Strategies to optimize women’s participation in palm cattle integration

S Wulandari* and R Villano

1 Indonesian Center for Estate Crops Research and Development, Bogor Indonesia
2 University of New England, Armidale NSW Australia

*Email: suciwulandari@hotmail.com

Abstract. Palm cattle integration as an integrated farming system is intrinsically complex. The model involves different processes and interactions between various actors in the value chain. The participation of women farmers in agriculture is considered the primary social capital in creating agricultural sustainability and improving productivity, but norms and socio-cultural aspects often dictate these roles. Investing in women in smallholder-based supply chains is expected to increase productivity, reduce costs, and improve broader goals. Approximately 49% of agricultural households comprise of women farmers. While both men and women contribute significantly to palm cattle integration, rural women’s roles in production activities and technology transfer are not fully documented. On the other side, women’s participation in agricultural activities is still faced with various constraints. Hence, this study’s aim is twofold: to analyze the driving factors and constraints that motivate women’s participation and formulate strategies to increase women’s participation in palm cattle integration. This study provides useful information to develop appropriate intervention policies and strategies to support, enhance, and increase women’s participation in palm cattle integration.

1. Introduction

The integration of oil palm cattle is an integrated farming system model that combines oil palm plantation and livestock activities in an integrated system. This system involves many different processes and interactions between various value chain actors. Their outcomes are influenced by and affect multiple stakeholders and sectors in diverse and sometimes conflicting ways, including women farmers. There is established evidence of women’s role in the farming system. Women’s participation in agricultural activities is an essential social capital that can boost productivity and implement sustainable agriculture, but norms and socio-cultural aspects often dictate these roles.

Empowering women and promoting gender equality is an integral part of the 17 Sustainable Development Goals (SDGs) and a very strategic way to accelerating sustainable development. The fulfillment of women’s rights in all objectives will promote justice and inclusion, an economy that works for all, and sustainable development.

Rural women play an essential role in both income generation and household management [1]. Previous studies suggest that investing in women in smallholder-based supply chains is expected to increase productivity, reduce costs, and improve broader goals. About 49% of agricultural households in Indonesia comprise of women farmers. While both men and women contribute significantly to palm plantations and cattle management activities, rural women’s roles in production activities and technology transfer in palm cattle integration are not fully documented. On the other side, women’s participation in
agricultural activities is still faced with various constraints. Hence the objective of this study is twofold: to analyze the driving factors and constraints that motivate women’s participation in palm cattle integration and to formulate strategies to increase women’s participation.

2. Agricultural households profile in Indonesia

The agricultural household is defined as a household that at least one household member undertakes an agricultural activity aiming to be (partly or wholly) sold or exchanged. The number of agricultural households in Indonesia is 27,682,117, which is separated into 34 provinces. The agricultural activity could be managed by the owner or an operator and includes agricultural services activity. The composition showed that agricultural households are mostly located on Java Island. The largest agricultural households are in East Java (5,164 million), followed by Central Java (4,470 million) and West Java (3,251 million) [2]. Based on the composition, the number of household members by sex in 2018 is relatively proportional, 50.38% for males and 49.62% for females [2]. Based on the number of agricultural households by age group of the male and female main farmer in 2018, the largest proportion of main farmers are in the range of 45-54 years both for the male (20.92%) and female (6.51%) of the main farmer (Figure 1).

![Figure 1. Number of agricultural households by age group of the male and female main farmer, 2018 [2]](image1)

Based on the number of agricultural households by cultivated subsector, the number of agricultural households in food crops-paddy and livestock is the highest. In 2018 the number of agricultural households in crops-paddy was 13,561,253, and in livestock was 13,155,108 households (figure 2). Indonesia’s livestock sector contributes significantly to the national agricultural sector, with its growth surpassing the latter.

![Figure 2. Number of agricultural households by cultivated subsector, 2018 [2]](image2)

The livestock business is an economic activity that includes the management and breeding of domestic, livestock, or farm animals to obtain their meat and all other products. Indonesian beef production fluctuated widely. Data showed that in 2016 production reached 518,484 tons, but in 2019, only 490,420.8 tons. On the other side, Total beef demand in 2019 was 686,270 tons, with Indonesian beef demand at 2.56 kg/capita/yr.
Estate crops subsector involves 12.074.520 households, which oil palm is the newest and fastest-growing tree crop [2]. Indonesia is the world’s largest producer and exporter of palm oil. During 2013-2017, Indonesia produced 144.7 million tonnes of oil palm fruit bunches, or 49% of world production. Indonesia’s exports for the 2012-2016 period were recorded at 22.3 million tonnes/year or contributed 52% of the world’s traded palm oil [3].

3. Women’s participation in palm cattle integration
Palm cattle integration is encouraged to be developed in Indonesia and motivated by the various benefits. At the national level, the strategy aims to support meat self-sufficiency and to increase oil palm productivity. Palm cattle integration is defined as the management of cattle that integrated with oil palm. The objectives are to maximize the land used through the optimal use of resources and control the weeds through biological control with the cattle integration system [4]. Palm cattle integration will optimize land use and reduce the costs of managing oil palm plantations, thus providing a higher total return for each hectare of land resources used [5].

The implementation of palm cattle integration is relatively low, caused by various obstacles such as difficulty obtaining livestock breeds, technical constraints and additional costs in raising livestock, the issues of Ganoderma and soil compaction, and lack of infrastructure in remote areas [6]. On the other side, there is a great prospect for developing palm cattle integration that is viewed from comparative and competitive advantages, profit levels, farmers’ preferences, and farmer groups’ contribution [7]. Moreover, there is a significant potential contribution of women in palm cattle integration.

Rural women are effective agents of community mobilization and social development. Rural women play a vital role in the agricultural production system [8]. Women’s role in the cultivation and processing of agricultural products ranges from 20 to 70%, and their involvement is increasing in many developing countries [9]. At the household level, women play an important role in food security and the nutritional status of their household members [10].

Women are involved in palm plantations in planting, cultivating, weeding, fertilizing, spraying, harvesting, and picking fruits. Women are intensively involved when the plantation in an immature stage, and it tends to be decreased when palm starts harvesting [11]. Most women play an active role in livestock management activities in almost all business management and livestock production activities such as fodder collection, feeding, watering, health care, and marketing. [12].

4. Driving factors motivates women’s participation in palm cattle integration
Women’s motivation to be involved in the agricultural sector is due to economic factors and increasing income, besides having knowledge and experience. The use of free time is directed to productive activities, which are mostly related to farming activities. The involvement of women is also in the context of using family labor so that it is expected to reduce production costs.

Women’s participation in agricultural activities is influenced by marital status, age, market access, access to credit, and interactions with agricultural extension agents [13]. Meanwhile, education level, age, and marital status significantly determine women’s participation in agricultural activities [14]. Specifically, the demographic variable that affects women’s participation in agricultural production includes age, household size, number of experience, a distance of the women’s farm from the homestead, the disposable income level of the woman, perception, and extension service, and tenure right [15].

Factors affecting the economic empowerment of rural women in agricultural activities can be divided into three groups: (1) demographic characteristics (age, family size, education status of women and married relationship); (2) economic factors (household farm income, income from non-farm activities, household farm size, employment/doing any paid work and access to own property) and (3) social factors (utilization of credit, access to information channels, contacts with extension agents, participation in community affairs and distance from market center) [11].

Palm cattle integration is a combination of two different agricultural activity systems in an agricultural production system. Palm plantations offer potential feed sources, including understory herbage, green palm fronds, and by-products such as palm kernel cake and solid ex-decanter. Integrated farming systems provide significant benefits to optimizing resource use and incorporating all elements in the system [16]. The integrated crop-livestock system is the potential to promote economic and social
benefits [17]. The integration is very complex in terms of their role in reducing the nutrient cycle’s transparency, following industrial ecological reasons, regulating land use and agricultural practices, and increasing agricultural resilience to adverse climate and economic events [18].

Based on the characteristic of palm cattle integration, the factors driving women’s participation are grouping into three groups: personal factors, economic factors, and enabling factors (Figure 3).

![Factors Driving Women’s Participation in Palm Cattle Integration](image)

**Figure 3.** Factors driving women’s participation in palm cattle integration

Personal factors related to the individual characteristics consist of education level, years of experiences, perception, and entrepreneurial skill. These four factors have a positive value on women’s participation. Economic factors are related to the potential for increasing income through additional benefits or cost reduction, which consists of household farm size, household income, income from non-farm activities, employment, and access to own property. In terms of the economy, household farm size, household income, income from non-farm activities, employment, and access to own property are income levers that provide opportunities for investment activities that are a driving force for women participation.

Enabling factors are external factors that drive the implementation of palm cattle integration. The availability of these factors will create the best practices of palm cattle integration, which will motivate women to participate. Enabling factors include credit utilization, extension service, access to technology, and social capital.

5. The constraint of women’s participation in palm cattle integration

Women’s participation in agricultural activities is still faced with various obstacles such as cultural factors, gender perceptions, women’s dual roles, status, age, access to assets and resources, organizational membership rules, laws and policies, women’s preferences and motivations, and access
to information [19]. It is also influenced by several important aspects such as rural-based enterprise development, access to training, support from local institutions, developing appropriate technology, and risk management [20]. The primary constraints in women’s participation are lack of technical knowledge of the farming system, health problems, secondary status in decision making, poor economic condition, and household work burden [21]. Data about the number of farmers by educational attainment showed that the largest group of farmers in Indonesia had a completed primary school background (Figure 4).

Figure 4. Number of farmers by educational attainment and sex, 2018 [2]

The number of women farmer who not/not yet completed and completed primary school is dominant (73.57%) (Figure 5), that is higher than the number of men farmer (65.63%).

Figure 5. Percentage of female farmers by educational attainment, 2018 [2]

The internet has become an essential part of agricultural activities today. The development of a network that reaches various regions in Indonesia has made it easier for internet users to access and utilize it. The data show that the number of women who access the internet is relatively less than men (Figure 6).

Figure 6. Percentage of farmers by sex and internet use within the last 12 months, 2018 [2]
Palm cattle integration has a specific characteristic, and its implementation needs to be organized beyond the technical aspect. However, there are several constraints faced by rural women to participate in palm cattle integration: lack of knowledge, lack of entrepreneurial skill, limited access to the asset, lack of access to credit, limited access to extension, lack of access to technology, and limited of networking.

Palm cattle integration is very highly recommended for palm plantation owners. Farmers already have information and are interested in implementing palm cattle integration. Still, because of the lack of skills and knowledge, they refuse to take the risk of implementing this system [22]. This phenomenon also occurs in smallholders in Indonesia. The introduction of livestock is carried out to smallholders who are already running palm plantation businesses. As an additional activity, smallholders have limited knowledge in their animal husbandry technical know-how. This condition is increasingly limited to women due to the limitations of their involvement in the production system.

Palm cattle integration must be operated by farmers who desire to generate value by expanding economic activity by identifying and exploring new products, processes, production, and markets. Operating palm cattle integration needs specific characteristics in strategy, competencies, and management [17] that align with the entrepreneurship aspect.

Most of the women have limited access to assets related to the ownership of assets carried out on behalf of the family’s head. The implementation of palm cattle integration requires financial support. However, there are several obstacles to accessing formal financial institutions faced by rural women, such as time allocation, autonomy in decision making, and limited information [22].

Technological innovation has a significant role in structural transformation, where at the beginning of its diffusion, technological innovation can change the roles and responsibilities of men and women [23]. Technology can reduce labor in farming systems, which opens opportunities for men to diversify outside of agriculture or outside of family farms [24]. Extension activities mostly focused exclusively on men to the cultivation stage, hence deterring many women from being involved in the decision making and production process. This condition leads to the low involvement of farmer women in access to technology.

As an integrated farming system, the development of palm cattle integration requires solid networks. In general, networking in palm cattle integration is about constructing social capital in bonding, bridging, and linking. Bonding social capital describes the links between farmer group members. Bridging social capital indicates the connections between farmer groups and actors in the value chain of palm cattle system production. Linking social capital showed a possibility of reaching out to institutions or people outside the farmers in different situations. Thus farmers enable to leverage a broader range of resources than are available in the community.

6. Strategies to increase women’s participation in palm cattle integration

Three types of cattle management are extensive, semi-intensive, and intensive systems. In the extensive system, cattle management is carried out by implementing controlled grazing throughout the day in palm plantations. In the semi-intensive system, cattle get the feed from the grazing land every morning and are penned in the afternoon. In an intensive system, farmers provide grass and feed it in pens known as the cut and carry system.

Women’s participation is not about the quantity of their involvement related to cattle management, but how to include women in agricultural value-addition activities. At the individual or household level, strategies to improve individual capabilities and intra-household relations are crucial for promoting women’s participation and leadership [19]. Therefore, some strategies are needed to increase women’s participation, consisting of technical and managerial skills (Figure 7).
From the technical aspect side, the strategies to increase women’s participation include strengthening cattle management skills, complete feed processing skills, organic fertilizer processing skills, and risk mitigation skills. From the managerial aspect, women’s participation can be optimized by developing entrepreneurial skills, linking networks, bonding networks, and bridging networks. In line with this, the government needs to create a support system that will facilitate women in optimizing their participation. The support system includes increasing credit access and utilization, extension service access, technology access, technology adoption, and strengthen social capital.

7. Conclusion
Rural women have become effective role players in income-generation by implementing palm cattle integration. Based on the characteristic of palm cattle integration, the factors driving women’s participation are dividing into three groups: personal factors, economic factors, and enabling factors. Several constraints faced by women’s participation in palm cattle integration are lack of knowledge, lack of entrepreneurial skills, limited access to the asset, lack of access to credit, limited access to extension, lack of access to technology, and limited networking.

The strategies are needed to strengthen rural women’s technical and managerial skills. From the technical aspect side, the strategies to increase women’s participation include strengthening cattle management skills, complete feed processing skills, organic fertilizer processing skills, and risk mitigation skills. From the managerial aspect, women’s participation can be optimized by developing entrepreneurial skills, linking networks, bonding networks, and bridging networks. Simultaneously, the government is needed to develop a support system that facilitates women in optimizing their participation. The support system includes increasing credit access and utilization, extension service access, technology access, technology adoption, and strengthen social capital.

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