

Analysis of Factors Affecting Local Revenues with Integration System of Oil Palm - Cattle

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Abstract: The goals of oil palm-cattle livestock integration system are 1) improving the optimization of oil palm plantation management, 2) enhancing the acceleration of population increase and livestock production; 3) increasing the income of oil palm farmers and cattle farmers. The purpose of this study was to analyse factors that affect the income of livestock oil palm - cattle integration system. This research is a quantitative research using field observation method applying questionnaire instrument and structured interview to 40 farmers who apply integration system. The analysis is multiple linear regression analysis to identify the factors that influence farmers' income. The results showed that: 1) Simultaneously, all independent variables (Calf Cost, Feed, Cattle Breeding Scale, Farmers' Age, Farmers' Education, and Breeding Experience) influenced the variable with the income of 64.9%; 2) Partially, the free variable Calves Cost, Feed, Cattle Maintenance Scale, Farmers' Age, and Livestock Experience did not provide a tangible return to farmers' income with integrated systems. Only variables of farmers' education had a significant value smaller than α (0.05), meaning that education variables could affect the farmers' income through livestock by the use of innovation or new technology.

1 INTRODUCTION

Beef is a priority commodity of food sovereignty in addition to rice, corn, soybeans, sugar, and fish. Based on the details of Nine Government Priority Agenda (Nawacita), the priority agenda in agriculture consists of two things, namely the increase of agroindustry and the improvement of food sovereignty. Agricultural development in the next five years is based on the third Medium Term National Development Plan (RPJMN) (2015-2019) (Kementerian Pertanian, 2015). The vision to be achieved in the Strategic Plan in the body of General Directorate of Animal Husbandry and Health (Ditjen PKH) 2015-2019 is the realization of sovereignty and food safety of livestock origin with the aim of, among others, developing integrated livestock business and increasing the income and welfare of farmers (Ditjen PKH, 2017).

Since the revitalization of agriculture and forestry (RPPK) launched by the government in 2005, the concept of integration of cattle-palm began to be adopted and in 2007, some local governments

make it a flagship program (Edwina & Maharani, 2014). Local governments that have adopted this concept include: West Kalimantan (Ibrahim and Gufroni, 2008), Riau (Sisriyenni and Sutopo, 2008). In addition to local governments, plantation companies engaged in oil palm cultivation have also implemented this system, such as PTPN III North Sumatra (Agro et al. 2014). Implementation of integrated systems can directly overcome the problem of limited resources of conventional feed using agricultural based-feed materials and agricultural industry by developing integrated crop farming system. The problem is the integration of livestock is still limited to the small scale done by smallholder farms. Integration of plantation and cattle are still limited.

The cattle-oil palm integration program in Bireuen District is a government commitment with a mandate of national medium-term development plan (RPJMN) and Strategic Plan of 2015-2019 through the Directorate General of Animal Husbandry and Animal Health with the Livestock Area Development program 2014, where Bireuen District

is directed as a commodity development area cattle with a system of integration of oil palm.

Bireuen Regency is one of the districts in Aceh with high contribution of the agricultural sector to the Gross Domestic Product. According to Bireuen *BPS* data (2016) the contribution of the agricultural sector to the total GRDP is 33.98%, meaning that the agricultural sector is a very influential sector in the economy of Bireuen Regency. Plantation and livestock sub-sectors are the second largest sub-sector in GDP formation in the agricultural sector.

Bireuen District is also a center of livestock, especially cattle. The number of cattle population in Bireuen Regency in 2014 was 56,422 heads (*BPS* of Bireuen, 2016), then increased to 62,291 in 2016 (Bireuen Regency 2017) while the livestock population in Aceh Province in 2016 was 600,759 heads (DG PK 201/20). Bireuen Regency contributes 10.36% to the provincial livestock population. Potential oil palm plantations and the distribution of cattle population is an opportunity to implement the integration of cattle-palm in Bireuen Regency.

Implementation of oil palm-cattle integration system can increase the optimization of oil palm plantation management, while also accelerating the increase of population and livestock production. One example of land optimization is the fulfillment of animal feed needs by utilizing vegetation and byproducts of oil palm plantation industry (Wijono et al. 2015), while livestock can contribute to the provision of organic fertilizer and weed control.

From an economic perspective, the application of the concept of integration can help increasing the income of both oil palm farmers and cattle farmers. Increased breeder income is mainly influenced by the feed cost savings of 20-40% to produce 1 kg weight gain (Batubara, 2003). In addition, the welfare of farmers with the pattern of integration of oil palm - cattle is potentially increasing with the increasing farmers' income (Gabdo and Ismail, 2013). Research conducted in Bengkulu Province shows that there is an increase of 1.81 times income compared to the pattern of oil palm plantations only with the assumption that each family owns 3 hectares of land with cattle of at least 3 heads (Gunawan et al. 2004). In general, the advantages of cattle-plant integration systems are: 1) diversification of resource use, 2) reducing business hazard, 3) efficiency of labor uses, 4) efficiency of inputs, 5) reducing chemical energy dependence, 6) environmentally friendly, 7) increasing the production, and 8) sustainable farm household income (Handaka et al. 2009).

Based on this background, this study aims to analyze several factors that affect the income of livestock enterprises in the system of integration of oil palm and cattle.

2 MATERIALS AND METHODS

This research is a quantitative descriptive research using field observation method applying questionnaire research instrument and structured interview to 40 farmers who apply the system integration. Determination of farmers as a sample of the population is done with the selected sample system, purposive sampling. The sampling criteria were farmers in Juli Sub-district, Peusangan Selatan Sub-district, Peusangan Sub-district Siblah Krueng, and Makmur Sub-district, Bireuen District, Aceh Province, which implemented the integration system of oil palm with cattle, either using the loose system as well as the cow population and the largest oil palm plantation area. Secondary data was obtained from several institutions, namely *BPS*-Statistics of Bireuen Regency.

2.1 Data Analysis

To answer the purpose of the study, the analysis is a multiple linear regression analysis to identify factors affecting the farmers' income, formulated as follows:

$$y = a + bx_1 + bx_2 + bx_3 + bx_4 + bx_5 + bx_6 + \mu \quad (1)$$

With:

y	= Cattle Farmers' Revenue (Rp / year)
x1	= Calf Cost (Rupiah / year)
x2	= Feed Cost (Rupiah / year)
x3	= Cattle Maintenance Scale (ST / year)
X4	= Farmers' Age (year)
X5	= Farmers' Education (year)
X6	= Breeding Experience (year)
a	= Constants
b	= Variable Coefficient
μ	= Error

3 RESULT AND DISCUSSION

Regression analysis of factors affecting farmers' income in Bireuen District is shown in Table 1. The value of R^2 in Table 1 is 0.649 and the value of

Adjusted R² is 0.586, meaning all of independent variables affected the dependent variable which is the income of 64.9% and the rest 35.1% is influenced by other variable (μ) which is not examined in this study. To see whether there is the influence of the independent variable on the dependent variable can be seen from the value of significance. The smaller significance value than α (0.05) is the variable X5 (educational variable). While other variables, the resulting significance

value is greater than α (0.05). These results may explain that simultaneously the factors of calves cost, feed cost, maintenance scale, age, farming experience do not affect the income of beef cattle farmers. The smaller (<0.05) significance value is or the greater t table value is compared to the value of t arithmetic shows the independent variables are increasingly influential on the dependent variable.

Table 1: Statistical Analysis into Factors Affecting Farmers' Income.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	0.806 ^a	0.649	0.585	0.272	0.649	10.176	6
a. Predictors: (Constant), Experience, Calf, Maintenance, Feed, Farmers' Age, Education							
b. Dependent Variable: Y							

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.528	6	0.755	10.176	0.000 ^b
	Residual	2.447	33	0.074		
	Total	6.975	39			
a. Dependent Variable: Y						
b. Predictors: (Constant), Experience, Calf, Maintenance, Feed, Farmers' Age, Education						

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0.267	0.755		-.354	0.725
	Calf	0.106	0.097	0.124	1.088	0.284
	Feed	0.214	0.108	0.229	1.985	0.056
	Maintenance	0.043	0.106	0.048	0.405	0.688
	Farmers' Age	0.161	0.105	0.192	1.527	0.136
	Education	0.343	0.123	0.385	2.786	0.009
	Experience	0.218	0.125	0.245	1.750	0.089

The regression model of multiple linear regression analysis is $Y = -0.267 + 0.106X_1 + 0.214X_2 - 0.043X_3 + 0.161X_4 + 0.343X_5 + 0.218X_6$

The variable cost of calf statistically has a regression coefficient of 0.106 indicating a positive value which means if the value of the regression coefficient of other variables is considered fixed (unchanged) then each additional cost of calves/livestock of Rp 1,- will increase revenue by Rp 0.106, but this increase does not effect on income too much. Based on the significance value, calf cost has a value of $0.282 > \alpha$ (0.05) which means that the cost of calf has no big effect on the income earned. This can be caused by the raise of not the same calf,

most farmers raise local calf of Aceh, Bali Calf and there are some farmers who raise Simental calves.

The calf cost is related to the quality of the beef cattle, the higher the price of calf the better the quality will be, the quality will be determined by outside appearance such as milk breeding, body shape and livestock cleanliness. The better the quality will affect the calf born. Saleh et al states that the calf is one of the factors that determine the success of farm production (Saleh et al. 2006). The calf cost issued will certainly affect the value of beef cattle at the end of the year, if the beef cattle is not sold then the added value of the livestock will be counted as revenue for the breeder.

Partially the cost of feed does not give a big effect on farmers' income. The result of regression of significant value is 0.056 bigger than α (0.05), meaning that feed cost has no big significance on farmers' income. The value of regression coefficient for feed cost is positive equal to (0.214). With this positive relationship, it means every increase of feed cost as much as Rp 1 will increase income equal to Rp 0.214. The contribution of feed costs to income can affect profits or losses. Regression results indicate that increased feed costs will increase the income.

Livestock can be intensively maintained with cheaper feeding costs sourced from oil palm plantations than livestock using conventional concentrates. If both livestock conditions (using conventional concentrate feed and silage) are maintained intensively then the cost of feed sourced from oil palm plantations still has a smaller economic value compared to the conventional concentrate.

The comparison of these two types of feed indicates that silage feeds that use natural resources from oil palm plantations have better economic value to increase farmers' income. According to Gunawan et al, cheap feed using local resources is one of the alternative solutions to reduce production costs (Gunawan et al. 2003). Preparation strategy is done by selecting the feed ingredients based on the materials availability, nutritional content and price.

The role of oil palm plantations as one of the forage sources that can be used as livestock development is very supportive, supported by the role of land vegetation as land cover and crop residues as animal feed. However, forage processing is required in order to maximize the nutrient content and benefits of plantation waste as a substitute feed during the dry season. The pattern of integration with cattle is expected to be an integral part of the oil palm plantation business, which ultimately can have a huge impact on increasing farmers' income.

Significant value on the maintenance scale also shows a less effect (0.688) on income. The result of regression coefficient from maintenance scale shows positive value of 0,043. With this positive relation, it means every increase of maintenance scale as much as 1 ST will increase farmers' income equal to 4% per cattle so that more number of livestock raised hence the cattle farmer will obtain bigger income.

According to Soekartawi, the income of cattle business is strongly influenced by the number of livestock sold by farmers (Soekartawi, 2003). Krisna and Mansur states that the higher the scale of the business run and owned, the greater revenue will be

accepted because it can reduce production costs (Krisna and Mansur, 2006). The study results show that farmers have average 8.8 cows (8 ST mature cattle), meaning that this maintenance includes household scale, with the addition of the number of cows raised, and it will increase the family income. Saleh et al states that in the business of beef cattle farming, every addition of 1 ST of cattle can increase farmers' income (Saleh et al. 2006). Krisna and Manshur add that the high income earned by farmer in running their livestock business is influenced by the number of livestock raised (Krisna and Manshur, 2006). The more cattle are raised, the more profit the farmers will obtain.

Farmers' age based on the regression result shows a positive relationship (0.161) which means that every 1 year in farmers' age the farmers' income will also increase by 16.1%. But this increase has no big effect on income based on significant value. In this case, the age effect of the breeder is relatively uniform in the productive age criteria (22-55 years). Based on the data obtained, 92% of respondents are 25-55 years old, with details of 25-35 years (20%), 36-45 years (40%), and 46-55 years (32%). Age level in beef cattle business is one of the aspects that affect the performance of business activities undertaken. Work productivity will increase if the farmers are still in a productive age and will decrease the ability of work along with the increase of the age. In addition, according to Maharani, by the age, farmers tend to receive new innovations faster and various information related to the development of farming information technology and information related to price and marketing (Maharani, 2001).

The regression coefficient of education shows a positive value (0.343). If the value of regression coefficient of other variables remain (unchanged) then any increase in education level will affect farmers' income. The value of education significance is $0.009 < \alpha$ (0.05) which means it has big effect on the income earned. This may be due to higher educated farmers, or having a non-formal education related to good livestock business. They are generally more actively exploiting innovation or new technology and although still using traditional breeding systems.

The intensive integration of cattle-palm requires feeding aids, farmers with better education will be more receptive to receiving technology, so we expect educated farmers can be pioneers to begin paying attention to potential replacement feeds for existing beef cattle in their respective areas. The younger age of educated farmers according to

Edwina & Maharani are generally more curious and interested in adopting higher technology. Education can be obtained through formal and non-formal education (Edwina and Maharani, 2014).

If the regression coefficients of other variables are fixed then each addition of one year of breeding experience will lead to an increase in income of 21.8%. Significant value of breeding experience is $0.089 > \alpha$ (0.05) which means that the livestock experience has no big effect on income. According to Saleh et al in terms of livestock raising management, farmers with more livestock farming experience should master good farming practices such as feeding, cage and livestock hygiene care, health care and disease management. Breeding experience in raising cows is a very valuable capital to develop the business (Saleh et al. 2006). The respondents experience of cattle raising shows the experience of raising beef cattle between 2 to 40 years. The results of questionnaires and interviews show that as much as 80% of the respondents have experience breeding between 10-30 years, even 5% of respondents have experience rearing for 31-40 years.

Age and experience in managing livestock will affect the farmers' ability running their business. The farmers should increasingly know how to develop their business in order to succeed and be able to capture opportunities in the business. But in the field there is no effect as expected. This can be caused by the fact that the farmers do not make positive changes in the income-generating effort, for example the farmers raise the feed for his beef cattle and tend to let the animals feed themselves. This condition will cause the livestock not to get a good weight, so this kind of thing is a habit (social culture) for the general farmers.

4 CONCLUSIONS

Based on the result of data, analysis and discussion, it can be concluded that:

1. Simultaneously, all independent variables (Calf Cost, Feed, Cattle Maintenance Scale, Farmer's Age, farmer's education, and Breeding Experience influence dependent variable which is income of 64.9% and the other 35.1% is influenced by other variables (μ).
2. Partially, the calf cost, feed, cattle maintenance scale, farmers' age, and breeding experience variables do not provide a big escort to farmers' income with integrated systems. Only variables of farmers' education have a significance value

smaller than α (0.05), meaning that education variable can affect livestock farmers' income through the use of innovation or new technology.

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REFERENCES

- Agro, Rahardjo, K., Wicaksono, K.P., 2014. Optimalisasi Strategi Integrasi Kelapa Sawit – Sapi Pada Badan Usaha Milik Negara (BUMN) Perkebunan di Indonesia (Studi Kasus Pada PT. Perkebunan Nusantara III (Persero) Medan, Sumatera Utara). <http://www.ejournalfia.ub.ac.id/index.php/profitarticleview/466885.pdf>. Accessed April 2018.
- Batubara. L. 2003. Potensi Integrasi Peternakan Dengan Perkebunan Kelapa Sawit Sebagai Simpul Agribisnis Ruminan. *Wartazoa* Vol. 13 No. 3. 83-91.
- BPS. 2016. Kabupaten Bireuen dalam Angka. Dirjen Peternakan dan Kesehatan Hewan. 2017. Statistik Peternakan Dan Kesehatan Hewan 2017. Direktorat Jenderal Peternakan dan Kesehatan Hewan Kementerian Pertanian RI. ISBN 978-979-628-034-6.
- Edwina, S., Maharani, E., 2014. Kajian kerapatan karakteristik dan tingkat pengetahuan petani tentang sistem integrasi sapi dan kelapa sawit (SISKA) di Kecamatan Pangkalan Lesung, Kabupaten Pelalawan. *SEPA* 11(1): 110-117.
- Gabdo, B.H., Ismail, A., 2013. Analysis the benefits of livestock to oil palm in an integrated system: Evidence from selected districts in Johor, Malaysia. *Journal of Agricultural Science* 5(12): 48-55. Doi.105539/jas.v5n12p47
- Gunawan B., Hermawan, Sumardi, Praptanti, E.P., 2004. Keragaan Model Pengembangan Integrasi Sapi-Sawit pada Perkebunan Rakyat di Provinsi Bengkulu. Makalah disampaikan pada Seminar Nasional Sistem Integrasi Tanaman-Ternak di Denpasar, Bali tanggal 20-22 Juli 2004.
- Handaka A., Hendriadi, Alamsyah, T., 2009. Perspektif Pengembangan Mekanisasi Pertanian dalam Sistem Integrasi Ternak-Tanaman Berbasis Sawit, Padi dan Kakao. Dalam Prosiding Workshop Nasional Dinamika dan Keragaan Sistem Integrasi Ternak-Tanaman: Padi, Sawit, Kakao. Badan Litbang

- Pertanian. Pusat Penelitian dan Pengembangan Peternakan, Bogor, Indonesia.
- Ibrahim, T.M., & Gufroni, L.M., 2008. Potensi pengembangan integrasi ternak dan sawit di Kalimantan Barat. Prosiding Seminar Optimalisasi Hasil Samping Perkebunan Kelapa Sawit dan Industri Olahannya sebagai Pakan Ternak. <http://peternakan.litbang.pertanian.go.id/fullteks/lokakarya/plimbah08-19.pdf>. Accessed April 2018.
- Kementerian Pertanian. 2015. Rencana Strategis Kementerian Pertanian 2015-2019.
- Krisna R., & Manshur, E., 2006. Tingkat kepemilikan sapi (skala usaha) peternakan dan hubungannya dengan keuntungan usaha tani ternak pada kelompok tani ternak sapi di Desa Tajur Halang Bogor. *Jurnal Penyuluh Pertanian* 1(1): 61-64.
- Maharani, E., 2001. Analisis Pemasaran Jeruk Siam dan Faktor-faktor yang Mempengaruhi Posisi Tawar Menawar Petani di Kabupaten Kampar. Tesis. Universitas Padjadjaran, Bandung.
- Saleh E., Yunilas, Sofyan, Y.H., 2006. Analisis pendapatan petani peternak sapi potong di Kecamatan Hampan Perak Kabupaten Deli Serdang. *Jurnal Agribisnis Peternakan* 2(1): 36-42.
- Sisriyenni, D., & Sutopo, D., 2008. Potensi, Peluang dan Tantangan Pengembangan Integrasi Sapi-Sawit di Provinsi Riau. Dalam Prosiding Lokakarya Pengembangan Sistem Integrasi Kelapa Sawit-Sapi.
- Soekartawi. 2003. *Agribisnis Teori dan Aplikasinya*. Jakarta (ID) : PT. Raja Grafindo Persada.
- Wijono, D.B., Affandhy, L., Rasyid, A., 2015. Integrasi Ternak dengan Perkebunan Kelapa Sawit. Dalam Prosiding Lokakarya Sistem Integrasi Kelapa Sawit-Sapi. <http://peternakan.litbang.pertanian.go.id/fullteks/lokakarya/probklu03-15.pdf>. Accessed April 2018.