



(RESEARCH ARTICLE)



Analysis of strategies for developing food security for coffee farming households in Kledung District, Temanggung Regency, Central Java

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World Journal of Advanced Research and Reviews, 2025, 26(03), 2210-2221

Publication history: Received on 12 May 2025; revised on 18 June 2025; accepted on 20 June 2025

Article DOI: <https://doi.org/10.30574/wjarr.2025.26.3.2409>

Abstract

Food security is an effort to achieve a high-quality population, namely a population that is healthy, active, and productive, thereby capable of living prosperously. The objective of this study is to formulate strategies for developing food security among coffee-farming households in Kledung Subdistrict, Temanggung Regency. This study employs an observational method with a survey approach. The location was selected purposively, specifically active coffee farmers in the villages of Kruwisan, Tlahab, Kledung, Petarangan, and Tuksari. The number of respondents was determined using proportional random sampling from the total population of coffee farmers, amounting to 100 respondents and key persons. Data analysis used the SWOT development strategy. The results of the study showed that the development strategy based on SWOT analysis placed the food security of coffee farmer households in quadrant I with an aggressive approach (SO) utilizing strengths and opportunities by increasing productivity through the use of the latest technology, such as faster coffee processing.

Keywords: Food Security; Food Access; Coffee Farmers; Nutritional Intake; Development Strategies

1. Introduction

Food is the most basic human need, and therefore its fulfillment is part of every individual's human rights. In Indonesia, ensuring food sufficiency for all citizens is an obligation, both morally, socially, and legally, including the human rights of every Indonesian citizen. Given the importance of ensuring food sufficiency, every country prioritizes the development of food security as the foundation for the development of other sectors. Food security development in Indonesia is aimed at ensuring the availability and consumption of sufficient, safe, high-quality, nutritious, and balanced food at the household, regional, and national levels, at all times and evenly distributed (Food Security Council, 2010).

Based on data from the 2022 Global Food Security Index (GFSI), food security in Indonesia has improved. This is evident from the state of food security based on aspects such as food price affordability, supply availability, nutritional quality and food safety, as well as natural resource resilience. The Global Food Security Index (GFSI) ranks Indonesia's food security at 69th out of 113 countries, with a score of 60.2, higher than the previous year's score of 59.2. However, despite the increase, Indonesia's food security remains below the global average of 62.2. Indonesia's food affordability is considered fairly good, although other indicators, such as food availability, quality, safety, sustainability, and adaptability, remain weak.

One of the regions in Indonesia that has an impact on national food security, particularly in terms of food availability, is Central Java Province. In terms of population size and density, Central Java Province has a population of 37 million people and is the third most populous region in Indonesia (BPS, 2022). The population size and density have an impact on the quantity and quality of food that the government must provide to meet the food and nutritional needs of its population. The government, in Article 7 of Law Number 18 of 2012, states that food planning must take into account

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population growth and distribution. This indicates that population size and density play a crucial role in achieving food security.

The Food Security Index for Central Java Province ranks second out of 34 provinces in Indonesia. This index is the average ranking of the availability, affordability, and utilization of food in Central Java Province. The availability of food in Central Java Province is ranked 6th, affordability is ranked 17th, and utilization is ranked 3rd (Tono et al., 2022). Based on the 2022 Food Security and Food Vulnerability Map, Central Java Province is ranked as priority 6 or highly food secure. The map was created based on aspects related to food security, such as food availability, food access, and food utilization.

Temanggung Regency is one of the regencies in Central Java Province that has natural resources with agricultural support. This condition has led the community to earn their livelihood as farmers. The agricultural sector plays a crucial role in the economic development of Temanggung Regency, as it contributes 22.94% to the Gross Domestic Product (GDP), with a total coffee production of 10,172 tons from a total plantation area of 14,959 hectares. The GRDP figure for the agricultural sector represents the second-largest contribution after the manufacturing sector. (Central Java Province Statistics Agency, 2023).

Kledung Subdistrict is one of the subdistricts in Temanggung Regency, which is a coffee-producing area. Most of its residents are coffee farmers who rely on coffee production as their primary source of income, as coffee is a non-food commodity. Although they play a role as producers in the agricultural sector, coffee farmers in Kledung Subdistrict do not directly produce staple foods such as rice, corn, or vegetables. As a result, the food security of coffee farmer households depends on the proceeds from coffee sales and their ability to access food from external sources. Household income will determine the type and quantity of food consumed and indirectly influence household food security. Additionally, coffee as a key source of foreign exchange for the country, a provider of employment opportunities, and a source of income for farmers should ensure the food security of farming households.

However, based on the 2022 Food Security and Food Vulnerability Map, Kledung Subdistrict in Temanggung Regency is ranked as priority 3 or moderately vulnerable to food insecurity. This score indicates that Kledung Subdistrict is still classified as low in terms of food security. Most of the agricultural land in Kledung Subdistrict is rain-fed land, which only allows for one crop cycle per year. This condition leads to dependence on the rainy season and limits efforts to diversify food production. Additionally, limited access to agricultural infrastructure, including irrigation systems, transportation facilities, and post-harvest storage facilities, acts as a barrier to the distribution of agricultural products and maintaining the stability of food supply in Kledung Subdistrict (Temanggung District Food Security, Agriculture, and Fisheries Office, 2022).

One strategy in developing food security is to have the potential and opportunities for food security development. Coffee farming yields can help farmers achieve economic prosperity and ensure food availability. The strategy for addressing external factors in developing food security for coffee farmers is to understand the threats and opportunities. After identifying the external environment, an internal analysis must be conducted to determine the strengths (Strengths) and weaknesses of food security development for coffee farmers, ensuring that efforts to achieve food security for coffee farmers in Kledung Sub-district, Temanggung Regency, can be sustained in the long term.

2. Material and methods

This research was conducted from July 2024 to August 2024, Determination of location using *purposive*, namely the selection of locations or research objects on purpose. Sampling areas in this study were active coffee farmers in Kruwisan Village, Tlahab Village, Kledung Village, Petarangan Village and Tuksari Village with the largest number of farmers compared to 8 other villages from a total of 13 villages in Kledung District, Temanggung Regency, Central Java Province, Indonesia. The method used in this research is the survey method. The survey method is a method used to obtain data from a certain place by collecting data using questionnaires, questionnaires, tests as research tools conducted on large and small populations. The data found and studied is data from samples taken from the population, so that relative incidence, distribution and relationships between variables, sociological and psychological are found (Sugiyono, 2015).

The respondent sampling technique used in this study is *random sampling* technique using *proportional random* sampling method. *Proportional random sampling* is determined by the number of researchers with the consideration that it is able to represent a sample of the number of coffee farmers available. According to Arikunto (2010) explains that proportional random sampling is a technique of taking proportions to obtain a representative sample, taking subjects from each region is determined to be balanced or proportional to the number of subjects from each region.

According to Arikunto (2010) explains that if the population is more than 100, then the *error tolerance* level is 10-15%. The number of samples taken using the Slovin formula with an error rate of 10% is as follows:

$$n = \frac{N}{1 + (Ne^2)}$$

Description:

- n= Number of samples
- N= Total population
- e= error tolerance limit

$$n = \frac{3.295}{1+3.295 (0,1)^2} n = 97$$

Based on the calculation of the Slovin formula, the number of farmer samples was 97.05 rounded up to 100 samples. Furthermore, to determine the sample in each village, the method of the total population of coffee farmers in Kledung District, Temanggung Regency is quite large, so the number of respondents is determined proportionally as many as 100 coffee farmers who are active coffee farmers in each selected village using the proportional allocation formula as follows (Riduwan and Kuncoro, 2011):

$$ni = \frac{Ni}{N} \cdot n$$

Description:

- ni = number of sample members in each village
- n = total number of sample members
- Ni = number of population members in each village
- N = total number of population members

Table 1 Number and Distribution of Research Samples

| No. | Village | Number of Farmers | Number of Respondents |
|-----|------------|-------------------|-----------------------|
| | | (org) | (org) |
| 1 | Kruwisan | 592 | 18 |
| 2 | Tlahab | 460 | 14 |
| 3 | Kledung | 497 | 15 |
| 4 | Petarangan | 861 | 26 |
| 5 | Tuksari | 885 | 27 |
| | Total | 3.295 | 100 |

Source: Primary data processed, 2024.

As for *key person* respondents, namely informants who have comprehensive information about the problem of developing food security of coffee farmers in Kledung District, Temanggung Regency. The *key person* respondents are:

- 5 farmer group leaders from each village
- 1 extension worker
- 1 person Head of the Agriculture Office of Temanggung Regency
- 1 person Head of Temanggung District Food Security Office
- 1 person Regional Development Planning Agency

The tool used to develop a food security strategy for coffee farmers in Kledung District is the SWOT matrix. The SWOT matrix is a matching tool used to systematically identify various factors in order to formulate organizational strategies. This matrix can clearly illustrate how external opportunities and threats faced by an organization or region can be matched with its internal strengths and weaknesses (Rangkuti 2014). SWOT analysis is important for helping to develop four types of strategies. The four strategies in question are:

- SO Strategy (Strength-Opportunity). This strategy uses internal strengths to seize opportunities outside the region (external). Generally, entrepreneurs strive to implement WO, ST, or WT strategies to apply the SO strategy.
- WO Strategy (Weakness-Opportunity). This strategy aims to minimize internal weaknesses by leveraging external opportunities.
- ST Strategy (Strength-Threat). Through this strategy, entrepreneurs seek to avoid or reduce the impact of external threats.
- WT (Weakness-Threat) Strategy. This strategy is a tactic to survive by reducing internal weaknesses and avoiding external threats.

Before determining a strategy through SWOT analysis, an evaluation of the internal and external factors of the organization or region is conducted first. This evaluation is carried out using the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrices. The IFE matrix is designed to identify internal environmental factors and measure the extent of a region's strengths and weaknesses, while the EFE matrix is designed to identify external environmental factors and measure the extent of opportunities and threats faced by a region.

3. Results and discussion

3.1. Analysis of Strategies for Developing Food Security of Coffee Farmer Households through Coffee Cultivation Activities

Coffee is one of the plantation sectors that has great potential in supporting the community's economy, especially in high coffee-producing areas. One of the coffee-producing areas in Central Java is Temanggung Regency. However, behind its great economic potential, coffee farmers in Kledung District, Temanggung Regency, are still faced with various obstacles in managing their production. The main obstacle is the limited post-harvest processing tools and technology.

Most coffee farmers, especially smallholders, do not yet have access to modern equipment such as adequate pulpers, hullers, or dryers. Processing that is still done manually or with makeshift equipment has an impact on the low quality of the coffee produced. As a result, the selling price of coffee at the farm level often does not reflect optimal quality, and added value cannot be maximized. This condition has a direct impact on the food security of coffee farming households. Unstable or low incomes make it difficult for farmers to fulfill their basic needs, including adequate, nutritious and sustainable food, so it is necessary to formulate a strategy to develop coffee cultivation activities in Kledung District, Temanggung Regency.

3.1.1. Internal factors

The results of the internal factor scoring are arranged in the form of an Internal Factor Evaluation (IFE) matrix as can be seen in Table 2.

Table 2 IFAS Matrix (Internal Factor Analysis Summary)

| Strategy Factors | Weight | Rating | Value |
|---|--------|--------|-------|
| Strengths | | | |
| Easy food access / smooth transportation access | 0.104 | 4 | 0.414 |
| Structural institutions for food security | 0.099 | 3 | 0.298 |
| Large and productive land | 0.107 | 4 | 0.426 |
| High demand for coffee | 0.096 | 3 | 0.287 |
| Sufficient labor available | 0.107 | 4 | 0.428 |
| Total Strengths | 0.513 | 18 | 1.855 |

| Strategy Factors | Weight | Rating | Value |
|--|--------|--------|-------|
| Weaknesses | | | |
| Energy and protein availability is not ideal | 0.104 | 4 | 0.414 |
| Farmers are not incentivized to diversify their food | 0.099 | 3 | 0.298 |
| Consumption of staple foods is not yet diverse | 0.107 | 4 | 0.426 |
| Low education | 0.096 | 3 | 0.287 |
| The technology used is still traditional | 0.107 | 4 | 0.428 |
| Total Weakness | 0.502 | 8 | 0.813 |
| Total Strengths and Weakness | 1.042 | | 2.668 |

Source: Primary data processed, 2024.

Based on Table 2. it can be seen that internal factors consist of strengths and weaknesses. After weighting, the weight value of each factor is obtained. As the opinion of Wahyudi *et al.* (2012) that the weighting value above 0.1 indicates that this factor has a dominant role. Some of the dominant strength factors are easy access to food / smooth transportation access, large and productive land, and sufficient labor available.

Access to easily accessible food is an important component of the food security strategy. At the household level, the main unit of food security target group is individuals in a household. The benchmark for achieving food security is the guarantee of physical and economic accessibility to food and the availability of food at the household level must be able to ensure that each household member obtains food in sufficient quantities to live a healthy and productive life. Large and productive land is an important factor in increasing income. The larger the land area and the more productive it is, the greater the potential yield that will increase farmers' income. Adequate income allows Kledung Sub-district coffee farmer households to meet food consumption needs. In addition, the labor factor is sufficiently available to help expedite the cultivation and processing of coffee plants.

The dominant weakness factors are the availability of energy and protein is not ideal, farmers are not too incentivized to diversify food, the consumption of staple foods is not diverse and the technology used is still traditional. The availability of energy and protein that is not ideal in coffee farmer households in Kledung Sub-district, Temanggung Regency is caused by consumption patterns that are not yet diverse. The factor that coffee farmers are not too incentivized to diversify their food is because coffee farmers already have experience and knowledge of coffee farming so they tend to choose crops that they have mastered and are proven by the results they get. Food diversification is often not considered an urgent priority, especially when the main focus is on coffee yields and income.

The staple food consumption factor is not yet diverse, although coffee farmers do not grow rice, coffee farmers still make rice the main daily staple food, this happens because the consumption culture in Indonesia is very rice-oriented. Coffee farmers consider that satiety and energy can only be obtained from rice, not from tubers or sago. This shows that changing consumption patterns takes time and a cultural approach, not just an economic one. The technological factors used are still traditional, causing farmers' coffee production efficiency and quality to be low. This affects competitiveness in the market as well as farmers' income. Changes towards modern technology need support from training, financing, and access to tools.

A large strength factor rating value indicates that the parties related to this activity have been able to take advantage of existing strengths. Conversely, a small rating value on the weakness factor indicates that the parties involved have not been able to overcome the weaknesses that arise (Wahyudi *et al.*, 2012). The strength factors that have been able to be utilized are easy food access / smooth transportation access, large and productive land and sufficient labor available. As for weaknesses, those that have not been overcome are low education.

3.1.2. External Factors

The results of the scoring of external factors are arranged in the form of an Internal Factor Evaluation (EFE) matrix as can be seen in Table 3.

Table 3 Evaluation Matrix of External Factors of Coffee Farmers of Kledung District, Temanggung Regency

| Strategic Factors | Weight | Rating | Value |
|--|--------|--------|-------|
| Opportunities | | | |
| Increased land productivity in the food crop subsector | 0.107 | 4 | 0.426 |
| Increase farmers' motivation to grow shared food crops | 0.104 | 4 | 0.417 |
| Diversity of food consumption | 0.086 | 3 | 0.257 |
| Reducing unemployment | 0.087 | 3 | 0.262 |
| Assistance from the government | 0.096 | 3 | 0.287 |
| Community awareness in tourism development | 0.09 | 3.43 | 0.30 |
| Local Government Concern | 0.08 | 3.33 | 0.28T |
| Total Opportunities | 0.480 | 17 | 1.651 |
| Threat Factors | | | |
| Threat | | | |
| Food supply dependency | 0.095 | 1 | 0.094 |
| Climate change | 0.107 | 2 | 0.214 |
| Low public interest in agriculture | 0.104 | 2 | 0.207 |
| Coffee prices fluctuate | 0.1 | 1 | 0.099 |
| Conversion of agricultural land to non-agricultural land | 0.102 | 2 | 0.204 |
| Total Threats | 0.508 | 8 | 0.820 |
| Total Opportunities and Threats | 0.831 | | 2.472 |

Source: Primary data processed, 2024.

Based on Table 3. it can be seen that external factors consist of opportunities and threats. The dominant opportunity factor is the increase in land productivity in the food crop subsector and increasing farmers' motivation to plant shared food crops. Increasing land productivity in the food crop subsector at the farmer household level has a very important role in ensuring food security, increasing family income, and encouraging agricultural sustainability. Household farmers often have limited land, but with the right approach, they can optimize their land to produce better yields. Motivating farmers to grow a variety of food crops alongside coffee, known as intercropping, can provide many benefits, both in terms of yield diversity and sustainable land management.

The dominant threat factors are climate change, low public interest in agriculture, fluctuating coffee prices and conversion of agricultural land to non-agricultural uses. The climate change factor has a significant impact on coffee crops because coffee is a crop that is very sensitive to changes in temperature, rainfall, and extreme weather patterns that cause a decrease in yield and coffee quality and result in a decrease in the income of coffee farmers. The factor of low public interest in agriculture, especially the younger generation, views the farming profession as less prestigious than jobs in the more modern industrial, technological, or service sectors. In addition, agricultural businesses often generate uncertain income because they are affected by fluctuations in commodity prices, the risk of crop failure and high production costs. The fact that coffee prices fluctuate is that coffee farmers in Kledung Sub-district, Temanggung Regency, depend on the yields from coffee plants. When coffee prices fluctuate, coffee farmers' income is also unstable. This can have an impact on household food security. The factor of conversion of agricultural land to non-agricultural land. Kledung Sub-district of Temanggung Regency has interesting natural potential that can be converted into tourist areas, such as agro-tourism and recreational parks. The reduction in agricultural land area results in a decrease in crop yields. Dependence on domestic food production may decrease, leading to dependence on food imports from other regions or abroad. This may increase its vulnerability to food supply disruptions.

3.1.3. Internal and External Matrix

From Table 2 and Table 3. it can be seen that the main factors of the internal and external environment with the highest weight are 1) Main strengths: easy food access / access smooth transportation with a weight of 0.104, large and productive land with a weight of 0.107, sufficient labor available with a weight of 0.107. 2) Main weaknesses: The availability of energy and protein is not ideal with a weight of 0.104, Farmers are not too incentivized to diversify food with a weight of 0.105, Consumption of staple foods is not diverse with a weight of 0.102 and the technology used is still traditional with a weight of 0.102. 3) Main opportunities: Increased land productivity in the food crop subsector with a weight of 0.107, increasing the motivation of farmers to plant shared food crops with a weight of 0.104. 4) Main threats: 1) Climate change with a weight of 0.107, low public interest in agriculture with a weight of 0.104, fluctuating coffee prices with a weight of 0.1 and conversion of agricultural land to non-agricultural with a weight of 0.102.

Total IFE score (2,668) > EFE score (2,472). Based on this data, it can be seen that internal factors are more dominant than external factors so that internal factors are more influential than external factors. The IFE and EFE values obtained can be made in the form of an internal external (IE) matrix as shown in Figure 1.

| | Tinggi 3,0 – 4,0 | Sedang 2,0 – 2,99 | Lemah 1,0 – 1,99 |
|----------------------|---------------------|----------------------|---------------------|
| Tinggi 3,0 – 4,0 | SEL I | SEL II | SEL III |
| Sedang 2,0 – 2,99 | SEL IV | SEL V | SEL VI |
| Rendah 1,0 – 1,99 | SEL VII | SEL VII | SEL IX |

Figure 1 Internal-External Matrix

Based on Figure 1. it can be seen that the strategy obtained is in cell V because the IFE value is 2.668 and the EFE value is 2.472 which is between 2.0-3.0 which is the range of cell V values. Cell value V is the Hold and maintain strategy, with alternative market penetration strategies, and product development (David, 2016). The purpose of this strategy is to maintain existing coffee production without being affected by external uncertainties or fluctuations, by maintaining the resilience of coffee production, coffee farmers can ensure sufficient food supply for coffee farmers' household needs and maintain economic stability despite facing external challenges.

3.1.4. Grand Strategy Matrix

The grand strategy matrix is determined from the difference between total strengths - total weaknesses (x) and total opportunities - threats (y). The following strategic position for the development of food security of coffee farmers in Kledung Sub-district, Temanggung Regency is presented in Figure 2.

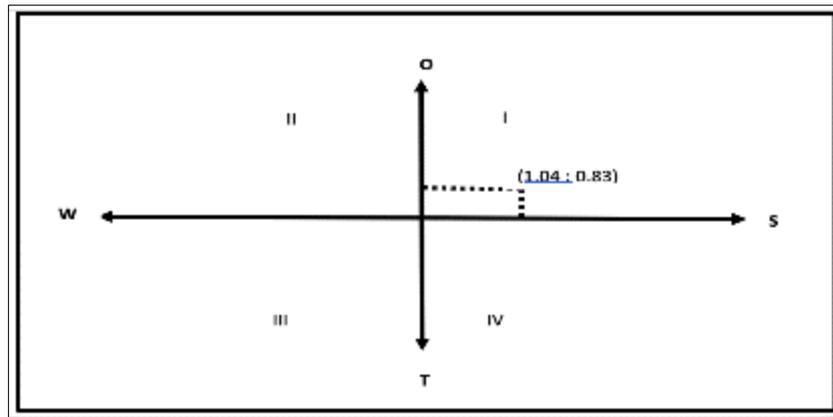


Figure 2 Grand Strategy Matrix for Development of Food Security of Coffee Farmers

Based on Figure 2, it can be seen that the plotting results show that the position is in quadrant I which illustrates that the situation is very good because there are strengths that are utilized to seize profitable opportunities. The strategy applied in this condition is to support aggressive development policies. The total score of strengths is greater than the total score of weaknesses, meaning that the food security development strategy of coffee farmers in Kledung Sub-district, Temanggung Regency, has more strengths to be improved. Meanwhile, the total score of opportunities is greater than the total score of threats, meaning that the food security development strategy of coffee farmers in Kledung Sub-district of Temanggung Regency has more opportunities to be improved.

The strategy applied based on the results of plotting in quadrant I is to increase productivity through the use of the latest technology, such as manual *pulper* and coffee bean sorting equipment, more efficient irrigation systems, and faster coffee processing machines. However, the development of modern technology is inseparable from the issue of capitalization, so coffee farmers in Kledung Sub-district need capital assistance. In addition, developing land that supports household food security, such as planting vegetables, fruits, or other food crops around coffee land can be a way to increase the diversity of coffee farmers' income.

3.2. Determination of Food Security Development Strategy for Coffee Farmers in Kledung District, Temanggung Regency

The strategy for developing food security of coffee farmers in Kledung Sub-district, Temanggung Regency, was carried out by creating a SWOT matrix. The SWOT matrix was prepared based on internal factors (strengths-weaknesses) and external factors (opportunities and threats). After calculating the weight of each internal and external factor, it was then analyzed using a position matrix to see the position of the food security development strategy for coffee farmers in Kledung District, Temanggung Regency. According to David *et al.* (2009) the SWOT matrix uses internal and external factors as the basis for generating strategic strategies that are worth considering. Alternative strategies resulting from analysis with the SWOT matrix can be seen in Table 4.

Table 4 SWOT Matrix of Food Security Development Strategies for Coffee Farmers in Kledung District, Temanggung Regency

| Internal and External Factors | Power (<i>Strengths</i>) | Weaknesses (<i>Weaknesses</i>) |
|--|---|---|
| | Easy food access / smooth transportation access Structural institutions for food security Large and productive land High demand for coffee | Energy and protein availability is not ideal Farmers are not incentivized to diversify their food Consumption of staple foods is not yet diverse Low education |
| | Sufficient labor available | The technology used is still traditional |
| Opportunities (<i>Opportunities</i>) | S-O Strategy | Strategy W-O |

| | | |
|---|--|--|
| Increased land productivity in the food crop subsector Increase farmers' motivation to grow various food crops Diversity of food consumption Reducing unemployment Assistance from the government | Proceeds from coffee production can be used to invest in family food production, such as growing vegetables or raising livestock. Utilize food security institutions and government assistance to promote food diversification. | Facilitate access to agricultural technology through subsidies or farm equipment assistance programs |
| Threat (<i>Threats</i>) Food supply dependency Climate change Low public interest in agriculture | Strategy S-T Implementing integrated farming (coffee + food + livestock) so that land remains productive and has a high economic value to | Strategy W-T Organize informal training for young farmers to reawaken interest in sustainable agriculture |
| Coffee prices fluctuate Conversion of agricultural land to non-agricultural land | to prevent land conversion Diversification of coffee products (processed coffee, packaging, or coffee tourism) for | |

Based on Table 4, it can be seen that six strategies can be carried out for the development strategy of food security of coffee farmer households with the aim that coffee farmer households can improve household food and non-food consumption so that the food security of coffee farmer households in Kledung District, Temanggung Regency becomes better.

The resulting strategy is adjusted to the income factor which is a factor affecting the food security of coffee farmer households in Kledung District, Temanggung Regency. Some food security development strategies that can be done are as follows:

- Production from coffee can be used to invest in family food production, such as growing vegetables or raising livestock. A large enough land area can be applied to the *agroforestry* system on coffee plantation land in Kledung District, Temanggung Regency, so that it has the potential to increase income not only from coffee production, but also from the application of the *agroforestry* system. As research conducted by Rifatul Huhasna (2021), the results showed that the coffee *agroforestry* system with fruit crops, chilies, and livestock provided greater income or profit. The conversion of land into agricultural land has caused many problems such as decreased soil fertility, erosion and global environmental changes. *Agroforestry* is one of the land management systems that can be offered to overcome problems arising from land use change and at the same time also to overcome food problems. According to Irwan (2024), the contribution of *agroforestry* agriculture to coffee farming income is significantly favorable at 66.6%. *Agroforestry* farming is very suitable to be applied because it is considered to help increase farmers' profits or income in meeting their needs and making farmers more prosperous.
- Utilize food security institutions and government assistance to promote food diversification. Food institutions are systems or sets of institutions that play a role in organizing and managing important aspects related to food, from production to distribution, including food-related policies, regulations and organizations. As research conducted by Astuti *et al.* (2015) that food diversification can be well developed when there is high institutional potential, the ability to implement food diversification programs and the benefits felt by institutions. The policy scenario for food diversification development is through strengthening local institutions by preparing yard intensification packages, processing technology, empowerment modules, training, coaching and capital strengthening.
- Facilitate access to agricultural technology through subsidies or farm equipment assistance programs. The use of agricultural machinery is one way to increase productivity and efficiency of farming, improve the quality and added value of products, and empower farmers. The use of agricultural tools and machinery (Alsintan) to support the operational process of farming, starting from land clearing, planting preparation, planting, crop maintenance, harvesting to post-harvest is known as agricultural modernization. Agricultural modernization is a major change in agricultural patterns from traditional methods to more advanced or modern methods covering various aspects including agricultural institutions, agricultural technology, natural resource development, and regulations (Rifkian *et al.*, 2017). This is in line with the research of Alpandari *et al.* (2020) that coffee farmers still rely on traditional agricultural equipment. One of the factors causing this is that

agricultural equipment that has used modern technology is quite expensive. Coffee drying also still relies on sunlight. Some coffee producers have been able to purchase coffee processing machines, such as *roasting* machines and coffee grinders, but still on a small and simple scale. The structure of the national coffee processing industry is not yet proportional, as only 20% of coffee is processed into processed coffee (ground coffee, instant coffee and coffee mix), while 80% is in the form of dry coffee *beans*. Government policies are needed to influence coffee production (Gathura and Jomo, 2013). The coffee processing industry is still underdeveloped due to technical, social and economic factors. According to research conducted by Oelviani and Hermawan (2017), the need for coffee cultivation technology and seed breeding technology can affect coffee production. The application of coffee product processing technology has only been applied by a small number of coffee processing industry companies, this is due to limited information, capital, technology, and business management. Whereas processed industrial products have great potential in providing high added value (Lestari *et al.*, 2021). The price of coffee beans is IDR 16,000 per kilogram, but when sold in the form of powder and packaging, the price can reach IDR 60,000 - IDR 70,000 per kg (Commodity Futures Trading Supervisory Agency, 2015).

- Implementing integrated agriculture (coffee + food + livestock) to keep the land productive and have high economic value to prevent land conversion. Realizing food security requires sustainable steps, approaches and strategies. One of the strategic steps that can be taken in realizing food security is through the concept of an integrated livestock-plant integrated farming system. Kathleen (2011) states that crop-livestock integrated agriculture can improve soil quality, increase yields, produce diverse foods and improve land use efficiency. Integrated farming systems provide considerable opportunities in increasing farmers' income in rural areas. An integrated farming system is basically an interaction and linkage of various agricultural activities that can increase productivity, farmer independence and ensure the welfare of farmers in a sustainable manner. The development of sustainable production innovations needs to be produced, one of which is land empowerment innovation. The concept of an integrated system between agriculture, plantations, livestock and fisheries will increase biomass and or other benefits. This is in line with Rahardjo's research (2013) that the *Integrated farming system* developed in Sragen, Central Java with an integration pattern of 10 beef cows, corn, and peanuts for 5 years with the results of an increase in productivity and efficiency of dry land farming by 75% and the formation of sustainable agriculture.
- Diversification of coffee products (processed coffee, packaging, or coffee tourism) to reduce dependence on raw coffee prices. Kledung District of Temanggung Regency has abundant coffee production, but the economic conditions of some coffee farmers are still far from prosperous. This is due to the unfavorable pattern of distribution and sale of coffee beans. Some coffee farmers in Kledung Sub-district, Temanggung Regency, sell their coffee beans in raw form to middlemen or collectors at relatively low prices. Dependence on middlemen means that farmers have no control over the selling price of their products. As a result, they earn very limited profits, even though coffee production continues to increase. Processing coffee beans into ground coffee is one form of product harmonization that can increase added value for farmers in Kledung District, Temanggung Regency. By developing processed products such as ground coffee, farmers are no longer solely dependent on selling raw coffee beans at low prices. Coffee farmers can sell processed products at higher prices and access a wider market (Hasanah *et al.*, 2022). This opportunity can help increase farmers' income, create new jobs in the village, and reduce dependence on middlemen.

Organizing informal training for young farmers to reignite interest in sustainable agriculture. The Ministry of Agriculture (2015) revealed that the agricultural sector contributes around 35.3% to labor absorption in Indonesia. However, this figure has changed over time due to the changing demographic structure. Older farmers (>55 years old) are increasing and are not matched by younger workers. The decline in the number of young farmers is due to the decreasing willingness of young people, both in rural areas where they live and in urban areas, to work in the agricultural sector. They have a tendency to prefer jobs outside the agricultural sector (Susilowati, 2016). Young people who enter the world of agriculture generally occur through the process of regeneration of farmers in the family, which means that the management of agricultural businesses is passed down from parents to their children (Anwarudin and Satria, 2020). The use of technology is also still traditional and classified as low technology while the industrial and service sectors already have very advanced technology so that many young people are interested in working in these sectors compared to working in the agricultural sector. Low income, high risk in agricultural businesses and insufficient profits compared to businesses in other sectors make agriculture the last choice compared to other jobs (Umunnakwe *et al.*, 2014). Strategies that can reinvigorate interest in agriculture are the establishment of joint business groups focused on agriculture for farmer youth, training and apprenticeships for farmer youth in agriculture and optimization of extension workers to encourage and develop farmer youth. Attracting the younger generation to work in agriculture can be done with agricultural activities that are carried out using technology packages. Agricultural development is currently technology-oriented and an absolute requirement when wanting to grow agriculture (Silaban and Sugiharto, 2016).

4. Conclusion

Some strategies for developing food security in Kledung Sub-district, Temanggung Regency are 1) Production from coffee can be used to invest in family food production, such as growing vegetables or raising livestock. 2) Utilize food security institutions and government assistance to encourage food diversification. 3) Facilitate access to agricultural technology through subsidies or agricultural equipment assistance programs. 4) Implement integrated farming (coffee + food + livestock) to keep land productive and have high economic value to prevent land conversion. 5) Diversify coffee products (processed coffee, packaging, or coffee tourism) to reduce dependence on raw coffee prices. 6) Organize informal training for young farmers to reinvigorate interest in sustainable agriculture.

Compliance with ethical standards

Disclosure of conflict of interest

The author(s) declares no conflict of interest.

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