The Effects of Production Factors on Commercial Production of Etawah Crossbred Goats in Boyolali, Central Java, Indonesia

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ABSTRACT : The objective of this study was to evaluate the effects of some production factors on commercial production of Etawah Crossbred Goats (ECG) of *Inpres Desa Tertinggal* member groups (AKIDT) at Krasak, Pandansari, Brajan, and Kragilan villages in Boyolali regency, Central Java, Indonesia. The study was from February to April 2000. Eighty respondents of AKIDT were selected by simple random sampling and the data were analyzed using Cobb Douglas Production Function. The results showed that ECG production simultaneously were highly significant ($p<0.01$) influenced by amount of feed consumed (kg TDN/year, x_1), number of does of ECG (Animal Unit/year, x_2), number of kids and does/ barn/year (Animal Unit/year, x_3), labor use (man-days/year, x_4) and work capital (US$/year, x_5) with $R^2= 0.6568$. In addition, ECG production was partially influenced by x_2, x_3 and x_5 ($p<0.01$) and x_1 ($p<0.05$), but not significant ($p>0.05$) by x_4. Technically, production factors of x_1, x_2, x_3, x_4, x_5 had reached technique efficiency ($0<Ep<1$) and goats production still can be increased by all of these production factors simultaneously. There were increasing return to scale position proved by total production elasticity (Ep=1.4416). For economic efficiency, the production factor of x_1, x_3, x_4, x_5 did not showed efficiency ($Ep<1$) and x_2 was not efficient yet. ***(Asian-Aust. J. Anim. Sci. 2002. Vol 15, No. 9 : 1263-1266)***

Key Words : Etawah Crossbred Goats (ECG), Feed, Labor Use, Work Capital, Economic Efficiency

INTRODUCTION

Since the five-years-development plan VI, Indonesian Government set out additional special program (*Inpres Desa Tertinggal*, IDT) to increase the capability of the poor rural condition through the productive activities (Bappenas and Depdagri, 1993; 1995). In Central Java, most of the IDT program funds are being used to raise Etawah Crossbred Goats (ECG). These ECG are easily raised and cared, relatively resistant to diseases, consume agricultural and industrial by-product, and feces can be used as fertilizer (Devendra, 1993, Devendra and Burn, 1994).

There are production factors to appraise success of the ECG management: number of doe of goat, feed availability, management, health and reproduction, in which these factors were called *Panca Usaha Ternak* or Five Working-Program for Animal (Soehadji, 1993; Soedjana, 1993; Wiryosuhanto, 1997), beside of capital, labor and land (Heady and Dillon, 1964; Dilon and Hardaker, 1980; Soekartawi, 1990; Mubyarto, 1994).

The relation between the production factors and the production results can be estimated by production function such as Cobb Douglas Function (Heady and Dillon, 1964; Battie and Taylor, 1985; Amir and Knipscheer, 1989; Gasperzs, 1990; Soekartawi, 1990). There were three reasons for researchers using Cobb Douglas Function, those are: 1) the function is easier than other functions such as quadratic function; 2) the linear estimation of Cobb Douglas result in regression coefficient and also as value of production elasticity; and 3) the production elasticity is showed as Return The Scale (RTS). In addition, Cobb Douglass function also has another advantage, i.e. it shows technique efficiency in the meaning of the production elasticity value between 0 and 1 or $0<Ep<1$ and economic efficiency, in which Marginal Production Value (MPV) of the production factor equals the price (P) of production factor.

The objective of this study was to evaluate the effects of some production factors on commercial production of Etawah Crossbred Goats in Boyolali, Central Java, Indonesia.

MATERIALS AND METHODS

Materials

The household raising Etawah Crossbred Goats (ECG) from member farms of the IDT program were used. The farmer groups involved were *Ngesti Makmur* and *Mekarsari* in Teras district; *Kepodang III* and *Tunas Karya* in Mojosongo district, in which both of those districts are in Boyolali regency, Central Java, Indonesia. These farmers were chosen purposively based on the consideration of which these villages were the location of the ECG development program and have followed the IDT program for 2 years.

Methods

Method of the study was survey method (Suryanto, 1986; Singarimbun, 1989) from February to April 2000. Random sampling was used to select 80 respondents as the sample units. Primary data were collected using questionnaire, consisted of farmer characteristics, the use of production

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factors, total kid production, cost and revenue, labor use and work capital. Secondary data were taken from Animal Husbandry Services and related institution.

Model

The relationships between production factors and the production of ECG were analyzed using Cobb Douglass function (Heady and Dillon, 1964; Battie and Taylor, 1985; Amir and Knipscheer, 1989; Gasperzs, 1990; Soekartawi, 1990).

Mathematical model used was:

$$y = b_0 x_1^{b1} x_2^{b2} x_3^{b3} x_4^{b4} x_5^{b5} e^u$$

where y=number of kids born/year; x_1=number of feed consumed (kg/TDN/year), x_2=number of does of goats (Animal Unit/ year), x_3=number of kids and does per barn (Animal Unit/year), x_4=number of labor (man-days/year), x_5=number of work capital (US dollar/year) and e^u=error. The b0 is constant, while b1, b2, b3 and b4 are coefficients of regression.

Animal Unit (AU) used here is defined as measurement to predict the equivalent of many kinds of animal that differ in body size and the requirement of feed (Srigandono, 1996).

Data analysis

Quantitative analysis was transformed into logarithmic natural linear regression (Wonnacott and Wonnacott, 1979; Soekartawi, 1990) as follows:

$$\ln y = \ln b_0 + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + \mu$$

The assumption used was Ordinary Least Squares (OLS) method. The data were analyzed by *Microstat* computer program (Mustafa, 1990). F-test was used to measure the effects of production factors simultaneously on the number of the kids born during a year. The t-test was used to measure the effects of the production factor partially to the kids born.

The production elasticity of the respective production factor was used to measure the technique efficiency. Technique efficiency is defined as rate of using a production factor shows more efficient compared to other production factors when it results in higher production and reach maximum production (Teken and Asngari, 1977).

Ratio of Marginal Product Value (MPV) of the production factor with its price (P) is used to measure the economic efficiency. Economic efficiency is rate of using a production factor to reach maximum profit. Economic Efficiency is reached if $(MPV_{xi})/(P_{xi})=1$, where xi is the i^{th} production factor (Heady and Dillon, 1964; Battie and Taylor, 1985; Gasperz, 1990; Soekartawi, 1990).

RESULTS AND DISCUSSION

Characteristic of the farmers

The members of farmer groups were 35 years old. Eighty percent of them were in productive ages. The formal education is very low, i.e. primary school. They have experience in animal husbandry up to 8 years, who are guided by government services. Therefore, they have ability to develop their business.

The use of production factors

Production factors used in this study were feed consumed (kg TDN/year), number of does (AU/year), the number of kids and does per barn (AU/year), labor (man-days/year), and the work capital (US dollar/year) as presented in Table 1.

It can be seen in Table 1, the production of the kid born for a year was 2.30 or 0.08 AU. Moreover, the doe of goat raised in a year were 1.78 head (0.25 AU). This meant that each doe gives 1.3 kids. Result of analysis showed that rate of the feed consumed was 3237.12 kg TDN/year or 1818.61 kg/TDN/year/head of doe. This consumption is higher than 373.03 kg TDN/year as reported by Haryanto and Djajanegara (1993). The labor used was 61.78 man-days/year/respondent in our samples, that was lower than report of Hartono et al. (1996) that was 123.64 man-days/year/respondent.

The effects of production factor

The effects of production factors on ECG production can be seen on the result of logarithmic natural linear regression as follows:

$$\ln y = \ln 0.6465 + 0.2217 \ln x_1 + 0.4884 \ln x_2 + 0.3657 \ln x_3 + 0.1612 \ln x_4 + 0.2046 \ln x_5$$

The effects of production factors for feed consumed (x_1), the number of does of goat (x_2), the number of kids and does per barn (x_3), labor use (x_4) and work capital (x_5) simultaneously were highly significant ($p<0.01$) for the ECG production with $R^2=0.6568$. The effects of production factors partially are presented in Table 2.

Table 1. The use of production factors on number of kids born

Production factors	Unit	Total number of respondents (80)	Mean
Feed (x_1)	Kg TDN/year	258,969.60	3,237.12
Doe of goats (x_2)	Head (AU)/year)	142	1.78 head (0.25 AU)
Kid-doe per barn (x_3)	Head (AU)/year)	184	2.30 head (0.08 AU)
Labor use (x_4)	Man-days/year	4,942.40	61.78
Work capital (x_5)	US$/year	5,065.40	63.32

As can be seen in Table 2, labor use (x_4) had no significant effect ($p>0.05$) to the production of kids born (y). Therefore, the members of the farmer groups of IDT were recommended to increase the labor spent, as stated by Hartono et al. (1996).

The feed consumed (x_1) was significant ($p<0.05$) for production of the kid born (y), while does of goats (x_2), the number of kids and does per barn (x_3) and the amount of work capital (x_5) were highly significant ($p<0.01$).

The feed availability, both quantitatively and qualitatively, affects growing of ECG (Devendra, 1993) and (Haryanto and Djajanegara 1993). The members of farmer groups were recommended to increase the number of does per goat. The coefficient of regression was 0.4884, meant that the increasing a unit of doe could increase as much as 0.4884 unit of kid born, *ceteris paribus* (Amir and Knipscheer, 1989; Gasperz, 1990; Soekartawi, 1990).

Technique efficiency

Technique efficiency of each production factor can be seen in Cobb Douglass production elasticity resulting from the calculation of logarithmic natural linear regression transformation, that is: $y=1.9088\ x_1^{0.2217}x_2^{0.4884}x_3^{0.3657}x_4^{0.1612}x_5^{0.2046}$.

The production elasticity of each production factor was higher than 0 and lower than 1 or $0<Ep<1$, meaning that rate of technique efficiency was reached by each production at the value of production elasticity. The total production elasticity was 1.4416 showed that the production function was $Ep>1$, meant that it was in position of *increasing return to scale*. In this phase, if all production factors (feed, does of goat, kids-does per barn, labor use, work capital) increase, number of kid born (y) could incease (Amir and Knipscheer, 1989; Gasperz, 1990; Soekartawi, 1990).

Economic efficiency

Economic efficiency of the production factors were measured by comparing Marginal Product Value (MPV) of each production factor with their price unit as can be seen in Table 3.

The economic efficiency of the feed (x_1) was 0.0004,

Table 2. Partial regression coefficient of number of kids born on the production factors

Variable	Coefficient of regression	Significance of t-test
Feed (x_1)	0.2217	2.071*
Doe of goats (x_2)	0.4884	5.422**
Kid-doe per barn (x_3)	0.3657	3.560**
Labor use (x_4)	0.1612	1.083^{NS}
Work capital (x_5)	0.2046	3.465**
Constant	0.6465	

* $p<0.05$, ** $p<0.01$, ^{NS} Not significant, $R^2=0.6568$.

Table 3. Economic efficiency of the production factors on number of kids born

Variable	Px_1 (US$)	MPV (US$)	Economical efficiency
Feed (x_1)	0.0262	0.0001051	0.0004
Doe of goats (x_2)	36.8947	42.5957	1.1545
Kid-doe per barn (x_3)	8.4757	8.1683	0.9639
Labor use (x_4)	0.2632	0.0046	0.0174
Work capital (x_5)	0.1735	0.000000947	0.0000055

meaning that the increase the amount of feed consumed was not efficient economically. Feed supply for each doe 3237.12 kg TDN/year/head must be revised as reported by Haryanto and Djajanegara (1993) that minimum feed was 373.03 kg TDN/year/head. The economic efficiency of the doe (x_2) was 1.1545, larger than 1, meaning that the use of the number doe was not efficient yet. The efficiency of the kid and doe per barn (x_3) was not efficient economically as showed by value of economic efficiency 0.9639. The members of farmer groups were recommended to increase the number of doe or the number of kid born per doe. The labor use (x_4) was not efficient, because the value of economic efficiency was 0.0174. The members were recommended to rearrange the number of labor used as for factual need. Economic efficiency of the work capital (x_5) was 0.0000060, in which was not efficient for the capital used. The member of farmers was recommended to rearrange use of capital fitted with factual need.

In conclusion, production factors of number of feed consumed, number of does, number of kids and does per barn, number of labor and work capital simultaneously had significant effect to the number of kid born. The total production elasticity was 1.4416, in which it was in position of *increasing return to scale*. Technically, most of production factors used was efficient, except labor use. Economically, the number of does was not efficient. The present study suggests that the member of farmer groups should increase their commercial production technically and increase the number of doe.

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