Research Article

The Effect of Implementing 12/14 Day Harvest Rotation on FFB Production and Harvest Employee Income: Case Study at PT Nusaina Agro Kobi Manise

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ABSTRACT

The policy regarding crop rotation is relatively new. However, this policy is still being debated, because it is not yet known that a consistent harvest rotation pattern has a significant effect on harvest premiums, FFB production and harvest employee income at PT Nusaina Agro Kobi Manise. This research aims to analyze the effect of 12/14 day harvest rotation and harvest premiums on FFB production and harvest employee income. This research uses quantitative descriptive methods. Data were analyzed using SmartPLS 3.0 Software. The results of the research show the effect of implementing 12/14 day harvest rotation and harvest premiums on FFB production and harvest employee income. It is clear that implementing 12/14 day harvest rotation does not have a direct influence on FFB production and harvest employee income but the implementation of 12/14 day harvest rotation days have an indirect influence through harvest premiums on production and harvest employee income. The t-calculated path coefficient value of 12.140 is greater than the t-table value of 1.96 with a p-value of 0.00 which is smaller than 0.05 so that the variable implementing 12/14 day harvest rotation has a significant effect on the harvest premium variable. The specific indirect effect value of implementing a 12/14 day harvest rotation has an effect on the harvest premium and in turn has an effect on FFB production with a calculated t-value of 2.500 which is greater than the t-table value of 1.96 and with a p-value of 0.013 which is smaller than 0.05 so can be said to have a significant effect.

Keywords: *FFB production, Harvest employee income, Harvest premium, Harvest rotation*

Introduction

Palm oil (Córdoba, Selfa, Abrams, & Sombra, 2018)is one of commodity plantations that own role important in economy regional and national specifically in provision material food oil vegetable, acquisition foreign exchange, and provision field Work. Activity cultivation and industry coconut palm has give contribution For prosperity big for businessman as well as give livelihood employees and farmers involved in it such as on the islands of Sumatra, Kalimantan, Sulawesi including Maluku and

Papua, and the island of Java. The government also joined in enjoy increasing income from sector tax from sector plantation. Plantation area area coconut palm oil in 2018 amounted to 14.3 million hectare with total Crude Palm Oil (CPO) production of 42.9 million tons (BPS 2020).(Kenalemang-Palm & Eriksson, 2023; Savitri, Herlina, & Novijanto, 2021)

Total area and production coconut palm placing Indonesia as a producing and exporting country coconut palm largest in the world with The area reaches 14.8 million hectares and production of CPO and products its derivatives amounting to 48.3 million tons, with total exports approaching 32.2 million tonnes or 67% of total production in 2019. Export Value oil palm oil and its derivatives reaching US$ 16 billion in 2019 so put coconut palm as commodity plantations that provide donation biggest to foreign exchange compared to with commodity plantation others, even more big compared to contribution sector oil and gas (Kasan 2020). Apart from that, coconut palm give contribution to field Work amounting to 16.3 million workers, namely 4 million worker direct and 12.3 million worker No directly (Junaedi 2020; Sipayung 2020). Palm oil also provides contribution to resilience energy Because is material standard for industry *biofuel* (Sinaga and Tranggono 2020).(Tolvanen et al., 2020; Widiastuti, 2018)

PT Nusaina Agro Kobi Manise (PT NAKM) is moving company in the field plantation coconut palm oil in the Maluku islands. PT NAKM did cultivation coconut palm oil in Seram Utara Timur Kobi District, Central Maluku Regency, Maluku Province. This company has operate more less than 15 years since first operated in 2008. PT NAKM's plantation is at an altitude of 12.5-100 meters above sea level with type land

Inceptisols, Alfisols and Ultisols. Rainfall annual namely 1,600 mm/ yr up to 2,500 mm/ yr with type Zone D climate according to Oldeman . Total area gardens that have produce production or called producing plantations (TM) covering an area of 2,801.93 ha consisting of over 7 Afdeling with average productivity of 3 (three) years final of 10 tonnes/ha/ yr .

For reach optimal production and productivity, coconut plants cultivated palm oil influenced Lots factor, one among them is policy rotation harvest to come give impact on the production of fresh fruit bunches (FFB) obtained as well as income employee harvest. In activities harvest coconut palm, rotation harvest is very common heard Where understanding from rotation harvest is hose time (interval) between One treatment harvest with treatment harvest next in the same area stated in day . Rotation is time required between harvest last with harvest next at the same place (Zainuddin Rela et al., 2021; Zinngrebe et al., 2020)

Implementation rotation 12/14 harvest has been zoom out amount harvester required +/- 50 % of need compared to with rotation harvest 6/7. Additionally, for guard consistency power harvest in a way productivity The allowance per person and minimum attendance of ≥ 20 HK/ month are also enforced provision premium new harvest. Enforcement provision rotation 12/14 harvest expected add amount fruit ripe harvest in the field and premium harvest stimulate harvester For harvest more Lots fruit so that FFB production increases and of course amount income harvester every the month will too follow increase.

Based on description the show exists linkages between variable study. Framework draft study can depicted in a way simple that is as following ;
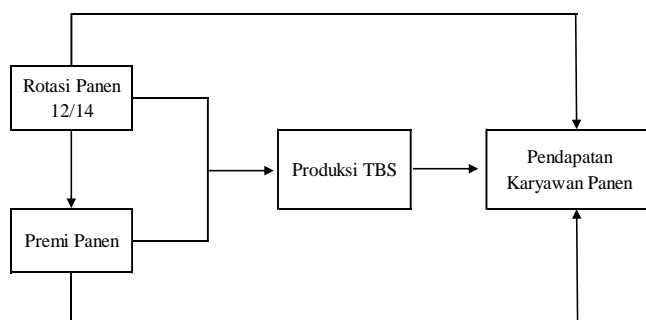

Figure 1. Framework Thinking Study

Framework the thoughts in figure 2.2 can be explained as following ;

1. Direction sign arrow from Rotation harvest 12/14 to direction income employee harvest It means rotation harvest influence income harvester.
2. Direction sign arrow of the harvest premium to direction income employee harvest It means rotation harvest influence income harvester.
3. Direction sign arrow up and over lower between rotation harvest 12/14 and premium harvest interpreted in a way together give influence to FFB production and FFB production produced influential to income employee harvest.
4. Direction sign arrow up and down lower between rotation harvest 12/14 and premium harvest interpreted in a way together give influence to income employee harvest.

As for the hypothesis in study This as following;

H1 = Rotation 12/14 harvest is influential real to premium FFB harvesting and production.

H2 = Rotation harvest and premium harvest influential real to income employee harvest.

H3 = Rotation harvest, premium FFB harvest and production are affected real to income employee harvest.

Methods

Place study This determined in a way deliberately (*purposively*) with consideration certain namely in the company plantation coconut PT Nusaina palm oil Agro Kobi (NAKM) which is located in Seram Utara Timur Kobi District, Central Maluku Regency with amount respondents as many as 88 special people power available harvesters.

Data analysis methods used in research This is using equation models 1632 education or structural equation modeling (SEM). The SEM method offers ability For analysis path (path analysis) (Ghozali , 2015). Analysis path used that is *partial least squares* (PLS) with using SmartPLS 3.0 software. This model is generation advanced from analysis regression multiple Because can do analysis for two or more dependent variables. The analysis carried out covers Outer model analysis, Inner model and Hypothesis Testing (Creswell, 2014; Getliffe, 2008)

Result and Discussion
Characteristics Respondent

Characteristics respondents in study This covers age, level education, length of service and monthly income. Characteristics This is distinguishing characteristic every respondents. Amount respondents used as many as 88 people harvest which is the total energy harvest at PT Nusaina Manise Kobi Agro .

Table 1. Characteristitcs Respondent

No	Variabel	Kriteria	Jumlah (Orang)	Persentase
a	b	c	d	e
1	Umur	< 30 thn	46	52%
		30-40 thn	25	28%
		40-50 thn	13	15%
		> 50 thn	4	5%
2	Pendidikan	SD/MI	35	40%
		SMP/MTsN	20	23%
		SMA/MA	32	36%
		Diploma/S1	1	1%
3	Masa Kerja	< 3 thn	40	45%
		3-5 thn	15	17%
		5-8 thn	11	13%
		> 8 thn	22	25%
4	Pendapatan	< = 3 Jt	61	69%
		3,1-4 Jt	17	19%
		4,1-5 Jt	8	9%
		> 5 Jt	2	2%

Testing the Outer Model or Measurement Model

There is four criteria For assess validity and reliability tests in the outer model, namely

Convergent Validity, Discriminant Validity, Composite Reliability, and Cronbach Alpha.

Table 2. Outer Model or Measurement Model Results

Variabel	Indikator	Convergent Validity		Discriminant Validity	Reliability	
		Outer Loading (Iterasi awal)	Outer Loading (Reiterasi)	Cross Loading	Cronbach Alpha	Composite Reliability
Rotasi Panen 12/14 hari	X1.1	0.709	Dihapus	Valid	0.786	0.874
	X1.2	0.817	0.810			
	X1.3	0.682	Dihapus			
	X1.4	0.828	0.863			
	X1.5	0.798	0.833			
Premi Panen	X2.1	0.801	Dihapus	Valid	0.874	0.922
	X2.2	0.844	0.893			
	X2.3	0.778	Dihapus			
	X2.4	0.861	0.885			
	X2.5	0.882	0.903			
Produksi TBS	Y1.1	0.746	Dihapus	Valid	0.781	0.874
	Y1.2	0.781	0.748			
	Y1.3	0.379	Dihapus			
	Y1.4	0.789	0.859			
	Y1.5	0.806	0.895			
Pendapatan Karyawan Panen	Y2.1	0.844	0.844	Valid	0.893	0.922
	Y2.2	0.913	0.913			
	Y2.3	0.707	0.704			
	Y2.4	0.863	0.867			
	Y2.5	0.854	0.852			

Convergent Validity

Convergent Validity is carried out with view indicator items Validity is shown by the loading factor value. A indicator considered Enough tall If the loading factor value more big of 6 for exploratory research or more large 0.7 for explanatory research. Table 2 shows indicator Y1.3 has more loading factor numbers small from 0.6 so eliminated from the model. After that is all indicator has own the loading factor value is more big of 0.7, so can done analysis continued.

However so, for produce more models OK , after done reiteration , then a number of indicator need eliminated from the model. Indicator the including X1.1 and X1.3; X2.1 and X2.3; Y1.1 and Y1.3. After done reiteration repeat, happens enhancement mark *factor loading* For indicator namely X1.4, X1.5, X2.2, X2.4, All model indicators have own mark more latent variables big from 0.7 so model analysis meets condition For next .

Discriminant Validity

Discriminant Validity was carried out with method see cross loading measurement value construct. The cross loading value shows big correlation between every construct with indicators and indicators from construct variable other. A measurement model has good discriminant validity If correlation between construct with the indicator more tall than correlation with indicator from construct variable other

The cross loading results show that mark correlation construct with the indicator more big than mark correlation with construct other. With thereby that all construct or latent variables already has good discriminant validity , where indicator on the block indicator construct more Good than indicator is blocked other .

Next, an evaluation is carried out that is with compare mark AVE root with correlation between construct. Good AVE value required

own mark more big from 0.50. AVE value is more big than required > 0.50 with mark The smallest AVE is 0.698, namely variable Application Rotation Harvest 12/14 days.

Composite Reliability

Apart from being measured with The convergent validity and discriminant validity values of the Outer model can also be obtained done with see reliability construct or the latent variable being measured with composite reliability value. Construct stated reliable if composite reliability has value > 0.7, then with mark the construct stated reliable. The output results use SmartPLS 3.0 software for composite reliability value can be seen in table 2 above. Composite Reliability value is more big from 0.70 so all construct has own mark more Good than required.

Cronbach's Alpha

Cronbach's alpha was performed For measure the lower limit mark reliability something construct. Required Cronbach's Alpha value is more big from 0.7 for research is confirmatory and the value is still 0.6 can accepted For explanatory research.

The Cronbach's alpha value seen in table 2 above has exceed required value For evaluate lower limit reliability something construct so that can stated that every construct has own mark good reliability.

Inner Model or Structural Model Testing

After Outer model testing is complete done and done fulfil requirements, next done inner model testing (structural model). Different with a purposeful measurement or outer model test connection inter loading factor and inter composing indicators something latent variables, inner models or structural models aim For test capital quality, in particular level significance influence between One variable free (exogenous) with variable bound (endogenous).

Inner model can evaluated with look at r-square (reliability indicator) for construct dependent and t- statistical values from testing coefficient path (path coefficient). The more tall r-square value means the more good prediction model from the proposed research model. The path coefficients value shows level significance in testing hypothesis.
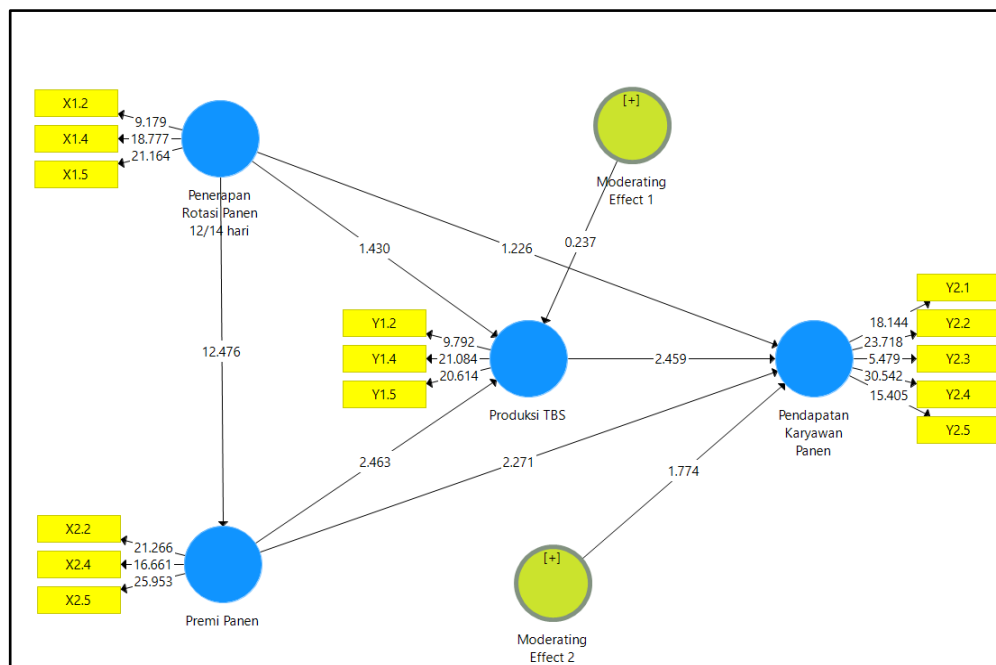

Figure 2. Inner Model or Model Structural with Two Moderating Variables

Analysis of Variant (R^2) or Determination Test

Analysis of Variant (R^2) or Determination Test, namely For know big influence variable independent to variable dependent the, value from coefficient determination from results testing with using SmartPLS 3.0 software can seen in the table following ;

Table 3. R Square Value

Variabel	R Square	R Square Adjusted
Pendapatan Karyawan Panen	0.693	0.678
Premi Panen	0.683	0.680
Produksi TBS	0.529	0.512

If seen from R square in table 3 above, determination rotation harvest, premium harvest, FFB production can be achieved explain variation mark income employee harvest amounting to 67.8%. The rest 32.2 % is influenced by other outside variables study This. It means donation variation determination rotation harvest, premium and FFB production against income employee harvest is 67.8%. In terms of This need explained that premium harvest role important in moderate FFB production so influential to income employee harvest.

By partial, implementation rotation harvest 12/14 days influential by 68% against premium harvest. Likewise variation mark in FFB production is influenced by the determination rotation harvest 12/14 days and premium harvest amounting to 51.2%. The remaining 48.8% is influenced by variables other. It means donation variation mark rotation harvest to premium is 68%. According to Chin (1998), the R square value is 0.67 or 67% included category strong, 0.33 or 33% classified category moderate, and 0.19 or 19% classified category weak. So influence determination rotation harvest and premium to production including category strong, I see island influence determination rotation harvest, premium harvest , and production to income employee harvest , classified category strong .

Goodness of Fit

Evaluation advanced about the model is with look at goodness of fit. There are three frequent indicators made For evaluate although No absolute done. Three indicator That is Standardized Root Mean Square Residual (SRMR), Normed Photo Index (NFI) and root mean squared residual covariance matrix (rms Theta).

SRMR is goodnesss of fit ie difference between observed correlations and matrix models correlation implied or difference between observed and expected correlations as model fit. The threshold SRMR value is <0.1 or <0.08 (Hu and Bentler, 1999, in Ghozali, 2021). NFI is size compatibility addition, have mark between 0 and 1, increasingly near to number 1 then the more suitable the model, so recommended value is NFI > 0.9. rms Theta rates pure models reflective, the extent of the external model residuals correlated, so size This expected approach zero the more good, for example 0.208 describes a very good model. This is predicted and observed model indicators. With Thus, based on relative values of SRMR, NFI and rms Theha approach to number standard, then the model can said has sufficient goodness of fit OK, because approach mark standard, though Not yet be the best model.

Table 4. Summary Model Suitability

	Saturated Model	Estimated Model
SRMR	0.089	0.091
d_ULS	0.830	0.873
d_G	0.503	0.530
Chi-Square	247.285	242.143
NFI	0.749	0.755
rms Theta		
rms Theta	0.208	

Testing Hypothesis

By Specific connection influence between variable exogenous and endogenous are presented in table 4.7. in the table Of these, there are 8 types hypothesis study. Answer against 8 hypotheses intended is as following :

1. effect 1 no influential real to FFB production. The calculated t-value = 0.248 and sig = 0.805 or 80.5% > 5%. That means implementation rotation harvest 12/14 days No become moderator effect on premium harvest in influence FFB production
2. Moderating effect 2 no influential real to income employee harvest. The calculated t-value = 1.887 and sig = 0.061 or 6.1% > 5%. It means premium harvest No become moderator effect or No can moderate FFB production in influence income employee harvest.
3.
4. Application rotation harvest 12/14 days to income employee harvest own calculated t-value = 1.216 and sig = 0.225 or 22.5% > 5%. It means Application rotation harvest 12/14 days No influential real to income employee harvest.
5. Application rotation harvest 12/14 days to premium harvest own calculated t- value = 12.140 and sig = 0.000 or 0% < 5%. It means

If happen change One unit on application rotation harvest 12/14 days so will give rise to change as big as 0.827 units at premium harvest.
6. Application rotation harvest 12/14 days to TBS production has t- calculated value is 1.402 and sig = 0.162 or 16.2% > 5%. That means policy application rotation harvest 12/14 days No influential real to FFB production.
7. Harvest premium to income employee harvest own calculated t- value = 2,169 and sig = 0.031 or 3.1% < 5%. That means, premium harvest influential real in a way direct to income employee harvest.
8. Harvest premium to TBS production has calculated t- value = 2.442 and sig = 0.015 or 1.5% < 5%. It means premium harvest influential real to FFB production viz If premium harvest increases by 1% then FFB production increased by 0.439%.

FFB production against income employee harvest own calculated t- value = 2.331 and sig = 0.020 or 2.0% < 5%. It means FFB production is influential real to income employee harvest that is If FFB production increases by 1% then income employee harvest will increase by 0.271%.

Table 5. Hypothesis Test: Path Coefficients-Mean, Stdev, T-Values, P-Values

No.	Hipotesis	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	10.0%	90.0%
1	Moderating Effect 1 -> Produksi TBS	-0.012	-0.019	0.050	0.248	0.805	-0.065	0.035
2	Moderating Effect 2 -> Pendapatan Karyawan Panen	-0.072	-0.072	0.038	1.877	0.061	-0.117	-0.025
3	Penerapan Rotasi Panen 12/14 hari -> Pendapatan Karyawan Panen	0.180	0.189	0.148	1.216	0.225	0.001	0.372

4	Penerapan Rotasi Panen 12/14 hari -> Premi Panen	0.827	0.826	0.068	12.140	**0.000**	0.718	0.902
5	Penerapan Rotasi Panen 12/14 hari -> Produksi TBS	0.294	0.333	0.210	1.402	**0.162**	0.074	0.606
6	Premi Panen -> Pendapatan Karyawan Panen	0.325	0.322	0.150	2.169	**0.031**	0.139	0.507
7	Premi Panen -> Produksi TBS	0.439	0.405	0.180	2.442	**0.015**	0.178	0.616
8	Produksi TBS -> Pendapatan Karyawan Panen	0.271	0.264	0.116	2.331	**0.020**	0.102	0.409

If seen from side of the specific indirect effect (influence No directly), there is four generated hypothesis of the models that have influence in a way No direct that is :

Table 6. Specific Indirect Effects: Mean, STDEV, T-Values, P-Values

No.	Hipotesis	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	10.0%	90.0%
1	Penerapan Rotasi Panen 12/14 hari -> Premi Panen -> Pendapatan Karyawan Panen	0.269	0.267	0.130	2.075	**0.038**	0.114	0.435
2	Moderating Effect 1 -> Produksi TBS -> Pendapatan Karyawan Panen	-0.003	-0.006	0.016	0.213	**0.831**	-0.020	0.008
3	Penerapan Rotasi Panen 12/14 hari -> Produksi TBS -> Pendapatan Karyawan Panen	0.080	0.091	0.074	1.079	**0.281**	0.013	0.187
4	Premi Panen -> Produksi TBS -> Pendapatan Karyawan Panen	0.119	0.104	0.065	1.840	**0.066**	0.027	0.192
5	Penerapan Rotasi Panen 12/14 hari -> Premi Panen -> Produksi TBS -> Pendapatan Karyawan Panen	0.098	0.085	0.052	1.883	**0.060**	0.024	0.158
6	Penerapan Rotasi Panen 12/14 hari -> Premi Panen -> Produksi TBS	0.363	0.330	0.145	2.500	**0.013**	0.146	0.498

1. Application rotation 12/14 harvest is influential real to premium harvest, and premium harvest in a way direct influential real to income employee harvest. The calculated t-value = 2.075 and sig = 0.038 or 3.8% < 5%.
2. Harvest premium will influential real to FFB production, then FFB production is influential real to income employee harvest at a rate significance 10% with calculated t-value = 1.840 and sig = 0.066 or 6.6% < 10%. Whereas For level 5% significance is not influential real.
3. Application rotation harvest 12/14 will be influential real in a way direct to premium harvest, then premium harvest will influential real to FFB production , next FFB production will influential real to income employee harvest at a sig value of 10% ie calculated t- value = 1.883 and sig = 0.060 or 6.0% < 10%. Whereas For level 5% significance is not influential real.
4. Application rotation harvest 12/14 will be influential real to premium harvest, and premium harvest will influential real to FFB production at the level 10% significance ie calculated t- value = 2.500 and sig = 0.013 or 1.3% < 10%. Whereas For level 5% significance is also very influential real.

Discussion of Research Results

Based on results analysis study influence application rotation harvest 12/14 days to FFB production and income employee harvest obtained information that application rotation harvest 12/14 days No give influence in a way direct to FFB production and income employee harvest but application rotation harvest 12/14 days give influence No direct through premium harvest to production and income employee harvest.

Influence application rotation harvest 12/14 days to premium harvest

Based on hypothesis test results obtained information that variable results testing statistics variable rotation harvest 12/14 days give influence significant to premium harvest. This matter in accordance with path coefficients results with the original sample value is 0.827 which shows number positive with the calculated t- value is more than 12.140 big from t-table value 1.96 with the p-value is more than 0.00 small from 0.05 so can said variable application rotation harvest 12/14 days influential significant to variable premium harvest matter This can interpreted that application 12/14 days as innovation newly implemented company give impact in a way direct to enhancement premium harvest .

Influence application rotation harvest 12/14 days and premium harvest to FFB Production

Based on The results of the path coefficients in table 4.7 show that application rotation harvest 12/14 days No in a way direct give influence real to FFB production and income employee harvest will but application harvest 12/14 day rotation influential to FFB production through premium harvest. Furthermore premium FFB harvest and production are affected in a way direct to income employee harvest. It means premium harvest is variable key application rotation effective 12/14 day harvest For repair production and income employee harvest.

If seen from the specific indirect effect side of application rotation harvest 12/14 days influential to premium harvest and so on influential to FFB production with The original sample value is 0.363 which shows number positive with the calculated t- value is more than 2,500 big from The t- table value is 1.96 and the p-value is more than 0.013 small from 0.05 so can said influential significant.

Influence rotation harvest 12/14 days , premium FFB harvesting and production against income employee harvest

Statistical test results to income premium FFB harvest and production have a very positive and significant influence to income employee harvest. This matter in accordance with path coefficients results with The original sample value is 0.51 which shows number positive with a t- value of more than 5.53 big of 1.96 and a p-value of more than 0.00 small from 0.05.

Income employee harvest is results Work during One month do work harvest fruit coconut palm with decision wages and premiums harvest already determined based on targets or work bases harvester every day. So that every harvester will own different income based on results work obtained. This matter seen from mark *path coefficient* FFB Production => Income Employee Harvest with the t- value is 2.331 and the P-value is more than 0.020 small from 0.05. It means enhancement amount results work (production) will give influence to income employee harvest

Conclusion

The conclusions that can be drawn taken from results study This is as following :
1. Application rotation harvest 12/14 days influential positive and significant to premium harvest at PT. Nusaina Manise Kobi Agro.
2. Application rotation harvest 12/14 days influential positive and significant to FFB production through premium harvest.
3. By together, Implementation rotation harvest 12/14 days, premium FFB harvest and production are affected significant to income employee harvest coconut palm oil at PT. Nusaina Agro Kobi Manise with variable key premium a yielding harvest more influence big to income employee harvest.

Suggestion

Researcher with a number of consider, suggest for researchers who will do it study in the the same topic For :
1. Do research on systems rotation different harvests. Because with done research on systems rotation different harvests will make study This complete as well as can used For taking comprehensive decision in the FFB production process.
2. Research connection application rotation harvest 12/14 days with variable other. Because, when This related research with rotation harvest still very few and far between

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