Conference Paper

Analysis of the Implementation of Ettawa Crossbred Goat Manure Treatment in the District Kulonprogo Yogyakarta, Indonesia

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Abstract
Livestock manure is a potential for soil fertility and increases the income of farmers. This research is to identify characteristic farmers and utilization of manure and the factors that influence the choice of farmers in carrying out manure treatment. The research was conducted in Kulon Progo Regency as a production center Ettawa Crossbred goats and taken one location the Village Ngargosari Samigaluh District of implementing mixed farming crops and livestock. The numbers of the sample were 65 respondents. The survey method was used to collect data using questionnaires to respondents. The data were analyzed quantitatively using Binomial Logistic Regression models. The results showed that the views of characteristic respondent had productive age (48.75 yr), have similar primary school education (51.00 %), business experience (22.63 yr) and dominance in the on-farm jobs (80.00 %). Average livestock ownership as much as 4.88 goats or 0:55UT. Utilization of manure for plants was 89.00 % and the remaining 11.00 % for fertilizer plants and sold. A total of 70.80 % of farmers did not do a manure treatment through fermentation. The independent variable number of livestock is the most influential factor positive and significance of the choice of farmers in implementing waste treatment ($P < 0.05$), the age of farmers positive and significant ($P < 0.1$), and the number of family members negative and significant ($P < 0.1$). This is due in goat raising is still dominated household. The implication of this research is the need for socialization understanding of the importance of manure treatment to improve the intangible benefits at the household of farmers.

Keywords: Fermentation, Intangible benefit, Ettawa crossbred, Income, Manure treatment

1. Introduction

Goat is considered an attractive business for small-scale farming in developing countries and less-favored areas due to their well-adapted to the grazing on poor marginal lands [1]. Small ruminants like sheep and goats are important for a larger part of the Indonesian rural population. The major breeds of goats found in Indonesia are the Kacang and
Etawah goats. The concentration areas for raising Ettawa Crossbred goats are upland regions, such as Kulon Progo and Sleman Yogyakarta. Besides producing animal products, they also provide manure to maintain soil fertility [2]. Livestock manure is an important resource for food and feeds production because it supplies measure nutrients such as nitrogen (N), phosphorus (P), and potassium (K) [3]. Ruminant manure is a valuable resource as a soil fertilizer, providing both macro, and micronutrients required for the plant growth, and is a low cost alternative to mineral fertilizer [4]. Farmers use sheep and goat manure as fertilizer for their fruit trees and paddy fields [5]. Ettawa goat manure and urine have a good potential for rice farming [6]. Adult goats in Turi Sleman Regency produced 1 kg manure per day [7]. In Indonesia, the goats on small farms are generally kept in wooden housing with slatted flooring and raised above the ground, so goat manure can be collected [8].

2. Material and Method

The location selected in Kulonprogo district which is a center for the breeding production of Ettawa crossbred goats in Yogyakarta. Collecting data census farmers comes from 65 respondents in the hamlet Tegalsari, Village Ngargosari, Samigaluh, and Kulonprogo. Descriptive analysis was used to explain the characteristics of the respondents and obtained from the tabulation of questionnaires.

Binomial Logistic regression (logit) was in use to seek the determinant factors that influences to the choice of farmers ready implemented waste treatment or not. The logit model is a function of cumulative probability logistic, which is formulated as follows:

$$P_i = E(Y = 1/X_i) = 1/1 + e^{-(\alpha + \beta X_i)}.$$  \hspace{1cm} (1)

For ease of exposition, it can be written as

$$P_i = 1/1 + e^{-z_i},$$ \hspace{1cm} (2)

where $z_i = \alpha + \beta X_i$

Equation (2) was the cumulative logistic distribution function. In that equation, $z_i$ ranges from $-\infty$ to $+\infty$, $P_i$ ranges between 0 and 1 and that $P_i$ is non linearity related to $z_i$ (in $X_i$ and the $\beta$'s).

If $P_i$ is probability of a farmer ready to implementation waste treatment, then $(1-P_i)$ is the probability of waste treatment not ready to implementation where,

$$1 - P_i = 1/1 + e^{z_i}.$$ \hspace{1cm} (3)
Therefore, it can be written as:

\[ \frac{P_i}{1 - P_i} = 1 + e^{z_i/1 + e^{-z_i}} = e^{z_i}. \]  

(4)

Further \( \frac{P_i}{1-P_i} \) is the Odds Ratio or the ratio of the probability that a farmer will ready to implementation waste treatment.

In the form the natural log of the Odds Ratio, namely

\[ \ln \frac{P_i}{1-P_i} = Z_i = \alpha + \beta X_i \]  

(5)

e = 2.71828

In the form equation was:

\[ \ln \frac{P_i}{1-P_i} = \alpha + B_1 X_1 + \beta_2 X_2 + D_1 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \]  

(6)

\[ P_i = \frac{1}{1 + e^{-(\alpha + B_1 X_1 + \beta_2 X_2 + D_1 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5)}} \]  

(7)

where

- \( P \) = choice farmers to implementation waste treatment
- \( \alpha \) = intercept
- \( \beta_1 \ldots \beta_5 \) = regression coefficient
- \( X_1 \) = age (year)
- \( X_2 \) = formal education (score)
- \( D_1 \) = dummy of non formal education
  - \( 1 \) = trainee
  - \( 0 \) = not trainee
- \( X_3 \) = experience (year)
- \( X_4 \) = member of household (person)
- \( X_5 \) = goat ownership (goat)
- \( \mu \) = stochastic disturbance term

Because the model was nonlinear, so that the model was tested using Maximum Likelihood Estimation (MLE) test. It means to get the value of Likelihood Ratio Index (LRI) which should be equal to R-squared in OLS regression, Likelihood Ratio (LR) test which should be equal to F-test in OLS regression, and Wald test which should be equal to t-test in OLS regression [9, 10].
3. Results and Discussion

Based on the research results, judging from the characteristic of respondents including productive farmers age (48.75 yr) and business experience has been effort hereditary (22.63 yr). The mean level of similar elementary school education (51.00 %) in particular is relating to the low implementation of waste treatment technologies (11.27 %). The average family size was 3.63 ± 1.50 of people. Farmers involved their family members in participating in managing the farm business [11].

| Component                          | value          |
|------------------------------------|----------------|
| Age (year)                         | 48.75 ± 10.15  |
| Business experience (year)         | 22.63 ± 14.43  |
| Formal education (%)               |                |
| No School                          | 2              |
| Elementary School                  | 51             |
| Junior High Schools                | 18             |
| High Schools                       | 26             |
| Colleges                           | 3              |
| Family members (person)            | 3.63 ± 1.50    |
| The main job (%)                   |                |
| government employees               | 3              |
| private                            | 6              |
| farm workers                       | 11             |
| farmers                            | 80             |
| Non formal education (%)           |                |
| Feed technology                    | 50             |
| Recording goat                     | 66.68          |
| Waste treatment                    | 29.2           |

| Type of goat                     | goat | Animal Unit | Selling price (IDR per goat) |
|----------------------------------|------|-------------|------------------------------|
| Male goat                        | 1.42 | 0.94        | 2 527 500                    |
| Parent doe                       | 2.03 | 0.91        | 1 519 230                    |
| Breastfeeding doe                | 1.70 | 0.97        | -                            |
| Doe                              | 1.70 | 0.98        | -                            |
| Young                            | 1.42 | 0.69        | 1 920 000                    |
| Kids male                        | 1.66 | 0.77        | 1 770 000                    |
| Kids female                      | 1.79 | 0.89        | 1 416 155                    |
| Total                            | 4.88 | 0.55        |                              |
Table 2 shows the average ownership of 4.88 goats per farmers or 0.55 AU per farmers. The highest of parent doe showed heterogeneity livestock awake. While waiting for a good price for selling, farmers have the opportunity to obtain additional products such as kids and manure. Kids with 3 mo to 4 mo is ready for sale IDR 1 770 000 per goat for males and females IDR 1 416 155 per goat. Utilization of manure for plants was 89.00 % and the remaining 11 % for fertilizer plants and sold. In Kulonprogro potential crops being developed are plantation crop cloves (*Syzygium aromaticum* (L.) Merrill & Perry), coffee (*Coffea* L.), tea (*Camellia sinensis* (L.) Kuntze), and coconut (*Cocos nucifera* L.). A total of 70.80 % of farmers did not do a manure treatment through fermentation. This concurs with the statement that farmers knowledge on handling and processing of goat manure is still lacking [12]. Farmers do not calculate the intangible benefits of goat manure to provide added value to the family income. In Turi Sleman Regency 10.20 % of farmers had been processing the manure and selling the compost [12]. In this area, the utilization of goat manure is mainly to support fruit production, especially for *Salak Pondoh* [*Salacca zalacca* (Gaertn.) Voss cultivar Pondoh] because these fruits are the main agriculture products which require goat manure as the fertilizer.

**Table 3:** Binary Logistic Regression for the factors that affect the choice of farmers in implementing waste treatment.

| Independent variable          | Coefficient | Std. Error | z-Statistic | Prob. | Odds Ratio |
|-------------------------------|-------------|------------|-------------|-------|------------|
| Constanta                     | -5.078      | 2.417      | -2.100      | 0.035 | 160.4523   |
| Age (X1)                      | 0.07        | 0.039      | 1.777*      | 0.075 | 1.071436   |
| Formal education (X2)         | 0.025       | 0.349      | 0.072       | 0.942 | 1.025315   |
| Non formal education (X3)     | 1.119       | 0.756      | 1.481       | 0.139 | 3.061789   |
| Experience (X4)               | -0.003      | 0.027      | -0.984      | 0.325 | 1.027368   |
| Number of family (X5)         | -0.448      | 0.259      | -1.730*     | 0.084 | 1.565178   |
| Goat ownership (X6)           | 0.457       | 0.179      | 2.541**     | 0.011 | 1.579328   |
| McFadden R-squared            | 0.16992     |            |             |       |            |
| LR statistic                  | 13.34666    |            |             |       |            |

Note: *** = level significantly 0.01 \( (P < 0.01) \)

** = level significantly 0.05 \( (P < 0.05) \)

* = level significantly 0.1 \( (P < 0.1) \)

The results of the binary logistic regression model analysis showed that goat ownership had a significant positive effect \( (P < 0.05) \) to the choice of farmers in implementing waste treatment. The value of the Odds Ratio showed probability goat ownership increased by 1.5778 times higher than in those who did not implement waste treatment. Similarly, a number of family and age significantly \( (P < 0.10) \).
4. Conclusion

Based on the results of research on the benefits of understanding farmers’ goat manure is still lacking. The implication of this research is the need for socialization understanding of the importance of manure treatment to improve the intangible benefits at the household of farmers. Farmers groups should be facilitated to cooperate with the Department of Agriculture or Animal Husbandry, education institutions, and corporate Research and Development of Agriculture. Forms of cooperation include education about processing technology goat manure into compost and liquid fertilizer, livestock procurement assistance, and marketing of fertilizers.

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