International Journal of Scientific Research and Engineering Development-– Volume 2 Issue 5, Sep – Oct 2019

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

Economic, Technical and Allocative Efficiency of Stochastic Frontier of Broiler Poultry Farmingwith Close House System Patterns in Lamongan Regency East Java

1) Niswatin Hasanah 2) Zaenal Fanani 2) Bambang Ali Nugroho 2) Suyadi

1) Animal Husbandry of Jember State Polytechnic

2) Postgraduate Animal Husbandry of Brawijaya University

Abstract

The purpose of this study was to examine and analyze the level of economic, technical and allocative efficiency of the use of production factors for the type of closed house system cages per breeder individual in Lamongan Regency and study and analyze what factors affect economic efficiency, allocative efficiency and technical efficiency in the closed house system cages.The sampling technique used in this study was a multistage sampling method which consisted of 14 breeders who partner with PT. X Lamongan Regency, East Java. The result of thestudy was the R/C ratio of broiler poultry farming with Closed House System (CHS) of 1.12. Input variables that affected the production function of broiler poultry farming with a Closed House System (CHS) patterns are DOC, feed, vaccines, and electricity & water. Input variables that affect the cost function of poultry farming with a Closed House System (CHS) pattern were DOC, feed, vaccines, and electricity & water. The Closed House System (CHS) broiler poultry farming business in Lamongan Regency has not been technically efficient even though a high level of technical efficiency was obtained in each of the business patterns of 0.959 in the Closed House System (CHS) pattern. The diversity of technical efficiency level in the broiler poultry farming business with a Closed House System (CHS) pattern of 0.036 was influenced by inefficiency sources, namely age and education because the age of close house system breeders in the average productive age and the average education of scholars who supported the operation of broiler poultry cages. The ability of breeders in minimizing costs to achieve average broiler production with a Closed House System (CHS) pattern of 15,142.8 live chickens was at satisfaction level but did not meet economic efficiency with an average economic efficiency of 0.9999750 with Closed House System (CHS) pattern. The average level of allocative efficiency in broiler poultry farming business with the pattern of Closed House System (CHS) the average level of allocative efficiency obtained was 1.044. This showed that the Closed House System (CHS) broiler poultry farming business has been allocatively efficient. The suggestions of this studyare the real time monitoring from the core parties namely reporting sapronak data, mortality and daily events on plasma parties by using the application of the FMDC tool for monitoring and evaluating the implementation of partnership cooperation, strict criminal and civil law sanctions for plasma parties which are proven to commit fraud in implementing partnership cooperation, an increase in the price of guarantee certificates for each new plasma that wants to join as a breeder

I. INTRODUCTION

The Indonesian's local poultry market faces uncertain market conditions because Indonesia lost the 2019 World Trade Organization (WTO) session. Indonesia's defeat triggered the opening of opportunities for imported Brazilian broilers to enter the Indonesian market which is predicted to have lower prices because it has a stock of used vaccine thigh meat overflow. The cost of poultry industry feed is high because the price of corn is expensive. The government must protect traditional markets so that the majority of products sold are dominated by local breeds rather than imports. The Indonesian government has made several efforts, namely limiting the production of DOC in breeding with scheduling programs, parent stock rejects early and infertile hatching eggs sold in the market as consumption eggs.

The Indonesian government needs to increase the efficiency of national chicken production, one of them is to improve an efficient cage management system, provide stable and inexpensive chicken feed, increase national chicken production efficiency and regulation of poultry partnership management. By looking at these conditions, the availability of cheap chickens is needed from the efficient management of broiler poultry farming thereby increasing the competitiveness of local poultry products. The purpose of this study was to study and analyze the level of economic, technical and allocative efficiency of the use of production factors for the type of closed house system cages per breeder individual in Lamongan Regency and study and analyze any factors that affectedeconomic efficiency, allocative efficiency and technical efficiency in the close house system cages.

II. MATERIALS AND METHODS

A. Research Time and Place

The study was carried out from November 2018 to August 2019. The location was in Lamongan Regencywith a closed house system cages in partnership with PT. X in Lamogan Regency.

B. Sampling Method

The Multistage Sampling Method was used to select PT'. X to determine the sample size of 14 respondents from a total population of 104 respondents from the open house and close house breedersby using the Slovin formula:

$$n = \frac{N}{1 + N(e)^2}$$

Description;
n = the total of samples desired
N = total population
e = precision used 10% which is the degree of deviation from the characteristics of the sample to the population.

The research data used were 6 times the last production process from each breeder. The total of data used was the multiplication between the total of broiler poultry breeders and the

total of production processes. The Illustration matrix of Closed House System and Open House System contract partnership research data is presented in the following table.

Table 1. Close House System (CHS) Research Data Matrix

Period	**Farm**							
Production	1	2	3	4	5	6	7 until	14
I	1.I	2.I	3.I	4.I	5.I	6.I	7.I	14.I
II	1.II	2.II	3.II	4.II	5.II	6.II	7.II	14.II
III	1.III	2.III	3.III	4.III	5.III	6.III	7.III	14.III
IV	1.IV	2.IV	3.IV	4.IV	5.IV	6.IV	7.IV	14.IV
V	1.V	2.V	3.V	4.V	5.V	6.V	7.V	14.V
VI	1.VI	2.VI	3.VI	4.VI	5.VI	6.VI	7.VI	14.VI

C. Data Collection Techniques

Data collection in this research was carried out as follows:

Interview, namely in-depth interview with breedersby using a questionnaire, in the form of semi-closed and open questions.

D. Data Analysis Methods

The stages of data analysis in this study were as follows: 1) the analytical method used to determine the level of income of closed house system breeders was income analysis. 2) To find out the data used in this study was the Best Linear Unlimited Estimator (BLUE) classic assumption test was performed. 3) To find out the factors that affected the production function and the cost function of broiler poultry farming business with closed house system pattern by using Ordinary Least Squares (OLS) and Maximum Likelihood Estimation (MLE) methods. 4) To analyze the level of technical and economic efficiency per individual broiler poultry breeder with the Closed House System pattern, an efficiency analysis with the Technical Efficiency Effect Model option and on the level of technical and economic efficiency obtained was determined by allocative efficiency value per individual broiler poultry breeder. 5) Based on the level of income, technical efficiency, economic efficiency and allocative efficiency achieved per individual broiler poultry breeder with the Closed House System and Open House System pattern the average difference test was performed. All data in this study were analyzed by using Minitab 16 and Frontier software version 4.1c. to obtain in-depth information and perceptions from respondents.

Analysis of Production Function of Broiler Business

Factors that directly affect the production of broiler poultry in the closed house system of the contract partnership pattern are: chicken seedlings (DOC), feed, medicine, electricity, fuel and labor. The functional form of Cobb-Douglas is mathematically formulated as follows:

$$\text{LnYchs or ohs} = \beta 0 + \beta I \text{LnXl} + \beta 2\ \text{LnX2} + \beta 3\ \text{LnX3} + \beta 4\ \text{LnX4} + \beta 5\ \text{LnX5} + \beta 6\ \text{LnX6} + \beta 7\ \text{LnX7} + \beta 8\ \text{LnX8}\ Vi - rUi$$

Description:
Y = Production of closed house broiler poultry systems or open per production period (kg live weight/production period)
XI = Total of broiler poultry seeds (DOC) per production period (chick in tail/production period)
X2 = Total of feed used per production period (kg feed intake/production period)
X3 = Total of medicine used per production period (liters of orange vitamin medicine/production period)
X4 = Total of electricity used per production period (kwh/pp)
X5 = Total of fuel used per production period (liters of gasolek/production period)
X6 = Total of workers used per production period (JKSP/production period)
β0 = constant
βi chs or ohs - β6 chs or ohs = Predicted variable fixed input parameter
Ln = Natural Logarithm e = 2,718
Vi = An error has been made because of a random retrieval
Ui = Effect of technical efficiency that appears

Function cost analysis of Broiler Poultry Farming Business

Factors that directly affect the cost function in the broiler poultry farming business with the closed house system (CHS) and open house system (OHS) contract partnership patterns are: chicken seed costs (DOC), feed costs, medical costs, electricity costs, fuel costs, labor and production costs. The mathematical formula is as follows:

$$LnCi\ chs\ or\ ohs = \alpha 0 + \alpha 1 LnW1 + \alpha\ 2LnW2 + \alpha 3LnW3 + \alpha 4LnW4 + \alpha 5\ Ln\ W5 + \alpha\ 6LnW6 + \alpha\ 7LnY + \alpha\ 8LnY\ Vi + Ui$$

Description:
LnCi = Production costs of broilers poultry closed house system or open house system per production period (IDR/head/production period)
W1 = Cost of broiler seedlings (DOC) per tail (IDR/ tail/production period)
W2 = Feed cost per kilogram in one production period (IDR/tail/production period)
W3 = Medical cost per unit in one production period (IDR/tail/production period)
W4 = Cost of electricity used per production period (IDR/kwh/tail/production period)
W5 = Fuel cost per liter in one production period (IDR/liter/tail/production period)
W6 = Labor costs used per production period (IDR JKSP/day/production period)
Y = Total of broiler poultry production closed house system or open house system per production period (IDR/tail/production period)
α0 = Constant
α1 - α6 = Parameter for expected input variable
Ln = Natural Logarithm e = 2,718
Vi = An error has been made because of a random retrieval
Ui = Effect of technical efficiency that appears

III. RESULT AND DISCUSSION

Technical Efficiency Analysis

Table 2: Technical Efficiency Description of the Broiler Business in Lamongan District

Technical Efficiency	*Closed House System (CHS)*

Average	0.959
Standard Deviation	0.036
Minimum	0.826
Maximum	1.000

Source: Processed Primary Data (2019)

Table 30 is found that the Closed House System (CHS) has been technically efficient. The achievement of a high technical efficiency index value reflects the achievements of broiler poultry breeders in both business groups that are very satisfying in managing livestock business, especially in the mastery of information and the decision making the process for managing factors production. The Closed House System (CHS) is a measure that breeders still have the opportunity to add several input variables to increase broiler poultry production, but the possibility to increase productivity is very small because of the narrow interval between the level of productivity that has been achieved with the maximum level of productivity. The decision on the addition of several variables became the choice of the second breeder of the broiler poultry farming business group. The input variables that are recommended to be added by broiler poultry breeders with a Closed House System (CHS) pattern are chicken feed and seedlings (DOC).

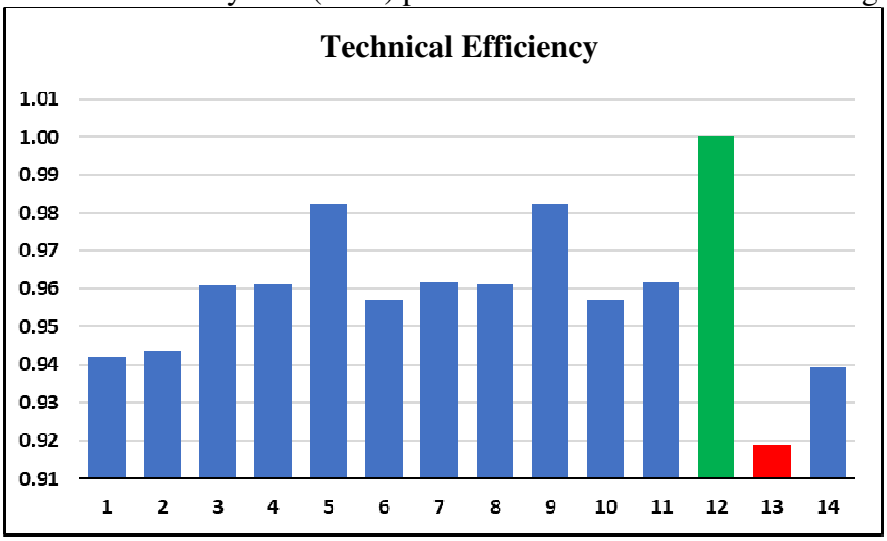

Figure 10: Distribution of Technical Efficiency per Individual in Broiler Poultry Business with Closed House System (CHS) Pattern

Figure 10 shows the technical efficiency per individual in a broiler poultry farming business with a Closed House System (CHS) pattern. From these results, it is obtained the highest value of 0.999 in breeder no. 12 and the lowest value of 0.919 in breeder no. 13.

5.6.1.2 Sources of Technical Inefficiency

Table 3: Estimating the Technical Inefficiency Parameters of Production Function of Broiler Poultry Business with the Closed House System (CHS) pattern in Lamongan Regency

Variable	Coefficient	Std Error	z count	Sig.
Age	-247.676	104.994	-2.360	0.018**

Education	1257.756	452.293	2.780	0.005**
Experience	57.088	368.578	0.150	0.877
Family	980.529	948.755	1.030	0.301
Job status	3900.448	2621.124	1.490	0.137
Constant	6288.526	238491.700	0.030	0.979

Source: Processed Primary Data (2019)

The estimation of the effect of the technical inefficiency of production in the broiler poultry farming business with the Closed House System (CHS) pattern shows that the Age and Education variable has a significant effect on the production of the broiler poultry farming business, while the other variables do not have a significant effect.

Allocative Efficiency Analysis

Every entrepreneur in production always uses several inputs in an optimal total to get the maximum number of production results. The use of several production factors will be different between one entrepreneur and another entrepreneur so that the production results and the profits obtained will also be different. The difference is also experienced by broiler poultry breeders with an open house system pattern. The difference is thought to be caused by differences in the ability of both knowledges about livestock business and financial capabilities. The difference in ability between broiler poultry breeders causes differences in the proportion of the use of production factors and the price of production factors. The use of production factors and the different price of production factors between breeders in the broiler poultry farming business with a closed house system pattern and broiler poultry breeders with a close house system pattern will have an impact on the profits obtained by breeders. Therefore, with different abilities owned by breeders, it will be different in maximizing profits. The efforts of broiler poultry breeders with a closed house system pattern in maximizing profits can be seen from the achievement of allocative efficiency values.

The estimation of the allocative efficiency level in most previous studies uses the ratio between the Marginal Product Value (MPV) and the price of production factors. The estimation aims to determine the level of use of production factors. In this study, the allocative efficiency level is assumed to use the ratio between the results of the level of economic efficiency derived from the frontier cost function and the result of the level of technical efficiency derived from the frontier production function. The purpose of using this method is so that the level of allocative ability per individual breeder both broiler poultry breeders with a closed house system pattern can be known. The distribution of allocative efficiency values achieved by broiler poultry breeders with the closed house system pattern is presented in the following table.

Table 4 Description of the Allocative Efficiency of Broiler Poultry Farming in Lamongan Regency

Technical Efficiency	***Closed House System (CHS)***
Average	1.044
StandardDeviation	0.042
Minimum	1.000
Maximum	1.211

Source: Processed Primary Data (2019)

Table 33 shows that the allocative efficiency values obtained by broiler poultry breeders with a closed house system pattern range from 1,000 to 1,211. Based on the highest and lowest allocative efficiency values achieved by the two broiler poultry farming businesses, there is diversity in the ability of breeders to maximize profits, but this is not the case when seen from the average allocative efficiency values obtained. The average value of the allocative efficiency of a broiler poultry farming with the closed house system pattern obtained is 1.0 (rounding number). These results indicate that the overall broiler poultry farming business with closed house system pattern has maximized the level of profit or in other words that the overall broiler poultry farming business has used several inputs optimally to obtain the maximum total of production. The achievement of the average allocative efficiency values between the two groups of the same broiler poultry farming (rounding numbers) is thought to be caused by several factors of production used originating from the same source and the similarity in the price of these factors of production.

Allocative Efficiency per Individual in Broiler Business with Close House System (CHS) Pattern

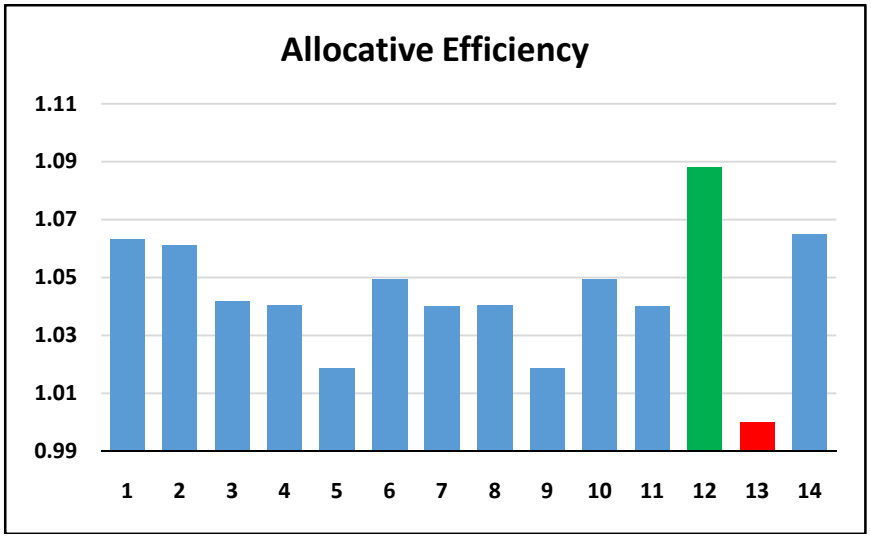

Figure 13: Distribution of Allocative Efficiency per Individual in Broiler Poultry Farming Business with Closed House System (CHS) Pattern

Figure 13 shows the technical efficiency per individual in a broiler poultry farming business with a Closed House System (CHS) pattern. From these results obtained the highest value of 1,000 in breeders No. 12 and the lowest value of 1.088 in breeders No. 13.

Economic Efficiency Analysis

The success rate of the performance of broiler poultry breeders with a closed house system pattern can be known through the use of production factors in producing high production with minimum costs to the production factors. The success rate of broiler poultry farming can be said to be economically efficient if technically the breeders are efficient using production factors by streamlining the prices of these production factors. The level of success achieved between breeders will differ from one another due to differences in the level of knowledge and ability to

the broiler poultry farming business. Achieving economic efficiency from broiler poultry breeders with a closed house system pattern is presented in the following table.

Table 5: Description of the Economic Efficiency of the Broiler Poultry Farming Business in Lamongan Regency

Economic Efficiency	*Closed House System (CHS)*
Average	0.9999750
StandardDeviation	0.0000002
Minimum	0.9999746
Maximum	0.9999756

Source: Processed Primary Data (2019)

Based on table 32,it shows the average value of economic efficiency achieved by the broiler poultry farming business with a closed house system pattern is 0.9999740 (rounding number). This shows that on average all breeders in the two broiler poultry farming business groups have almost the same ability in minimizing production costs for the use of several production factors. The ability which is almost the same between the two broiler poultry farming businesses is thought to be caused by all the production factors used originating from one source which causes the uniformity of the price of the production factor.

Distribution of Economic Efficiency per Individual in the Broiler PoultryFarming Business with a Close House System (CHS) Pattern

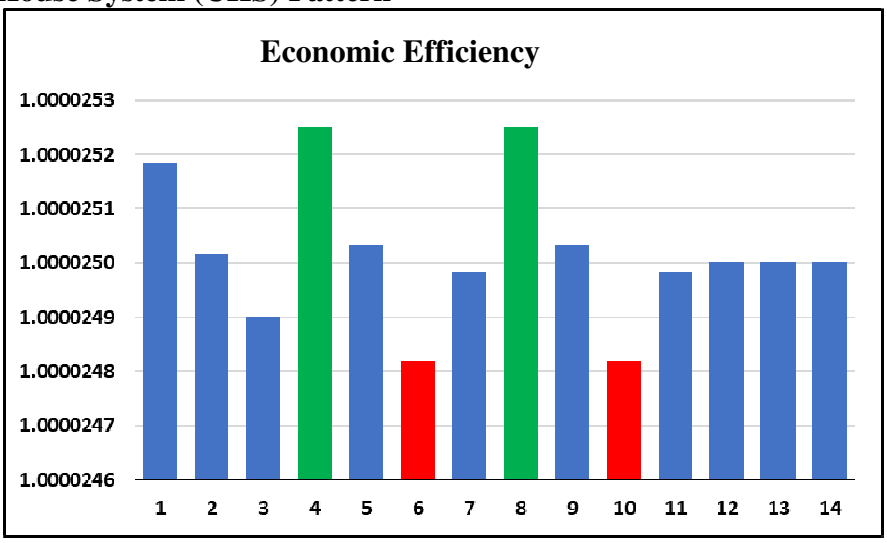

Figure 15: Distribution of Economic Efficiency per Individual in Broiler Poultry Farming Business with Closed House System (CHS) Pattern

Figure 15 shows the economic efficiency per individual in a broiler poultry farming business with a Closed House System (CHS) pattern. From these results obtained the highest value of 1,0000253 in breeders 4 and 8 and the lowest value of 1,0000248 in breeders no 6.

Conclusion

Based on the results and discussion it can be concluded that:

1. R/C ratio of broiler poultry farming business with Closed House System (CHS) is 1.12.
2. Input variables that affect the production function of broiler poultry farming business with a Closed House System (CHS) pattern are DOC, feed, vaccines, electricity & water, and labor.
3. Input variables that affect the cost function of a poultry farming business with the Closed House System (CHS) pattern are DOC, feed, vaccines, and electricity & water.
4. Broiler poultry farming with Closed House System (CHS) in Lamongan Regency has not been technically efficient even though a high level of technical efficiency is obtained in each of the business patterns of 0.959 in the Closed House System (CHS) pattern.
5. The diversity of technical efficiency level in the broiler poultry farming business with Closed House System (CHS) pattern of 0.036 is influenced by inefficiency sources, namely age and education.
6. The ability of breeders in minimizing the cost to achieve average broiler poultry production with a Closed House System (CHS) pattern of 15,142.8 live chickens is at a satisfactory level but does not meet economic efficiency with an average economic efficiency of 0, 9999750 with the Closed House System (CHS) pattern.
7. The average level of allocative efficiency in broiler poultry farming business with Closed House System (CHS) pattern, the average level of allocative efficiency obtained is 1.044. This shows that the Closed House System (CHS) broiler poultry farming business is allocatively efficient.

Suggestion

1. Real time supervision from the core parties namely reporting sapronak data, mortality and daily events on plasma parties by using the application of the FMDC tool for monitoring and evaluating the implementation of partnership cooperation.
2. Strict criminal and civil law sanctions for plasma parties which are proven to commit fraud in implementing partnership cooperation.
3. An increase in the price of guarantee certificates for each new plasma that wants to join as a breeder.
4. The government needs to involve the Association of Indonesian Poultry Slaughterhouse (ARPHUIN) as an element of control of import volumes because it has data on the supply capacity of demand for chicken, the amount of stock in cold storage so that over supply in the market can be avoided.

References

Abayie Eric FosuOteng, Kofi Amanor and Joseph Magnus Frimpong. 2011. The Measurement and Determinants of Economic Efficiency of Microfmance Institutions in Ghana: A Stochastic Frontier Approach. African Review of Economics and Finance, June, Vol. 2, No. 2.

Adiningsih. S. 1991. EkonomiMikro. BPFE.Yogyakarta.

Aigner, D.J.C., A.K. Lovell and P. Schmid. 1977. Formulation and estimation of stochastic frontier production function model. Journal of Econometrics 6: 21-37.

Akinbode S. 0, Dipeolu A. 0 and Ayinde I. A. 2011. An Examination of Technical, AllocativeAnd Economic Efficiencies in *Ofada Rice* Farming in Ogun State, Nigeria. African Journal of Agricultural Research Vol. 6(28), pp. 6027-6035.

Aryanti. F. 2010. Kompetensikinerjakaryawankandangayam broiler milikpeternak di wilayahdesaCisalopa, Cinagara, Bogor. http://www.deptan.go.id/bpsdmlbbpkhcinagara/index.php?option=comcontent&view=article&id=69:kinerja-karyawan-anakkandang&catid=28:peternakan&Itemid=44.

BadanPusatStatistik. 2010. KabupatenJemberDalamAngka. BadanPusatStatistikKabupatenLamongan.

BadanPusatStatistik. 2010. Kota JemberDalamAngka. BadanPusatStatistik Kota Lamongan.

Bahari. 2010. Contract Farming danUpayaPeningkatanPendapatan Usaha TernakAyamPotong (Broiler); StudiKasus di Kec:matanBululawangKabupatenLamongan. Disertasi.UniversitasBrawijayaJember(tidakdipublikasikan).

Battese G.E and Ccellli T.J. 1995. A model for technical inefficiency effects in stochastic frontier production for panel data. Empirical Economics, 20: 325-345.

Battese GE, Coelli TJ (1988) Prediction of Grm-level technical efficiencies: With a generalized frontier production function and panel data. Journal of Econometrics 38:387-399

Belbase, K. and Grabowski, R. 1985. Technical efficiency in Nepalese agriculture.*The Journal ofDeveZopingAreas.*Vol. 19, No. 4, 515-525.

