American Journal of Economic and Management Business
p-ISSN: XXXX-XXXX
e-ISSN: 2835-5199
Vol. 3 No. 8 August 2024

Impact of Sustainable Intensification of Coconuts Toward Women Farmer's Empowerment in Sarmi Papua

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Abstract

This study analyzes the impact of sustainable intensification of coconut plants on the empowerment of women farmers in Sarmi, Papua, by integrating SDG 5 indicators with SDG 1, SDG 2, SDG 8, and addressing the challenges of achieving SDG 10 and SDG 15 in the context of sustainable agricultural intensification. Using a qualitative approach and the Sustainable Intensification Assessment Framework (SIAF), this research evaluates the gender-specific impacts through an in-depth analysis of relevant domains. Data were collected through purposive sampling and in-depth interviews with coconut farmers, local government officials, and women activists in Papua. The findings indicate that improved knowledge and skills in coconut oil production have shifted women's roles from domestic to productive, enhancing their confidence and participation in decision-making processes. Challenges include price instability, land inheritance biases, livelihood diversification, and financing constraints. The study highlights direct linkages between women's empowerment and SDGs 1, 2, 5, 8, 10, and 15 in efforts to eradicate poverty, ensure food security, achieve gender equality, and promote decent work. Managerial implications include integrating gender mainstreaming in sustainable agriculture initiatives, enhancing monitoring systems, and adopting eco-friendly intensification practices. Four key areas for program sustainability are knowledge enhancement, mechanization, financing, and market access. These findings provide insights into advancing gender equality and women farmers' participation in rural agricultural development.

Keywords: Sustainable Intensification, Sdgs, Farmer Women, Gender, SIAF.

INTRODUCTION

Sarmi Regency is a coconut-producing area with a productive plant area of 5,085 Ha or 19.9% of the total coconut land area in Papua Province covering an area of 25,700 Ha in 2019 (Manwan et al., 2022). Coconut plants that grow along the coast and lowlands of Sarmi Regency

are individually owned by farmers from the local community and are among the leading commodities.

Agricultural intensification means an increase in output per unit of input per unit of time, while sustainable intensification means more food production on the same land while reducing negative impacts on the environment and, at the same time, increasing contributions to natural capital and environmental services (Shrestha et al., 2021; Zurek et al., 2016). Continuous intensification promotes a balance of agricultural goals in the economic, social, and environmental spheres. The social sphere shows how little effort has been made to incorporate gender and social justice issues into programs or analyses of continuous intensification (Snyder & Sulle, 2022).

In developing countries, the gender gap is mainly indicated by women's low access to inputs, resources, and services needed for agricultural production as well as greater vulnerability in land ownership than men due to various institutional-based constraints (Croppenstedt et al., 2013; Djurfeldt et al., 2018). Research conducted by (Mulema & Damtew, 2016) found some gender-based constraints in agricultural intensification programs in Ethiopia that prevent women from engaging in and adopting "new" agriculture. Some of these factors are related to the process of sustainable agricultural intensification, namely women's lack of access and control over productive resources, income, markets, labor, information, and extension of agricultural services. Women's power in decision-making is low, and they cannot manage capital flows effectively (Haggar et al., 2021; Sasa et al., 2022).

Women's empowerment and gender equality are ethical imperatives and essential to environmental conservation and women's socio-economic lives. Different researchers have shown synergies between women's empowerment/equality and increased productivity, access to food, soil management, water, health, and energy (Kaltenborn et al., 2020) (UN Gender Equality and Sustainable Development, 2014).

Sustainable Development Goal (SDG) number 5 is to achieve gender equality and empower all women and girls in direct alignment with SDG 1 (no poverty), SDG 2 (no hunger), SDG 3 (healthy life and improved welfare), SDG 4 (quality inclusive education), SDG 8 (creating decent jobs and promoting inclusive growth) and SDG 10 (reducing inequality) (Women, 2018).

In previous research by Fischer et. al. (2024) in Developing gender-transformative innovation packages for sustainable intensification, the case of maize leaf stripping in northern Ghana shows that sustainable intensification (SI) seeks to achieve multiple development goals simultaneously, one of which is the social aspect of sustainability. However, interest in gender norms as a driver or barrier to achieving these goals is still low. To find social aspects, especially unfair norms, that the gender transformative innovation package can target (Fischer et al., 2024). using the SIAF assessment framework as an analytical lens. The study found that many Overlapping things shaped the actions of men and women who interacted with the SI package, creating a clear difference between the two. These overlapping norms must be targeted to support gender equality. It is important to note that the evaluation of the social and technical aspects of the

intervention should be made more consciously in a transdisciplinary process with a more equitable framing of objectives.

The Sustainable Intensification Assessment Framework (SIAF) has been developed with the support of USAID (Musumba et al., 2017) and adopted in Africa, Asia, and Latin America to implement agricultural programs in rural areas. This guide provides a logical framework for designing sustainable intensification programs and measuring their impact on five domains: Productivity, Economy, Environment, and Human and Social Conditions. A search of papers and reports on the implementation of sustainable intensification in six countries in Asia and Africa shows that very few studies or papers have paid attention to the integration of the five domains in their entirety (Jones-Garcia & Krishna, 2021; Xie et al., 2019). Most papers and programs concentrate on the domains of productivity and economics. Little focus is on environmental, human, and social domains (Snyder & Sulle, 2022).

The 2030 Agenda emphasizes that achieving gender equality through empowering women and girls is essential. SDG 5 on Gender Equality intersects with SDG 1, Eradicating Poverty; SDG 2, Eradicating Hunger, Access to and Quality of Education (SDG 4), Access to Clean Water and Sanitation (SDG 6), Access to Jobs (SDG 8) and Sustainable Communities (SDG 11). SDG 1. b calls on countries to "... creating policy frameworks at the national, regional and international levels based on development strategies that favor the poor and gender-sensitive..." effectively carry out their activities (Kaltenborn et al., 2020).

In the sustainable development goals, all stakeholders must pay attention to development that supports women. One of Indonesia's mainstay sectors, namely agriculture, also needs the same attention. Women farmers still experience significant social and economic injustices. They are seen as less independent, and the influence of patriarchal culture has fueled the belief that peasant women cannot thrive. Although their contribution is quite large. Women's contributions even exceed men's contributions in agriculture in some places (Abidin & Prasetyani, 2021).

The general goal of the SDGs is to create a fair, egalitarian, and inclusive society for all. It is a global call to end poverty, protect planet Earth, and guarantee that all people live in peace, justice, and well-being. When women are empowered, they will have more control over their own lives. It can also be considered an important step in achieving gender equality, meaning "the rights, responsibilities, and opportunities of each individual will not depend on whether they are born male or female". UN Population Data states that empowered women have the ability to influence the direction of social change and have control over their own lives, both inside and outside the home. Before gender equality can be achieved and maintained, women must be "empowered" to narrow the "gender gap" and create equality between women and men. Gender sensitivity is included in every SDG (Pathania, 2017).

RESEARCH METHODS

This research was conducted using a qualitative descriptive approach to understand and interpret social phenomena from the perspective of the research subject, namely the impact of the

implementation of sustainable intensification of coconut plants on the empowerment of women farmers in Sarmi Regency, Papua, where the government facilitates this agricultural program. This qualitative method is suitable for use because the issue of women's empowerment is related to gender transformation, which is considered a sensitive topic (Hennink et al., 2020). With this technique, the researcher decides on the domain that needs to be known from the sample and looks for respondents who are willing and able to provide information based on experience and interaction in their environment.

Data Collection Methods

In this study, primary data was obtained. Primary data refers to data obtained through direct observation in the field. Primary data were collected through in-depth interviews with relevant sources. In-depth interviews are conducted with key informants who play a significant role in the research context. The in-depth interview aims to understand better the events, activities, people, organizations, feelings, motivations, demands, concerns, and other relevant aspects of this research.

Sample Withdrawal Method

In this study, sample withdrawal was carried out using the Non-probability sampling method. Non-probability sampling is a method that does not provide an equal opportunity for any element or member of the population to be selected as a sample. The Non-probability sampling technique used in this study is purposive sampling. Purposive sampling is a technique carried out deliberately by selecting samples based on a specific purpose. In purposive sampling, samples are selected selectively with the aim of obtaining the most relevant and representative information related to the research topic. This study involved 12 respondents, including male and female coconut farmers and representatives of the district and provincial governments. The sampling location is the respondent's domicile with land that is cultivated in the same customary area

Data Analysis Methods

This study was analyzed using qualitative content analysis on primary data obtained from the results of in-depth interviews with respondents. This model proposes that data analysis is carried out interactively and continuously until a comprehensive conclusion is reached. The qualitative content analysis consists of three analysis flows that are carried out simultaneously: data reduction, data presentation, and drawing a conclusion. Data reduction involves summarizing, selecting, and focusing on important things and looking for themes and patterns that appear in the data.

This study uses the triangulation method to strengthen the validity of the findings. Triangulation is an analysis technique that compares data from different sources or techniques. In this study, Source Triangulation and Engineering Triangulation were used. Source triangulation was carried out by verifying the findings by comparing data from different informants and comparing the results of this study with those of other relevant studies. Meanwhile, triangulation techniques are carried out to test the credibility of the data by examining data from the same source but using different analysis techniques.

The research respondents were selected using the purposive method from the populations with the best knowledge of the research objectives in the relevant location (purposive sampling method). With this method, the samples obtained are hoped to meet the data analysis requirements (representative and homogeneity).

Variables and Measurements

The impact of sustainable intensification is assessed using the SIAF Method in five domains: Productivity, economy, environment, human condition, and social (Musumba et al., 2017). The impact assessment as a whole will be illustrated from the relationship between gender analysis level assessment and general level assessment, where these two assessment levels are spread across five SIAF domains (Fischer et al., 2024). Relationships between these two levels will produce aspects or indicators that are found in in-depth interviews, observations, and document studies.

RESULT AND DISCUSSION

Findings The research provides relevant indicators or aspects that spread across five SIAF domains, as shown in the table below.

Table 1. SIAF domain and the indicators or aspects that are found

Productivity	Economy	Environment	Human condition	Social
Seed access	Market access and income	Access to fertilizers and pesticides	Knowledge	Access to natural resources and ownership
Adopt new ways	Income materializatio n		Diversificatio n of livelihoods	The working relationship, duties and load
Product productivity	Access financing			Institutional

Productivity Domain

This domain focuses on seed access and adopting a new way of processing coconut oil. Like any other domain, it discusses women's empowerment issues and gender.

Seed access

Related to the availability of coconut seedlings from the nursery developed by the Papua Provincial Agriculture Office and the Ministry of Agriculture in the Sarmi area, women farmers who In the interview, it was not confirmed that there were new varieties of coconut seedlings from deep coconut seedlings and Mapanet-Minahasa varieties. In the interview, Meng can explain the good coconut seedlings and the nursery's location. Where are the three nursery locations in Papua,

one of which is in Sarmi Regency? This farmer woman's ignorance is reinforced by an explanation from one of the Sarmi Regency Agriculture Office that the socialization of coconut seeds has been carried out to farmers. However, it is not women farmers who are present. Although farmers complained that they did not receive information regarding the correct selection of seeds, another part of the interview with the government admitted that it was the women farmers who provided local coconut seedlings crossed with seeds from outside to produce certified coconut seedlings on the district nursery land. When the researcher asked the female farmer respondents how the coconut seedlings were obtained, they replied that the seedlings were taken from coconut plants that were already on the land. Even the other respondents received assistance from the government with coconut seed.

In the interview, all respondents stated that local coconut seedlings are better than the seeds of the Yan variety prepared by the government, even though not all respondents said that there has been a new variety of coconut nurseries in Sarmi. Belief in the quality of the seeds that are taught by parents is still strong. The assumption is that the quality of coconut seedlings in Sarmi is better than that of the seeds. This assumption has been passed down from generation to generation from parents teaching them how to choose coconut seeds.

Adopt new ways

Since intensified, a new way of coconut farming has been the introduction of coconut oil product derivatives, namely VCO, produced by an extraction technique without heating. The old way is to produce oil products using a heating technique. A new way of adopting because it more prosper and farmers can be done at home. The government facilitates the equipment needed, such as graters, basins, bottles, and sarin tools. In interviews with women and men, all respondents can explain the stages of the VCO production process and an extraction technique without heating. Farmer women grouping In the interview, emphasis was placed on the assistance of equipment and machinery. Gai Reason adopts a new method in oil manufacturing. Meanwhile, the male group emphasizes the government's invitation through proGrams intensification of sustainable agriculture. Farmer women in the interview say that he recorded in a process book that is taking place, including the number of coconuts Used, sebathorns raw materials, and the amount of oil produced in the cycle. This habit is recognized as being done consistently. When asked, what is the purpose of recording? The respondent replied that he wanted to count and compare the results obtained from each oil processing. These records are meaningful in oil processing carried out in households because they will give the meaning of 'productivity' and 'efficiency' in processing oil.

Product productivity

Many women lament that choosing new or old ways is not a problem. In processing, coconut has become a product of VCO or orange oil. This is associated with the respondent's statement that the fulfillment of outbound needs is urgent and demands to be fulfilled at all times. So, if the respondents did not get the marketing received VCO products, they chose to sell fruit coconuts to coconut traders who entered the camp with an open-top car. This is the Ga, which explains why women sell and transact with the market.

A peasant woman who, in the interview, explained that there was no difference in coconut production yield before and after intensification was implemented. In addition, there is an increase in revenue at the level of farmers with the application of a new way of processing coconuts in VCO.

Economy Domain

The economic domain is an important aspect according to the recognition of all respondents. They admit that the output of coconut farming intensification boils down to how coconut products can be marketed and how the income obtained can cover daily living needs. This aspect will be related to the diversification of livelihoods, and access to natural resources will be discussed in relation to human conditions and the social domain.

Market Access and Income

Coconut products, namely oil, are sold more by women in thegkan man. The decision to sell is in the hands of women farmers because it is related to the responsibility of meeting family needs such as food, children's school fees, and others in the women's territory. Women farmers will choose a market to sell coconut, fruit, or oil and its derivative products depending on the urgency of household needs. There is no real difference in income in selling coconuts, either in the form of fruit or in the form of coconut oil. For women farmers, product choice is not important. Because the most important thing is that there is money to cover the costs of household needs, where urgent needs usually come suddenly without being taken into account. There is almost no savings at home. Usually, the urgent need is the child's school needs.

Income Materialization

All respondents said that income was used to meet daily needs and expenses for schoolchildren or children studying in the city. Two male respondents added part of the income earned to savings.

When researchers asked female farmer respondents who decided how to use the income from selling coconuts, two women answered that they decided by themselves, and two other women answered that they discussed it with their husbands. In this case, female farmers are the subjects who decide how the family income is used. It is interesting to note that of the two female farmers who answered that they decided independently, one of them explained that she made her own decision because her husband did not help in processing coconuts into VCO. When researchers asked further, why didn't the husband help? The respondent answered that the husband had a job in Sarmi town, and even though the husband returned to the village, the husband did not help process coconuts into oil. It must be acknowledged that some men consider coconut farming work to be women's. This is in accordance with the thesis conveyed by Papuan women's activists and activists during interviews on different occasions that agricultural work is the role of women in the context of society in the Tabi traditional region and Papua in general, even though men are the pioneers in clearing land.

Access to Financing

The availability of the required equipment determines the sustainability of adopting new methods. So, it requires sufficient investment to buy new equipment or replace damaged equipment. Replacing damaged equipment, such as spare parts for grazing machines, is an extra expense that is not included in the agricultural intensification program financing scheme. Meanwhile, only a few farmers set aside their income to buy equipment, which is only the last priority. The women farmers interviewed believed that equipment replacement must be completed immediately, so the financing was taken from the group's treasury. Meanwhile, male respondents hope for a permanent financing institution like a cooperative. The idea of cooperatives emerged in discussions with male respondents. Meanwhile, in discussions with female respondents, this idea did not emerge. The practical solutions of female respondents might be translated as a mechanical problem-solving attitude that requires attention to find a solution immediately. Meanwhile, men want to solve financial problems institutionally. This is understandable because, in relation to men's duties in clearing forests into agricultural land, they need to use grass-cutting machines where technology and machinery need to be provided. Women, youth, and farmers face specific problems and major challenges in gaining access to funding (Snyder, K., & Sulle, E., 2022). Various agricultural innovations are important to ensure farmers can afford technology without having to take on high debt (Snyder, K., & Sulle, E., 2022).

Environment Domain

The experience of the community clearing land traditionally and movingly instills local knowledge of soil fertility; therefore, fertilization is unnecessary. Planting land must be fertile because nature maintains the soil. Meanwhile, the sale or marketing of products is seen as a government intervention that must be provided.

Access to fertilizers and pesticides

There is no use of fertilizers and pesticides. All the speakers interviewed said that the soil is fertile enough and no fertilizer is needed. At the same time, the application of pesticides is hardly mentioned. All interview respondents agreed that local coconut seeds (coconuts in Sarmi) are better than those prepared by the government through the nursery certification. The community's reason is that local seeds are more disease-resistant, although there has been no research on this. Therefore, there is no fertilization or spraying of pesticides on coconut plants. Note here that coconut plants produce old coconut plants inherited from their parent and Tete. The reason put forward is that local seeds are more resistant to diseases and pests, although the agriculture department rejects this statement. Explaining pest diseases found in Coconut trees newly grown and leaf borer pests on old coconuts in a field visit to a different village the village was researched.

Human Condition Domain

This domain focuses on farmers' welfare and quality of life, including discrimination, socialization, and other social aspects that affect their lives. The aspects that emerge from the interview are knowledge and diversification of livelihoods.

Knowledge

All farmers in the interview can explain the stages of a new way of processing coconut milk into coconut oil and VCO. Farmer women respondents were not only able to explain the stages of the new way of production of coconut oil, but they also had a production workbook starting from the input of how many coconuts are peeled and taken and what is the output of VCO that produced in a single process cycle. All woman farmer respondents have written records and steps processing oil in new ways, from all knowledge related to the intensification of Coconut Farming, materials for making oil in a new way of enthusiastically conveyed by women farmers. They ran smoothly and confidently.

On the question of what material do respondents want to learn more about, there are three materials, starting with the most: oil processing, plant maintenance, and coconut seeds. Half of the respondents wanted to learn more about oil processing; perhaps this could be analyzed as a tendency to want to carry out experiments to get more efficient products.

In terms of knowledge, especially about oil processing in a new way, there is a transformation of knowledge that complements each other for women and men. The knowledge that was initially only trained to women through groups eventually attracted men to join the coconut oil business group. The same happens to adult boys and girls.

Diversification of livelihoods

In addition to coconut plants, farmers also plant pinang, bananas, and cocoa. Some of these plants are planted among coconut plants. There is always an option if the oil product is not absorbed into the market. However, this is also counterproductive because selling fruit coconuts remains the farmers' choice. At least this choice is the decision of farmer women because of the urgency to meet the household's needs. At the same time, male respondents are inclined to show fishing options or netting fish in the sea.

Unstable coconut oil prices become a pending farmer woman selling fruit coconuts. Traders from Jayapura go to the village with an open-top vehicle looking for fruit coconuts to buy. The unstable price of coconut oil incentivizes women farmers to sell coconuts.

Social Domain

This domain focuses on natural resource access, ownership, decision-making, workforce relations, duties, loads, natural resources, and institutional conflicts. Women's empowerment issues and gender are also discussed in this domain, just like any other domain.

Access to natural resources and land ownership

Land ownership and agricultural land are two different things. Ondoafi owns the land. Ondoafi is a center of the structure of society custom who is drawn through a straight line with the founder of the village hamlet and is the son of the previous son of Ondoafi. With the patriarchal primogeniture system, the kinship system takes into account the relationship of kinship by drawing or taking the bloodline from the father's side so that all the paternal relatives are included in the kinship boundary, while all the maternal relatives are outside that boundary, it can apply to the eldest only or all the sons. The implication is that the position of the leader or customary head is inherited, ascribed status with all privileges attached to it, including land ownership in his

customary. The land owned can be managed as much as agricultural land to the community in its tradition but only to men in the same group of people.

The men and women interviewed emphasized that the inheritance rights of land and land belong to men. This land inheritance does not apply to men outside the village who are married to women in the same customary group. Meanwhile, women do not have the right to ask for land managed by their husbands from different customs. However, one female respondent claimed to have gotten land because it was given to her brother. In this context, it has a good impact on a woman if she marries a man in the same custom. However, it will have a beneficial impact if this woman marries a man in a different custom.

Land controlled by certain customary practices can positively affect the sustainability of agricultural intensification. However, the culture of inheritance only to the male side can cause the land to be transferred to another party who asks for land to be purchased. Selling land can mean saving the area of land to be planted. This can be difficult for women because it means less land can be planted, while they have to look for alternative crops that can generate income if the coconut is not enough to meet the company's needs; likewise, in the land dispute between the exits of the ga, which usually involves men. In such a situation, the disputed land should have no agricultural activities.

The working relationship, duties, and load

Cultivating farmland, picking, and selling is the work area of women in the tradition and culture of the local community. Some are still semi-nomadic. The land is a source of livelihood, and both Indians cultivate land or look for food in the forest. Working relationships, duties, and missed loads in the observation have no change in relationship and loads work before and after programs for agricultural intensification are carried out. Transformation gender was marked, with half of the respondents working on farms for the same length of time as women and men.

This shows that there is no difference in the means between women and men related to relation levers and workloads in midwives' coconut farming. Although a man first carried out the land clearing and cut down large trees, after that, the women cleared the land and made an income. During the sustainable intensification program, government assistance succeeded in connecting men as heirs of land and women culturally as pioneers, maintainers, and managers of production, marketing, and agriculture, achieving an equal relationship between men and women.

Institutional

The establishment of joint business groups of coconut farmers in villages is designed to involve women farmers, and this organization has strengthened the participation of women farmers in accelerating gender transformation efforts. The group, which consists of 10 members per hamlet per village, sets a schedule for a joint work plan, calculates inputs and outputs for oil processing work, and sells the oil produced. These groups provide a peer-to-peer learning space among women farmers to improve their knowledge and skills

CONCLUSION

The intensification of coconut plantations in Sarmi has transformed traditional gender norms where maintaining crops and processing coconuts were women's domestic roles. Now, women have become part of the production class despite not holding land rights, reflecting a shift towards more equitable roles. This transformation aligns with SDG 5 indicator 5.a.1, although land ownership among women remains unfulfilled. Women farmers have adopted new methods for processing coconut oil, deciding on income use, which prioritizes household and educational needs. This participation supports SDG 8 indicator 8.1.1 (GDP per capita) and SDG 2 indicator 2.3.1 (production volume per labor force), even though it has not been formally measured. The equal workload distribution between men and women also highlights gender parity in sustainable agricultural practices. Through the sustainable agriculture intensification program, women have gained knowledge and increased productivity by processing old coconuts into VCO, aligning with SDG 1 indicator 1.a.1 (government resource allocation for poverty eradication). However, challenges remain in increasing coconut productivity and market access to secure stable incomes, addressing SDG 10 indicator 10.1.1 (reducing disparities) and SDG 15 indicator 15.1.1 (forest area preservation). Women farmers seek government support for the program's sustainability in knowledge improvement, mechanization, financing, and marketing.

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