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Comparative Analysis of Mixed Farming Business Performance at Several Levels of Compost Fertilizer Use

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Abstract:
This study aims to analyze the added value of compost use in mixed farming to diversify the compost industry's target market. The research survey was conducted in the village of Dataran Kempas on three groups of business actors in the processing plant waste and processing industry of oil palm and solid waste from cattle housing. The research uses historical data collection, interviews, and direct field observations. The Hayami method is used for added value analysis, while institutional analysis is carried out through a descriptive analysis approach. The results showed that the mixed cultivation cultivated by the three groups of farmers was not fully organic. This can be seen from using chemical fertilizers but with different levels and ratios between compost and chemical fertilizers. Nevertheless, the positive impact of the use of compost can be seen in the performance of each group's farming business. Using compost and a higher ratio of chemical fertilizers can increase cost efficiency, business profits, and the added value of better compost. The sequence of the performance of mixed farming from the highest to the lowest was MJFG, followed by KTMFG, and the lowest was SISFG, with the added value of compost at 58.79%, 37.15%, and 2.85%, respectively. Based on the study's results, it can be concluded that using compost in mixed farming will be more profitable. However, because of its slow release nature, replacing chemical fertilizers with compost must be done gradually or avoid full replacement.

Keywords: compost, mixed farming, performance, added value.

不同堆肥使用水平下混耕经营业绩比较分析

摘要：
本研究旨在分析堆肥在混合农业中使用的附加值，以使堆肥行业的目标市场多样化。这项研究调查是在达兰肯帕斯村对油棕加工厂废物和加工业以及牛舍固体废物的三组商业行为者进行的。该研究使用历史数据收集、访谈和直接实地观察。速见方法用于附加值分析，而制度分析则通过描述性分析方法进行。结果表明，三组农户的混耕不完全有机。这从使用化肥可以看出，但堆肥和化肥的用量和比例不同。尽管如此，

使用堆肥的积极影响可以从各组农业业务的表现中看出。使用堆肥和更高比例的化肥可以提高成本效率、商业利润和更好堆肥的附加值。混耕表现由高到低依次为 MJFG，KTMFG 次之，SISFG 最低，堆肥附加值分别为 58.79%、37.15%和 2.85%。根据研究结果，可以得出结论，在混合农业中使用堆肥将更有利可图。但是，由于其释放缓慢的性质，必须逐步用堆肥代替化肥或避免完全代替。

关键词：堆肥、混合农业、性能、附加值。

1. Introduction

The compost fertilizer group business development program in several areas in Jambi Province, Indonesia, has provided many social, economic, and environmental benefits. This program has directly contributed to increasing the added value of organic waste from plants, processing industries, and smallholder livestock businesses. The need for raw materials for this waste causes waste that has been wasted and has no price. Now, it is starting to have commercial value and become a source of additional income for farmers. This program can indirectly push the cattle breeding system towards an intensive due to the increasing demand for stable waste, providing job opportunities and reducing poverty. Especially for the research area, which is the center for smallholder oil palm plantations, this empowerment program has also increased the readiness of farmer households to face the community oil palm rejuvenation program. Income as a business actor and workforce is one of the alternative sources of income for households that have the potential to lose temporary income during the replanting process until the palm oil produced by replanting produces an economic level of production again. The ecological benefit value of compost, which is currently a superior product in rural areas, was emphasized by the award for Dataran Kempas Village as the Main Pro-Climate Village from the Ministry of Forestry and Environment of the Republic of Indonesia in 2019 (Novra et al., 2021a, 2021b).

One of the problems that are still an obstacle in the compost fertilizer development program is the inefficiency of the output market faced by groups of business actors. The monopsony market (single buyer) they face causes their low bargaining power in determining the market price for compost products. After several months of negotiations, limited company Wira Karya Sakti, an industrial forest plantation company, as a single buyer (market share > 90%), has lowered the agreement price from IDR 1,170 to 970. Additionally, the previously agreed supply volume reached 1,000 tons/month for each group dropped drastically to only 200 tonnes/month for Dataran Kempas Village (there are four compost business groups). The condition that has lasted since the end of 2019 has continued until now, so it needs serious attention from various parties to maintain this business's sustainability, providing many social, economic, and environmental benefits. Diversification of target markets and increasing the use-value of compost is an alternative option that can be developed to create market demand for compost (Novra & Fatati, 2021). Organic farming is the best choice because it can provide added value and create market demand for organic fertilizers.

Interest in organic farming is growing worldwide as sustainable agricultural practice nowadays. The applications of organic fertilizers in agriculture present multiple environmental benefits since it reduces the use of chemical fertilizers and avoids the cost of less appropriate waste treatment techniques such as incineration and landfilling (Arachchige et al., 2020). Organic fertilizers are sustained sources of nutrients due to slow release during decomposition. By increasing soil organic matter, organic farming can reinstate the damaged soil's natural fertility, improving crop productivity to feed the growing population (Singh, 2012). Organic fertilizer refers to materials used as fertilizer that occur regularly in nature, usually as a by-product or end product of a naturally occurring process. Organic fertilizers such as manure have been used in agriculture for thousands of years; ancient farmers did not understand the chemistry involved, but they did recognize the benefit of providing their crops with organic material (Martey, 2018). Organic fertilizer use significantly increases productivity and crop income log by 1.43 and US$132, respectively, and reduces total household expenditure, food expenditure, and poverty by US$174, US$58, and 8%, respectively. Disaggregation of the results based on landholdings and household size suggest that adopters of organic fertilizer with large farm size and household members recorded the lowest probability of being poor (Sustainable Agriculture Research and Education, 2003). The findings of this study demonstrate that the gains in the use of organic fertilizer can be consolidated with complementary input support and increased market participation.

Different types of factors influence the organic sector development. However, the following groups are most frequently indicated as impeding the growth: a) management-related factors, b) national policy on organic agriculture, c) cultural barriers, and d) market uncertainty (De Cock et al., 2016). This was also reflected in farmers' decisions to discontinue organic production due to economic reasons, concerns related to certification and production techniques, and macro-environmental issues (Sahm et al., 2013; Serebrennikov et al., 2020). Organic regulations are extremely complex and cover the entire food chain, including production, labeling, control, and import. Organic farmers are often the first to admit that their yields declined as they transitioned to organic systems. Many studies have shown that, initially, a decline in yields occurs during the conversion to organic production. However, once the transition period has passed – usually in three to five years – organic crop yields often rebound to within 90 to 95 percent of conventional yields, according to an Organic Farming Research Foundation review of comparative studies (Sustainable Agriculture Research and Education, 2003). Based on the brief description above, a study was conducted to analyze the added value of using compost in organic farming and to compare whether it is more profitable than selling compost directly.

2. Methods

The research action was conducted during one planting season involving three farmer groups of compost processing businesses in Dataran Kempas Village, Jambi Province, Indonesia. The planted area and types of crop commodities cultivated by each participant group varied according to the aspirations and plans of each group (Table 1).

Table 1. Types of crop commodities and planting area for each participant farmer group (Farmer group recording, 2020)

No	Commodity	Planted Area (m^2)			Total
		MJFG	KTMFG	SISFG	
1	Honey pumpkin	150.00	150.00		300.00
2	Corn	150.00			150.00
3	Eggplant	200.00	150.00	100.00	450.00
4	Bitter melon	150.00	130.00		280.00
5	Mustard greens	200.00			200.00
6	Cassava	100.00		200.00	300.00
7	Red chili	500.00	100.00	200.00	800.00
8	Ginger	200.00			200.00
9	Bean		100.00		100.00
10	Cayenne pepper		150.00		150.00
11	Bull pumpkin		180.00		180.00
12	Cale		200.00		200.00
13	Celery		50.00		50.00
14	Ridged Gourd		100.00		100.00
15	Cucumber		140.00		140.00
16	Basil		50.00		50.00
17	Bangalore		200.00		200.00
	Total	1,650.00	1,700.00	500.00	3,850.00

The data collected come from group records, including input usage and prices, labor usage and area data, and production and sales prices. The assumption used in the analysis is that the proportion of using compost as a substitute for commercial fertilizer for each commodity is the same. In contrast, the use of other inputs (seeds and labor) varies and is proportional to needs. The data were processed using the Hayami method (Table 2) to determine the amount of added value for each commodity and business group and compare it with the direct selling price of compost.

Table 2. Formulas and stages of calculation of value added of the Hayami modification method (Sudiyono, 2004)

No	Variabel	Formula
Input, Output and Prices		
1	Output (kg)	(1)
2	Waste materials volume (kg)	(2)
3	Direct labor (WPD)	(3)
4	Convertion factor	= (1)/(2)
5	Direct labour coeeficient (WPD/kg)	= (3)/(2)
6	Output Price (IDR/kg)	(6)
7	Direct labor wage (IDR/HOK)	(7)
Revenue and profitability		
8	Price of waste material (IDR/kg)	(8)
9	Price of the other's input (IDR/kg)	(9)
10	Output value (IDR)	x (6)
11	a. Value added (IDR)	(11a) = (10) - (8) - (9)
	b. Value added ratio (%)	(11b) = ((11a)/(10)) x (8)
12	a. Direct labor income (IDR/kg)	(12a) = (5) x (7)
	b. Share direct labour	(12b) = ((12a)/11a) x 100
13	a. Profit (IDR/kg)	(13a) = (11a)-(12a)
	b. Profitability rate (%)	(14a) = ((13a)/(10)) x 100

3. Result and Discussion

3.1. Overview of the Rural Composting Industry

Overview of the rural composting industry Dataran Kempas Village is one of the expansion villages from the main village of Purwodadi, located about 124 km from the capital city of Jambi Province. The village, the majority of oil palm farmer households, is one of the buffer zones for the Industrial Plantation Forest area managed by PT. Wira Karya Sakti is the supplier of raw materials for the Sinar Mas pulp and paper industry. Some households are actors in integrating oil palm and beef cattle, using oil palm plantation areas as grazing areas and as a source of forage between crops. Through the economic recovery program for oil palm households affected by the smoke and thick haze of land and forest fires in 2015, which was integrated with the Desa Makmur Peduli Api (DMPA) program, 2016 a compost fertilizer group business was developed. Rapidly developing composting business utilizes waste as the main raw material: solid waste from cattle cages (a mixture of feces and forage residues) (30%), industrial palm oil mill waste in the form of empty fruit bunches (30%) and boiler ash (25%), and oil palm plant waste in the form of chopped palm fronds (15%) (Novra et al., 2019, 2020).

The direct positive impacts of developing the rural composting industry include providing additional income for households and groups, absorbing rural workers, and reducing poverty. The indirect positive impacts include increasing recognition of Dataran Kempas Village as a compost village, becoming the target of learning and visits for other community groups and outside institutions, and establishing compost as a superior product in rural areas (abbreviated Prukades) by the Ministry of Villages and Development of Disadvantaged Villages of the Republic of Indonesia. In addition, Dataran Kempas Village won an award as a Pro-Climate Village from the Ministry of Forestry and Environment of the Republic of Indonesia in 2019. So far, five composting business groups have developed in the village, and 3 of these farmer groups have started using compost in vegetable and horticultural cultivation, namely Mekar Jaya (MJ). Karya Trans Mandiri (KTM) and Sekawan Inti Sejahtera (SIS).

3.2. Cost Structure and Revenues

The three farming groups have not fully implemented organic farming, which can be seen from using chemical fertilizers (organic substances) at different levels. Variations in the use of fertilizers will affect the cost structure, but labor costs are generally the largest input cost (Table 3).

Table 3. Cost structure of vegetable and horticultural cultivation in each farming group (Ha) (Data processing, 2021)

No	Type of cost	Farmer Groups		
		MJFG	KTMFG	SISFG
A	Cost (IDR/Ha)			
1	Compos	13,33	19,41	11,00
2	Chemical Fertilizer	15,76	30,29	103,00
3	Seed	8,84	3,35	3,82
4	Labour	103,03	58,82	80,00
5	Depreciation	4,25	10,29	15,73
6	Others cost	0,79	0,58	1,08
	Total Cost	146,00	122,75	214,63
B	Proportion (%)			
1	Compos	9,13	15,81	5,13
2	Chemical Fertilizer	10,79	24,68	47,99
3	Seed	6,05	2,73	1,78
4	Labour	70,57	47,92	37,27
5	Depreciation	2,91	8,39	7,33
6	Others cost	0,54	0,47	0,50
		100,00	100,00	100,00

The largest proportion of farming costs is labor wages and fertilization, but the composition differs between groups, mainly related to the use of compost. The highest proportion of costs is labor costs unless using chemical fertilizers is still high, as in the SIS farmer group. Replacing chemical fertilizers with compost will save farming costs, especially fertilizer costs, and encourage increased use of labor. Whether this replacement with compost will affect the productivity of mixed farming can be seen in Table 4.

Table 4. Revenue of mixed vegetable and horticulture farming in each research partner group (Data processing, 2021)

No	Commodity	Revenue (IDR)			Proportion (%)		
		MJFG	KTMFG	SISFG	MJFG	KTMFG	SISFG
1	Honey pumpkin	10.500.000	9.000.000		30,15	21,11	-
2	Corn	7.000.000			20,10	-	-
3	Eggplant	720.000	750.000	500.000	2,07	1,76	4,77
4	Bitter melon	400.000	1.400.000		1,15	3,28	-
5	Mustard greens	750.000			2,15	-	-
6	Cassava	1.750.000		2.915.000	5,02	-	27,81
7	Red chili	4.770.000	4.500.000	7.065.000	13,70	10,56	67,41
8	Ginger	8.940.000	9.000.000		25,67	21,11	-
9	Bean		1.500.000		-	3,52	-
10	Cayenne pepper		8.000.000		-	18,77	-
11	Bull pumpkin		2.400.000		-	5,63	-
12	Cale		300.000		-	0,70	-
13	Celery		1.720.000		-	4,03	-
14	Ridged Gourd		1.000.000		-	2,35	-
15	Cucumber		1.290.000		-	3,03	-
16	Basil		90.000		-	0,21	-
17	Bangalore		1.680.000		-	3,94	-
	Total	34.830.000	42.630.000	10.480.000	100,00	100,00	100,00

Based on the commodity, the types of plants classified as horticulture, such as honey pumpkin, red chili, and red ginger, are the main sources of income for the group's business. When compared to the same area, there is no significant difference in the product's value between the three groups even though the use of different inputs, especially the use of compost fertilizer, is found. The comparison between the three groups even shows that the higher the use of compost, the higher the acceptance of the combined farming of several commodities. Furthermore, with the difference between farm income and costs being higher, it can be concluded that the use of compost will provide greater value for benefits (Table 5).

Table 5. Comparison of mixed cultivation performance between research partner farmer groups (Data processing, 2021)

No	Indicators	Farmer Groups		
		MJFG	KTMFG	SISFG
1	Revenue (IDR)	34.830.000	42.630.000	10.480.000
2	Cost (IDR)	24.089.181	20.866.742	10.731.250
3	Net Revenue (IDR)	10.740.819	21.763.258	-251.250
4	RC Ratio	1,45	2,04	0,98
5	Compost and Chemical Ratio	0,85	0,64	0,11
6	Cost Proportion of Fertilizer (%)	19,93	40,50	53,12
	a. Compost	9,13	15,81	5,13
	b. Chemical	10,79	24,68	47,99

Using balanced fertilizers between compost and chemical fertilizers still provides better business performance than using full compost directly. The nature of compost as an organic fertilizer that is "slow-release" causes it to be replaced gradually. In short, slow-release fertilizer is a fertilizer that releases small amounts of nutrients that are stable over a while, like natural organic fertilizers, which release nutrients to the soil by breaking down and decomposing naturally (Lorum, 2022). Controlled release of organic fertilizers is an effective and advanced way to overcome these impacts and maintain sustainable agriculture yield (Shaji et al., 2021). This was implemented by MJFG, which provided both types of fertilizer in a balanced manner. For KTMFG, the reduction in chemical fertilizers was not matched by an increase in the use of compost (the amount of fertilizer was still less than needed). On the other hand, SISFG has poor business performance with an RC ratio of < 1. This indicator value indicates that the revenue earned is smaller than the cost of farming. The main factor that causes the loss of mixed farming in SISFG is the high cost of fertilization and the small planting area, causing inefficiency in the use of labor.

3.3. Compost Value Added

Value-added (VA) analysis involves the analysis of business processes to identify the value creation steps in an activity that cause changes in the nature or form of a product or service to exactly what the customer wants. The main goal of VA analysis is obtaining a value for the end product, which is higher than its production cost (MBA Skool Team, 2015), to eliminate production behavior that does not add value so that the process is more efficient and faster, meaning more processes without additional resources. The results of the analysis of performance indicators consisting of added value and probability level in mixed farming of each farmer group with different levels of compost use are presented in Table 6.

Table 6. Comparison of value added and probability rate between mixed farming of farmer groups with different levels of compost use (Data processing, 2021)

No	Performances	Farmer Groups		
		MJFG	KTMFG	SISFG
1	Added Value			
	a. Nominal (IDR)	12.940.819	25.063.258	298.750
	b. Relative (%)	0,37	0,59	0,03
2	Profitability Rate			
	a. Overall (%)	53,69	120,10	2,71
	b. Business Groups (%)	37,13	58,79	2,77

The performance of mixed farming is in line with the level of compost use and inversely proportional to the use of commercial fertilizers. The higher the use of compost, the better the performance of mixed cultivation, as indicated by the increasing added value and profitability of the farming business. This means that increasing the use of compost and conversely reducing the use of commercial fertilizers (chemicals) will increase farming efficiency. The efficiency of this farming business is predicted to increase from one planting period to the next, not only with the higher use of compost but also with the slow release nature of compost which will be more effective in increasing soil fertility. Organic agricultural management practices range from small to large-scale production (Reganold & Wachter, 2016). They are generally based on farming practices that enhance soil quality through crop rotation, cover cropping, organic inputs, and reduced tillage (Fess & Benedito, 2018). Soil enriched with nutrients from sources other than those which have undergone industrial transformations during their production can help to counteract climate change by enhancing soil carbon sequestration (Tu et al., 2006). Organic farming practices depend on complex integrated biological systems to sustain production. Effective nutrient management in organic farming systems needs to address immediate nutrient requirements while maintaining and improving soil fertility in the longer term (Shepherd et al., 2006).

This unidirectional or positive relationship between the level of compost use and the performance of mixed farming shows that using compost produced by farmer groups for seasonal crop cultivation can be an alternative market and not only dependent on a single buyer (monopsony). More extensive use of compost can be carried out with organic farming campaigns, both on replanting oil palm plantations and land use between replanting or intercropping oil palm stands. Types of intercropping can be in the form of seasonal crops (food, vegetables, and horticulture) or fodder plants (high-quality grass). For a sustainable crop and cattle integration system, it is recommended that seasonal crops with a dual function, namely crops for human consumption and crop residues (by-products), be used as a feed source for beef cattle, such as corn, sorghum, and others. Increasing the area of organic farming land is not only a potential source of additional income for palm oil replanting households. However, it will also create demand for compost so that this waste-based, environmentally friendly rural industry can be sustainable. Efforts to improve the product value chain will expand the distribution of the benefits of compost, create new sources of income, and have the potential to boost the welfare of rural households. While soil improvement based on certified organic standards can contribute to socio-economic development and ecosystem services, local soil characteristics must be considered in parallel with potential new avenues for sourcing nutrients, including organic matter management (Sapinas & Abbott, 2020). Investments in quality aspects, increased consumer interest in organic food, product differentiation, and supply chain management efficiency are relevant factors contributing to higher added value (Sanders et al., 2016).

4. Conclusion

Based on the results of the study, it can be concluded that the campaign for organic seasonal crop cultivation is a potential strategy of choice for the expansion and diversification of the waste-based rural industrial compost product market. The added value and level of profitability resulting from the cultivation of mixed vegetable and horticultural crops is increasing with the increasing use of compost. Concerning the smallholder oil palm replanting program, it is recommended that socialization encourages the growth and development of a potential organic intercropping pattern of cultivating crops as sources of substitute for household income temporarily lost due to replanting and distribution of the value of the benefits of compost. Expansion of the value chain through the development of value-added rural businesses is aimed at maintaining the welfare level of rural communities within the framework of sustainable agriculture.

5. Limitations and Further Study

Ideally, mixed farming data are collected for several growing seasons, but time and cost constraints mean that observations and data collection is only for one growing season. This causes the slow release nature of compost fertilizer to the level of land fertility which has implications for the productivity and performance of organic farming that is not visible. For this reason, it is necessary to carry out further multi-year research with various variations of commodities and treatment of the use of compost in the direction of sustainable organic agriculture.

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acceleration scheme.

Appendix 1. Stages of calculation of the added value of the Hayami method in each farmer group

No	Variables	Farmer Groups		
		MJFG	KTMFG	SISFG
1	Output (kg)	6.300	5.556	1.154
2	Compost (kg)	2.000	3.000	500
3	Labour (man)	5,00	5,00	2,00
4	Conversion Factor	3,15	1,85	2,31
5	Labour Coefficient (Man/kg)	0,00	0,00	0,00
6	Output Prices (IDR/kg)	5.528,57	7.672,79	9.081,46
7	Average Wage (IDR/man)	3.400.000	2.000.000	2.000.000
8	Compost Price (IDR/kg))	1.100,00	1.100,00	1.100,00
9	Others Input Contribution (IDR)	4.889.181	7.566.742	6.181.250
10	Output Value (IDR)	34.830.000	42.630.000	10.480.000
11	Added Value (IDR)	12.940.819	25.063.258	298.750
12	Added Value Ratio (%)	0,37	0,59	0,03
13	Labour Benefit (IDR)	8.500	3.333	8.000
14	Shared Labour (%)	6,57%	1,33%	267,78%
15	Profit (IDR)	12.932.319	25.059.925	290.750
16	Profitability Rate (%)	53,69	120,10	2,71
17	Farmer Groups Benefit Margin (IDR)	34.828.900	42.628.900	10.478.900
	Indirect Labour Income (%)	0,02%	0,01%	0,08%
	The other input contribution (%)	14,04%	17,75%	58,99%
	Business Groups Profitability (%)	37,13%	58,79%	2,77%

References

[1] ARACHCHIGE, U.S.P.R., RANAWEERA, S.J., AMPEMOHOTTI, A.A.L.T., WELIWATHTHAGE, S.R.G., SIRIWARDENA, M.B.D.K, & WEERAKOON, J. (2020). Development of an Organic Fertilizer. *Journal of Research Technology and Engineering*, 1(1), 1-7. Retrieved from https://www.jrte.org/2020/01/25/development-of-an-organic-fertilizer/

[2] DE COCK, L., DESSEIN, J., & DE KROM, M.P. (2016). Understanding the development of organic agriculture in Flanders (Belgium): A discourse analytical approach. *NJAS: Wageningen Journal of Life Sciences*, 79(1), 1–10. https://doi.org/10.1016/j.njas.2016.04.002

[3] FESS, T.L., & BENEDITO, V.A. (2018). Organic vs conventional cropping sustainability: A comparative system analysis. *Sustainability*, 10(1), 272. http://dx.doi.org/10.3390/su10010272

[4] LORUM, D. (2022). *Gardening Know-How: Long Lasting Fertilizer: When To Use A Slow Release Fertilizer.* Retrieved from https://www.gardeningknowhow.com/ garden-how-to/soil-fertilizers/what-is-slow-release-fertilizer.htm

[5] MARTEY, E. (2018). Welfare effect of organic fertilizer use in Ghana. *Heliyon*, 4(10), E00844. https://doi.org/10.1016/j.heliyon.2018.e00844

[6] MBA SKOOL TEAM. (2015). *Value Added Analysis - Meaning & Definition.* Retrieved from https://www.mbaskool.com/business-concepts/marketing-and-strategy-terms/12704-value-added-analysis.html

[7] NOVRA, A., & FATATI. (2021). How to Predict the Impact of the Smallholder Oil Palm Replanting Program on Households and Regional Economy? *Asian Journal of Social Science and Management Technology,* 3(5), 32-43. Retrieved from http://ajssmt.com/Papers/353243.pdf

[8] NOVRA, A., ADRIANI, & FATATI. (2021a). Characteristics and Readiness of Oil Palm Households for Replanting Program: Is an Empowerment Program Needed? *Technium Journal*, 3(8), 110-125. http://dx.doi.org/10.47577/technium.v2021i1.4022

[9] NOVRA, A., ADRIANI, & FATATI. (2021b). Preparing households for the oil palm replanting Program: Is an empowerment program needed? *Journal of Southwest Jiaotong University*, 56(3), 179-195. https://doi.org/10.35741/issn.0258-2724.56.3.15

[10] NOVRA, A., ADRIANI, SUPARJO, NELSON, & NOVIANTI, S. (2019). Penguatan usaha kelompok peternak pelaku integrasi sawit-sapi berbasis limbah di Kecamatan Mestong. *Riau Journal of Empowerment*, 2(2), 43-54. https://doi.org/10.31258/raje.2.2.43-54

[11] NOVRA, A., SUPARJO, LATIF, A., & SYARIF, S. (2020). Pemulihan Ekonomi Rumah Tangga Perkebunan Sawit Rakyat Terkena Dampak Kebakaran Lahan dan Hutan. *Jurnal Abdimas Mahakam,* 4(1), 1-7. https://doi.org/10.24903/jam.v4i1.511

[12] REGANOLD, J.P., & WACHTER, J.M. (2016). Organic agriculture in the twenty-first century. *Nature Plants*, 2, 15221. http://dx.doi.org/10.1038/nplants.2015.221

[13] SAHM, H., SANDERS, J., NIEBERG, H., BEHRENS, G., KUHNERT, H., STROHM, R., & HAMM, U. (2013). Reversion from organic to conventional agriculture: A review. *Renewable Agriculture and Food Systems*, 28, 263–275. https://doi.org/10.1017/S1742170512000117

[14] SANDERS, J., GAMBELLI, D., LERNOUD, J., ORSINI, S., PADEL, S., STOLZE, M., WILLER, H., & ZANOLI, R. (2016). *Distribution of the added value of the organic food chain.* Braunschweig: Thünen Institute of Farm Economics.

[15] SAPINAS, I.P., & ABBOTT, L.K. (2020). Soil Fertility Management Based on Certified Organic Agriculture Standards – A Review. *Sustainable Agriculture Research,* 9(2), 1–16. https://doi.org/10.5539/sar.v9n2p1

[16] SEREBRENNIKOV, D., THORNE, F., KALLAS, Z., & MCCARTHY, S.N. (2020). Factors influencing adoption of sustainable farming practices in Europe: A systemic review of empirical literature. *Sustainability*, 12(22), 9719. https://doi.org/10.3390/su12229719

[17] SHAJI, H., CHANDRAN, V., & MATHEW, L. (2021). Chapter 13 - Organic fertilizers as a route to controlled release of nutrients. In: LEWU, F.B., VOLOVA, T., THOMAS, S., & RAKHIMOL, K.R. (eds.) *Controlled Release Fertilizers for Sustainable Agriculture.* Academic Press, pp. 231-245. https://doi.org/10.1016/B978-0-12-819555-0.00013-3

[18] SHEPHERD, M.A., RAYNS, F., & PRICE, P.N.

(2006). *Soil and nutrient management on organic farms.* Department for Environment, Food and Rural Affairs, United Kingdom. http://dx.doi.org/10.13140/2.1.3331.9684

[19] SINGH, R.P. (2012). *Organic Fertilizers: Types, Production and Environmental Impact*. New York: Nova Science Inc.

[20] SUDIYONO, A. (2004). *Agricultural Marketing.* Malang: Muhammadiyah University of Malang.

[21] SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION. (2003). *Economics of organic production: Transitioning to organic production.*

[22] TU, C., RISTAINO, J.B., & HU, S. (2006). Soil microbial biomass and activity in organic tomato farming systems: Effects of organic inputs and straw mulching. *Soil Biology and Biochemistry,* 38(2), 247-255. https://doi.org/10.1016/j.soilbio.2005.05.002

参考文:

[1] ARACHCHIGE, U.S.P.R., RANAWEERA, S.J., AMPEMOHOTTI, A.A.L.T., WELIWATHAGE, S.R.G., SIRIWARDENA, M.B.D.K, & WEERAKOON, J. (2020)。开发有机肥。研究技术与工程杂志，1（1），1-7。取自 https://www.jrte.org/2020/01/25/development-of-an-organic-counter

[2] DE COCK, L., DESSEIN, J., & DE KROM, M.P.（2016 年）。了解法兰德斯（比利时）有机农业的发展：一种话语分析方法。美国国家航空航天局：瓦赫宁根生命科学杂志，79（1），1-10。https://doi.org/10.1016/j.njas.2016.04.002

[3] FESS, T.L. 和 BENEDITO, V.A.（2018 年）。有机与传统种植可持续性：比较系统分析。可持续性，10（1），272。http://dx.doi.org/10.3390/su10010272

[4] LORUM, D. (2022)。园艺诀窍：长效肥料：何时使用缓释肥料。取自 https://www.gardeningknowhow.com/garden-how-to/soil-ferters/what-is-slow-release-fertiler.htm

[5] 马蒂，E.（2018 年）。加纳有机肥使用的福利效应。赫利昂，4（10），E00844。https://doi.org/10.1016/j.heliyon.2018.e00844

[6] 工商管理硕士斯库尔团队。（2015 年）。增值分析 - 含义和定义。取自 https://www.mbaskool.com/business-concepts/marketing-and-strategy-terms/12704-value-added-analysis.html

[7] NOVRA, A., & FATATI。（2021 年）。如何预测小农油棕种植计划对家庭和区域经济的影响？亚洲社会科学与管理技术杂志，3(5)，32-43。取自 http://ajssmt.com/Papers/353243.pdf

[8] 诺瓦拉、A.、阿德里亚尼和法塔蒂。（2021 一个）。油棕家庭重新种植计划的特点和准备情况：是否需要授权计划？技术杂志，3（8），110-125。http://dx.doi.org/10.47577/technium.v2021i1.4022

[9] 诺瓦拉、A.、阿德里亚尼和法塔蒂。（2021b）。让家庭为油棕再植计划做好准备：是否需要授权计划？西南交通大学学报，56(3), 179-195. https://doi.org/10.35741/issn.0258-2724.56.3.15

[10] NOVRA, A., ADRIANI, SUPARJO, NELSON, & NOVIANTI, S. (2019)。加强麦通区废旧棕牛一体化农户业务。廖内赋权杂志，2（2），43-54。https://doi.org/10.31258/raje.2.2.43-54

[11] NOVRA, A., SUPARJO, LATIF, A., & SYARIF, S. (2020)。受土地和森林火灾影响的家庭油棕种植园的经济复苏。期刊阿卜迪马斯·马哈坎，4（1），1-7。https://doi.org/10.24903/jam.v4i1.511

[12] REGANOLD, J.P. 和 WACHTER, J.M. (2016)。二十一世纪的有机农业。自然植物，2，15221。http://dx.doi.org/10.1038/nplants.2015.221

[13] SAHM, H., SANDERS, J., NIEBERG, H., BEHRENS, G., KUHNERT, H., STROHM, R., & HAMM, U. (2013)。从有机农业转向传统农业：回顾。可再生农业和粮食系统，28, 263–275。https://doi.org/10.1017/S1742170512000117

[14] SANDERS, J., GAMBELLI, D., LERNOUD, J., ORSINI, S., PADEL, S., STOLZE, M., WILLER, H., & ZANOLI, R. (2016)。分配有机食物链的附加值。不伦瑞克：图嫩农业经济研究所。

[15] SAPINAS, I.P. 和 雅培, L.K.（2020 年）。基于有机农业认证标准的土壤肥力管理——回顾。可持续农业研究，9(2)，1-16。https://doi.org/10.5539/sar.v9n2p1

[16] SEREBRENNIKOV, D., THORNE, F., KALLAS, Z., & MCCARTHY, S.N.（2020 年）。影响欧洲采用可持续农业实践的因素：实证文献的系统回顾。可持续性，12（22），9719。https://doi.org/10.3390/su12229719

[17] SHAJI, H.、CHANDRAN, V. 和 MATHEW, L. (2021)。第 13 章 - 有机肥料作为一种受控释放养分的途径。在：LEWU, F.B., VOLOVA, T., THOMAS, S., & RAKHIMOL, K.R. (编辑。) 可持续农业的控释肥料。学术出版社，第 231-245 页。https://doi.org/10.1016/B978-0-12-819555-0.00013-3

[18] SHEPHERD, M.A., RAYNS, F., & PRICE, P.N.（2006 年）。有机农场的土壤和养分管理。英国环境、食品和农村事务部。http://dx.doi.org/10.13140/2.1.3331.9684

[19] SINGH, R.P. (2012)。有机肥料：类型、生产和环境影响。纽约：新星科学公司。

[20] SUDYONO，A.（2004 年）。农业营销。玛琅：玛琅穆罕默迪亚大学。

[21] 可持续农业研究和教育。（2003 年）。有机生产经济学：向有机生产过渡。

[22] TU, C., RISTAINO, J.B., & HU, S. (2006)。有机番茄种植系统中的土壤微生物生物量和活性：有机投入和秸秆覆盖的影响。土壤生物学和生物化学，38（2），247-255。https://doi.org/10.1016/j.soilbio.2005.05.002