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A Structural Equation Modelling Approach in Assessing the Sustainability of Indonesian Smallholder Oil Palm Farming

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Abstract

Oil palm plantations (Elaeis guineensis Jacq) in Indonesia have been considered as a leading sector to increase the country's economic growth, create jobs, and improve the distribution of people's income The production of oil palm fruit commodities in 2019 reached a total of 51,443,315 tonnes (Director General of Plantations, 2020). Its export volume in 2019 was 29,135,179 tonnes, equivalent to US$ 20,802,708,000. Oil palm crop production in Indonesia is managed by three groups: state-owned plantation companies, private plantation companies, and smallholder plantations. Oil palm plantation areas spanned 14,677,560 hectares in 2019, 41% of which were community-based plantations. These areas produced 14,846,112 tonnes of palm oil in the same year, accounting for 16% of the national palm oil crop production volume (Directorate General of Plantations, 2020). The development of oil palm plantation areas has made a major contribution to the country's foreign exchange reserves, added to local revenue, encouraged the acceleration of economic development, and encouraged poverty alleviation in rural areas. This study aims to analyse the economic, social, environmental, institutional, and technological influences on the sustainability of independent oil palm farms in Sintang District. The research method used is the Structural Equation Model (SEM) operated through the AMOS programme. While the tools used in this study using a questionnaire with 216 respondents. From a total population of 491 respondents. The findings of this study indicate that the C.R value of the economic dimension is 4.026, social is 2.920, environmental is 3.237, institutional is 3.247, and technology is 2.694. This shows that there is a positive and significant relationship between the dimensions of the sustainability of independent oil palm farming.

Keywords: *Independent Oil Palm Smallholders, Sustainability, SEM-AMOS.*

Introduction

In most developing countries, oil palm is considered the most productive vegetable oil crop per unit area and contributes to economic growth especially in developing countries (Gaveau et al., 2023). Oil palm is the second most important tree crop in the economy after cocoa, yet it is considered the main cash crop in the rural economy of forest areas (Zimmer, 2010). The development of oil palm plantation area has contributed greatly to the country's foreign exchange reserves, created intensive employment and increased potential income streams for farmers, offered an additional source of local revenue, promoted accelerated economic development, and promoted rural poverty alleviation (Sulistianingsih, 2022). Oil palm plantations in Indonesia have been regarded as a leading sector to increase the country's economic growth, create jobs, and improve the distribution of people's income (Susila & Setiawan, 2017).

Palm oil is an important commodity, used (i) in cooking, (ii) in food and cosmetics, (iii) as a detergent, (iv) in plastics, (v) as a chemical and (vi) as biodiesel (Paterson, 2017). Indonesia's economy is supported by high financial returns from palm oil and accounts for more than 30% of global vegetable oil demand. Current global production shows that 61% comes from Indonesia which is the world's largest producer (Yee et al., 2019). Most of Indonesia's oil palm is located in Sumatra and Kalimantan and the greatest potential for developing new plantations is in Sulawesi and Papua, although preservation of natural forests for environmental reasons is essential (Russell & Paterson, 2020).

Independent, often self-employed smallholders earn lower monthly incomes compared to smallholders from private companies (Ser et al., 2013). The difference is mainly due to four main factors: (i) price

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distortions between smallholders and independent smallholders; (ii) lack of technical management; (iii) income variability, depending on changes in fresh fruit bunch prices, given that trade tends to be monopsony, and (iv) inadequate knowledge of the palm oil business (Syahza, 2011). Independent plantations are considered an important element in the palm oil agro-industrial supply chain. It supplies raw materials for the palm oil industry, while the commodities it produces can serve as a buffer for certain conditions, such as extreme demand for palm oil production as well as fulfil mill capacity and guarantee continuity of supply. Measured by the productivity of plantations managed independently by local communities, the results of field studies show that local communities do not fully understand sustainable oil palm cultivation practices (Brandi et al., 2015).

Oil palm cultivation can improve food security and nutrition through increased income and thus better economic access to nutritious food (Shahputra and Zen, 2018). Monitoring and evaluation activities are carried out to ensure activities take place as planned. Evaluation of activities is carried out in two aspects, namely, process evaluation and evaluation of target achievement. The process evaluation is intended to determine the effectiveness of the activities while the target achievement evaluation is intended to determine the level of programme success in accordance with the process implemented (Perrin, 2012).

Figure1: Independent Palm Oil Management.Sustainable Palm

Oil Management in Sintang District

In addition, there is an increase in the wealth of local farmers, a positive contribution to economic activity in small villages, and poverty alleviation. Plantations bring considerable positive impacts to local farmers, as indicated by an increase in the welfare index, which in turn increases purchasing power (Syahza, 2011). In addition to low productivity, independent plantations have to work harder to generate a reasonable income compared to plasma plantations. However, independent plantations receive less attention from relevant government agencies compared to plasma farmers (Alwarritzi et al., 2015). Independent, often self-employed smallholders earn lower monthly incomes compared to smallholders from private companies (Ser et al., 2013). The difference is mainly due to (Syahza, 2011) four main factors: (i) price distortions between smallholders and independent smallholders; (ii) lack of technical management; (iii) income variability, depending on changes in fresh fruit bunch prices, given that the trade tends to be monopsony, and (iv) inadequate knowledge of the palm oil business.

Independent plantations are considered an important element in the palm oil agro-industry supply chain. It supplies raw materials for the palm oil industry, while the commodities it produces can serve as a buffer for certain conditions, such as extreme demand for palm oil production as well as fulfilling mill capacity and ensuring continuity of supply. Institutional formation and empowerment of oil palm farmer groups as suppliers and vital actors in the supply chain can be a resounding effort. Such institutional approaches are also aimed at improving bargaining, access to capital, production inputs, and marketing, accommodated by

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various measures, to achieve effective institutional goals (Ochiewo et al., 2020). Measured by the productivity of plantations that are self-managed by local communities, the results of field studies show that local communities do not fully understand sustainable oil palm cultivation practices (Brandi et al., 2015). Measures related to environmental protection and conservation as well as environmental ethics. The inability of oil palm growers to practice sustainable oil palm horticulture is evidenced by the widespread deforestation caused by the spread of oil palm (Ivancic & Koh, 2016). It is important to realise that sustainability plays an important role in supporting environmental, economic and social conditions, as well as being economically beneficial, environmentally friendly, socially equitable and acceptable, and technically appropriate (Irianto et al., 2020).

In particular, West Kalimantan's independent oil palm farmers already have some ecological knowledge (Utami & Dewantara, 2020). However, environmental pollution usually occurs because oil palm is a new commodity, not a local commodity. Independent small-scale oil palm growers do not yet have sufficient knowledge about environmentally friendly oil palm cultivation, especially in plantations. When planting oil palm, the principles of sustainable environmental protection must be followed, because if oil palm is not grown according to sustainable environmental protection rules, the plantation produce will not reach the market (Schoneveld et al., 2019). For example: local communities grow oil palm whose seedlings are not nationally certified, so the produce cannot be sold according to national market standards. There is an urgent need to optimise the ecological friendliness of oil palm communities so that local communities have the ability to raise environmental awareness in addition to marketing (Higgins & Richards, 2018).

Some field observations suggest that the inability of independent smallholders to market the productivity of their plantations is related to their knowledge of sustainable palm oil. Palm oil plantations must follow sustainable environmental principles. Environmental protection is the basis for marketing the productivity of oil palm plantations. Socialisation of sustainable palm oil is essential for independent smallholders (Nesadurai, 2018). This socialisation was conducted for independent oil palm farmer groups in Sintang District. Independent oil palm smallholders are smallholder groups that do not receive government support (Hutabarat, 2017) Socialisation of sustainable palm oil plantations is fundamental to subsidised oil palm plantation farmers with the aim of improving knowledge, understanding and practice of sustainable palm oil horticulture.

Materials and Methods

Independent palm oil farmers in three sub-districts in Sintang district, namely, Kelam Permai, Sintang and Binjai sub-districts with a total of 216 farmers, the data were collected with the help of questionnaires as a tool with a 5-scale scale for answers Strongly Agree, Agree, disagree, disagree, and strongly disagree.

The analytical technique used in this study is the Structural Equation Model (SEM) operated through the AMOS programme. SEM is a statistical technique for testing and estimating causal relationships by integrating factor analysis and path analysis (Hartono, 2014). The reason for using SEM is because SEM can be used to analyse research models that have several independent (exogenous) and dependent (endogenous) variables.

Research Location

The research location is in Sintang District West Kalimantan where oil palm is a crop that has been cultivated and is one of the businesses developed by farmers in Sintang District. The population of 491 farmers from three sub-districts. The respondents in this study using the Slovin formula were 216 independent oil palm farmers, Sampling using snowball sampling because farmer data has not been recorded at the village, sub-district, and district levels. Data was collected through in-depth interviews using questionnaires, note-taking, and observation. Data obtained from farmers was then cross-checked with extension workers and farmer group organisers.

Table 1. Number of Samples for Each Sub-district

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No	District	Number of Farmers	Sample
1	Binjai Hulu	170	170/491x216 = 75
2	Kelam Permai	211	211/491x216 = 93
3	Sintang	110	110/491x216 = 48
Total Independent Farmers		491	216

Source: Primary data analysis, 2023.

Data Analysis

The use of the SEM (Structural Equation Model) programme with AMOS (Analysis Moment of Structural) as an analytical tool has several reasons, namely: (i). Confirm the unidimensionalisation of various indicators for a construct/ concept/factor. (ii). Testing the suitability / accuracy of a model based on the empirical data studied. (iii). Test the suitability of the model as well as the causal relationship between factors built/observed in the research model. (iv). Can determine the strength of the relationship between the independent variable and the dependent variable. How significant is the relationship between variables, and how fit the hypothesis model is compared to real field data.

The data normality test aims to test whether the data used is normally distributed or not. the resulting Critical Ratio (CR) value of each research variable is smaller than 2.58, so the data distribution is normal (Firmansyah & Widiatmaka, 2016). Goodness of fit measures the suitability of observed or actual input (covariance or correlation matrix) with predictions from the proposed model. Structural models are categorised as good fit (Firmansyah & Widiatmaka, 2016) if they meet the following requirements:

Table 2. Goodness-of-Fit Index

No	Model Fit and Quality Indices	Fit Criteria
1	X2 chi-square	Expectedly small
2	Probability	> 0,05
3	RMSEA (The Root Mean Aquate Error of Approximation)	0,05< RMSEA ≤ 0,08
4	GFI (Goodness-of-fit Index)	≥ 0,90
5	AGFI (Adjusted Goodness-of-fit Index)	≥ 0,90
6	CMIN/ DF	≤ 2
7	TLI (Trucker Lewis Index)	≥ 0,90
8	CFI (Comparative Fit Index)	≥ 0,90

Source: (Firmansyah & Widiatmaka, 2016).

Results and Discussion

Results

The normality test shows that the c.r. value for multivariate is 1.627 which is in the range of ± 2.58, so it can be concluded that the research data is normally distributed multivariate.

Table 3. Assessment Of Normality Test Results

Variabel	Min	Max	Skew	c.r	kurtosis	c.r
Ke.5	2	5	-0,304	-1,823	-0,255	-0,765
Ke.4	2	5	-0,313	-1,879	-0,415	-1,244
Ke.3	2	5	-0,315	-1,893	-0,543	-1,628
Ke.2	2	5	-0,349	-2,091	-0,396	-1,187
Ke.1	2	5	-0,302	-1,811	-0,804	-2,411

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T.1	2	5	-0,151	-0,908	-0,621	-1,863
T.2	3	5	-0,013	-0,079	-1,000	-2,999
T.3	3	5	-0,032	0,194	-0,979	-2,938
T.4	3	5	-0,006	-0,035	-0,861	-2,584
K.1	3	5	-0,080	-0,477	-0,658	-1,975
K.2	2	5	-0,203	-1,218	-0,491	-1,472
K.3	3	5	-0,061	-0,368	-0,666	-1,999
L.1	2	5	-0,311	-1,865	-0,493	-1,478
L.2	2	5	-0,617	-3,703	0,665	1,996
L.3	2	5	-0,184	-1,103	-0,562	-1,685
L.4	2	5	-0,084	-0,504	-0,556	-1,668
S.1	2	5	-0,199	-1,191	-0,863	-2,589
S.2	2	5	-0,356	-2,135	-0,124	-0,373
S.3	2	5	-0,143	-0,858	-0,690	-2,071
S.4	2	5	-0,201	-1,203	-,0315	-0,946
E.1	2	5	-0,411	-2,468	-0,590	-1,770
E.2	2	5	-0,319	-1,914	0,080	0,240
E.3	2	5	-0,139	-0,837	-0,615	-1,846
E.4	3	5	-0,097	-0,582	-0,479	-1,436
Multivariate					7,821	1,627

Source: Primary data processed, 2023

The normality test results show that the c.r. value for multivariate is 1.627 which is in the range of ± 2.58, so it can be concluded that the research data is normally distributed multivariate.

Table 4. Goodness-of-Fit Model Test Results

Goodness of fit index	Cut off Value	Results	Description
Chi square	Expectedly small	270,233	Good
Probability	> 0,05	0,068	Good
RMSEA	0,05< RMSEA ≤ 0,08	0,026	Good
GFI	≥ 0,90	0,906	Good
AGFI	≥ 0,90	0,881	Good enough
CMIN/ DF	≤ 2	1,140	Good
TLI	≥ 0,90	0,982	Good
CFI	≥ 0,90	0,984	Good

Source: Primary data processed, 2023

The results of the calculation show that the goodness of fit index criteria have been met because the value tends to be good. It can be said that the model is acceptable, which means that there is a fit between the model and the data.

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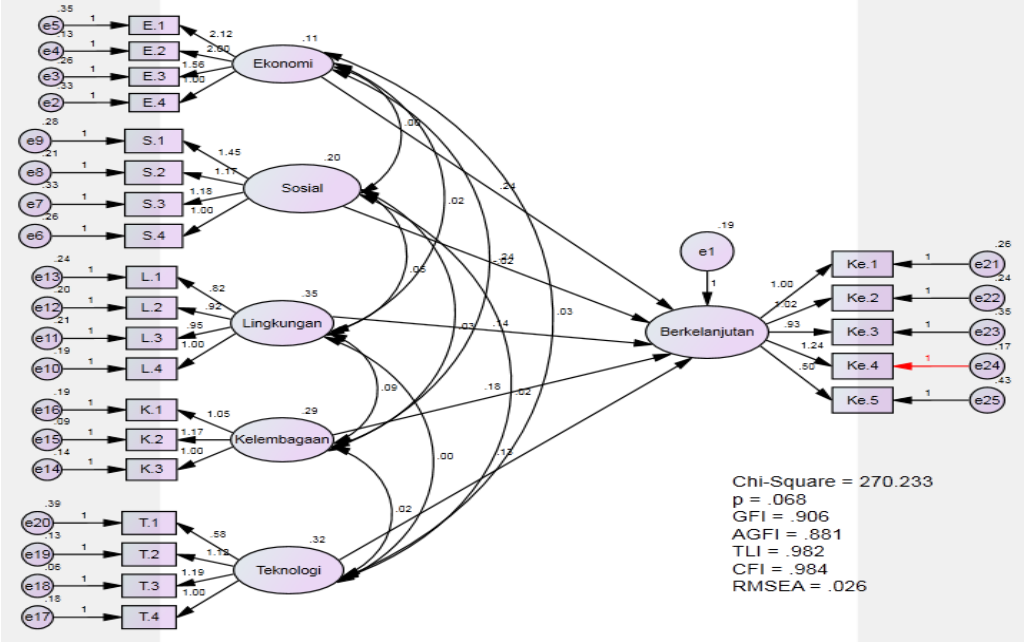

Gambar 1. Goodness of Fit

Figure 2. Goodness of Fit

Table 5. Estimation Results Of C.R (Critical Ratio) And P-Value

Variabel	Estimate	S.E	C.R	P	Description
E → B	0,560	0,139	4,026	***	Significant
S → B	0,230	0,079	2,920	0,003	Significant
L → B	0,377	0,116	3,237	0,001	Significant
K → B	0,225	0,069	3,247	0,001	Significant
T → B	0,204	0,075	2,694	0,007	Significant

Source: Primary data processed, 2023

Discussion

Economic, social, environmental, institutional and technological influences on the sustainability of oil palm farming businesses

Economics

The analysis found that the economy has a significant effect on the sustainability of farming in Sintang Regency, West Kalimantan. Based on the results of the study of economic variables (X1) obtained tcount value of 4.026 and t table of 1.972 (4.026 > 1.985) while the p-value of *** (*** < 0.05). Economy has a significant effect on the sustainability of self-help farming. The results of research (Ruslan and Supiandi, 2013) economic dimension sustainability index value of 88.97%, the economic dimension is included in the category of very sustainable. Four (4) attributes are considered to affect the sustainability of oil palm farming, namely (i) oil palm production, (ii) the price of fresh fruit bunches (FFB), (iii) the number of workers, and (iv) the contribution of oil palm plantation control.

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Oil palm plantation development is essentially rural-oriented economic development. The goal of development of the plantation sector is to increase the income of rural communities. While oil palm has been a driver of economic growth in producing countries, it has also been heavily criticised for its negative environmental and social impacts (Gatto et al., 2015). Farmers must find a balance between profit and non-profit objectives in order to maximise their income levels, without compromising the environment or natural ecosystems (Creemers et al., 2019). Such non-profit objectives refer to the overall agricultural business environment and relate to issues such as sustainable agriculture. Strategic decision-making processes are becoming increasingly important to balance multiple interests and needs (Methorst et al., 2016). The rapid evolution of new agricultural sustainability challenges and unpredictable drivers makes it important for farmers to find alternative ways of assessing their farming systems. Farmers need to take into account considerations related to the environmental, social and economic impacts of their activities. For example, the need to limit production levels so as not to exceed market capacity (Obeng et al., 2020). Farmers must balance farming objectives relating to issues such as sustainability, to maximise income levels (Creemers et al., 2019). Economic resilience can be assessed by the relationship between productivity and income; since income is directly related to productivity levels, practices that improve soil quality and productivity over time will increase farmers' income (Anning et al., 2022).

Social

The analysis found that social has a significant effect on the sustainability of farming in Sintang Regency, West Kalimantan. Based on the results of the study of social variables (X2) obtained a tcount value of 2.920 and t table of 1.972 (2.920 > 1.985) while the p-value is 0.003 (0.003 < 0.05). Social significantly influences the sustainability of independent farming. The results of the study (Saragih et al., 2020) the value of the social dimension sustainability index is 66.83%, the social dimension is included in the moderately sustainable category. Three attributes are considered to have an effect on the sustainability of oil palm farming, namely (i) access to health, (ii) community views on oil palm plantations, and (iii) access to education.

Socio-cultural functions as an adhesive and unifier of the community and nation. Through participation the ability of communities and their struggles to generate and sustain collective growth is strengthened. The main purpose of measuring sustainability is to detect opportunities to improve sustainability (Hayati et al., 2010). Comparing the sustainability of supply chain arrangements can be useful to identify strategies and technologies that excel from a sustainability point of view. Empirical applications are still needed, not to obtain a magic number but to identify improvement paths (Creemers et al., 2019). A business needs sustainable profits to survive and remain in the market, and to continue providing public goods and ecosystem services. The design of alternative and sustainable agricultural systems and technologies is rapidly evolving. Sustainable agriculture implies the need for farmers to remain competitive. Therefore, farmers need to innovate continuously in order to adapt to market developments and changes in the quality and availability of resources (Obeng et al., 2020). The community in development is not an object but is placed as the main subject that must determine the course of development. Community-based development means that development must be based on local resources, based on social capital, based on local culture, respect or based on local wisdom and based on spiritual capital owned and or believed by the local community.

Environment

The analysis found that environment has a significant effect on the sustainability of farming in Sintang Regency, West Kalimantan. Based on the results of research on environmental variables (X3), the tcount value is 3.237 and the ttable is 1.972 (3.237> 1.985) while the p-value is 0.003 (0.001 < 0.05). The environment has a significant effect on the sustainability of independent farming.

The results of the study (Suardi et al., 2022) the sustainability index value of the environmental dimension is 50.62%, the social dimension is included in the fairly sustainable category. Three attributes are considered to affect the sustainability of oil palm farming, namely (a) environmental awareness, (b) land use, and (c) access to infrastructure. Natural resources and the environment are natural capital, as one of the main capitals to achieve development goals to improve people's welfare.

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Sustainable development must create environmental sustainability, and vice versa, environmental sustainability will sustain development. Farmers are faced with growing pressure to become more environmentally friendly from an environmental standpoint and increasing market uncertainty that tends to undermine their economic viability. Farmers' perceptions of choice influence strategic decision-making (Methorst et al., 2016). Traditional tillage may be a useful measure for weeding farmland and controlling pests, but it may not be useful in areas prone to climate change; it can compromise the physical quality of the soil, thereby increasing erosion and soil degradation (Stavi, 2013). The use of chemical and organic fertilisers improves soil quality, water retention capacity and soil organic carbon retention (Stavi et al., 2018). On the other hand, improper use of chemical fertilisers can lead to increased soil degradation due to overuse. Integrated soil fertility improvement using organic and chemical fertilisers falls under this broad theme. Fertiliser use in agriculture contributes to farmers' income and financial capital by increasing crop yields, and to soil management through nitrogen fixation (Onyeneke et al., 2019). The utilisation of the environment should aim at achieving harmony, compatibility and balance between humans and the environment. Environmental management is based on identifying, assessing, and controlling risks across all phases of a business, from exploration to development, operations, and considering perspectives and knowledge in decision-making.

Institutions

The results of the analysis found that institutions have a significant effect on the sustainability of farming in Sintang Regency, West Kalimantan. Based on the results of research on institutional variables (X4), the t-count value is 3.247 and the t-table is 1.972 (3.247 > 1.985) while the p-value is 0.001 (0.001 < 0.05). Institutionalisation has a significant effect on the sustainability of independent farming.

The results of the study (Suardi et al., 2022) the sustainability index value of the social dimension is 52.21%, the social dimension is included in the moderately sustainable category. Four attributes are considered to affect the sustainability of oil palm farming, namely (i) participation in farmer groups, (ii) participation in cooperatives, (iii) access to financial institutions, and (iv) accessibility of training and extension workers.

Access to credit services can improve household livelihood resilience, and also improve adaptability to climate change by providing easy access to diversification tools. Index-based insurance services in agriculture also serve as an incentive for farmers to plan for climate change-related disruptions (Anning et al., 2022). Access to finance will provide financial capital and also enable the acquisition of natural capital such as new farmland, which is essential for the survival and improvement of rural livelihoods (Atitianti et al., 2018). Farmers also benefit from appointments between extension and lead farmers, where lead farmers are trained on correct agricultural practices aimed at climate adaptation, and they transfer the knowledge to other group members (Anning et al., 2022).

Self-organisation or groups of farmers, and there may be little room for exchange between key stakeholders, such as government agencies, extension, and farmers. This can potentially slow down the generation of new ideas and the adoption of new agricultural technologies to help adopt to climate change (Famakinwa et al., 2023).

Technology

The results of the analysis found found that technology has a significant effect on the sustainability of farming in Sintang District, West Kalimantan. Based on the results of the technology variable research (X5), the tcount value is 2.694 and the ttable is 1.972 (2.694 > 1.985) while the p-value is 0.007 (0.007 < 0.05). Technology has a significant effect on the sustainability of independent farming.

The results of this study are supported by research (Saragih et al., 2020) the value of the social dimension sustainability index is 59.02%, the social dimension is included in the moderately sustainable category. Three attributes that are considered to have an effect on the sustainability of oil palm farming, namely (i) soil management mechanisms, (ii) planting distance, and (iii) the use of fertilisers according to recommendations. Technology, too, helps accelerate the path to achieving sustainability strategies.

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Technology can play an important role in helping to reduce the environmental impact of human activities and promote sustainable development. Increased agricultural productivity is one of the main impacts of food technology on sustainable agriculture.

Integrated soil fertility improvement using organic and chemical fertilisers falls under this broad theme. Fertiliser use in agriculture contributes to farmers' income and financial capital by increasing crop yields, and to soil management through nitrogen fixation (Anning et al., 2022). Increased environmental benefits: Improved soil management adaptation techniques promote improved soil health and are key to productive and sustainable agriculture. Economic resilience can be assessed by the relationship between productivity and income; as income is directly related to productivity levels, practices that improve soil quality and productivity over time will increase farmers' incomes (Onyeneke et al., 2019). Family-supplied labour services are beneficial in terms of human capital enhancement, where more knowledgeable household members transfer knowledge of farming practices to other members, and financial capital preservation or enhancement, where household farm labour wages are retained by the household members, rather than paid. The associated reduction in input costs is expected to maintain current income levels or increase profitability (Anning et al., 2022). The use of chemical and organic fertilisers improves soil quality, water retention capacity and soil organic carbon retention (Asfaw et al., 2017). On the other hand, inappropriate use of chemical fertilisers can lead to increased soil degradation due to overuse (Anning et al., 2022)..

Figure 3. Farmers Practising Fertilisation Techniques

Through the application of technologies such as genetic engineering and selective breeding, crop varieties have been developed that are more resistant to diseases, pests and conditions crop varieties that are more resistant to diseases, pests and extreme environmental conditions extreme environmental conditions. Crops that are resistant to adverse weather conditions or pests can reduce yield losses and increase agricultural productivity.

In addition, food technology also enables more efficient use of fertilisers and pesticides, thereby reducing the use of chemicals fertilisers and pesticides, thereby reducing the use of chemicals that can damage the environment damaging the environment.

Conclusion

Economic factors have a significant effect on the sustainability of independent oil palm farms, which means that the development of independent oil palm farms is shaped by which means that the development of independent oil palm farming is shaped by economic factors that support. The function of the economy is to increase prosperity and welfare of the people and strengthening the economic structure of the region.

Labour services supplied by the family are beneficial in terms of human resource enhancement, where more knowledgeable household members transfer knowledge about farming practices knowledgeable household members transfer knowledge of farming practices to other members, and the preservation or and the

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preservation or enhancement of financial capital, where the wages of household farm labourers are maintained by the household members, rather than being paid. The associated reduction in input costs is expected to maintain farmers' income levels.

Social factors have a significant effect on the sustainability of independent oil palm farming, meaning that the the development of independent oil palm farming can be influenced by a good level of social factor social factors. Dimensions of social sustainability includes the following attributes: local origin, health benefits health benefits, brand knowledge, and safety assurance. Consumers have now adopting local food consumption patterns because they are considered more environmentally and climate-friendly climate-friendly. In addition, short supply chains are perceived to be more reliable thanks to increased direct communication between producers and consumers. Food can boost local employment and help these businesses access the market, while consumers can feel that they are supporting the community when they eat local food markets, while consumers can feel that they are supporting the community when they buy locally-produced food; this is why "origin" is so important locally produced food; this is the reason why "local origin" should be considered as an attribute of origin" should be considered a social attribute.

Environmental factors have a significant effect on the sustainability of independent oil palm farming, which means that the development of independent oil palm farming. This means that the development of independent oil palm farming can be shaped by good environmental factors environmental factors. The high productivity of conventional agriculture achieved at the expense of great damage to the natural environment and distressing social disturbances social disruption. To reverse the negative impacts of conventional agriculture various forms of sustainable farming systems have been recommended as alternatives to achieve the goal of an economically favourable and environmentally production systems that are economically profitable and environmentally friendly.

Institutional factors have a significant effect on sustainability of independent oil palm farming, which means that the development of independent oil palm farming is formed by the presence of institutional factors.

The development of independent oil palm farming is formed by institutional factors, the higher the interaction of farmers with other farmers, the more the higher the interaction of farmers with other farmers, the higher the interaction with community leaders (farmer group chairman, farmer group the higher the interaction with other farmers, the higher the interaction with community leaders (farmer group leaders, village officials, successful farmers), and the the higher the interaction with agricultural extension workers, the farmer will develop an independent oil palm farming. The potential of farmer groups is no less important in all agricultural activities. The ability to co-operate is the ability to put aside personal interests for the benefit of the larger group, while trust will ultimately result in a sense of responsibility while trust will ultimately result in a sense of responsibility responsibility. Both depend on the degree to which the group shares norms and values. The capacity of farmers both in terms of individual and group potential is one of the farmer's assets in carrying out farming activities.

Agriculture for farmers is not just a means of livelihood, but a way of life that makes their value system, traditions and beliefs a way of life that makes the value system, traditions, and beliefs guide them in acting and making decisions guide their actions and decisions.

Technological factors have a significant effect on sustainability of independent oil palm farming, which means that the development of independent oil palm farming can be influenced by the level of technological factors independent oil palm farming can be influenced by the level of technological factors that are good. Seen from an agricultural perspective, that the choice of these three dimensions is appropriate because the contribution to sustainable agriculture is threefold: (1) the production of production of goods and services (i.e. the economic pillar), (2) natural resource management and the provision of environmental public goods (i.e. the environmental pillar), and (3) contribution to rural dynamics (i.e. the social pillar). The combination harmonious combination of these three interconnected dimensions is the backdrop for sustainable agriculture background of sustainable agriculture. To move towards sustainability, we need to make simultaneous progress in all three dimensions. Since these three dimensions are interconnected, improving (or maintaining) economic performance alone is meaningless if it is not accompanied by improving (or

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maintaining) economic performance is meaningless if it is not accompanied by improvement (or maintenance) of environmental and social performance maintenance) of environmental and social performance. For example, the economic benefits of a production system are not sufficient to compensate for unbearable ecological and social costs that are unbearable. Farmers need to take into account considerations related to environmental, social and economic impacts of their activities. Farmers' attitudes towards sustainability influences the intention to implement certain farming strategies.

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