes and valleys. The Arfak community occupies a small part of the valley and mountain ridge areas considered relatively safe for settlement. The farming area is located on a small part of the plains and mountain slopes. The Arfak tribe can survive in the area due to its managing environmental and natural resources. Forests are considered sources of life, food, construction materials, firewood, medicinal herbs, and others. Arfak people's lives depend on the natural environment, especially the forest, from which they take food, medicine, and materials to build houses/cages and where they hunt. For people like this, nature or forest is a life-giving "mother" that must be

respected. The people of Arfak express it with the sentence: "If you continue to exploit it, its milk will run out, then you will die." Therefore, forests and land must be protected and preserved.

The Arfak community uses the forest for farming purposes with a shifting cultivation system using local knowledge *igya ser hanjob* or *mastogow hanjob* (Hujairin et al., 2017). Local knowledge *igya ser hanjob* or *mastogow hanjob* means "standing up to guard the boundaries," which implies that everything in nature (including humans) has a limit. If the limit is exceeded, it will cause a massive disaster. Maintaining boundaries does not only include dividing the boundaries of forest areas that may and may not be used but include all aspects of the Arfak community's life, especially the agricultural aspect as the main livelihood of the Arfak community.

Knowledge of *igya ser hanjob* or *mastogow hanjob* is used by the Arfak community to keep the forest sustainable for humans in harmony with the forest. This knowledge has been integrated into the Arfak community's life and culture and is maintained together with rules as customs, norms, and prohibitions. Laksono et al. (2001) divide the forest in the Arfak area into four areas: *Susti*, *Nimahamti*, *Bahamti*, and *Tumti*. Meanwhile, Mulyadi et al. (2007) divide it into three areas: *Susti*, *Nimahamti*, and *Bahamti*. The *Bahamti* and *Tumti* areas cannot be utilized (conservation areas), while the *Susti* and *Nimahamti* areas can be utilized. The *Susti* area is a residential area for farming, while the *Nimahamti* area is used for limited and controlled forest resources. The Arfak community's obedience to the *igya ser hanjob* is a form of their joint responsibility to protect the forest because the division of forests into several areas is based on their mutual agreement, so cooperation in the community is essential for the tribal chiefs and owners of customary rights in the area.

Several studies have been carried out related to forest use through local knowledge of *igya ser hanjob* or *mastogow hanjob* in the Arfak community, such as those by Laksono et al. (2001) and Mulyadi et al. (2007). However, they mainly discuss only the division

of forest areas based on their functions. Not much has been revealed about how the Arfak community cultivates crops based on local knowledge of *igya ser hanjob* or *mastogow hanjob* in their forest area. This study specifically aims to explore the knowledge and practices of the Arfak community in subsistence farming.

2. Method

2.1. Data Collection and Analysis

The study was conducted from September to December 2020 in Anggi District, Arfak Mountains Regency. This research is descriptive research with a qualitative approach. Qualitative data were obtained through in-depth interviews, participant observation, and FGDs. Primary data were obtained from the community in the research location, both as informants who were selected using purposive and snowball techniques as many as 65 people representing 13 villages in Anggi District. Secondary data were obtained from the literature related to the purpose and location of the study. Data analysis uses qualitative analysis presented by Miles and Huberman, namely the stages of data reduction, data presentation (data display), and drawing conclusions and verification (Emzir, 2018).

2.2. Research Site

Anggi District is one of 10 sub-districts in the Arfak Mountains Regency, West Papua Province. Arfak Mountains Regency was expanded in 2012 and is located south of Manokwari Regency. Astronomically It is located in the northern part: 0°55' South Latitude; southern part: 1°40' South Latitude; west: 133°10' East Longitude; eastern part: 134°05' East Longitude (Badan Pusat Statistik, 2021).

Anggi District is located at an altitude of 1,925 - 2,089 masl. The average height of the Anggi District is 2,013 meters above sea level. Ayaubey village is at the lowest altitude of 1,925 masl, and Suteibey village is at the highest altitude of 2,089 masl. In this sub-district, there are three mountains: Mount Lina with an altitude of 2,870 meters above sea level, Mount Mamofeu with an altitude of 2,985 meters above sea level, and Mount Mosabri with an altitude of 2,700 meters above sea level (Badan Pusat Statistik, 2020).

The area of Anggi District is 256.79 km² which is generally a forest area. It has 13 villages with the capital in Ingebai/Imbeisba Village. The majority of the population is the native Arfak. The number of Anggi District residents until 2019 was recorded as 8,277 people (4,383 men and 3,894 women) (Badan Pusat Statistik, 2020).

The Geographical Difficulty Index (IKG) of villages in Anggi Subdistrict is an average of 74.68, which indicates that villages in Anggi Subdistrict have a high level of difficulty in basic services, infrastructure, transportation, and communication. Ayaubey and Ullong Villages had the highest GIG of 80.26, and

Testega Pamaha's Villages had the lowest one of 58.24. The villages in the Anggi sub-district are all self-help villages.

The cold air of 23.4°C in Anggi District occurs in April, while hot air of 32.4°C occurs in October, with an average air temperature of 27.82°C. The minimum humidity of 56.0% occurs in April, while the maximum humidity of 96.0% occurs in July, with an average humidity of 80.75%. The lowest rainfall of 66.7 mm occurs in September, and the highest of 385.2 mm occurs in April, with an average annual rainfall of 207.0 mm. The lowest 12 days of rainy days occurred in September and December, and the highest 21 days occurred in February and December, with an average of 17 rainy days. Based on the climate classification of Schmidt and Fergusson, this area is included in the area of climate type A (very wet category, Q value: 0 - 14.3%).

The population in Anggi District has increased every year. A noticeable increase occurred in 2019, with a population density of 32.23 people/km². The increase in population resulted not from an increase in the number of births but the migration of the population to work or open a business in the private sector and as a civil servant (PNS) because Anggi District is the capital of Arfak Mountains Regency.

The commodities produced by Arfak farmers in Anggi are corn (cereal), brenebon beans and chickpeas (legumes); sweet potatoes, taro, cassava (tubers). Maize and sweet potatoes are dominantly cultivated, while brenebon beans, chickpeas, and cassava are partially cultivated by farmers. This is influenced by the possibility of increasing the added value, production facilities, and infrastructure related to controlling plant pests and diseases. In addition, farmers who have tried cultivating the plants consider them unsuitable for planting in their gardens. Corn, sweet potato, and taro are cultivated for family consumption.

The Arfak community generally inhabits the "millipede house," which is the original traditional house of the Arfak Tribe. The traditional house is nicknamed so because it has many foundation poles underneath, so it has many legs like a millipede. The traditional millipede house of the Arfak tribe has local wisdom that adapts to natural, geographical, and cultural circumstances (Hematang et al., 2014).

The millipede house is uniquely shaped, built to resemble a house on stilts, made entirely of wood, with walls of thatch grass and a roof with pandanus leaves and no windows. The size of the millipede house is about 8 × 6 meters, while the height of the stage is between 1 and 1.5 meters. The top of the house can reach 4.5 meters at the tip of the pandanus leaf roof. The wooden pillars that support the stage are 10 centimeters in diameter. The house walls are made of wide bark so that it covers all the walls and leaves two front and back doors. The house's roof is tied with supporting wood, including the connection between the poles, by rattan rope and bark fiber.

3. Results and Discussion

3.1. Cultural Values of Subsistence Agriculture: *Igya Ser Hanjob*

Forests and land for the Arfak community are very important to sustain their life. Therefore, the forest and land must be guarded and protected, just like guarding and protecting the mother. The Arfak community believes that the fertility of the soil will someday decrease if agricultural land is continuously used, therefore the garden must be rested and replaced with a garden with fertile soil or pass the fallow period (rest period) and be ready to be processed. Mulyadi and Iyai (2016) stated that the Arfak community has cultural values of preserving nature, such as knowledge of rotation of the garden through shifting cultivation, protecting the forest, and cultivating intercropping through the cultivation of various plants in one garden.

Arfak community's subsistence agriculture knowledge is guided by the local wisdom *igya ser hanjob* or *mastogow hanjob*, meaning standing and guarding boundaries, including space boundaries, actions, time limits, and labor division boundaries that are interrelated and have their own goals. Subsistence farming behavior in the Arfak community is carried out to maintain the availability of family food to avoid the danger of starvation. Scott (1994) assessed that subsistence farmers still use the principle of "safety-first" and risk distribution as rational behavior.

According to Weber's theory of rationality (Johnson & Lawang, 1994), the subsistence agriculture knowledge system in the Arfak community is also a value-rational action (*werk rational*), traditional action, and instrumental rationality action (*zwerk rational*). The rational action of values (*werk rational*) is reflected in the act of awareness and has been considered in advance by the Arfak community to prioritize the cultural value of *igya ser hanjob* or *mastogow hanjob*, which implies the importance of maintaining boundaries. The traditional action can be seen from the behavior of the Arfak community using forest areas as a function of conservation, farming, and settlement due to the habits acquired from their ancestors. The act of instrumental rationality (*zwerk rational*) relates to the means or tools used to protect natural resources and settlements, fulfill food needs through shifting farming, gathering forest products, hunting.

3.2. Knowledge of the Arfak Tribe Scratching

3.2.1. Climate and Weather Knowledge

Knowledge of climate and weather is used to determine the growing season. The planting season is determined by observing the morning sun and stars in the sky at night. Based on the climate and weather in the mountains of Arfak, the people of Arfak distinguish three planting times: (1) Small planting time: March, whose three weeks of no rain can be used for planting; (2) Moderate planting season: May with no rain to be

used for planting; and (3) Large planting season: August - October, when there is no rain for two months.

Knowledge of climate and weather using natural phenomena to determine the planting season in the Arfak community are also owned by other communities with different designations or terms. Sobirin (2018) reported that the Javanese people have always had a planting season regulation called *Pranata Mangsa*, which is an agriculture calendar based on the apparent circulation of the sun made in the form of a planting calendar and used by farmers as a guide for farming in the fields. In Bugis society, knowledge of climate and weather is called *Pananrang* and is recorded in a book called *Lontara Allarumang* (Kamaluddin et al., 2016).

3.2.2. Determination of Places for Farming

The determination of the place for farming in the *Susti* area, which is the territory of the client/clan, is carried out by the head of a large family to make decisions in family deliberation meetings. The area of land to be cleared is adjusted to the ability of the family to manage the garden. The shifting cultivation carried out by Arfak farmers is a form of garden rotation, where they have 3-5 gardens, but only one garden is managed intensively. The garden is cultivated for three years; after that, it is rested for 3-5 years, and some gardens are rested for 5-10 years. The rotation of the garden is carried out if the garden's yield seems to be decreasing; the soil is less fertile, so it is necessary to move to gardens with more fertile soil.

The location of the new garden for reprocessing is determined by considering the tree's growth. When the height has reached 2-4 meters, the moss has been attached a lot, the land is considered fertile for re-cultivating. The determination of the place of farming in the Arfak Community has a similar phenomenon as in several other communities whose lives are related to the forest.

Agricultural land is land used for farming and gardening and land that is fallow (having a fallow period in shifting cultivation). Efriani et al. (2020) reported that the *Tamambaloh Dayak* community has a tiered division of the area according to its benefits or designations, namely protected customary areas (*Toan Palalo*), customary production areas, residential areas. Customary production areas are generally used as agricultural land and plantations.

3.2.3. Garden Opening

Each land cleared for the garden was started by the head of a large family. The felling of large trees is only done partially. Only their bark remains for drying and using as firewood. *Para-para* is made by piling up tree branches, grass, and shrubs. Their burning depends on the weather conditions. The timeframe for opening the garden is the growing season. The land cleared is left for 1-2 weeks; after being burned, it is left for about one month. The women cleared the grass, bushes, small trees, and prepared food, while the men cut down the

big trees, peeled the bark from trees, set garden fences and fires.

3.2.4. Division of Garden Plots

The division of the cleared land into several plots depends on the number of heads of families in a large family. All heads of the family must attend the division of this land. If one of the heads of the family is absent, the land division cannot be carried out to avoid conflicts within the family. The plots are made by sticking wooden twigs at each boundary corner. The family's every head obtains their share in the plots, which is the right of control and responsibility for cultivating until the harvest.

The division into plots does not use a definite measurement tool (e.g., meters) and does not have to be measured straight but is made based on estimation. Furthermore, each head of the family and family members collect wood branches left after burning to form a mound, which is then burned. The time limit for the division of garden plots is approximately one month after burning.

3.2.5. Soil Cultivation and Soil Fertility

Tillage is carried out when the harvest has been completed by using pigs. When the gardens were harvested, the garden fence was deliberately opened and allowed the pigs to enter and eat the leftovers of the harvest. The number of pigs that enter the garden is quite large so that apart from looking for and eating the rest of the harvest, they also gouge the soil looking for worms. The activities of pigs in the garden can loosen the soil. If the farmer wants to replant in the garden, the garden's gate is closed again, ensuring that pigs cannot enter the garden again. The farmer then clears the garden for the next planting.

Soil cultivation for Arfak farmers has applied a natural farming system based on local knowledge. This is in line with the four principles of natural agriculture mentioned by Fukuoka (2019): 1) No tillage; 2) Not using chemical fertilizers at all; 3) No weed eradication either by land cultivation or herbicides; 4) Complete independence from chemicals. The no-tillage system is a conservation measure to prevent the adverse effects of erosion that reduce soil productivity. The system without tillage will save farming costs, labor costs, planting time, and increase farmers' income.

Wang et al. (2020) reported that tillage practices using the no-tillage method could increase soil organic carbon storage and reduce carbon dioxide emissions in agricultural systems producing crop residues. Mondal & Chakraborty (2021) explain that improving soil quality leads to higher input use efficiencies, adding to the economic efficiency. The no-tillage practice contributes to soil structural development and increases in water retention. Long-term sustainable agricultural development needs to follow the no-tillage practice, but it is necessary to identify the climate and soil types.

3.2.6. Seed Preparation

The seeds for planting are collected from the harvest in the garden, which is in the *Susti* area and is the client/clan area. The seeds for planting are selected based on shape and color. The seeds are tied and hung above the kitchen fireplace, and tuber seeds are hung using a *noken* around the house. The selected seeds are prepared before burning. Seed preparation time is about three months before planting. The preparation of seeds is done by women because they are considered producers of offspring.

3.2.7. Planting

The planting is conducted by a small family on a plot of the garden owned. During the planting, they invite the family and neighbors to traditional ceremonies, help with planting, and pray together. The planting is done by *tugal* without spacing, moving forward following the planting hole, bringing the latest sarong, placed in the garden. The planting is done while the ashes from the combustion are still warm. During the planting, a large family prepares food, the men work together, and the women plant.

Planting does not use spacing and fertilizers. After the planting, they use a twig to signal that the area in the plot has been planted. The planting uses an intercropping system in one garden stretch. Pumpkins are planted around the burning mounds, then potatoes, corn, peanuts, red beans (*brenobon*), and, finally, sweet potatoes are planted. Meanwhile, taro plants are planted on the outskirts of small rivers or where there is water flow. Spinach and mustard plants are scattered/sown in the parts with much ash from the combustion. Feng et al. (2021) reported that intercropping of maize with peanuts is more efficient in land use than single crops and can sustain high yields.

3.2.8. Pest Control and Plant Maintenance

Each small family carries out plant maintenance on their garden plot. Plant maintenance is done by pulling out the grass (weeds), piling up rotten wood around the taro plant. Rat pest control is made by making snares or traps from bamboo, installed around the garden, considered a nest or a place for rats to walk; sweet potato or potato tubers are used as bait.

Black caterpillar pest control (*siskemeta gogor*) is carried out by taking the *decnebei* plant, then circling on the ground around the plant so that the black caterpillar pest that comes from the soil is trapped/attached to the hairs of the *decnebei* plant, which has a binding/sticky power. In addition, one can also use *kebargouh* leaves placed on the ground in the gaps between plants so that the caterpillar pests do not eat the leaves of the cultivated plants, but they eat the *kebargouh* leaves, which look green and fresh. Farmers also use stove ashes (*irogmor*) in their home kitchens which are scattered among the plants to become fertilizer to fertilize the soil, preventing the emergence of black worms that come from the soil.

3.2.9. Harvesting and Processing

Each small family harvests on its garden plot. The harvesting is not done fully at once, but only according to family consumption needs, supplies of seeds, and some harvest is sold if there are other needs. The Arfak community does not carry out post-harvest processing. Sweet potato harvesting is performed only by experienced parents. The first harvest is brought to the church for a prayer of thanksgiving, eating together, sharing the harvest, and giving it to the pastor/servant of God. Harvest time is carried out according to the harvest age of the plant. Women harvesting and bringing their produce home are carried out by women, while men only carry machetes, arrows, and spears to guard.

4. Conclusion

The subsistence agriculture knowledge system in the Arfak community is guided by the local knowledge *igya ser hanjob* or *mastogow hanjob*, which means "standing up to guard the boundaries." The cultural value of "standing up to guard the boundaries" is contained in the knowledge of determining the planting season to harvest, including space boundaries, actions, time limits, and labor division boundaries that are interrelated and have goals. The spatial boundary relates to the function of the forest area as a place for farming (the *Susti* area), client/clan area, garden fence, and garden plot. The limit of action is based on the decision-making and actions of the extended family head and family members. The time limit is related to the timing of agricultural actions. The boundaries of the division of labor involve the division of labor by family and sex.

The results of this study provide valuable information on how we should understand *igya ser hanjob*. Its understanding only on forest area boundaries as in previous studies is not enough. Local knowledge of *igya ser hanjob* covers many aspects of human life and the environment, including aspects of agriculture which are the main source of livelihood for the people of Arfak. In this aspect, it is clear that the understanding of *igya ser hanjob* (maintaining boundaries) in agriculture from planting to harvesting is clearly illustrated.

This study only focuses on how the knowledge of the Arfak community in growing plants is based on local wisdom *igya ser hanjob*. There are still many aspects of this local wisdom needing disclosing, such as using *igya ser hanjob* knowledge to manage household consumption, *igya ser hanjob* knowledge adaptability to and compatibility with modern agricultural knowledge, and *igya ser hanjob* knowledge maintenance, development, and socialization by the Arfak community.

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