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Policies to Increase Calves Production in East Nusa Tenggara as a National Production Center

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Abstract. The determinant factors of the growth of calf cattle production in NTT Province (both technical/technological, economic, socio-cultural, investment, and related institutions) have not been specifically identified and measured. This is very important for the purpose of formulating and implementing related policies. The objectives of this study were to analyze the main factors affecting the level of calf production, and to formulate policy interventions to increase calf production. A research survey was carried out on parties related to the planning and development of cattle business. The quantitative approach is in the form of regression analysis of time series data. The economic phenomenon of calf production in Kupang Regency has been simplified into a mathematical model (response function). The result reported that the estimated value of the parameters in the total calf production equation model in NTT was: TPRAS= – 20434.1 + 0.2262 LTTSIP* – 0.0032 TLPRA^{ns} + 0.2147 TLLTP* + 0.1036 TPTRU* + 0.1877 TRKUT** + 0.2067TRDIB** + 0.1057 TRDVT** + 0.3647 LTPRAS* + 811.7645 TREND**. In conclusionl, the increased production of calves was dependent on the increase in support for the main production factors [number of productive cows, number of farmers, amount of feed, and amount of cement/vaccine] adequatly. Policy investment (through interest rates and realization farming loans), policy of productive cows control (through postponement of slaughter and the provision cash incentives), and policy of technology support (through realization AI doses of semen and livestock vaccines) significantly affect to production of calves.

Keywords: production policy, calves production, NTT Province

Abstrak. Faktor determinan pertumbuhan produksi pedet di Provinsi NTT (baik teknis / teknologi, ekonomi, sosial budaya, investasi, dan instansi terkait) belum teridentifikasi dan diukur secara spesifik. Ini sangat penting untuk keperluan perumusan dan pelaksanaan kebijakan terkait. Penelitian ini bertujuan untuk menganalisis faktor-faktor utama yang mempengaruhi tingkat produksi pedet, dan merumuskan intervensi kebijakan untuk meningkatkan produksi pedet. Survei penelitian dilakukan terhadap pihak-pihak yang terkait dengan perencanaan dan pengembangan usaha sapi. Pendekatan kuantitatif berupa analisis regresi data dari waktu ke waktu. Fenomena ekonomi produksi pedet di Kabupaten Kupang telah disederhanakan menjadi model matematis (fungsi respon). Hasil penelitian menunjukkan bahwa nilai estimasi parameter dalam model persamaan produksi pedet total di NTT adalah: TPRAS= – 20434.1 + 0.2262 LTTSIP* – 0.0032 TLPRA^{ns} + 0.2147 TLLTP* + 0.1036 TPTRU* + 0.1877 TRKUT** + 0.2067TRDIB** + 0.1057 TRDVT** + 0.3647 LTPRAS* + 811.7645 TREN**. Kesimpulannya, peningkatan produksi pedet sangat bergantung pada peningkatan dukungan faktor produksi utama (jumlah sapi produktif, jumlah peternak, jumlah pakan, dan jumlah semen / vaksin) yang memadai. Kebijakan investasi (melalui suku bunga dan realisasi pinjaman usahatani), kebijakan pengendalian sapi produktif (melalui penundaan pemotongan dan pemberian insentif tunai), dan kebijakan dukungan teknologi (melalui realisasi dosis AI untuk semen dan vaksin ternak) berpengaruh signifikan terhadap produksi ternak.

Kata kunci: kebijakan produksi, produksi sapi, Provinsi NTT

Introduction

The data of the last 10 years show the production of cattle in the province has grown by 2.2 percent (with a population in 2017 of about 905.326 head) (NTT Disnak, 2018). Approximately 68.5% of cattle population is in West Timor, including the District of Kupang, TTS, TTU, Belu, and Malaka (Yusuf and Nulik, 2009; Lole et al., 2013). The slow growth rate of calves production is simultaneously influenced by factors, such as technical/technology, economy, socio-culture, investment, institutions, and related policies (Lole et al., 2013; Guntoro and Priyadi, 2012; Khan and Iqubal, 2010; Etwire et al., 2013). Each of the

contributing factors needs to be identified and analyzed for the level of significance and the impact on livestock production rate of calves (Lole et al., 2013; Guntoro et al., 2016; Ajetomobi, 2010; Bunmee et al., 2018).

Over the past 10 years, NTT has been classified the national top five suppliers of cattle, although sometimes there are fluctuations in light with the growth rate of about 6.7 percent, where exports in 2017 reached 60.000 heads (NTT Disnak, 2018; Wirdahayati, 2010; Tawaf, 2013). The slight fluctuations may occur because of lack regulation or restriction through the quota policy, which consists of the number of cattle (cattle units of quota) and the minimal cattle weight (Lole, 2013). In the level of regional development and a long-term scale, restricting the quota is expected to be contra-productive to the flexibility of farmers in business development (livestock production) and the utilization of the crops (supply and marketing of livestock) (Musemwa et al., 2010; Lole et al., 2018; Gupta et al., 2012; Han et al., 2016). The prevalent adverse effects include the declining level of income and welfare of farmers and communities in NTT (Lole et al., 2013; Zhu and Yang, 2012; Sodiq, 2011).

Based on this phenomenon, the important issues to investigate is the causes of low level of calves production and the slow rate of development of the cattle population in NTT. The research objectives were to analyze main factors that affect the production rate of calves in NTT and to formulate policies to increase the production of calves in NTT.

Materials and Methods

This study covers NTT province to collect the required data and aggregate data at the provincial level. Primary data were collected through interviews with the regional leaders associated with the development of cattle in the province. The survey was conducted on various parties related to the planning and development of cattle farms.

Respondents at provincial and district levels included the chiefs of livestock agency, agricultural agency, development planning agency, NGOs and cooperatives, and others (key persons). Most of the data in the form of time series data over the last 30 years were collected from various document-related institutions. The secondary data were sourced from the Livestock Agency of NTT, NTT BPS, Directorate General of Livestock, slaughterhouses, and other related stakeholders. The primary data were obtained from various parties through in-depth interview.

The economic phenomenon of calf production has been simplified into a mathematical model in the form of a response function. This quantitative model is an abstraction of actual phenomena that is formulated in the form of a combination of equation relations, such as the form of an econometric model or an operations research model (Sitepu and Sinaga, 2006; Siswijono, 2013; Dunn, 2012). According to the outcome to be achieved, namely policy intervention through variables that have a significant influence, a quantitative approach is used through regression analysis. The formulated and analyzed mathematical model of Total Calf Production in NTT are below:

$$TPRAS_t = a_0 + a_1LTTSIP_t + a_2TLPRA_t + a_3TLLTP_t + a_4TPTRU_t + a_5TRKUT_t + a_6TRDIB_t + a_7TRDVT_t + a_8LTPRAS_{t-1} + a_9TREND_t + E_1$$

The sign of the estimated parameters that are expected to occur: $a_1 - a_9 > 0$,

where:

$TPRAS_t$ = total production of calves in NTT in year t (head)
$TTSIP_t$ = total productive cows in NTT in year t (head)
$TLPRA_t$ = total area of natural pastures in NTT in year t (ha)
$TLLTP_t$ = total area of cropland in NTT in year t (ha)
$TRKUT_t$ = total realization of farm loans in NTT in year t (Rp/yr)
$TPTRU_t$ = total of ruminant farmers in NTT in year t (KK/yr)
$TRDIB_t$ = total doses AI realisation in NTT in year t (units/yr)
$TRDVT_t$ = total doses of vaccine were realisation in NTT in year t (units/yr)
$LTPRAS_{t-1}$ = lag total production of calves in NTT in year t-1 (head)

$TREND_t$ = time trend (1,2,3,..., 30)
E_1 = error variables i (i = 1,2,3, ... n)

Results and Discussion

The results of the regression analysis in Table 1 show the influence of several main variables that determines the levels of calf production and the development of the cattle population in NTT. Variables that have a significant effect can be used as the intervention variables or policy variables to increase calf production and the development level of the cattle population.

Table 1 shows that the total production of calves was influenced in a positive and highly significant way (at p <0.01) by the total population of productive cows in NTT. Accordingly, a high population of productive cows is very influential to increase calf productio, because it has the ability to breed using a variety of natural resources (Paly, 2009; Rahardjo and Suroyo, 2013; Soejosopoetro, 2011). Cattle population in the province is dominated by cows (about 64.0 percent) and offers a tremendous, biological potential for increasing the number and quality of cattle, as well as economic value for farmers (Sodiq, 2011; Siswoyo et al., 2013; Olmo et al., 2016; Kemi, 2016). Thus, the practice of slaugthering productive cows will directly eliminate the productive cow opportunity to generate new cow through the reproductive process and will ultimately reduce the population (Lole et al*.,* 2018; Tawaf et al*.,* 2013; Isyanto and Iwan, 2016; Khan, 2017; Larsson and Berglund, 2008).

Considering the the magnitude elasticity, total production of calves is very responsive to changes in the total population of productive cows, with a value of elasticity of less than 1 is at 0.53 (short-term) and amounted to 0.85 (long-term). In other words, when the total population of productive cows increases by 1.0 percent, the total production will increase calf by 0.53 percent (short term) and 0.85 percent (long-term). This condition illustrates the importance of the position of productive cows in the cattle production development (Rahardjo and Suroyo, 2013). Moreover, it simultaneously becomes an empirical evidence that not all cattle (productive cows and studs) are capable of producing calves every year for different reasons. The technical reasons of the low birth rate of cow is the alarming level of productive cows slaughter in both slaghterhouse and non slaugtherhouse, which ranges from 60.00-75.00% between districts,

Table 1 Results of parameter estimation, statistical tests, and an average elasticity in the model equations total production of calves in NTT (TPRAS)

Equation/variable	Notation	The value of the parameter estimates	P > | t |	Elasticity	
				Short term	Long term
Total production of calves in NTT	TPRAS				
Intercept	-	-20434.1	0.1689		
Total productive cows in NTT	TTSIP	0.226195	0.0031	0.5302	0.8544
Total area of natural pastures in NTT	TLPRA	-0.00321	0.8432	-0.0088	-0.0163
Total total area of cropland in NTT	TLLTP	0.214672	0.1387	1.0312	1.6247
Total realization of farm loans in NTT	TRKUT	0.103546	0.0795	9.0542	14.2773
Total of ruminant farmers in NTT	TPTRU	0.187648	0.0103	0.9623	1.4878
Total doses AI realized in NTT	TRDIB	0.206738	0.0917	0.0061	0.0081
Total doses of vaccine were realized in NTT	TRDVT	0.105673	0.1796	0.2813	0.4534
Lag total production of calves in NTT	LTPRAS	0.364652	0.0317		
Time trend	TREND	811.7645	0.1223		
R-square	0.98154	Durbin-W statistic			1.857254
Adj R-square	0.97985	Durbin-h statistic			0.81356
Prob>|F|	0.0001	First order autocorrelation			0.0603

as well as the imbalance composition of males and females in a group (Wirdahayati, 2010; Ibragimov et al., 2016; Han et al., 2016).

The level of productive cows slaughtered is classified as very high, so it becomes a threat to livestock production levels, both short term and long term (Tawaf et al., 2013; Lole et al., 2018; Rasminati et al., 2010). The many reasons to slaughter productive cows (both objective or fake reasons) include the overpopulation of productive cows, a long delayed calving, infertility, physically handicap, diseased cows, lower price of living cows than beef, and others (Lole et al., 2018; Suardana et al., 2013). Accordingly, a lot of manipulations to productive cows were conducted by merchants or butchers (with or without being noticed by the officers) so that the productive cows are slaughtered. For example, the government issues statement from the village officials or the farm workers that are productive cows have been exposed to reproductive disease, have been classified as culled, sick, and physically disabled. It is suspected, as the common knowledge among locals, that the productive cows are purposively made disabled before they came to the slaughterhouse, such as creating a broken leg, a blind eye, or other injuries (up to 25-35% of the SIP to be cut). An enclosed information according to several drivers, traders, guards at the abattoir shelter, and butchers is that every day there are always productive cows with new defects when they are transported or slaughtered. However, it is not certain whether the new defect occurrs intentionally or not (Lole, 2018). Therefore, preventing the slaughter of productive cows must be done strictly, not only when the cattle are in the slaughterhouses and before the slaughter, but since the cattle are still in the hands of farmers (Tawaf et al., 2013; Lole et al., 2018; Ilham, 2010).

The total area of native pastures (PRA) in NTT have a negative influence but not statistically significant (at P>0.20). The evidence suggests that the spacious PRA at NTT continues to decrease over time, but the total production and cattle population continues to increase. This reflects the increased production of cattle in NTT is not entirely dependent on the production of forage derived from PRA (Lole et al., 2013; Gupta et al., 2012). High quality feed derived from other sources have been increasingly used and this reflects a shift in cattle raising management which was dominated by the extensive traditional raising system (Lole et al., 2013; Harmini et al., 2011; Hilimire, 2011). Although PRA produces low quality feed, it still has an important position in the ruminant livestock business because it remains the last source of feed supply during the long dry season to survive (Lole et al., 2013).

The total area of land crops which produces by-product in the form of forage crops (BTP) gives a posititive and significant effect (at p <0.15) to the total production of calves in NTT. This represents an increased size of cropland area or LTP which subsequently increased production of BTP would also increase cattle production in the future, and it reaches the balanced use of LTP and PRA according to economic and environmental needs. The quality sourced from by-product of foodcrop is much higher than the native grass of PRA because the feed capacity of by-product of foodcrop is 2-3 times as much as the forage. Therefore, the main focus of cow feed in the future is on BTP (in addition to superior grass and other forage), while native grass in time will only act as the supporting feed (along with a decrease in land area and degradation of PRA land quality) (Lole et al., 2013; Hilimire, 2011).

The elasticity of short-term and long-term scale is more than the 1.0, indicating the very large carrying capacity of animal feed derived from BTP, up to 2–3 times that of PRA. Furthermore, not all BTP derived from existing LTP can be used as cattle feed because not all food crop farmers raise cattle or only a few

cows, so BTP has not been used optimally. In addition, the government regulations on the spread of cattle to all districts in NTT based on the capacity of potential feed in each district have not been implemented strategically (Lole et al., 2013; Hilimire, 2011; Gupta et al., 2012).

The effect of total implementation of farm credit (KUT) for cattle development was relatively small but positive and statistically significant (at p <0.10) to the total production of calves in NTT. This suggests that the role or the share of KUT for cattle development is very important to support various efforts to increase cattle production in NTT, but the level of realization is minimum and has not been properly organized. Generally, KUT obtained by farmers in NTT are more geared to fattening cattle, so the portion for cattle breeding is very small. As a result, the realization of KUT has not been a significant impact on the increase in cattle production (Lole et al., 2013; Sodiq, 2011; Nxumalo and Oladele, 2013).

Drawing from the data analysis, the total production of calves in NTT is significantly (P<0.05) influenced by the total ruminant farmers. The short-term elasticity of 0.96 and long-term of 1.50 shows that the increasing number of ruminant farmers involved in food crop farming and raising cattle (with better farming abilities) will increase cattle production in the future, with the existing technology level. The increased number of ruminant farmers will directly raise cattle production due to the ability of each household cattle farmer to raise more than one head (Lole et al, 2013; Sodiq, 2011; Nxumalo and Oladele, 2013).

Policies for the implementation of AI technology are strategic policies to significantly increase the population. The analysis showed the total implementation of AI poses a positive and significant influence (at P<0.10). This positive relationship proves that the use of AI technology is an important alternative in the increased production of calves and cattle population (Wirdahayati, 2010). However, a small elasticity is a reflection that all AI programs and implementation efforts undertaken so far are not optimum, thus requiring improvement in an integrated manner (Lole, 2009; Ilham, 2010; Wirdahayati, 2010; Gosalamang, 2012).

Total realization of vaccine doses have a positive and significant effect (at P<0.20) on the total production of calves. Thus, the increase in the total realization of livestock vaccine doses will increase the total production of calves. The vaccine in this case are brucellosis and anthrax vaccine that is common in cattle in the province (Lake et al, 2010). The use of both vaccines have generally been able to save a lot of cattle that were presumed infected, but the number of vaccines has not been comparable with the number of animals that require similar efforts. Consequently, the use of vaccine (which is still relatively limited) to increase production is not significant. This is apparent from the relatively small elasticity. Therefore, the government's policy to increase the realization and application number of vaccine doses (including vaccines and other medicines) is very important and strategic to increase cattle production as a whole (Lole, 2009; Lake et al, 2010; Wirdahayati, 2010; Devendra, 2007).

Conclusions and Policy Implications

Conclusion

Total production of calves are influenced by the total population of productive cows and total ruminant farmers (as the main factors) and the total realization of AI dose, the total realization of cattle business loan, and the lag total calves production (as the supporting factors). Various supporting factors to the main production (cows, farmers, cement, and loan) have been given to adequately determine the level of calves production. The regression analysis found that investment policies can increase cattle ownership and population, policies to control slaughter of cows can increase birth rates and population, and

technology support policies through AI and vaccines/medicine can increase livestock productivity.

Policy implications

Some common policies that may be implemented include:

1. Increasing the production of calves in NTT needs support from various policies, such as the increase in the population of productive cows, the increase in NCC, cow distribution to farmers of food crops, intensification of feed, soft loans, and ease of access technologies (vaccines and AI).
2. Policies that improve the realization of loan, reduce the cull of productive cows, and increase the dosage realization of AI. The three alternative minimum partial policies that could be done in a single package policy (along with increased production of feed and livestock maintenance management improvements) are as follows:
   a. Reducing the slaughter of productive cows through preventive efforts should start from the farmers (the first-line prevention) rather than in RPH (last-line prevention). Alternatively, the provision of cash incentives for owners of cows that give birth may also reduce the slaughter. In addition, intervention programs to increase the price of productive cows is necessary to minimize different treatment between male and female animals.
   b. Increasing farmers' capital through the loan is key to get farmers involved voluntarily in the cattle business, especially for breeding. This effort may include loan with a regressive interest rates, increased loan ceiling, the extension of the grace period of loan, collateral mitigation of loan and reduction of levies/charges of cattle. These strategies are expected to encourage farmers to improve the business scale cattle and combine with other cattle business branch.

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