Income share and technical efficiency in the broiler partnership system in Sleman regency, Yogyakarta

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Abstract. This study aimed to measure the income share of the owner of production factors of plasma-core in partnership system, and analyze the technical efficiency based on economics of scale. The research was conducted in Sleman Regency as broiler production centre, using 64 determined farmers purposively as samples based on farmers’ participation in the partnership for at least 1 year long. Primary data was acquired by survey method with in-depth interviews using questionnaires. Descriptive analysis showed in average and percentage was used to measure income share in the partnership system, whereas Cobb-Douglass production function was used to determine technical efficiency with OLS method. The results showed that the core company as the owner of the production factors took 87.14% of the gross income for feed, DOC, medicines cost that were supplied. Plasma gets of income share from labor and management as 1.76% and 1.50% respectively. The Cobb-Douglass regression shown that coefficient β is 0.946 (P <0.01), this which mean the plasma was in a condition of decreasing return to scale. They need better cooperation between core and plasma in the use of production factors such as feed and medicines, then that the plasma can be technically more efficient.

1. Introduction
Broiler meat takes the largest supply for meat consumption in Indonesia. In 2017, the consumption reached 55.26% [1]. This condition is supported by the structure of the poultry industry that is growing rapidly in the upstream sub sectors (feeds, Day Old Chick/DOC, and medicine industries), and downstream sub sectors (product processing and marketing industries), those which are dominated by several large companies. However, almost sub sectors of broiler agribusiness farms are managed by small-scale farmers with small capital. There has been dualism of the development in the poultry industry in Indonesia which can lead to a welfare gap between the two actors. The plasma-core policy is a partnership system between large companies as the core that own capital and serve as suppliers of production facilities and plasma farmers that serve as actors in the cultivation/on farm [2]. Plasma farmers can be assured over the supply of production and marketing facilities when harvesting [2, 3].

The revenue of plasma farmers is composed of the sale of live birds, manure as fertilizer, feed sacks, and bonuses from the compensation of maintenance management in the form of FCR (Feed Conversion Ratio) and mortality if they perform above the standards set by core companies [4]. The plasma with limited business capital could run broiler breeding with Partner Company’s help as integrator that provided day old chicken (DOC), feed, and drugs, and marketed the harvest product. Meanwhile, core company with limited land and workers could also benefit from the related
partnership [5]. Benefit or income is important in the final process of production, which shows the success and failure of a business [6].

This study aimed to measure the income share of the group and the owner of production factors in a plasma-core partnership system, and to analyze the technical efficiency based on the economic scale.

2. Materials and methods

The research was carried out in the broiler production centers in Pakem, Cangkringan, and Ngemplak Sub-districts, Sleman Regency, the Special Region of Yogyakarta and was done out in July to September 2018.

In total, 64 samples of respondent farmers were collected from 6 of core in the research locations. They were taken purposively based on farmers who had joined the partnership system of at least 1 year. The number of farmer samples taken proportionally was at least 25% of the number of farmers who are members of each core. The partnership system was almost the same among the 6 core samples, related to the supply of production and marketing facilities at harvest by the core as well as bonuses from maintenance management compensation in the form of FCR and mortality if the plasma performance is above the standards set by the core companies. The primary data were obtained using a survey method with in-depth interviews. Direct interviews with the farmers were carried out using structures questions. The primary data included breeder profiles, business characteristics, the use of production factors, and cost and revenue in a breeding period. The secondary data were collected from the relevant agencies that support the primary data.

Income share is the ratio of the value of each group of factors of production to the value of total output and the ratio of the value of factors of production paid by each owner of the factor of production (core and plasma) to the value of total output, in percent. The calculation of income share was on average with unit of analysis per core and per plasma of farmer. In the economic theory of production, it is stated that the production process (including broiler production) is the process of transforming input or production factors into output [7, 8]. This can be written in the form of production function as follows:

$$Y = f(X_1, X_2, \ldots, X_n)$$ .......................................................... (1)

Notes:

$Y$ = output
$X_1, X_2, \ldots, X_n$ = inputs/production factors

The input can be in the form of fixed input/investment, production facilities for operation, labor, and management. The output multiplied by the price is the gross income or value of output, while the input multiplied by the price is the cost. The model of the calculation analysis of the income in the broiler business with partnership system in terms of the group and the owner of production factors were constant return to scale (CRS). Analyzed descriptively with average and percentage. Furthermore, the Cobb Douglass production function equation model was used to determine the technical efficiency level of production at the breeder level as follows:

$$Y = \beta_0 (X_1^n X_2^{1-n})eU$$ .......................................................... (2)

$$\ln Y = \ln \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + U$$ .......................................................... (3)

Notes:

$\beta_0$ = Constanta
$\beta_1$ and $\beta_2$ = regression coefficient
$Y$ = output or broiler production (kg body weight/live bird)
$X_1$ = feed (kg/live bird)
$X_2$ = vaccine and vitamin (gr/head)
$U$ = Error term

In the Cobb Douglass production function model $\beta_1$ and $\beta_2$ are the elasticities of $X_1$ and $X_2$, respectively.
Technical efficiency is the ability of the farmer to produce the largest possible quantity of output from a given level of inputs [9]. The technical efficiency can be seen from the elasticity or amount of value of regression coefficient ($\beta = \beta_1 + \beta_2$) using Ordinary Least Square (OLS) method with eviews program version 7. There will be three possibilities, if $\beta = 1$, constant return to scale (CRS), it means that the addition of production factors will be proportional to the addition of production. If $\beta > 1$, the increasing return to scale (IRS), meaning that the proportion of the addition of production factors will produce a greater increase in production. If $\beta < 1$, decreasing return to scale (DRS) that the proportional increase of all input levels produces a less-than-proportional increase in output levels.

3. Results and discussion

3.1. Technical and economic parameters of broiler cultivation

The results of this study indicated 14 samples of the respondents (21.87%) were Junior high school, 32 samples (50.00%) were graduates of senior high school and 18 samples (28.13%) held bachelor degree with an average experience of broilers raising from all of those sampels was 11.15±8.02 years. From the level of education and experience in broilers cultivation, the performance results show the technical parameters of broiler farming. Furthermore, the technical and economic parameters of broiler farming would determine the cost or value of the production factors and revenue or value of total output. The number of the technical and economic parameters from the results of this study are shown in Table 1.

Table 1. The average technical and economic parameters of broiler farming with partnership system (n= 64)

| Description                  | Mean     | Description                        | Mean     |
|------------------------------|----------|------------------------------------|----------|
| Business scale (birds)       | 6031±3610| Feed (IDR/kg)                      | 7,580±249|
| Number of core companies     | 6        | DOC (IDR/birds)                    | 5,773±634|
| Harvesting age (days)        | 35.89±1.16| Costs of housing and Equipment    | 2,260±248|
| Mortality (%)                | 4.30±1.96| Medicines (IDR/Bird/period)        | 965±438  |
| Standard of core (%)         | 5.00     | Brooder (IDR/bird/period)          | 941±193  |
| weight of harvest (kg)       | 1.93±0.10|                                    |          |
| Feed (kg/birds/period)       | 3.16±0.12|                                    |          |
| Feed conversion ratio/FCR    | 1.64±0.08|                                    |          |
| Standard of core (FCR)       | 1.67     |                                    |          |

The technical parameters are determined by the breeding management of plasma. The results of this study showed that the mortality and FCR of broilers was better than the standard set by the core. Furthermore, the economic parameters or the input and output prices received by the plasma were provided by the core company are referred to as the contract price. Nevertheless, there was market price that might pose a risk for the core company if there was an increase in the input price and/or a decrease in the output price. When the output price of live chicken in the market was higher than the contract price at a certain amount, the farmers would receive a compensation bonus.

A research related to the partnership system of broilers in Kendal Regency, Central Java showed that the age of broiler to be harvested was 36.24 days with a weight of 1.63 kg/head and an FCR of 1.54 [6]. Then a research on the similar topic on the partnership system of broilers in Malang Regency, East Java showed that at the age of 35 days the harvest weight reached 1.65 kg with an FCR of 1.70 [10]. Based on the broiler performance standards published in leaflets from Limited Company of Charoen Pokphand in 2016, it was stated that at the age of 35 days, the body weight of broilers could reach 2.05 kg with an FCR of 1.60 and 3-8% mortality. The technical parameters from this research was still in the range of values from previous studies.
3.2 The income share based on the group and the owner of the production factors in partnership system of broiler

The income share from each group and each of the owners of plasma-core production factors can be calculated as seen in Table 2. It can be seen that the total production facilities in broiler business take the largest part of the revenue, which is as much as 89.45%, while the total investment is 7.21%. From the owner of the production factors in the partnership system, the core company takes 87.14% of the revenue to pay for the production facilities it supplies. However, the plasma still obtains its revenue from the labor wages of 1.76% and the management of 1.50% from the revenue. Thus, it can be said that the partnership system can provide employment opportunities and income for smallholders who become the members of this system. Broiler farming with a partnership system is beneficial to the members [11-13].

Related to the use of production factors in the broiler business, the highest cost component/value factor of the production factor was the feed cost of 62.55% and the DOC of 29.23%, the costs of medicine and vaccines, labor, housing rent, and other costs were relatively small, which were as much as 4.06%, 1.34%, 1.23%, and 0.33% [14]. Another research showed that the cost of feeds in broiler businesses was 77.28% and the cost of DOC, health and labor were 20.22%, 1.12%, and 1.17% respectively, however the fixed costs were insignificant, which was only 0.08% [10].

Table 2. The income share based on the group and the owner of production factors on the business scale average of 6031 birds

| Production factors | Group of production factor | Owners of production factors |
|--------------------|---------------------------|-----------------------------|
|                    | Total/period (IDR)        | Core (C) IDR | % of O | Plasma (P) IDR | % of O |
| 1. Total of        |                           | 13,591,640 | 7.21    | 0        | 0       | 13,591,640 | 7.21    |
| Investment (I)     |                           | 168,603,212 | 89.45   | 164,251,680 | 87.14  | 4,351,533  | 2.31    |
| 2. Production facilities (PF) |           | 3,478,304 | 1.84     | 150,000 | 0.08   | 3,328,304  | 1.76    |
| 3. Labor (L)       |                           | 2,826,073 | 1.50     | 0        | 0       | 2,826,073  | 1.50    |
| 4. Management (M)  |                           | 188,499,230 | 100     | 164,401,680 | 87.22  | 24,097,550 | 12.78   |

Note: The investment consists of the cost of cages, eating and drinking equipment, and brooders. The production facilities consist of feed, DOC, medicine, vaccines/health, litter, electricity, and fuel. The total output consists of the sale of live chickens, manure, feed sacks, and bonuses from the management provided to those who successfully produced technical parameters above the standards set by the core company.

M = O - I - PF-L

3.3. Technical efficiency of the use of production factors

The most significant input or production factors in broiler farming were feeds, medicines, and vitamins. As for the labor, almost all farmers employed their family because they ran small scale business with 6,000 broilers on average. The feed took the largest cost from revenue. To find out whether the average use of the production input was efficient, a linear regression analysis of the Cobb Douglass production function model was used. The result of the analysis using Eviews software version 5.1 was shown in the following equation:

\[ \ln Y = 1n \beta_0 + \beta_1 nX_1 + \beta_2 nX_2 + U \]

\[ \ln Y = 0.421 + 0.0167 \ln X_1 + 0.946 \ln X_2, \]

where \( Y = \) production/output, \( X_1 = \) feed, and \( X_2 = \) medicines and vitamin

\[ e^{\beta_0} = (2.718281828)^{0.421} = 2.718 \]

\[ Y = 2.718 X_1^{0.0167} X_2^{0.946} \]

With \( R^2 \) of 0.96 and P<0.01.
The input coefficients or elasticity, \(\beta_1 + \beta_2 = 0.0167 + 0.946 = 0.963\) (Decreasing Return to Scale), show that the increasing feed input, medicines and vitamins will result in decreasing return to scale. This is possible in the partnership system because the core companies help market the nonoptimal feed. For example, there is a delay in the delivery of the feed production facilities and vaccines or medicine from the core to the plasma companies. In using those production factors, the plasma totally depends on the core companies.

4. Conclusion
Based on the income share received by core, the broiler partnership system can expand the market for feed production factor, DOC, medicines for the core companies. In addition, it can provide employment opportunities and income for plasma, corresponding to the income share received by plasma (1.76%) as the owner of production factor of labor. Nevertheless, plasma farmers were in a condition of decreasing return to scale so that they need better cooperation of core and plasma in the use of production factors of feed and medicines to be technically more efficient.

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