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DEVELOPING AN APPROACH IN CALCULATING THE NEED OF COWS REACHING BEEF SELF-SUFFICIENCY IN WEST PAPUA PROVINCE

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ABSTRACT

The objectives of this research was to develop an alternative approach to calculate the cows need to produce the condition of beef self-sufficiency in the West Papua Province.

The collected data involved the secondaries i.e. number of cattle slaughter and people population; and the primaries data i.e. number of bull < 1 year old, 1-2 years old, and > 2 years old and number of cows of the farmer household. Documenting of secondaries data, interviewing use quetionare, and field observation were used as the methods of data collecting in this study. Sources of data in this research were farmer household. Data were analyzed by using the mathematics and econometrics equation models, specially the Partial Adjustment Model (PAM) and Ordinary Least Sqaure (OLS) i.e. simple and multiple linear regression. The population of this study was farmers with the sample number of 189 respondens. Manokwari was choosen as the sample area of this study.

The results of this study showed that we could develop an approach to estimate the number of invested cows in order reaching beef self-sufficiency . This approach was consisted of three (3) steps of (a) to estimate number of consumption of beef (in animal unit) as a function of people population in the region, (b) to develop an estimator equation of the variables of number of cows and their produced bulls, (c) to use the developed estimator equation of the second step to calculate the number of need invested of cows to reach the condition of beef self-sufficency in the study area.

Keywords: an alternative approach, animal unit, estimator equation, self-sufficiency; Partial Adjustment Model (PAM).

INTRODUCTION

Indonesian beef supply was obtained from three major suppliers, namely the national cattle population, industry and imports (Oetoro 1997), and 90% of cattle population was hold by local farmers household (Baliarti in Kompas 9 November 2009). Both this information illustrates that self-sufficiency in beef in Indonesia is very possible and important to always trived involving cattle population in the starring role in the promotion and calculation of beef self-sufficiency.

However, various reports suggested that the national beef self-sufficiency by 2010 in Indonesia has been determined to have failed, so be prepared to re-program the same objectives in the year 2014. This failure indicates that the strategies and efforts to achieve self-sufficiency measures of beef in 2010 still need improvement and refinement. According to the results of some studies, the failure of beef self-sufficiency program planning in 2010 mainly lies in the weak basis of computation approach. Basic weakness of the calculation is meant is that the data the number of cattle population in an area has been deemed sufficient as the sole information for planning. Yet as is well known that the total population is indicated the number of beef cattle in an area but not precisely describe the very important information for planning self-sufficiency in beef cattle in a region covering the composition by age and sex, in addition to data on the number of beef demand in these area. This opinion is relevant to the statement Yusja and Ilham (2004), namely that one of the weaknesses of the management of livestock sector in Indonesia is the lack of population

data. Associated with beef self-sufficiency planning, data that existed for most of the cattle population data is only general without the details of the age and sex, so do not know things that are important for planning self-sufficiency in beef such as (a) the number of cows that can used to calculate the capacity of a particular production area to produce a calf, and (b) the number of bull are going to be output (the part that will be consumed) from the population will actually be useful in determining the level of cuts in order not to exceed the natural Increase.

The author believes that information regarding the composition of the cattle population by age and sex is what in fact will be able to provide images to the front of the number of the cows that has been available and must be provided, the number of bull for slaughtering. The latest information is very important for beef self-sufficiency planning because they can be used to condition the availability PREDICATIONAL cattle population in the future and the steps that must be done to meet the planning stages.

Papua, in general is an area of high potential for the development of beef cattle because the carrying capacity of natural grazing area such as large enough. Based on statistical data of West Papua in 2005, livestock feed and forage production of agricultural wastes / plantations in West Papua Province of 42.44275 million tons from an area of 4,244,275 ha. Total feed production should be capable of supplying feed to 3.87605 million head of beef cattle. The availability of farm resources, especially the potential for local food and forage land for pasture development is something that provides great opportunities for the development of cattle business in the province of West Papua. Potential animal feed in West Papua was also illustrates one of the great potential of this region to develop self-sufficiency in beef.

Population of West Papua province itself is heterogeneous because it comes from the various tribes that exist in the ground water. Expansion of the existence of the province, followed by expansion of the district and district impact on the spread of indigenous people and migrants are increasingly prevalent. Population shows a trend of increasing since the division in the provincial and district levels. Population growth rate of 2003 s / d in 2005 according to the survey (2005) reached 10.83% or up to the year 2005 the population reached 643012 inhabitants of this province. Population growth rate in this province were very high except in the District Fakfak and South Sorong. This population growth rate triggered the mobilization of population and high in-migration into the region. Total population and population growth in counties and cities in West Papua are presented in Table 1.

Tabel 1. Total Population and population growth based on Regency/Municipality in West Papua

No	Regency/Manicipality	2003	2005	Growth (%)
1	Fakfak	56.958	58.953	3.50
2	Kaimana	31.771	37.132	16.87
3	Teluk Wondama	14.165	20.414	44.12
4	Teluk Bintuni	39.886	47.419	18.89
5	Manokwari	143.949	152.302	5.80
6	Sorong Selatan	52.229	54.246	3.72
7	Sorong	70.081	87.048	24.83
8	Raja Ampat	29.248	36.51	24.83
9	Kota Sorong	141.836	148.988	5.04
10	**West Papua**	**580.193**	**643.012**	**10.83**

Source: BPS The Province of West Papua (2005)

Sharply increasing population would affect the amount of demand for livestock products (meat, eggs and milk) to the needs of consumers. .High demand for livestock products due to the increasing number of people on the move as a consequence of the existence of region expansion both provinces, counties and districts and villages. Increased number of activities in the field of tourism industry, hotels, restaurants, trade, transportation and other services business requires the availability of stocks of livestock products in large quantities. Based on data from BPS and Bappeda West Papua Province 2007, Population, the number of cutting, the number of cattle and meat consumption expenditures shown in Table2

Table 2. Population, Cutting, Expenditure and Beef Production Year 2003-2006 in the province of West Papua.

No.	Description	2003	2004	2005	2006
1	Calf population (head)	27.663	29.02	31.536	29.906
2	Slaughter (head)	3.926	4.701	5.214	4.799
3	Beef Producing (kg)/year	462.07	540.615	599.618	758.842
4	Supply for out of province (head)	190	209	230	-

Source: Dinas Pertanian dan Kehutanan Provinsi Papua Barat 2007.

Cattle population in 2006 decreased by 5.17%, while consumption is expressed in the production of meat has increased by 26.55% from the previous year. The trend in increase in consumption is not balanced with the growth of cattle population is a challenge for the region to seriously review the management aspects of the beef supply. In order to manage the balance between supply and demand for beef cattle production for sustainability need to be considered simultaneously to achieve the condition of safety stock. Related to this is an area within the administrative boundaries of provinces or districts, should have a supply of beef cattle management model that ensures the availability of cattle production over time.

Another thing to note is the participation of farm people as the greatest actor in the supply of beef cattle at every level of the region it is necessary to have a study to determine how much capacity the supply of beef cattle breeders on the level of the people

Based on the description above it is necessary to study the development of a farm to provide a model of supply management (stock management) of beef cattle in the province of West Papua in order to achieve adequacy targets of meat all the time. Expected from this research can provide an initial basis of the development of integrative policies providing cattle in West Papua Province to prioritize the implementation of the cattle population. This calculating model can be used as guidelines for livestock development policy decisions in order to keep meat self sufficiency in West Papua.

MATERIAL AND METHODS

Study Location

The study was conducted in Manokwari West Papua Province, an area of beef cattle production center. In this study used primary data include the number of calf aged 0-1 years, aged 1-2 aged ≥ 2 years and cows from the farmers household . Secondary data include the meat consumption (expressed by cow slaughtering) during 19 years, the total people population during 19 years and the people population predictions until the year 2014.

Data Analysis Model

To obtain self sufficiency in beef calculations there are three phase of the calculation to be done

Phase one

Estimating the amount of beef that must be provided / produced each year adjusted for people population growth is through the model equations Partial Adjustment Model (PAM) as follows.

.....(1)

Description **:**

$\hat{Y}_{beefpraduction(t)}$ = level of beef production is expected in year t (kg)

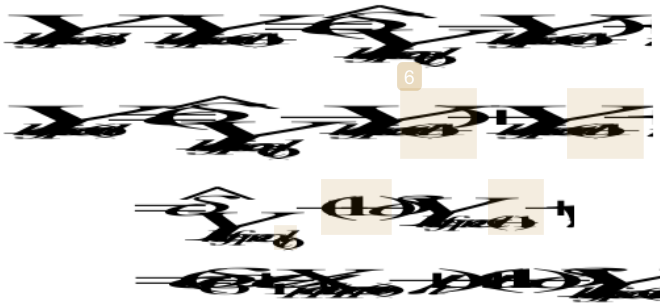
$X_{peoplepopulation(t)}$ = total population of the province in year t (soul

α_0 = Intercept

α_1 = coefficient of population change

μ_t = disturbance error

Because the value $\hat{Y}_{beefpraduction(t)}$ can not be observed directly so first look for value adjustment coefficients through the following mechanisms:



.....(2)

Description **:**

$\hat{Y}_{beef\ prod_{(t)}}$ = Level of beef production is expected in year t (kg

$Y_{beef\ prod(t)}$ = Actual level of beef production year t (kg)

$Y_{beef\ prod(t-1)}$ = Actual level of beef production year (t-1) (kg)

δ = Coefficient of change (adjustment) of short-term

v_t = disturbance error

So we get the equation of short-term supply of beef as follows:

.....(3)

Equation (4) can be solved by regression, with a known amount of time for different coefficients $(1-\delta)$, then you will know the amount of the adjustment coefficient δ (Pindyck & Rubinfield, 1976) , which can be searched coefficients values and parameters α_0 dan α_1 by dividing $\delta\alpha_0$ by δ. After the known magnitude of coefficient α_0 and α_1 hence can be made optimal long-term supply function as in equation (1).

Rewrite equation (1):

For the purposes of forecasting long-term supply of beef that adjusts pendududuk population, the population growth trend created by Geometric Rate of Growth (LIPI, 2007) as follows

$P_t = P_0(1+r)^t$ .....(4)

Description :

P_t = Population in year t

P_0 = The population of the early years

r = rate of population growth in West Papua 0.033

t = Year into its 1,2,3 etc.

Value P_t in equation (4), will be used for value $X_{people\ pop(t)}$ in equation (1),

or $P_{(t)} = X_{people\ pop(t)}$

Testing the hypothesis:

Increase of population and the change of time (years) affects the levels of meat supply in the province of West Papua .Tests base on autoregressive models in inventory adjustment model (PAM). If the variable $v_t = \delta e_t$ in which $0 < \delta \leq 1$, if e_t meet the assumptions of OLS, the variable v_t has homoskesdastis and no autocorrelation. So we can use OLS as estimator (Nerlove, 2007).

Phase 2. Knowing the breeding capacity of the national cattle population.

To determine the capacity of the national cattle population is to look at the relationship between the number of cows as a production machine and the amount of output produced in one year that we found in every farmers household . Actually the production cycle of beef cattle husbandry requires a period of more than one year, should be the ideal farm production function is a dynamic production function involving the duration of a particular production. However, given the limited recording process at the ranch the people themselves, then try the calculation done by the parent and child relationship regression generated in one year with the following equation;

1. Relationship between Bull under one year old with Cows:


.....(5)

2. Relationship between Bull 1 – 2 years old with Cows;


.....(6)

3. Relationship between Bull more than 2 years old with Cows;


.....(7)

From the equation of phase two will know the multiplier coefficients of the cow mother to produce a certain amount of bull. By comparing the output needs gained in phase one will be able to know the number of cows that must be invested to obtain the required output.

Stage 3: Calculating the size of the investment needs of the cows based on the amount of beef needs to be produced in five years.

Tabel3. Prediction of Beef Consumption and Cows Investment Requirement Every Years

Prediction of meat consumption (Animal Unit)	Needs cows investment (Animal Unit)
Beef consumption year t	Needs cows investment year t
Beef consumption in t +1	Needs cows investment year t+1
Beef consumption in t+2	Needs cows investment year t +2
Beef consumption in t+3	Needs cows investment year t+3
Beef consumption in t+4	Needs cows investment year t+4
Beef consumption in t+5	Needs cows investment year t+5

RESULTS AND DISCUSSION

Phase 1.
Estimating the amount of beef that must be provided / produced each year adjusted for people population growth is through the model equations Partial Adjustment Model (PAM)

Statistics obtained as follows:
Table 4. Results of regression equations PAM

Statistic Paramete	Value	Explanation
$\delta\alpha_0$	-2330.091	β_0
$\delta\alpha_1$	0.007	β_1
$(1-\delta)$	0.686	β_2
R^2	0.844	
R^2adj	0.832	
F.test (Sig.)	0.000**	Significant 0.05
t test	0.000**	Significant 0.05
DW test	1.718	
VIF	3.112	

So that can be calculated and the value δ,α_0 dan as follows:

$(1-\delta) = 0.686,$

$\delta = 0.308$

α_0 = -2330.091/0.308= -7565.23051

α_1 = 0.007/0.308 = 0.022727

Value α_0, and α_1 used as the coefficient in the equation:

$$\hat{Y}_{beef\ prod_{(t)}} = \alpha_0 + \alpha_1 X_{people\ popt)} + \mu_t$$

$$\hat{Y}_{beef\ prod_{(t)}} = -7565.23 + 0.022727 X_{people\ pop(t)} \quad \text{.....(8)}$$

After the value of X which is the value of population trends 2009 s / d in 2014 is obtained, then enter in the equation, we will get the following results:

Table 5. People Population Estimated 2009 s / d in 2014 and predicted needs of beef each year (Livestock Unit)

Year	People Population West Papua	Predicted Needs of beef (Animal Unit)
2009	742536	9310.39
2010	755110	9596.16
2011	767684	9881.92
2012	780258	10167.69
2013	792832	10453.46
2014	805406	10739.23

2. Knowing the relationship between amount of cows should be invested and the output generated using simple regression. Obtained the following results

Table 6. Regression Results of Cows and Bull Relationships

No	Correlation beween	Koefesien		R	R^2adj	Fhit.
		β_0	β_1			
1.	Bull < 1 year age -- Cow	-0,134	0,442	0,822	0,821	0.000**
2.	Bull 1-2 years age-- Cow	0,81	0,260	0,558	0,555	0.000**
3.	Bull >2 years age -- Cow	0,440	0,112	0,137	0,133	0.000**

From the regression results in Table 6. It appears that the best statistical value is the regression relationship between parent bull <1 years age and cows . Marked with the highest value of 0.821. This implies the fact that among farmers there has been no change in the amount due to the sale or transfer out of the farmer household. While the statistical values for the regression relationship Bull> 2 years age - Cows showed the lowest statistical value, with only equal to 0.133. It is understood that in these conditions adult cattle have been sold or slaughtered so many can no longer describe the relationship of parent and child male production actually happens . From these facts related to the interests of the calculation of self-sufficiency in the production relations Cows and Bull should be given priority generated by looking at the cows and bull relationship at the age of less than one year.

Phase 3. Having obtained the coefficient of parent and child (Cows and Bull) relationship equations are used to measure the amount of the cows which should be invested. Therefore, the Cows and Bull relationship resulting from the number of calves aged <1 year, we can conclude that:

Bull<1 years (t) = Bull >2 years (t+2)
Can be said also:

 eqivalen with 

eqivalen with 

Can be said that the large number of cattle aged> 2 years at year t, is influenced by a large cows investment in the two previous years.

Table 7. Estimates of Beef Supplies (Livestock Unit) and The Cows which must be invested every t-2

Year	Predicted amount of Bull for Beef supplay in (t) (Head)	Need invested cows in (t-2)	Cows(t-2)/Y(t)
t	Y(t)	Cow (t-2) = (Y(t) +0,134)/0,442	
2009	9310.39	21064.52	2.262
2010	9596.16	21711.06	2.262
2011	9881.92	22357.60	2.262
2012	10167.69	23004.13	2.262
2013	10453.46	23650.67	2.262
2014	10739.23	24297.20	2.262

From the table 7, shows that to get 1 (one) Animal Unit of Bull which ready for slaughtering (more than 2 years old) in year t, we have to invest 2,262 Cows Animal Unit in two years before.

CONCLUSION

1. The results of this study showed that we could develop an approach to estimate the number of invested cows in order reaching beef self-sufficiency . This approach was consisted of three (3) steps of (a) to estimate number of consumption of beef (in animal unit) as a function of people population in the region, (b) to develop an estimator equation of the variables of number of cows and their produced bulls, (c) to use the developed estimator equation of the second step to calculate the number of need invested of cows to reach the condition of beef self-sufficency in the study area.

2. To get 1(one) Animal Unit of Bull ready for slaughtering in year t , we have to invest 2,262 Cows Animal Unit in two years before.

RECOMMENDATION

This study requires improvement to the dinamic nature population data (available every year on a regular basis) which allows to calculate the amount of output (cattle ready for slaughtering derived from cattle bull and female cows which ready rejected.

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