Maintaining Welfare: Adaptation Strategies of Coffee Farming Communities in Lumajang, Indonesia, 2014-2023

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Abstract

This study analyzes the adaptation strategies of farmers in a village on the slopes of Semeru, specifically in Wono Cepoko Ayu Village, Senduro District, Lumajang Regency, Indonesia, which has long been recognized as a coffee cultivation area, namely Kolesem (*Kopi Lereng Semeru*; Semeru Slope Coffee). In 2014, many farmers shifted to cultivating balsa wood, but between 2018 and 2023, they returned to coffee farming. Therefore, this study addresses three main issues: (1) the factors that led farmers to shift from coffee to balsa wood cultivation in 2014; (2) the reasons behind their return to coffee farming between 2018 and 2023; (3) and the overall impact of this transition on farmer welfare. This study emphasizes the socio-historical aspect, applying economic sociology and rational choice theory, and employs historical methods to examine the changes. The findings indicate that the shift to balsa wood was driven by its high economic value, which temporarily improved farmers' welfare, evident in land acquisitions and home renovations. However, a virus outbreak in Balsa Wood forced farmers to return to coffee cultivation and adopt intercropping methods to support their economy. This situation highlights that such adaptation remains essential to support farmer welfare and underlines the importance of flexibility in dealing with economic changes and agricultural challenges.

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Introduction

Studies on the welfare of coffee farmers have been conducted by researchers from various backgrounds and disciplines. Sembiring et al. (2019) investigated the economic factors that impact the lives of coffee farmers, including coffee prices, government policies, integration into the global coffee value chain, and technological innovations in coffee plantations. Meanwhile, Mawardi et al. (2020) studied the adoption and impact of new technologies in coffee production, focusing on the role and contribution of women in coffee plantation activities and their impact on family and community welfare. Analysis of farmer organisations

and coffee cooperatives has been conducted by Wardhani and Fetia (2020), who examined the role and effectiveness of these organisations, cooperatives, and associations in supporting coffee farmers. Syahroni et al. (2021) evaluated community access and participation in education programs and their impact on increasing knowledge and welfare.

Regarding the welfare and risks faced by coffee farmers, those in Vietnam respond to climate change risks through adaptation strategies, including crop diversification and adjustments to planting times, thereby highlighting the importance of local knowledge and flexibility in decision-making (Nguyen and Tran, 2023). In this context, crop diversification is a highly effective economic measure for enhancing farmers' resilience to fluctuations in coffee prices (Smith and Lee, 2024). Furthermore, access to credit strengthens the collective capacity of coffee farmers in farmer groups, supporting their efficiency and courage in making strategic decisions (Suman, 2021). Participation in the global value chain promotes higher-quality and sustainable agricultural practices (Kato and Sato, 2023). On the other hand, micro-scale coffee farmers in Central Aceh implement sustainable strategies through economic diversification, environmental conservation, and training. This highlights the necessity for external support to enhance farmers' long-term resilience (Rahman and Putri, 2022).

However, previous research has not fully detailed the realities of coffee farmers' lives, making the proposed study by the author urgent and innovative compared to previous research. This study will explore the existence of Kolesem farmers in Wono Cepoko Ayu Village, Senduro Subdistrict, exhibiting high flexibility in managing their land by dynamically shifting from coffee cultivation to planting Balsa Wood. This rapid adaptation reflects farmers' resilience and responsiveness to market opportunities and agrarian changes. When Balsa Wood offered higher profit potential, farmers promptly shifted focus from coffee, utilizing their farming expertise to manage a different crop. This ease of transition not only demonstrates farmers' deep understanding of diverse farming techniques but also their ability to make strategic decisions (Popkin, 1979) to maximize production and profits. It also highlights farmers' characteristics in responding to environmental and economic changes, making them crucial pillars in sustaining the village economy.

From the above description, the author aims to address three main issues. First, why did the coffee farmers in Lumajang easily switch from coffee to Balsa Wood cultivation in 2014? Second, why did farmers return to coffee cultivation during the period 2018-2023? Third, what are the impacts of transitioning from Balsa Wood back to coffee cultivation? This research has a spatial scope in Wono Cepoko Ayu Village, a village located on the slopes of Mount Semeru, Senduro Subdistrict, Lumajang Regency, which is known for its coffee production. The temporal scope of this study begins in 2014, marking the initial period of Balsa Wood cultivation. The research period spans 2018-2023, as farmers started shifting back to coffee in 2018. The study also includes evaluation up to 2023 to assess the impact of changes from coffee to Balsa Wood and back to coffee cultivation. This study falls within the scope of social history, emphasizing the importance of understanding history from the perspective of grassroots communities, focusing on daily life, social changes at the grassroots level, and how communities adapt to these changes (Kartodirdjo et al., 2013).

Method

This study employs an economic sociology approach (Smelser, 2005). Smelser explains how social interactions and societal structures influence economic activities, particularly in the context of coffee farming in Wono Cepoko Ayu Village. Through this approach, it can be explored how farmers' decisions to plant Balsa Wood, switch back to coffee, and engage in

intercropping are influenced by social and economic factors such as changes in market prices, social capital, and community networks. The theory applied in this research is rational choice theory (Popkin, 1979). According to Popkin, farmers rationally consider the costs and benefits of each decision they make, including labor, time, and resource investment in agricultural activities as well as decisions related to political policies. For instance, farmers will support policies or leaders they believe will provide the greatest benefits or improve their long-term welfare. Popkin argues that farmers' behavior cannot be viewed solely as a result of traditional or community pressures but must be understood as the outcome of careful individual rational calculations.

The research conducted by the author is historical research, thus employing the historical method. This method involves the process of testing and critically analyzing records and relics from the past (Gottschalk, 1986). The historical method is used by the author to study, analyze, and critically evaluate historical traces and facts. The first step in this research is heuristics, the initial stage in historical research where historians gather relevant sources after formulating the research problem (Sjamsuddin, 1996). In the context of this research, the historical sources collected include written documents such as information from the Central Bureau of Statistics of Senduro Subdistrict regarding the community of Wono Cepoko Ayu Village. Oral sources were obtained through interviews with individuals or coffee farmer groups and their members in Wono Cepoko Ayu Village, who have a deep understanding of the shift from coffee cultivation to Balsa Wood, and vice versa. Interviews were conducted with several key informants, including Mr. Tuno, Mr. Ngatuwi, Mr. Muliyono, Mr. Lasmono, and Mr. Sutomo (these five individuals are the heads of farmer groups in Wono Cepoko Ayu Village, overseeing 106 farmers out of a total of 1,185). Interviews were also conducted with the heads of Krajan, Pandan, Pancen, and Wonoayu hamlets to obtain information about their residents who no longer work as laborers but have become farmers due to the significant increase in income from planting Balsa Wood. Interviews were also held with Field Agricultural Extension Workers (PPL) and the head of Forest Village Community Institution (LMDH) "Lestari Makmur" to gather information on the technology provided by PPL related to the cultivation of various crops, especially Balsa Wood. Information obtained from the LMDH head was related to land cooperation between residents and the Perhutani Agency. In addition, the author studied various literature related to Social History, which is the scope of this article's study (Kartodirdjo et al., 2013), and books related to the economic sociology approach, rational choice theory, and articles related to the socio-economic conditions of coffee plantation communities. The literature and journal articles were obtained by the author through online searches.

The next stage is criticism, which the author actually conducts continuously alongside the heuristic process. In this stage, the author selects and evaluates the sources that have been obtained to determine whether they are valid, genuine or fake, and trustworthy (Sjamsuddin, 1996). This criticism involves assessing, testing, or selecting the sources or evidence that are truly needed, genuinely authentic, and contain information relevant to the subject or historical narrative to be developed. This process is related to assessing the credibility of the sources or evidence. The third step in the historical method is interpretation. In this stage, researchers elaborate and analyze the acquired data, as well as connect the critically examined data to obtain historical facts (Kuntowijoyo, 2003). Researchers link various historical facts chronologically, thus producing a narrative of history that truly corresponds to the reality of past events.

Historiography is the final step in the historical method. It is the effort to synthesize historical data into a narrative or presentation through writing history books and articles (Gottschalk, 1986). The presentation of imaginative reconstruction of the past from the data and facts obtained involves linking these facts into a historical narrative. Historiography, or the writing of historical narratives, is not merely about arranging and connecting research findings, but also about conveying perspectives and thoughts through historical interpretation based on the researched facts. Historiography is the activity of organizing historical facts into a narrative presented in written form. The writing of the collected and analyzed historical traces can become a credible and logical research output based on scientific principles. In the historiography stage, the historical facts are compiled into a narrative presented in written form about adaptation strategies of coffee farming communities in Lumajang to maintain welfare.

The Life of the Wono Cempoko Ayu Village Community in 2014-2017

According to Senduro Subdistrict Figures (2014-2017), there are 12 villages in Senduro District, consisting of the villages: 1) Purworejo; 2) Sarikemuning; 3) Pandansari; 4) Senduro; 5) Burno; 6) Kandang Tepus; 7) Kandangan; 8) Bedayu; 9) Bedayu Talang; 10) Wono Cepoko Ayu; 11) Argosari; and 12) Ranupani. The distance from Wono Cepoko Ayu Village to Senduro District is 6 km, while the distance to Lumajang Regency is 24 km. Wono Cepoko Ayu Village consists of 4 hamlets, namely: 1) Krajan Hamlet, 2) Pandan Hamlet, 3) Pancen Hamlet, and 4) Wonoayu Hamlet.

Land use in Wono Cepoko Ayu Village covers several categories, including: 1) agricultural land; 2) yard and building land; 3) "*bengkok*" land, which means a part of village land that is traditionally given to village officials i.e., village head, village secretary, and other officials as a form of compensation on implementing government duties. Although it does not belong to personal, the land can be managed or rent by the obedient as long as the term of office and cannot be freely traded (Hutomo, R. I., 2024); and 4) land used for purposes other than agriculture, yards, buildings, and "bengkok" land (See Figure 1). The roads connecting the village to surrounding villages and the city are paved and easily accessible, supporting economic activities related to plantation products in the area.

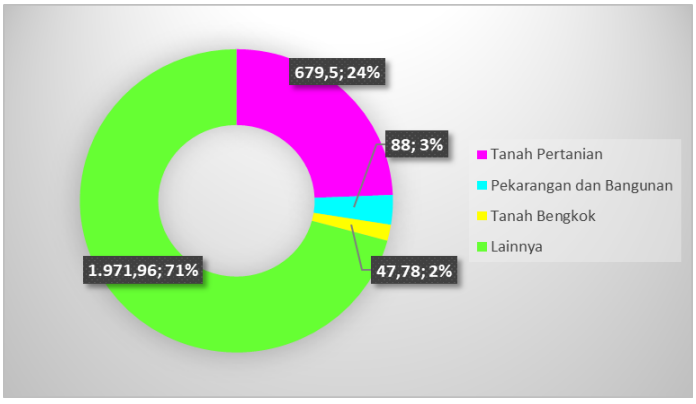

Figure 1. Land Use Distribution in Wono Cepoko Ayu Village by Area (in Hectares), 2013. Source: Senduro Subdistrict Monograph 2014.

The majority of the population in Wono Cepoko Ayu Village works as farm laborers, with the number reaching 755 people during the 2013-2017 period. Although agricultural land in this village covers 24% of the total area, according to The Centreal Bureau of Statistics

Lumajang Distrsict (BPS) (2017), only 524 farmers owned agricultural land during the same period. Farmers in Wono Cepoko Ayu Village do not fully focus on coffee cultivation on their plantations or on the land they manage in cooperation with Perhutani (Budiaman et al., 2024; Irwanto et al., 2024) on the slopes of Mount Semeru. Despite the land in this area being very fertile and suitable for coffee cultivation, they prefer to plant a variety of crops on their own land as well as on the land managed in collaboration with Perhutani. On one plot of land, they grow diverse crops such as coffee (Izzah, 2018; Izzah et al., 2024), Pisang (*banana*) Mas Kirana (varian of banana) (Safitri, et.al., 2023), cardamom (Tarigan, Saragih, 2023), mangosteen (Prajayanti, et. al., 2022), sengon wood (Zakiyah et al., 2017), and balsa wood (Wijoyo et al., 2018). Cardamom can be harvested several times a year, and Pisang Mas Kirana also provides a source of daily income. This differs from the Bondowoso region (Izzah, 2018) or Kayumas Village in Situbondo (Izzah et. al., 2020; Izzah et. al., 2022; Izzah et. al., 2023 a; Izzah et. al., 2023 b), which focus more on coffee cultivation on privately owned land or land managed in collaboration with Perhutani. Farmers in Wono Cepoko Ayu Village feel that solely planting coffee takes a long time to reach harvest, while coffee prices are not always stable. Therefore, they opt for the "intercropping" or "overlapping" method (See Figure 2 and Figure 3), as the farmers call it, where various crops are planted simultaneously without considering planting distances, although the harvest yield is not optimal. They also tend to ignore government programs, as they believe these programs only encourage planting without considering the market for their harvests.

In Wono Cepoko Ayu Village, there are five farming groups as follows: 1) The "Wono Tani" Farming Group, chaired by Tuno, with 25 members, manages 3 hectares of private land and 40 hectares of Perhutani land, cultivating coffee, sengon, and bananas; 2) The "Mekar Sari" Farming Group, led by Ngatuwi, with 15 members, owns 0.5 hectares of private land and 10 hectares of Perhutani land, growing coffee, bananas, cardamom, and wood (Ngatuwi, interview, 2023); 3) The "Pandan Makmur" Farming Group, led by Muliyono, with 21 members, manages 65 hectares of private land and 85 hectares of Perhutani land, cultivating coffee, bananas, and balsa wood (Muliyono, interview, 2023); 4) The "Pancen Makmur" Farming Group, chaired by Lasmono, with 20 members, manages 0.5 hectares of private land and 30 hectares of Perhutani land, growing coffee, bananas, and sengon wood (Lasmono, interview, 2023); 5) The "Tani Makmur" Farming Group, led by Sutomo, with 25 members, manages 1 hectare of private land and 7 hectares of Perhutani land, cultivating coffee, bananas, cardamom, and wood (Sutomo, interview, 2023).

In forming farmers group, the collective awareness of the farmers community in Wono Cepoko Ayu Village is not merely born from government intervention, but rather grew from the real need to support each other amidst agrarian dynamics. The formation of five farmer groups i.e., Wono Tani, Mekar Sari, Pandan Makmur, Pancen Makmur, and Tani Makmur, indicates a social initiative which bases on farmer's empirical experience in managing the land adaptively. The planting pattern of Tumpangsari (from such coffee, banana, cardamom, and sengon wood become the sustainable strategy to face price uncertainty and pest attack. This collective narration corresponds to a finding that the establishment of farmers' group in Indonesia is preferably supported by the need of social solidarity and local economic networks than merely external incentive (Puryantoro et al., 2024).

Historically, the transformation from coffee to balsa wood in 2014 reflects rational shift of farmers who prioritize fast commodity. Yet, this economic triumph is temporary due to virus attack on balsa plant. The failure stimulates awareness on the importance of diversification and local resilience based agricultural wisdom. The revert of farmers to

planting coffee between 2018–2023 become the turning point of identity restoration in coffee planting culture that has previously been shifted. This phenomena shows that the changing of commodity is not a form of local wisdom degradation, but an adaptive strategy in facing ecological and economic strains (Noer, 2022; Astuti et al., 2022).

Figure 2. Coffee Plantation Intercropped with Kirana Bananas, Kapulogo, Sengon Wood, Coconut, and Cloves

Figure 3. Coffee Plantation Intercropped with Kirana Bananas, Kapulogo, and Sengon Wood.

The Shift from Coffee Cultivation to Balsa Wood Farming

Wono Cepoko Ayu Village is popular with its farmers producing Kolesem coffee (Semeru Slope Coffee), which thrives on the slopes of Mount Semeru. During economic uncertainty and the challenges faced in coffee cultivation, they have to make difficult decisions regarding the crop types to grow for the sake of their life sustainability (Izzah, 2015; Rosiana, 2020). One of the primary considerations driving farmers to switch from coffee to other crops is economic seeking crops that generate income more quickly and have a lower risk of crop failure.

In 2014, these farmers decided to shift from coffee to balsa wood which has been popular with its rapid growth and high economic potential. Their decision is acknowledged by the prospect of obtaining faster and more sustainable income in the short term. Balsa wood can be harvested within a few years, compared to coffee, which requires intensive care (Sembiring et al., 2019) and takes longer to produce a marketable harvest (Syahroni et al., 2021). This economic consideration is important, especially when coffee prices fluctuate significantly in the global market, thus affecting financial stability of the farmers.

In 2014, Wono Cepoko Ayu Village saw a rapid increase in balsa wood cultivation. Nearly all farmers switched to balsa wood because seedlings were available from the wood factory, and the time from planting to harvest was only about three years. This decision aligns with Popkin's view that farmers make rational decisions by weighing the costs and benefits of each choice, including the investment of labor, time, and resources in agricultural activities. Therefore, switching from coffee to balsa wood was a rational decision. The profits from balsa wood (See Figure 5) cultivation were highly attractive, with one truckload worth up to 12 million rupiahs. By 2017, many farmers suddenly became wealthy thanks to the balsa wood harvest. Businessmen, particularly from the Chinese community, came with cash for direct transactions with farmers, both during the day and at night. However, after the first harvest, balsa wood cultivation failed as the plants were infected with a virus that could not be treated. In 2018, this virus not only attacked balsa wood but also threatened to damage other surrounding crops. As a result, the surge in balsa wood planting was short-lived, with only one harvest before the next balsa wood plants were also infected by the virus (See Figure 4).

Figure 4. Farmers in Wono Cepoko Ayu Village, Senduro District, Lumajang Regency, are facing challenges due to a wilt disease outbreak that has led to the widespread death of their balsa wood plants
Source: https://www.gempurnews.com/2022/03/05/ratusan-pohon-balsa-di-desa-cempokoayu-mati/

Figure 5. Balsa Wood in Lumajang Ready for Processing at the Sawmill.
Source: https://www.facebook.com/groups/718266349652054/

During waiting for balsa wood harvest that takes about three years, the farmers in Wono Cepoko Ayu Village optimize the time and land by planting intercropping i.e., kirana banana, cardamom, and coffee using tumpangsari pattern. This strategy does not only contribute as daily income but also the way to maintain family economic stability. However, in coffee

cultivation, the farmers face variety of serious challenges. The instability of selling price, the low productivity, the lack of technical knowledge, and the minimum of infrastructure support weaken the bargaining position of coffee farmers. Apart from it, the coffee from other areas with the strongest quality and branding complicate the local coffee to compete in regional and national market (Rico et al., 2021).

As a comparison, the average income of micro small coffee farmers merely achieves around 20 to 25 million rupiahs every harvesting period, and it is far more lower than the potential yields of one truck of balsa wood that can achieve 12 million rupiahs per carriage (Hermawati et al., 2023). This condition empower the rational reason to transfer into specific commodity or apply mixed agricultural system to preserve and keep for life sustainability.

Return to Coffee Cultivation After Suffering Losses, 2018-2023

In 2018, after suffering significant losses due to the balsa wood cultivation that was affected by a virus, the farmers of Wono Cepoko Ayu Village faced a major challenge to restore their economic conditions. The cultivation of balsa wood, which had once been highly profitable with one truckload fetching up to 12 million rupiahs, had become a bitter memory following the crop failure caused by the devastating virus. In addition to causing monetary losses, this failure harmed the farmers' standing and confidence in a crop that had looked promising in the past. The issue was made more difficult by the virus that attacked the balsa wood, which spread quickly and impacted not only the balsa but also other crops in the area. The farmers were compelled to look for alternate revenue streams because of all the impacted acreage.

The farmers started reevaluating the crops they were sowing in light of this urgent circumstance. They began searching for more reliable and ecological solutions after having a bad experience with balsa wood. Resuming coffee production, which had been their main crop before to the balsa wood phenomenon, was one possibility that surfaced (Budiartiningsih et al., 2010; Apsari et al., 2017; Sembiring et al., 2019; Mawardi et al., 2020; Syahroni et al., 2021). It was a difficult shift. The producers had to clean up their land from the virus's impacts and get it ready for coffee planting. According to Dermawan et al. (2018), they had to make sure that the environment and soil conditions were favorable for coffee development and perform the required actions to repair any damage caused by the prior cultivation of balsa wood.

As part of this process, farmer organizations actively sought out agricultural extension specialists for training and advice in order to guarantee the best coffee planting practices (Aryana et al., 2016). Along with upgrading methods and plans based on the most recent developments in coffee farming, they also sought to capitalize on their prior knowledge and expertise in coffee cultivation. By 2023, the farmers had gradually started to see the fruits of their labors through diligence and determination. They began to recover the money lost as a result of the unsuccessful balsa wood cultivation, and coffee growing showed hints of success. Their choice to go back to coffee shows how resilient and adaptable they are to changes and challenges in the agricultural industry, even though cultivating coffee and other crops took time and patience.

The Impact of the Shift from Coffee to Balsa World Cultivation, 2014-2023

The welfare of the farmers in Wono Cepoko Ayu Village was significantly impacted in 2014 when they switched from growing coffee to balsa wood (Khaeroni, 2018). This choice proved to be crucial for many of the village's farmers, who were first motivated by the possibility of significant income from balsa wood (Wijoyo et al., 2018). The explosion in balsa wood cultivation in 2014 resulted in a sharp increase in income for many farmers. Due to its strong market demand and very quick planting-to-harvest time of roughly three years, balsa wood emerged as the preferred option. A single balsa wood harvest might generate up to 12 million rupiahs each truckload, which is a significant price. The village's standard of living increased as a direct result of the significant earnings made from the cultivation of balsa wood.

One tangible impact of the success of balsa wood cultivation was the change in housing conditions in Wono Cepoko Ayu Village between 2014-2019 (See Table 1). The number of permanent and semi-permanent houses increased, while the number of simple or basic houses decreased. This reflects the improved economic capacity of the farmers, who previously might have only owned simple homes, now able to build or upgrade their homes to better and more durable structures. The increase in permanent homes also indicates the reinvestment of the profits they earned from balsa wood into more long-lasting assets, such as property.

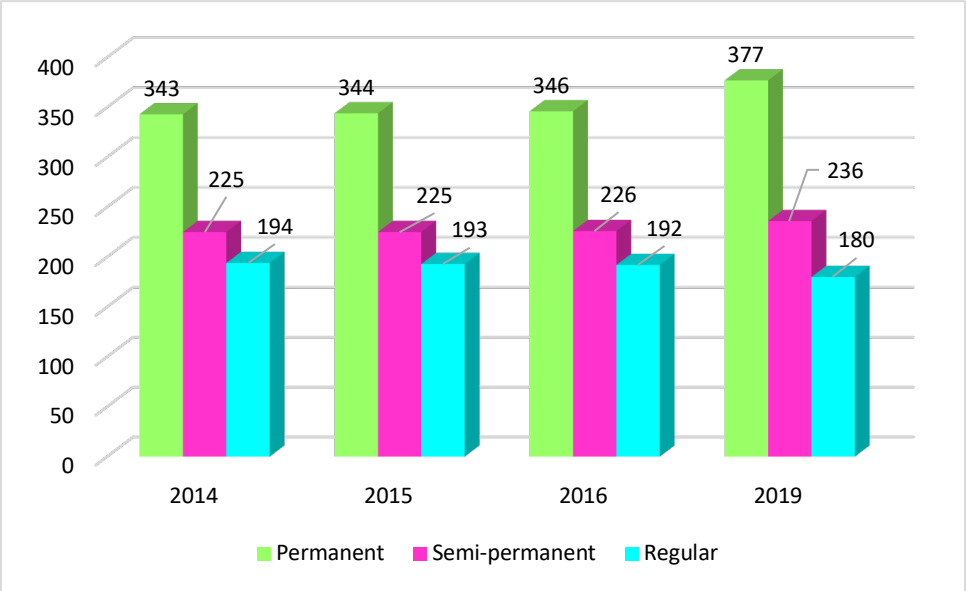

Figure 6. Residential Buildings by Construction Type in Wono Cepoko Ayu Village, 2014-2019.
Source: Data Processed from *Kecamatan Senduro dalam Angka* 2014-2023.

Figure 6 shows the table that in 2014, the number of permanent houses was recorded at 343 units, while semi-permanent houses numbered 225 units, and regular houses totaled 194 units. In 2015, the number of permanent houses slightly increased to 344 units, semi-permanent houses remained at 225 units, and regular houses decreased to 193 units. The trend continued in 2016, with the number of permanent houses rising to 346 units, semi-permanent houses slightly decreasing to 226 units, and regular houses further dropping to 192 units.

The number of semi-permanent homes in 2019 increased to 236 units, the number of ordinary homes decreased to 180 units, and the number of permanent homes increased dramatically to 377 units. Wono Cepoko Ayu Village residents' quality of life and general welfare have improved, as seen by the growth in sturdier permanent and semi-permanent homes and the decline in ordinary homes. The success of the village's balsa wood cultivation

can be attributed to this innovation. The successful planting of balsa wood had long-term effects on bettering living conditions in addition to immediate financial gains from the sale of wood. The village's total housing quality improved as a result of the residents' ability to construct homes with stronger and more resilient frameworks thanks to their increasing income.

Additionally, the farmers' social and economic standing was impacted by this shift. Many former farm laborers who relied on the daily pay and employment of larger landowners transitioned to independent farming. Instead of working only for others, they were able to buy property and start cultivating their own crops, including coffee, bananas, cardamom, cloves, mangosteen, and balsa wood. They gained more financial autonomy and the capacity to decide for themselves how to administer their land as a result of this change. Their confidence and social position in the community were also enhanced by their status as independent farmers. There were drawbacks to this change as well. Reliance on a single crop, such as balsa wood, entails significant risks in the event that market conditions shift or if the crop contracts an illness, as ultimately happened. Nevertheless, the benefits of this change were felt immediately in the beginning, both in terms of the farmers' increased economic independence and better living conditions. This shift is reflection of the farmers' flexibility and adaptation in pursuing more lucrative and long-term business prospects in Wono Cepoko Ayu Village.

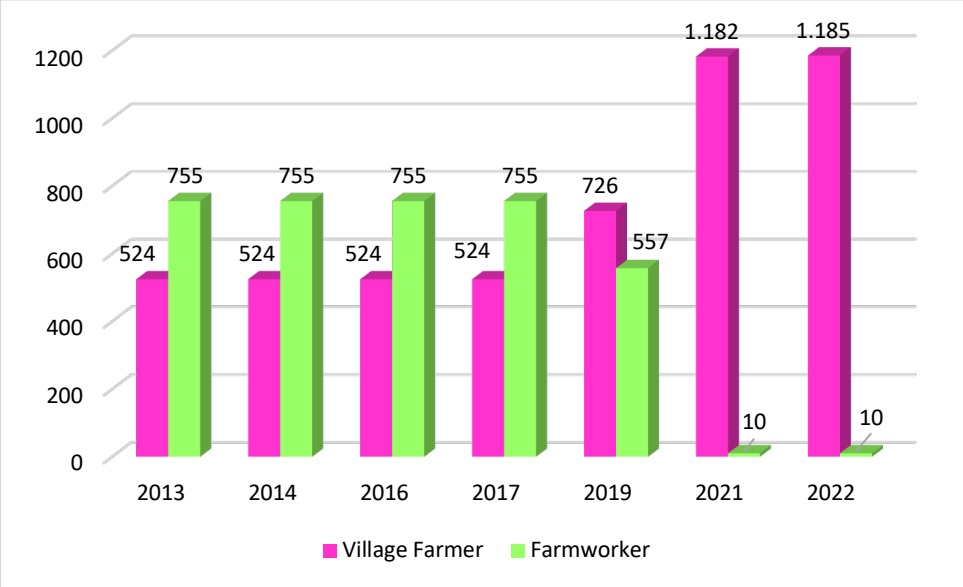

Figure 7. Farmers and Farm Workers in Wono Cepoko Ayu Village in 2013-2022.
Source: Processed from Data Available in *Kecamatan Senduro dalam Angka* 2014-2023.

Table 2 shows that Wonocepoko Ayu Village's farmer and farmworker populations changed significantly between 2016 and 2022, with a considerable rise in farmers from 2019 to 2022. Farmers' success in growing balsa wood was a major factor in this movement, and its advantages became apparent in 2017. However, a viral infection in 2018 presented significant obstacles to the cultivation of balsa wood, forcing farmers to adjust by switching back to growing coffee and putting intercropping systems with other crops into place.

In addition to demonstrating the farmers' tenacity and inventiveness, this adaption improved their financial circumstances. As the economy improved, a large number of former farm workers became independent farmers. More people decided to become farmers between 2019 and 2022, which reflected a shift in the socioeconomic makeup of the village and made this transition more noticeable (Smelser, 2005). This shift suggests that farmers in Wonocepoko

Ayu Village are becoming more skilled, taking more risks, and taking advantage of economic opportunities (Popkin, 1979).

Conclusion

Farmers in Wono Cepoko Ayu Village made a calculated decision to convert from cultivating coffee to balsa wood, which at first improved their well-being. The farmers were able to raise their standard of living by buying more property and remodeling their houses with the money they made from growing balsa wood. This illustrates how altering the crops cultivated might help rural populations generate a sizable revenue. This triumph was short-lived, too, as balsa wood eventually fell victim to a virus that made it unusable for growing. The farmers were compelled by this situation to stop producing balsa wood and resume intercropping coffee and other crops. The farmers adjusted well to the additional difficulties they faced, diversifying their crops to make the most of their land. The farmers benefited from the early transition to balsa wood, but the viral onslaught raised attention to the dangers of monoculture. Resuming intercropping demonstrated the farmers' adaptation and resilience in preserving their financial sustainability in addition to providing a way to reduce similar risks in the future.

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