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DECISION MAKING OF OIL PALM FARMERS IN CHOOSING REJUVENATION PARTNERS IN SIAK DISTRICT

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Abstract: Smallholder oil palm plantations in Riau have reached their economic age (25 years), resulting in decreased plantation productivity. One alternative to overcome this problem is oil palm rejuvenation (OPR). In implementing oil palm rejuvenation, there are two prominent partner institutions, the Village Unit Cooperative (VUC) and the Nucleus Estate-Smallholding (NES). As the main actors, farmers are in the position to choose partner institutions for oil palm rejuvenation. The purpose of this study was to find out the differences between the oil palm rejuvenation technology packages carried out by VUC and NES, and to identify the factors that influence farmers' decisions in choosing an oil palm rejuvenation partner institution. This research was conducted in the Kerinci Kanan District, Siak Regency. The data analysis used was descriptive and binary logistic regression. The technology packages carried out by VUC and NES partners have several differences, including types of seeds, number of plants per hectare, spacing, production potential, BPDPKS support, amount of interest paid, OPR budget plan, and sources of funds. The factors that influence farmers' decision-making in choosing OPR institutional partners are farmers' perceptions of income, the presence of extension services, and rights and obligations. Counseling plays an important role in establishing partnerships, by transferring technology to farmers so that the technology package implemented can increase the productivity and quality of oil palm.

Keywords: decision, NES partners, VUC partners, rejuvenation

Abstrak: *Perkebunan kelapa sawit rakyat di Riau sudah mencapai umur ekonomis (25 tahun) sehingga produktivitas menurun. Salah satu alternatif menghadapi permasalahan tersebut dilakukan peremajaan kelapa sawit (PKS). Pelaksanaan peremajaan kelapa sawit terdapat 2 model lembaga mitra yaitu mitra koperasi unit desa (KUD) dan inti-plasma (PIR). Petani sebagai pelaku utama memiliki peran pengambilan keputusan dalam memilih lembaga mitra peremajaan kelapa sawit. Tujuan dari penelitian ini adalah untuk mengetahui perbedaan antara paket teknologi peremajaan kelapa sawit yang dilakukan oleh mitra KUD dan PIR dan mengetahui faktor-faktor yang memengaruhi keputusan petani dalam memilih lembaga mitra peremajaan kelapa sawit. Penelitian ini dilakukan di Kecamatan Kerinci Kanan Kabupaten Siak yang ditentukan secara purposive. Analisis data yang digunakan adalah deskriptif dan regresi binary logistik. Paket teknologi yang dilakukan mitra KUD dan PIR terdapat perbedaan diantaranya jenis bibit, jumlah tanaman/ha, jarak tanam, potensi produksi, dukungan BPDPKS, besaran bunga yang ditanggung, RAB PKS, dan sumber biaya. Faktor - faktor yang memengaruhi pengambilan keputusan petani memilih mitra lembaga PKS adalah persepsi pendapatan petani, kehadiran penyuluhan, serta hak dan kewajiban. Penyuluhan memiliki peranan penting dalam menjalin kemitraan yakni, melakukan transfer teknologi kepada petani sehingga paket teknologi yang dilakukan dapat meningkatkan produktivitas dan kualitas kelapa sawit.*

Kata kunci: *keputusan, Mitra PIR, Mitra KUD, Peremajaan*

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INTRODUCTION

Oil palm is a plantation commodity that plays an important role in earning foreign exchange for the country. According to Ditjenbun (2021), the country's foreign exchange earnings can be seen from the value of commodity exports, with the total value of oil palm exports reaching US$ 18.73 billion in 2020. Since 2006, Indonesia has played a key role as a supplier of vegetable oil to the world. On the other hand, the oil palm commodity has a strategic role in employment, increasing people's welfare, regional development, technology transfer, investment inflows, and as a reliable source of revenue for both regional and central government (Kementerian Perindustrian, 2021).

Riau Province is an area with the largest oil palm plantation area in Indonesia, reaching 2.5 million hectares. Most of the oil palm plantations in Riau are cultivated by smallholders, which accounts for 1.76 million hectares (61.57%). Private plantations cultivate 1.02 million hectares (35.81%), and 0.08 million hectares (2.63%) are cultivated by large state plantations (PBN) (BPS, 2020). Based on these data, smallholder plantations in Riau play a vital role in the total area.

Oil palm plants have an economic age of around 25 years, causing productivity to decrease to around 10 tonnes/ha/year (Permentan, 2016). Oil palm plantations in Riau have passed an economic age ranging from 29-30 years. One of the government policies to develop people's palm oil businesses in a sustainable manner is oil palm rejuvenation (OPR). According to Suroso et al. (2020), the rejuvenation of smallholder plantations is needed to improve productivity, which generally has decreased. Support for the development of oil palm plantations is provided through Badan Pengelola Dana Perkebunan Kelapa Sawit (BPDPKS) to farmers who are members of farmer groups, combined farmer groups, cooperatives, and other planter organizations (Arman and Achmad, 2018). BPDPKS is a work unit in the form of Badan Layanan Umum (BLU) under Kementerian Keuangan Republik Indonesia. BPDPKS is responsible for collecting, managing, administering, storing, and distributing oil palm plantation funds (BPDPKS, 2019).

Partnership is one of the government policies through UU No. 18 Tahun 2004 concerning plantations, which recommends that oil palm plantations partner with nucleus-plasma with the aim of optimizing economic growth and community welfare (Suparjan and An, 2020). According to Suharno et al. (2015), there are two oil palm rejuvenation partnerships, namely cooperative partnerships and plasma partnerships managed by companies. OPR partner institutions in Kerinci Kanan District, Siak Regency, are VUC (Village Unit Cooperative) and NES (Nucleus Estate-Smallholder). Farmers play a role as decision-makers in determining the partner institution to be selected. In this study, the farmer's decision-making process to select partner institutions is influenced by several environmental factors, including the farmer's age, education level, the presence of technical counseling, rights and obligations, market guarantees, perceptions of production potential, and perceptions of increased farm income. This study aims to 1) find out the differences in the technology packages implemented by VUC and NES partners, 2) find out the factors that influence farmers in choosing OPR partner institutions. The aim of this research is different from Arman and Achmad's (2018) which aims to examine the factors that influence farmers' decision-making in oil palm rejuvenation programs.

Decision making is the process of choosing or determining various possibilities among uncertain situations (Fitriana et al. 2022). Rogers (2003) stated that the decision-making process consists of four stages, namely recognition, persuasion, decision, and confirmation. Factors that influence the decision-making process include age, farming area, income, education, economic environment, and social environment (Soekartawi, 1988). According to Fitriana et al. (2022), farmers' decision-making factors are influenced by environmental factors, including social, cultural, economic behavior, and behavior from rural community life. Oil palm plants that have reached economic age need to be rejuvenated. Rejuvenation is an effort to develop plantations by replacing old or unproductive plants with new plants, both as a whole and in stages (Permentan, 2016).

Most of the oil palm plantation partnerships are of the nucleus-plasma pattern. With oil palm rejuvenation activities, the partnership pattern is automatically broken, so that other partnership patterns appear, such as village unit cooperative partners and independent partners. Farmers play a role as decision-makers in

choosing partner institutions for oil palm rejuvenation. This research was conducted to determine farmers' decisions in choosing partner institutions and the factors that influence farmers' decision-making in choosing partner institutions for oil palm rejuvenation.

METHODS

The research location was chosen purposively, namely in the Buana Bakti and Buatan Baru Villages, Kerinci Kanan District, Siak Regency. The two villages were chosen because they are currently implementing Oil Palm Rejuvenation (OPR) with VUC and NES partners. The study was conducted in September-October 2022, and data was collected through interviews using both primary and secondary data. This study uses both quantitative and qualitative data. The sampling method for VUC partners was a census with a total of 31 respondents, while NES partners were chosen randomly with a total of 57 respondents.

Differences in OPR technology packages implemented by VUC and NES partners were analyzed descriptively using qualitative data. Meanwhile, several factors that are thought to influence the decision to choose partner institutions, including market guarantees, perceptions of production potential, perceptions of increased income, the presence of technical counseling, and rights and obligations, were measured using a Likert scale ranging from 1 to 5. The Likert scale used is described as follows: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. Furthermore, some of these factors were tested using binary logistic regression analysis. The regression model is as in the following equation:

$$Y = \ln(P/(1-Pi)) = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \beta 7X7 + e$$

Y = ln (P/(1-Pi)) represents the farmer's decision to choose VUC partners (0) or NES partners (1). β0 is a constant, while X1 represents market guarantee, X2 represents perception of production potential, X3 represents perception of increased income, X4 represents the presence of technical extension workers, X5 represents rights and obligations, X6 represents farmer's age (in years), and X7 represents level of education (in years).

To determine the accuracy of the model and test the hypothesis on the binary logistic regression model, several stages are involved. The first stage is a simultaneous significant test conducted to determine whether all the independent variables in the model together have a significant effect on the dependent variable. The test used is the G-test (Likelihood Ratio Test). The second stage involves interpreting the relationship between the independent variables and the dependent variable. Logit begins by converting probabilities into odds. The third stage is the model suitability test, which is carried out to determine whether the hypothesized model is consistent with the data so that the model can be considered fit. The logistic regression model's fitness was assessed using Hosmer and Lemeshow's Goodness of Fit Test, which is measured by the Chi-square value.

The framework of this research explains the partnership process in oil palm rejuvenation activities, and there are several variables that influence farmers' decisions in choosing partner institutions (Figure 1). According to the research by Munirudin et al. (2020) and Perwitasari et al. (2021), age influences farmers' decisions in partnering, while Arman and Achmad (2018) found that age, education, and extension activities are factors that influence farmers' decisions on oil palm rejuvenation programs. Market guarantee factors were also found to influence farmers' decisions to switch partnerships in farming according to Agiesta et al. (2017).

RESULTS

Characteristics of VUC Partner Farmers and NES Partners Based on Age and Gender

Age is a person's life time from birth to the present and is expressed in years. Age can affect the performance of a farmer. This is because age development can affect a person's thinking and ability to work (Thamrin et al. 2012). In addition, age influences farming decision making (Hasyim, 2006). The majority of oil palm farmers, both VUC partners and NES partners, are of productive age and are male. The average age of VUC partner oil palm farmers is 52 years, with the youngest being 24 years old and the oldest being 73 years old. While the average age of NES partner oil palm farmers is 53 years, the youngest is 22 years old and the oldest is 79 years old. A person's productive age is in the age range of 15-60 years. The condition of farmers who

are dominated by productive age illustrates that this condition has the opportunity for good farmer work productivity, so that they are able to develop their farming business more optimally. Productive age is the most appropriate time for work activities such as farming, as individuals are physically fit and highly motivated. Characteristics of oil palm farmers partners of VUC and NES based on age and gender in Table 1.

Characteristics of VUC Partner Farmers and NES Partners Based on Education Level

All oil palm farmers, including both VUC and NES partners who were used as research samples, had attended formal education. The majority of oil palm farmers have completed elementary school, with 48.39% of VUC partners and 75.44% of NES partners at this level. In the case of VUC partners, several farmers did not complete their elementary education (Table 2). Conversely, all NES partner farmers who participated in the study had completed their formal education, which is known as a people's school. Thus, it can be observed that oil palm smallholders who are VUC and NES partners have a relatively low level of education. The level of education affects a person's skills and ability to acquire information (Khanal et al. 2020). Additionally, the level of education will influence decision-making processes when adopting new innovations aimed at enhancing farming activities. This is due to the farmers' limited knowledge and insight (Lubis, 2000).

Characteristics of VUC Partner Farmers and NES Partners Based on Land Area Concession and Oil Palm Rejuvenation Land Area

The cultivated land area is the primary component of farming. This section discusses the land area owned by oil palm farmers, as well as the replanted land area. Based on Table 3, the majority of oil palm farmers, including both VUC and NES partners, own more than 2 hectares of land. Jelsma and George (2016) suggest that land ownership for middle-class farmers ranges from 3.1 to 15 hectares. Therefore, it can be concluded that oil palm farmers, including both VUC and NES partners, belong to the middle-class farmer category.

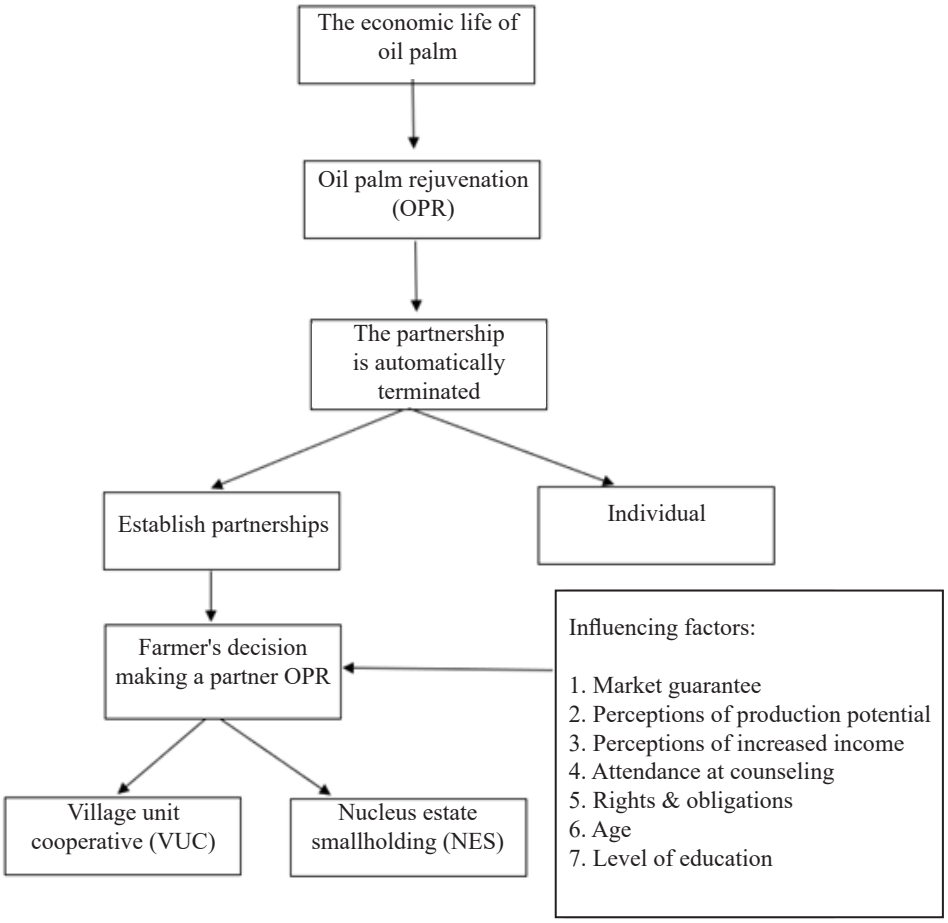

Figure 1. Framework

Table 1. Characteristics of oil palm farmers partners of VUC and NES based on age and gender

Age (Years)	VUC		(%) Percentage	NES		(%) Percentage
	Gender			Gender		
	Male	Female		Male	Female	
20 – 30	3	0	9.68	1	0	1.75
31 – 40	1	0	3.23	3	0	5.26
41 – 50	4	0	12.9	10	3	22.81
51 – 60	9	9	58.06	24	9	57.9
>60	5	0	16.13	7	0	12.28
Total	22	9	100.00	45	12	100.00

Table 2. Characteristics of oil palm smallholders VUC and NES partners based on education level

Education (Years)	VUC		NES	
	Amount	Percentage (%)	Amount	Percentage (%)
<6	4	12.90	0	0
7 – 9	15	48.39	43	75.44
10 – 12	9	29.03	8	14.03
>12	3	9.68	6	10.53
Total	31	100.00	57	100.00

Table 3. Characteristics of oil palm smallholders VUC and NES partners based on palm oil land area concession

Land area concession category (ha)	VUC		NES	
	Amount	Percentage (%)	Amount	Percentage (%)
0 – 3	12	38.71	22	38.6
3.1 – 15	18	58.06	34	59.65
>15	1	3.23	1	1.75
Total	31	100.00	57	100.00

Table 4 indicates that the majority of oil palm smallholders, including both VUC and NES partners, are replanting with a land area of 2 hectares. This can be attributed to several factors, such as the implementation of the first rejuvenation program, the continued production of existing oil palm plants, and insufficient replanting funds. However, some farmers rejuvenate more than 2 hectares of land because their current land is no longer productive.

Oil Palm Plantation Rejuvenation Partnership

Partnership is collaboration in running an agricultural system with various parties, namely between the private sector and the government and carried out by farmers (Hamyana et al. 2021). The Nucleus Estate Smallholder (NES) partnership requires the Village Unit Cooperative (VUC) to act as an intermediary between the nucleus and plasma. On the other hand, VUC plasma partnerships conduct farming through self-management while partnering with other parties for supervision and technical management of cultivation (Wildayana et al. 2019).

This research was conducted at a VUC previously guided by PT Asian Agri. VUC plays a critical role in bridging the interests of the core company and plasma farmers, as well as enhancing the welfare of its members. The total area of land fostered by each VUC varies; Mitra Usaha VUC manages 1200 hectares, while Bhakti Mandiri VUC manages 980 hectares. The type of business undertaken is plasma plantation business, which is a smallholder business that obtains land from government land reserves, plantation companies, community gardens, or smallholders who receive facilities from plantation companies to develop their plantations. Currently, the oil palm plasma plantations are entering the rejuvenation stage as they are technically unproductive (Permentan, 2016).

Table 4. Characteristics of oil palm farmers partners of VUC and NES based on oil palm rejuvenation land area

Land area (ha)	VUC		NES	
	Amount	Percentage (%)	Amount	Percentage (%)
2	22	70.97	47	82.46
4	4	12.91	10	17.54
5	2	6.45	0	0
6	3	9.67	0	0
Total	31	100.00	57	100.00

The partnership between the nucleus and plasma of oil palm plantations ends with the economic life of the plants. At this point, farmers play a crucial role in deciding whether to establish cooperation with available partner institutions, which include VUC partners and NES partners. NES partners require a joint agreement between farmers, VUC, and core parties (companies). VUC Mitra Usaha did not reach a mutual agreement in establishing cooperation with nucleus-plasma partners (NES). In contrast, VUC Bhakti Mandiri agreed to partner again with the core company. However, the decision to establish OPR partnership cooperation ultimately rests with the farmers, regardless of any differences in agreement.

The reasons for VUC Mitra Usaha's failure to reach an agreement with the company were the high costs of replanting and the use of various seeds. Additionally, VUC argued that people's business loans/bank credits were imposed in the first year, even though the money would be used in the second and third years. This placed a burden on farmers as loan interest continues and is deferred to them. VUC Mitra Usaha provided an alternative in running the OPR program, which involved self-management and partnering with several parties. In the initial management stage, the partnership was with the Kubu Raya Company. The process of disbursing funds was partnered with Bank Riau, and cultivation techniques were assisted by APASINDO (Asosiasi Petani Kelapa Sawit Indonesia).

Differences between the Oil Palm Rejuvenation Technology Packages carried out by VUC Partners and NES Partners

The technology package is a series of plant cultivation technologies that can be applied to farming (Manalu et al. 2012). Research by Hidayati et al. (2016) on the application of oil palm cultivation technology in plantation revitalization includes the use of watering technology and sprinklers, fertilization technology, and soil destruction technology, which have an effect on increasing productivity. In this study, the technology packages implemented by VUC and NES partners have several differences (Table 5). The types of plant seeds used are different; NES partners use topaz seeds, which are the result of a combination of seed sources from various countries. Four varieties are produced, namely topaz 1, topaz 2, topaz 3, and topaz 4. The advantage of topaz seeds is that they have the ability to adapt to land conditions and yield high productivity. The potential for FFB (fresh fruit bunch) production reaches 40.5 tons of FFB/ha/year with intensive care (Asianagri, 2022). This is different from the seeds used by VUC partners, namely the DxP PPKS 540 or Marihat variety. The DxP PPKS 540 variety is a cross between Dura Deli PA 131 D self/TI 221 D x GB 30 D with pure SP540T pisifera parents. The superior characteristics of this variety are quick starter and a very high percentage of mesocarp per fruit (88 – 90%). The potential for FFB production reaches 35 tons of FFB/ha/year with intensive care (Iopri, 2022). The spacing of the two types of seeds is different. For the topaz type, the spacing is closer together because it has short fronds, while the marihat type is wider and has long fronds.

The two partner institutions in this study received BPDPKS support with different amounts, namely NES partners received IDR25,000,000/ha while VUC partners received IDR30,000,000/ha. Meanwhile, the budget plan OPR for NES partners is IDR61,000,000/ha and VUC partners is IDR57,000,000/ha. The source of farmers' costs is obtained from bank loans (credit) for NES partners, while VUC partners are VUC loans or personal costs of farmers' savings. If you have bank credit, you have to pay interest according to the contract. All farmers who join NES partners apply for bank loans and must pay bank interest for 4 years, which is IDR17,080,000. Therefore, the total OPR cost is IDR78,080,000/ha. While most of the VUC partner farmers did not take loans, only 5 people took loans from VUC, and the interest rate was 13.2% per year

for 2 years. The amount of interest paid by farmers is IDR15,048,000/ha. Therefore, the total OPR cost is IDR72,048,000/ha. When viewed from the total cost with the number of plants/ha, it can be seen that the cost of one oil palm plantation for NES partners is IDR546,013 compared to VUC partners, which is IDR545,818. According to Khanal et al. (2020), the difference in price is one of the driving factors in establishing partners. Differences in technology packages implemented by VUC and NES partners in the oil palm rejuvenation program in Table 5.

OPR Cost Differences between VUC Partner Institutions and NES Partners

The results of the study indicate that there are differences in cost grouping between VUC and NES partners. Additionally, there are similarities that can be classified into two cost components, namely direct costs and indirect costs. The oil palm rejuvenation system employed is simultaneous collapse, which involves felling the old plants as a whole and replacing them with young plants. The felling activities are usually referred to as land preparation or P-0. The P-0 activities include measuring and staking the terraces, felling, chipping, digging the stump, rump-making, plowing the land, making planting holes, distributing seeds to the planting holes, applying basic fertilizer, and constructing roads and bridges. These activities are part of good oil palm management practices (Good Agriculture Practices/GAP), which are one of the ISPO (Indonesian Sustainable Palm Oil) assessment components. Table 6 shows that the direct costs for VUC partners are higher by IDR23,830,903 compared to those for NES partners by IDR22,268,148. This is because the distance between the land rejuvenation carried out by VUC partners is not close to each other, unlike the case with NES partners where the land is close together. Meanwhile, the indirect costs for VUC partners, namely IDR390,625, were lower than those for NES partners, which were IDR1,501,842.

Table 5. Differences in technology packages implemented by VUC and NES partners in the oil palm rejuvenation program

	VUC	NES
Seed varieties	Marihat	Topaz
Number of plants	132 trees/ha	143 trees/ha
Production potential	35ton FFB/ha/year	40.5ton FFB/ha/year
Planting distance	8.3 x 9.09 m	9.03 x 7.62 m
BPDPKS	IDR30,000,000/ha	IDR25,000,000/ha
OPR budget plan	IDR57,000,000/ha	IDR61,000,000/ha
Bank interest rate	13.2%/year	7%/year
Sale of FFB	Still in the process of submission by VUC	Asian Agri
Source of fund	BPDPKS + Farmer savings	
BPDPKS + VUC loan	BPDPKS + Kredit Usaha Rakyat (KUR)	

Table 6. Comparison OPR cost of VUC and NES

Year	Partners	Direct cost (IDR)	Indirect cost (IDR)	Total cost (IDR)
P-0	VUC	23,830,903	390,625	24,221,529
	NES	22,268,148	1,501,842	24,169,990
P-1	VUC	8,483,641	781,250	9,264,891
	NES	8,599,080	1,888,989	10,488,069
P-2	VUC	9,578,146	781,250	10,359,396
	NES	10,366,049	2,137,135	12,503,184
P-3	VUC	12,372,933	781,250	13,154,183
	NES	11,711,125	2,260,884	13,972,009

The treatment in the 1st and 2nd years includes fertilization consisting of dolomite, RP (rock phosphate), urea, MOP (Muriate of Potash), and borax fertilizers. In addition, maintenance activities for the 1st year include controlling pests and weeds, and inserting oil palm plants. The direct costs for P-1 and P-2 years for NES partners are higher than those for VUC partners (Table 6). This is because the number of plants differs; NES partners have 143 trees/ha, while VUC partners have 132 trees/ha. The results of the interviews indicate that there are differences in treatment regarding the prevention of pests such as beetles. NES partners are very intensive in preventing beetles in P-1 and P-2 years, while VUC partners are less intensive. Meanwhile, the indirect costs for P-1 and P-2 years for NES partners are higher than those for VUC partners.

The description of the 3rd maintenance activities is almost the same as for the 1st and 2nd years, namely fertilizing, pest and weed control, disposal of generative products (castration), and harvesting. The direct costs for the P-3 year of NES partners are lower, namely IDR11,711,125 compared to VUC partners of IDR12,372,933. In contrast, the indirect costs for NES partners are higher, namely IDR2,260,884, while VUC partners are IDR781,250.

Factors Influencing Farmers' Decisions in Choosing Partner Institutions for Oil Palm Rejuvenation in Kerinci Kanan District, Siak Regency

The decision-making process in choosing partners for OPR activities is influenced by several factors. The analysis used to determine which factors influence the decision-making process can use binary logistic regression (Table 7). The farmers' decision-making in selecting partners is divided into two categories: category 0, which means VUC partner, and category 1, which means NES partner. From the results of the binary logistic regression analysis, the following equation is obtained:

$$g(x) = \ln -48{,}7278 + 0{,}1287X_1 + 0{,}1185X_2 + 1{,}1671X_3 + 0{,}9033X_4 + 0{,}3716X_5 + 0{,}0478X_6 + 0{,}0087X_7 + e$$

The analysis results show that the model used is appropriate to explain the dependent variable. This can be seen in the Hosmer and Lemeshow probability value, which is 1.0000, greater than α, indicating that H0 failed to be rejected. The statistical LR probability value of 0.0000 is smaller than the 1% alpha, so H0 is rejected, meaning that the independent variables used jointly influence decision-making in selecting OPR partner institutions. The magnitude of the variation in the dependent variable in the model is indicated by the Pseudo R2 value. The Pseudo R2 value of 0.7022 suggests that 70.22% of the variation in the dependent variable at the level of decision-making in choosing a partner for oil palm rejuvenation can be explained by the variables in the model. The remaining 29.78% is explained by other variables not in the model.

The influence of independent variables on decision-making is determined by the significance value of z. If the z significance value is less than alpha (1%, 5%, and 10%), it indicates that the independent variable has a partial effect on the dependent variable. Variables that influence decision-making include counseling, market guarantees, rights & obligations, and perceptions of increased income. Explanation of the influence of each variable on the decision making of selecting an OPR partner institution is as follows:

Constant

The constant value obtained is -48.7278, which means that even when all other independent variables are considered non-existent or have a value of zero (0), the magnitude of the farmer's decision-making value to choose an OPR partner institution would still be -48.7278. The results show a significance value of 0.004, which is smaller than $\alpha = 0.01$, indicating that the constant value significantly influences farmers' decision making in choosing OPR partner institutions.

Market Guarantee

The significance value of the market guarantee variable is 0.620, which is greater than α=10%, so H0 fails to be rejected, meaning that the market guarantee variable does not have a significant effect on farmers' decision-making in choosing OPR partners. This is in contrast to the findings of Fidyansari's research (2016) and Purnaningsih's research (2007), which suggest that market guarantees are a significant factor that influences partnerships between farmers and institutions. The difference in results may be due to some VUC partner farmers finding it easy to sell their fresh fruit bunches (FFB) to buyers or middlemen at competitive prices. The regression coefficient of the market guarantee variable is 0.13 with a positive sign. The odds ratio

value is 1.14, meaning that every increase of 1 unit of the market guarantee variable will increase the probability of a farmer's decision to choose a NES partner in OPR activities by 1.14. Additionally, the market guarantee variable has a marginal effect value of 0.00804, indicating that each additional market guarantee unit increases the possibility of choosing a NES partner by 0.804%. Farmers who form NES partnerships do not need to search for partners to sell their FFB as it is their obligation to deliver all of their produce to the core company.

Perception of Production Potential

The perception of production potential is the farmer's response to the yield or FFB that can be obtained. In this study, there were two different varieties of seeds, namely Marihat and Topaz. The z significance value is 0.484, which is greater than α = 10%. Therefore, H0 fails to be rejected, meaning that there is no significant influence on decision making in selecting OPR partner institutions (refer to Table 7). The coefficient value shows a positive sign of hope, which is equal to 0.12. Meanwhile, the odds ratio is 1.13, indicating that every one unit increase in the perceived production potential variable will increase the probability of a farmer's decision to choose a NES partner in OPR activities by 1.13 times. This is supported by the potential for higher Topaz seed production of 40.5 tonnes FFB/ha/year. On the other hand, some farmers still choose Marihat seeds due to considerations of the fertilizer used. Farmers state that the high production yields are offset by the use of fertilizers. Increasing fertilizer prices are a consideration for farmers in selecting seeds used by partner institutions. The marginal effect value is 0.00741, indicating that for every additional unit of perception of production potential, the possibility of farmers choosing NES partners will increase by 0.741%.

Perceived Income Increase

The perceived increase in income variable has a significance value of 0.003 less than alpha 1%, so H0 is rejected, meaning that the perceived increase in income has a partially significant effect on farmers' decision making in choosing OPR partners, as shown in Table 6.12. The coefficient value shows a positive sign of 1.1671. Furthermore, the odds ratio value is 3.21, which indicates that every 1 unit increase in the perception of an increase in income will increase the probability of a farmer's decision to choose a NES partner in the OPR program by 3.21 times higher. These results are consistent with the research of Yulistiono and Hapsari (2019), which shows that an increase in income will influence farmers' partnership decisions. The marginal effect value of the perceived increase in income variable is 0.0729, indicating that for each additional unit of perception of an increase in income, the likelihood of farmers choosing NES partners will increase by 7.29%.

Table 7. The results of binary logistic regression analysis

Independent Variabel	Hope sign	Regression Coefficient	Dy/dx (%)	Sig	Odds Ratio
Constant		-48.7278		0.004	6.88e-22
X1 Market Guarantee	+	0.1287 ns	0.804	0.620	1.14
X2 Perception of Production Potential	+	0.1185 ns	0.741	0.484	1.13
X3 Perceived Income Increase	+	1.1671**	7.294	0.003	3.21
X4Attendance of Technical Counseling	+	0.9033**	5.645	0.009	2.47
X5 Rights and obligations	+	0.3716*	2.322	0.023	1.45
X6 Age	-	0.0478ns	0.299	0.295	0.95
X7 Education	+	0.0087ns	0.0544	0.941	1.01
Pseudo/Mc Fadden R2					0.7022
LR Statistic					80.19
Prob LR Statistic					0.0000
H-L Statistic					39.33
Prob Hosmer and Lemeshow Test					1.0000

Note: ** correlation is significant at the 0.01 level; *correlation is significant at the 0.05 level; ns (not significant)

Attendance of Technical Counseling

The presence of technical counseling has a significance value of 0.009, which indicates that H0 is rejected (<0.1). This shows that the presence of technical counseling partially has a significant effect on the decision-making of selecting an OPR partner institution with a 99% confidence level. While the coefficient for the presence of technical counseling has a positive expectation value of 0.9033 and an odds ratio value of 2.47, meaning that every 1 unit increase in the attendance score for technical counseling will increase the probability of farmers choosing NES partners by 2.47 times. The marginal effect value of the attendance variable for technical counseling is 0.0565, indicating that each additional unit of attendance for technical counseling increases the likelihood that farmers will choose NES partners by 5.65%. Technical counseling plays an important role in changing behavior and way of thinking when solving farming problems. This can increase production yields and enable farmers to adopt new technologies in agriculture (Fidyansari et al. 2016). The role of counseling and training can improve farmers' skills and abilities in implementing new innovations (Ahmad and Nasir 2020; Yuhendra et al. 2022). From the results of the interviews, it can be seen that NES partners often conduct technical counseling related to OPR activities either through VUC, farmer groups, or directly to farmers. Based on the results of the study, the more frequent counseling about OPR, the more farmers will tend to choose NES partners. In contrast, VUC partners provide little counseling about OPR activities.

Rights and obligations

The variables of rights and obligations have a confidence level of 95% with a z significance value of 0.023, indicating that they partially have a significant effect on farmers' decision-making in choosing OPR partner institutions. The regression coefficient value of rights and obligations is 0.37 with a positive sign. The odds ratio is 1.45, which means that a 1-unit increase in rights and obligations will increase the probability of a farmer's decision to choose a NES partner in OPR activities by 1.45 times. Rights and obligations in a partnership are mutually agreed upon by both actors, namely farmers and partner institutions. The rights identified in this study include the right to obtain capital from the government (BPDPKS), the right to obtain business capital, and the right to life insurance. Meanwhile, the obligations identified were the obligation to participate in the collection of plantation evaluation reports and the obligation to pay OPR costs installments. The marginal effect value of the rights and obligations variable is 0.02322, indicating that for every additional unit of rights and obligations, the likelihood of farmers choosing NES partners will increase by 2.32%.

Age

The age of oil palm farmers is currently dominated by farmers in the productive age range. The age variable has a significance value of 0.295, which is greater than α=10%, so H0 fails to be rejected. This shows that age has no significant partial effect on farmers' decision making in selecting OPR partners. The age variable has a negative coefficient value of 0.0478, which means that every time the farmer's age increases by 1 year, the probability of the farmer partnering with NES decreases. This is in accordance with Soekartawi's (1988) statement that relatively young farmers have a high curiosity, so they are more likely to adopt innovations even though they may be inexperienced. The odds ratio value for the age variable is 0.95, meaning that for every increase in farmer age, the probability of farmers choosing NES partners will decrease by 0.95 times. This result is because some farmers believe that with older age, they have more experience in farming oil palm that can be applied in the future. The value of the marginal effect of the age variable is 0.00299, indicating that if the farmer's age increases, the probability of choosing a NES partner increases by 0.299%.

Level of education

The level of education has a significance value of 0.941, which is greater than α = 10%. Therefore, H0 fails to be rejected, indicating that the level of education has no significant effect on farmers' decision-making in choosing OPR partners. The coefficient value for the positive education level is 0.0087, and the odds ratio is 1.01. This means that for every increase of 1 level in farmer education, the probability of the farmer choosing a NES partner in the OPR program increases by 1.01 times. The marginal effect value of the education level variable is 0.000544, indicating that for each additional level of farmer education, the probability of choosing a NES partner increases by 0.0544%. Mothersbaugh and Hawkins (2016) state that the level

of education influences ways of thinking, decision-making, preferences, and tastes. Additionally, the level of education affects livelihoods, and those with higher levels of education tend to work in the non-agricultural sector. Therefore, farming is often used as a side job, and farmers with higher education levels may choose more profitable and promising partners.

CONCLUSION AND RECOMMENDATIONS

Conclusions

There are differences in the technology packages offered by VUC and NES partners, including types of seeds, number of plants per hectare, spacing, production potential, BPDPKS support, amount of interest paid, budget plans for OPR, and sources of funds. Simultaneously, factors such as market guarantee, perceptions of production potential and increased income, attendance at counseling, rights and obligations, age, and level of education influence farmers' decisions in selecting OPR partner institutions. Variables that partially have a significant effect on farmers' decision making in selecting OPR partners are the availability of extension services, rights and obligations, and perceptions of increased income. Counseling plays an important role in establishing partnerships by transferring technology to farmers, thereby increasing the productivity and quality of oil palm.

Recommendations

It is necessary to increase awareness about management, partnership patterns, and procedures for oil palm rejuvenation activities related to the sustainability of natural resources and the environment. Farmers who plan to replant oil palm should engage in a partnership pattern.

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