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# The Optimum Fattening Period For Bali Cattle In Central Lombok Regency, West Nusa Tenggara

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## Abstract
The cattle productivity on fattening cattle is determined by all the inputs utilized. The output of cattle fattening is the cattle body weight produced in the rearing period. The aim of this study is to determine the fattening period which gives the maximum profit in Bali cattle fattening in Central Lombok Regency, West Nusa Tenggara. The results of this study that the average daily gain (ADG) is 0.27 kg/head/day; to produce 49 kg/head need 183 days. Maximum profit is reached in 196 days of time periode, assumed there no changes the inputs prices. The conclusion of this study is that the fattening business profit is influenced by production, cattle production price, inputs prices and the fattening period. Bali cattle fattening period is affected by cattle productivity. Therefore, the optimum period could be measured on production, production inputs and prices of production inputs as a function of time, when the maximum profit is reached.
***Keywords :*** Bali cattle, time, periode, profit.

## 1. Introduction
The cattle business is a potential source of income and a job opportunity for rural communities. The agricultural census in 2013 found that there were 600,613 agricultural households in West Nusa Tenggara, and the number of households in the cattle farming sub-sector was 286,410 households (BPS, 2013). The number of people working in cattle farms was 329,441 people. If this number is converted to the number of cattle, it means that every steer is reared by 0.32 people (Department of Animal Husbandry of West Nusa Tenggara, 2013).

The fattening business in Central Lombok Regency, West Nusa Tenggara, is mostly run by small-scale cattle farmers. The Bali cattle breed is preferred by the cattle farmers because it is adapts better than crossbreeds. Bali cattle are a local cattle breed that can be found easily almost everywhere in West Nusa Tenggara. The small-scale cattle farmers' limited ability in providing production input is the reason why production and cattle productivity is not yet optimum. Bali cattle productivity varies, depending on the farm management. Bali cattle, with their relatively low productivity level, would require more time to reach slaughter weight. The lower of cattle productivity need longer time to produce one kilogram of body weight, Longer production time would use up production inputs: feed and labor which is in line with the amount of time used.

Optimum fattening period could be applied cattle farmers to increase their income (Setiawan *et al.*, 2013). The determination of the optimum fattening period was important for the income and sustainability of cattle fattening businesses in Turkey (Sahin, et al., 2009). The fattening period is determined by the feeder cattle body weight, feed and management.

In general, cattle farmers pay little attention to the fattening period factor, so oftentimes the fattening business becomes less efficient. The costs during fattening are not worth the production, causing failure to reach maximum profit. Cattle farmers think that they have profit if the selling price of the beef cattle is higher than the buying price of the feeder cattle. A study method and information about study results that are applicable for cattle farmers are important so that they could get a better income.

The aim of this study is to determine the fattening period that gives the maximum profit to the Bali cattle businesses in Central Lombok Regency, West Nusa Tenggara.

## 2. Materials and Method
The study about Bali cattle was conducted in Central Lombok Regency, West Nusa Tenggara. The population of beef cattle in Central Lombok Regency in 2013 was 150,099 heads or 14.97 percent of the total population in West Nusa Tenggara (Departement of Animal Husbandry of West Nusa Tenggara, 2014). The samples were 44 cattle farmers with observations of 113 cattle sale transactions.

The study was conducted between July and September 2014; the data used were primary data which were cross sections, the results of interviews with cattle farmers using questionnaires containing open-ended questions. The results of the interviews were put in a table to estimate the variables in the equations that were developed.

Table 1. The Study's Respondents

| No. | Number of steer reared per production period (heads) | Number of respondents (people) | Percentage (%) | Number of cattles (heads) |
|---|---|---|---|---|
| 1. | 1 | 12 | 27.27 | 15 |
| 2. | 2 | 25 | 56.81 | 62 |
| 3. | 3 | 6 | 13.63 | 31 |
| 4. | 4 < | 1 | 2.27 | 5 |
| | Total | 44 | 100 | 113 |

### 2.1 Data Analysis

Fattening time was calculated as input; therefore (Soekartawi, 1994; Debertin, 1986):

$$\pi^* = {(P_y.Y - \sum P_{xi}.X_i - F)}/{t} + \lambda {(\sum P_{xi}.X_i - q)}/{t} \quad (1)$$

$Y = P_{xi}.X_i.t$ with the obstacles $\lambda(Y - P_{xi}.X_i.t)$

Thus: $X = f(t)$ : the input capacity that is used depends on time; $Y = f(t)$ : production is determined by time; $Y = f(X_i, t)$ : the contribution of certain input varies according to time; $F$ = fixed cost.

The function of production is a function of input which is converted to a function of time, where:

$$X_i = f_i(t_i) \quad (2)$$

Producers try to increase their profit in athe shortest period possible. Maximum profit is = ${\partial\pi^*}/{\partial t} = 0$; because $F$ is constant, ${\partial\pi^*}/{\partial F} = ( )$ so the equation is:

$$P_y\left({\partial Y}/{\partial t}\right) - \sum P_{xi}\left({\partial Xi}/{\partial t}\right) = \left(P_y.Y - \sum P_{xi}X_i\right)/t \quad (3)$$

So that $\pi^*$ reaches the maximum:

$$Py\left(\frac{\partial Y}{\partial Xi}\right) - \sum pi\left(\frac{\partial Xi}{\partial Xi}\right) = 0 \quad (4)$$

The function of fattening period is estimated using this linear equation:

$$t = \beta_0 + \beta_i X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 \quad (5)$$

The function of profit is estimated using the following linear equation:

$$\pi = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_5 P_{x1} + \alpha_6 P_{x2} + \alpha_7 P_{x3} + \alpha_8 P_{x4} \quad (6)$$

The variables that are estimated are: $t$ = fattening period (days); $Y$ = beef cattle production (kg/head); $P_y$ = beef cattle price (IDR/kg); $X_1$ = roughage feed (kg/head/day); $X_2$= agricultural byproducts (kg/head/day); $X_3$ = ricebran (kg/head/day); $X_4$ = labor (hours/person/day); $P_{x1}$ = price of roughage (IDR/kg); $P_{x2}$ = price of agricultural byproducts (IDR/kg); $P_{x3}$ = price of ricebran (IDR/kg); $P_{x4}$ = wages (IDR/person/hour/day). $\beta_0$ = constant of the period function; $\beta_{1\text{-}4}$ is the independent variable coefficient of the fattening period. $\alpha_0$= the constant of the function of profit; $\alpha_{1\text{-}8}$ = the independent variable coefficient of the function of profit.

Estimates were made using the Ordinary Least Square (OLS) method. The analysis was done using the Statistic Analysis System (SAS versi 9.0) software (Sitepu and Sinaga, 2006).

## 3. Results and Discussion

Bali cattle in this study are the rearing of male feeder cattle at an average age of 24.5 months (approximately 2 years old) intensively by cattle farmers. The average daily weight gain (ADG) was 0.27 kg/head/day, yeilding a production of 49.22 kg/head, and the time used in fattening was 183 days in average. The length of time used for fattening (the production period) depends on the ADG during the rearing. Differences in husbandry management and feed management result in varied ADG. The ADG could be used to determine the time needed for production. Diversity in the cattle farmers ability to provide different types and amounts of feed cause variety in length of time needed to produce beef cattle.

In the study conducted by Dahlanuddin *et al*. (2013) about Bali cattle in Central Lombok Regency, it was observed that cattle fed grass and agati *(Sesbania grandiflora)* produced a ADG of 0.44 ± 0.13, 0.32 ± 0.03 and 0.58 ± 0.05. To yield a production of 149 kg, 42 kg and 124 kg, the time needed for fattening was 375 days, 144 days and 249 days, respectively. Ratnawaty and Budianto (2007) observed that in Bali cattle fattening in East Nusa Tenggara, to produce 100 kg with an average ADG of 0.46 ± 0.17 kg/head/day, 255 days of fattening were needed. Mlote *et al.* (2013) in their study of the fattening of local cattle in Tanzania demonstrated that with a ADG of 0.65 kg/head/day to produce 58.6 kg, 92 days of fattening were needed.

The production variables and production inputs are presented in Table :

Table 2. The averages and standard error of mean values in the equation.

| Notation Variable | | Average | SEM |
|---|---|---|---|
| $Y$ | = | 49.22 | 3.74 |
| $X_1$ | = | 25.07 | 0.48 |
| $X_2$ | = | 4.65 | 0.19 |
| $X_3$ | = | 1.16 | 0.01 |
| $X_4$ | = | 2.02 | 0.08 |
| $P_{x1}$ | = | 231.12 | 0.13 |
| $P_{x2}$ | = | 123.17 | 0.04 |
| $P_{x3}$ | = | 1,773.42 | 11.08 |
| $P_{x4}$ | = | 6,867.90 | 58.61 |
| $P_y$ | = | 36,667.14 | 435.10 |
| $t$ | = | 183.24 | 8.71 |

Cattle production is a result of the utilization of production input and fattening time. Cattle productivity affects the time needed to produce. The amount of feed consumed by the cattle is limited, and the fresh roughage consumed depends on the cattle's body weight. In this study, the quality of feed was not observed and thus cannot be discussed further. Fattening time period is affected by cattle production and inversely proportional with productivity. Better cattle productivity would decrease the fattening period. The time during the fattening period expends production costs up to the

point where the cattle are sold. If the cost of each input unit is unchanged, it relatively does not affect the profit received. The gross profit received by cattle farmers, the difference between the beef cattle selling price and the feeder cattle price averages IDR 2,764,940. The variable cost is calculated from the cash expenditures for production input, consisting of feed, roughage and bran, averaging IDR 5,555/head/day.

The factors that affect fattening time in equation (5) and the factors that affect the profit in equation (6) are presented in the following table:

Table 3. Estimate results of the parameters which affect fattening period and profit.

| Variable | Estimate Parameter | t-value | P > \|t\| |
|---|---|---|---|
| **Fattening period (*t*)** | | | |
| Intercept | 45.56 | 0.44 | 0.6628 |
| *Y* | 1.75 | 8.34 | <.0001 |
| $X_1$ | 0.92 | 0.66 | 0.5098 |
| $X_2$ | 5.47 | 1.35 | 0.1804 |
| $X_3$ | -32.19 | 0.36 | 0.7170 |
| $X_4$ | 20.05 | 2.68 | 0.0085 |
| $R^2$ = 0.49; Pr > F = <.0001; Durbin-Watson = 1.59. | | | |
| **Profit (π)** | | | |
| Intercept | 63756483.00 | 2.32 | 0.0222 |
| *Y* | 25677.85 | 7.24 | <.0001 |
| *Py* | 161.90 | 7.50 | <.0001 |
| $X_1$ | 48373.98 | 2.59 | 0.0111 |
| $X_2$ | 259324.5 | 4.82 | <.0001 |
| $X_3$ | 7502354 | 2.20 | 0.0301 |
| $X_4$ | -153587 | -1.54 | 0.1278 |
| $Px_1$ | 47191.75 | 0.73 | 0.4655 |
| $Px_2$ | -646088.00 | -3.12 | 0.0023 |
| $Px_3$ | -5020.78 | -1.96 | 0.0527 |
| $Px_4$ | -447.45 | -2.98 | 0.0036 |
| *t* | 8829.97 | 6.77 | <.0001 |
| $R^2$ = 0.83; Pr > F = <.0001; Durbin-Watson = 1.63 | | | |

The price of beef cattle and production demonstrate a positive and significant correlation with profit (Table 3). The amount of input and price of input affect profit except for labor use, but wages have a significant effect. The use of labor affects fattening period but it has a negative correlation with profit. Increased labor would increase production cost while its contribution to production is relatively small. The price of input demonstrates a negative correlation with profit, except for the price of roughage which has a positive correlation and does not demonstrate a significant effect. The prices of input except for roughage have a significant effect on profit. Roughage is the main feed in cattle fattening, so the increase in its price does not affect the amount fed to the cattle.

Fattening period demonstrates a positive and significant correlation with profit. In fattening businesses in which the amount and price of each input is assumed to be constant, a longer fattening period could increase profit, but maximum profit is reached at the optimum period. Lengthening the fattening period would not result in an endless profit increase.

Mohammed *et al.*, (2013) in a study about cattle marketing in Nigeria estimated rearing time by a linear profit function and demonstrated that rearing time and the cost for purchasing feeder cattle had a significant effect on profit. Sarma *et al.*, (2014) conducted a study about local cattle fattening businesses in Bangladesh with an estimated fattening period towards production using the Cobb-Douglas fuction which resulted in an optimum fattening time of 4 months, but it did not have a significant effect on production. Mlote *et al.*, (2013) performed an estimate of the factors that influenced profit with a linear function and demonstrated that fattening time had no significant effect on income.

The results of the estimate of production variables, the amounts of input consisting of roughage, agricultural byproducts and labor, in equation (2) is presented in the following table:

Table 4. Parameter coefficient value

| Variable | $R^2$ | t-Value | Pr > F | | | Parameter |
|---|---|---|---|---|---|---|
| *Y* | 0.42 | 9.06 | <.0001 | $\partial Y/\partial$ | = | 0.247990 |
| $X_1$ | 0.03 | -1.87 | 0.0635 | $\partial X_1/\partial$ | = | -0.010010 |
| $X_2$ | 0.00 | -0.14 | 0.8860 | $\partial X_2/\partial$ | = | -0.000680 |
| $X_3$ | 0.00 | 1.24 | 0.2164 | $\partial X_3/\partial$ | = | 0.000116 |
| $X_4$ | 0.11 | 3.89 | 0.0002 | $\partial X_4/\partial$ | = | 0.003407 |

Fattening time length was calculated using equation (3) :

$$P_y\left(\partial Y/\partial\right) - \sum P_{xi}\left(\partial Xi/\partial\right) = \left(P_y . Y - \sum P_{xi} X_i\right)/t$$

(36,667.14 * 0.247990) – ((231.12 * -0.010010) + (123.17 * -0.000680) + (1773.42 * 0.000116) = {(36,667.14 * 49.22) – ((231.12 * 25.07) + (123.17 * 4.65) + (1773.42 * 1.16))} / t ; then 9,093.30 = 1,782,483 / t. The optimum fattening period (t) is 196.02 days or 6.53 months. The optimum period when maximum profit is reached demonstrates that the fattening period for Bali cattle at the point of time when the ratio of the marginal value of profit to fattening period equals zero. Cattle farmers would receive maximum profit when the fattening period is 196.02 days.

Setiawan *et al*. (2013) measured the optimum period for fattening Simmental-Ongole Grade cattle fed complete feed. To produce 372 kg of body weight, the fattening period was 56 days and maximum profit was reached at the optimum fattening period of 45 days.

## 4. Conclusion

. The profit of the fattening business is affected by production, price of beef cattle production, prices of production inputs and fattening period. Bali cattle's fattening time length is affected by cattle production Therefore, the optimum period for fattening Bali cattle could be measured on production, production inputs and prices of production inputs as a function of time when maximum profit is reached.

## References

[BPS] Badan Pusat Statitik (2013). Sensus Pertanian 2013. Badan Pusat Statistik Nusa Tenggara Barat.

Dahlanuddin, Yuliana BT, Panjaitan T, Halliday M & Shelton HM. (2013). *Growth of Bali bulls on ration containing Sesbania grandiflora in Central Lombok, Indonesia*. Tropical Grassland – Forrajes Tropicales Volume 1, pp 63-65. [periodically connected].

Debertin D L. 1986. *Agricultural Production Economics*. Macmillan Publishing Company. United State of America. pp 62 – 69.

[Disnak NTB] Dinas Peternakan dan Kesehatan Hewan Provinsi NTB (2014). *Statistik Peternakan*. 2014. Department of Animal Husbandry of West Nusa Tenggara Province.

Mlote S N, Mdoe N S Y, Isinika A C and Mtenga L A. (2013). Journal of Agricultural Economics and Development. *Profitability Analysis of Small Scale Beef Cattle Fattening in The Lake Zone in Tanzania*. Vol. 2 (5) pp. 203 -216. http://www.academeresearchjournals.org/print.php?id=51a1fba1428a5. Accesed 10 August 2015.

Mohammed S, Mohammed I & Adamu I. (2013). International Journal of Scientific and Technology Research. *Socioeconomic Factors Influencing Profitability of Cattle Marketing in Gombe Metropolis, Nigeria.* Vol. 2 Issue 12. pp 288 – 292. http://www.ijstr.org/final-print/dec2013/Socioeconomic-Factors-Influencing-Profitability-Of-Cattle-Marketing-In-Gombe- Metropolis-Nigeria.pdf. Accesed 3 August 2015.

Ratnawaty S, Budianto DA. (2011). J. Ternak Tropika. *Peluang Usaha Penggemukan Sapi dalam Kandang Kelompok di Desa Tobu, Kabupaten Timor Tengah Selatan, Nusa Tenggara Timur* Vol. 12, No. 2: pp 52-59. http://ternaktropika.ub.ac.id/index.php Accesed 15 Juni 2014.

Şahin A, Miran B, Yildirim I, Önenc & Alcicek. (2009). Turk. J. Vet. Anim, Sci. *Fattening Cost of Beef Breeds reared Under Controlled Conditions and The Determination of Optimum Fattening Period.* 33(6) : 485-492. http://journals.tubitak.gov.tr/veterinary/issues/vet-09-33-6/vet-33-6-6-0803-31.pdf. Accesed 2 August 2015.

Sarma P K, Raha S K, & Jorgensen. (2014). J. Bangladesh Agri. Univ. *An Economic Analysis of Beef Cattle Fattening in Selected Areas of Pabna an Sirajgonj Districts.*12(1) : 127 – 134. http://www.banglajol.info/index.php/JBAU/article/view/21402. Accesed 3 August 2015.

Soekartawi. (1994). *Teori Ekonomi Produksi*. Dengan Pokok Bahasan Analisis Fungsi Cobb-Douglas. PT. Raja Grafindo Persada. Jakarta.

Setiawan, B M., Isbandi, P. B. Santosa and E. Rianto. 2013 J. Indonesian Trop. Anim. Agric, . *Optimum Length of Raising Time and Relation with Business Income of Simmental-Ongole Grade Crossbred Beef Cattle Fattening Farm in Wonosobo Regency-Central Java.* 38 (2) June 2013. pp 109-115.

http://ejournal.undip.ac.id/index.php/jitaa/article/view/7418. Accesed 1 Desember 2014.

Sitepu R K and Sinaga B. (2006). *Aplikasi Model Ekonometrika*. *Estimasi, Simulasi dan Peramalan Menggunakan Program SAS.* Agricultural Economics Study Program. Graduate School. Bogor Agricultural University.