

# Journal of Economics and Sustainable Development

ISSN 2222-1700 (Paper)

ISSN 2222-2855 (Online)

Vol.8 No.18

2017

### About Journal of Economics and Sustainable Development

The scope of the Journal of Economics and Sustainable Development includes, but not limited to, Economic development; Sustainability management; Industrial sector; Corporate governance, public policy; international organizations; Environmental economics; Food systems, and populations. The journal is published in both printed and online versions. The ambition of JESD is to become a recognized top tier journal, acclaimed for redirecting international economics and sustainability research and for defining new directions.

**Journal of Economics and Sustainable Development** is published by IISTE and follows a monthly publication schedule.

General inquiries and Paper submission: [contact@iiste.org](mailto:contact@iiste.org) or [JESD@iiste.org](mailto:JESD@iiste.org)

### Index of this journal



### IISTE's acknowledgements to the supports from co-hosting universities worldwide

- University of North Carolina at Charlotte, United States
- California State University, United States
- The City University of New York, United States
- Aristotle University of Thessaloniki, Greece
- Universiteit Leiden, Netherlands

### **About IISTE**

The International Institute for Science, Technology and Education (IISTE) is an independent organization delivering supports and services to education professionals and researchers around world.

### **History & Missions**

The International Institute for Science, Technology and Education (IISTE) was established in 2008. In partnership with government, community organizations, public agencies, enterprises and other foundations, IISTE offers a variety of programs and activities to promote education development, international collaboration, including scientific publication, financial support for researchers and international academic projects (conference, workshops, etc). IISTE holds a number of academic journals, covering social science, engineering, economics and management. All the submissions to these journals will be subjected to peer-reviews, and the published ones are open-access (OA) for everyone to download.

### **Contact Us**

IISTE US Office

[contact@iiste.org](mailto:contact@iiste.org)

Suite 1304, 258 Madison Avenue, New York, NY 10016 United States

IISTE UK

[UK@iiste.org](mailto:UK@iiste.org)

Office Suite 310, 12 Melcombe Place London, NW1 6JJ United Kingdom

### **Printing and redistribution of paper materials**

The printing of IISTE journals is managed by the ColorWorks Service (Beijing) Limited. ColorWorks Service (Beijing) Limited is a subcontractor of IISTE and IISTE reserves all rights related to the copyright materials as well as other information related to the journals.

## Acknowledgement of Editors and International Reviewers

Prof. Dr. Narayan Chandra Pradhan  
Indian Institute of Technology, India

Prof. Dr. Hanadi AL-Mubarak  
Kuwait University, Kuwait

Prof. Dr. Y. Liu  
China Academy of Sciences (CAS), China

Prof. Dr. Chandan Kumar Sahoo  
National Institute of Technology, India

Prof. Dr. Tariq H. Ismail  
Cairo University, Egypt

Prof. Dr. P. Satheeshkumar  
Central Marine Fisheries Research Institute, India

Prof. Dr. Bibhu Kar  
Indian School of Business, India

Dr. M.A.H. Farquad  
The University of Hong Kong, Hong Kong, SAR

Saoussen Ben Gamra  
CEPN- University Paris 13, France

Dr. Chiung Ting Chang  
Maastricht University, Netherlands

Dr. Emmanuel Awuor  
The Management University of Africa, Kenya

Dr. Yogesh Kumar  
East York College, U.K.

Dr. Hasan Fauzi  
Indonesian Center for Social and Environmental  
Accounting Research, Indonesia

Dr. Hussien H. Komicha  
Entrepreneurship, Training and Trade, Government  
of Manitoba, Canada

Dr. Zulnaid Yaacob  
Universiti Sains Malaysia (USM), Malaysia

Odhiambo Odera  
University of Southern Queensland, Australia

Dr. Muhammad Asif  
University of Twente, the Netherland

Dr. S.L. Lodha  
Rajasthan University, India

Dr. Fabio Pizzutilo  
University of Bari, Italy

## International Journals Call for Papers

IISTE hosts and publishes more than 30 international academic journals in various fields **MONTHLY**. Prospective Authors can send their full manuscript(s) to the journals for review and possible publication.

- You must read the paper submission guide and use the IISTE standard paper template. Draft your paper based on the Paper Template provided on [www.iiste.org](http://www.iiste.org) will help you to go through the review process quickly and publish your work faster.
- Email your paper to the corresponding journal email addresses listed on [www.iiste.org](http://www.iiste.org) with a claim that your content is original. You cannot submit your article to multiple journals at the same time.
- You will get a notification from the editor that your email has been received.
- Review comment and result will be returned. Authors may receive,
  - Publish Unaltered: the paper is ready for publication and no change is needed.
  - Acceptance after Minor Changes: you need to make minor changes according to the editor's instruction.
  - Acceptance after Major Changes: you need to make major changes according to the instruction of the editor.
  - Rejection: Manuscript is flawed or not sufficiently novel
- Submit your final article (if required) before the deadline mentioned in the acceptance letter.
- The final publication both the online and printed version of your article in the journal.

You can find more information about the journals hosted by IISTE and submission instructions on [www.iiste.org](http://www.iiste.org)

## Book Publishing Service

As little as ten years ago, releasing your work through an independent book publishing company meant your book would instantly be labelled as “vanity publishing.” This meant that you published for publishing's sake and the quality of your writing was not a high priority. But attitudes are changing. Today, advancements in technology has shed its sullied past, emerging as a new avenue for authors to publish their works quickly.

IISTE gives authors complete access to superior publishing services—professional editorial services, excellent cover design, digital marketing, multiple sales channel, among other services—all aimed at ensuring the final product meets expectations and attracts the interest of readers and potential book buyers.

There are two options available for researchers / prospective book authors:

- **Traditional Book Publishing:** the author provides the full manuscript (normally more than 30 pages) that he/she wishes to publish. IISTE will help to revise, format and proofread the manuscript, design the cover for it and publish it in paper and electronic version in the United States. Potential readers can read it in paper, online or even on their Amazon Kindle. The book is purchasable online.
- **Book Chapter Publishing:** the author provides a book chapter (normally less than 20 pages) that he/she wishes to publish. IISTE Book Publishing Team collects and prepares book chapters from different authors under similar topics (such as Technologies, Social Sciences, Education, etc) and publish them in the United States. Same as the traditional publishing mode above, potential readers can read it in paper, online or even on their Amazon Kindle. The book is purchasable online.

You can find more information about the Book / Book Chapter publishing with IISTE and submission instructions on <http://www.iiste.org/book/>

# Vol 8, No 18 (2017)

## Table of Contents

### Articles

<a href="#">Journal Coverpage</a>	<a href="#">PDF</a>
<i>Journal Editor</i>	
<a href="#">Analysis of Factors Affecting Household Graduation from Ethiopian Productive Safety Net Program (PSNP): The Case of Babile District, Oromia Region, Ethiopia</a>	<a href="#">PDF</a>
<i>Desalegn Yadeta Wedajo, Yu Lerong</i>	1-21
<a href="#">Assessment of Dispute Resolution in the Construction Industry in Lagos State, Nigeria</a>	<a href="#">PDF</a>
<i>Akinradewo, Olusola Festus</i>	22-27
<a href="#">Determinants of Technical Inefficiency in Sentul Chicken Farming in Ciamis Regency, West Java Province, Indonesia</a>	<a href="#">PDF</a>
<i>Sudrajat ., Muhamad Nurdin Yusuf</i>	28-33
<a href="#">Economic Implications of a Changing Climate on Smallholder Pineapple Production in Ghana</a>	<a href="#">PDF</a>
<i>Portia Adade Williams, Olivier Crespo, George Owusu Essegbey</i>	34-43
<a href="#">Financial Inclusion and GDP Per Capita in Africa: A Bayesian VAR Model</a>	<a href="#">PDF</a>
<i>OLANIYI Evans, ALENOGHENA Raymond Osi</i>	44-57
<a href="#">Impact of Foreign Direct Investment on Economic Growth of the SAARC Countries</a>	<a href="#">PDF</a>
<i>Hasibul Islam Russell, John Kouraklis</i>	58-66
<a href="#">Income and Democracy in Sub-Sahara Africa</a>	<a href="#">PDF</a>
<i>Abdulkareem ALHASSAN, Adekunle Sarafa ALADE</i>	67-73
<a href="#">Pattern / Model of Community Empowerment of Village Community Self-Supporting Development (Community Capacity Building) Financial and Business Management Unit (FBMU) to Increase the Economic Growth of Cooperatives and Micro, Small-Medium Enterprises (CMS)</a>	<a href="#">PDF</a>
<i>Mochamad Muchson</i>	74-82
<a href="#">Leadership Pattern in Uncertainty Conditions and Its Impact on the Organizational Identification: Comparative Applied Study on Government Sector in the Hashemite Kingdom of Jordan</a>	<a href="#">PDF</a>
<i>Mo'tasim Al-Zaghlawan, Shadi Al-Sarairah, Ayat Al-Hunaiti, Ibrahim Khanji</i>	83-92

<a href="#"><u>Influence of Market Orientation on the Relationship Between Customer Relationship Management Practices and Performance of Large-Scale Manufacturing Firms in Kenya</u></a>	<a href="#">PDF</a>
<i>Lydia K. Mwai, Joseph O. Owino, Justus. M. Munyoki, James M. Njihia</i>	93-102
<a href="#"><u>Maximizing the Development Impacts of Remittances in Bangladesh: A Gender Perspective</u></a>	<a href="#">PDF</a>
<i>Mohammad Mahabub Alam</i>	103-116
<a href="#"><u>The Long-Run and Causal Relationship among Financial Development, Openness and Economic Growth in Bangladesh: An ARDL Bound Testing and Granger Causality Approach</u></a>	<a href="#">PDF</a>
<i>Md. Shahidul Islam, Md. Elias Hossain</i>	117-124
<a href="#"><u>Rural-urban Migrants' Remittances and the Physical Health Status of the Left-behind Children in Rural Areas of Niger State, Nigeria</u></a>	<a href="#">PDF</a>
<i>Bala Muktar, Mohd Razani B. Mohd Jali, Nor Azam Abdul Razak</i>	125-131
<a href="#"><u>The Demand of Organic Vegetables at Frismart Modern Market in Ambon City</u></a>	<a href="#">PDF</a>
<i>Natelda R. Timisela, Ester D. Leatemia, Febby J. Polnaya</i>	132-139
<a href="#"><u>The Impact of External Debt on Nigeria's Economic Growth (1980-2014): VAR, Cointegration and VECM Approach.</u></a>	<a href="#">PDF</a>
<i>Iliya, Ayuba Thompson, Tahir, Hussaini Mairiga</i>	140-151
<a href="#"><u>The Long-run and Causal Relationship among Financial Development, Openness and Economic Growth in Bangladesh: An ARDL Bound Testing and Granger Causality Approach</u></a>	<a href="#">PDF</a>
<i>Md. Shahidul Islam, Md. Elias Hossain</i>	152-159
<a href="#"><u>The Scale Efficiency of Nile Tilapia Pond Aquaculture and Its Determinants in Tampaksiring District of Bali Province</u></a>	<a href="#">PDF</a>
<i>Diantariningsih ., I Made Tamba</i>	160-167
<a href="#"><u>The reality of the informal economy in Algeria</u></a>	<a href="#">PDF</a>
<i>Benchellat Mostafa, Louali Fatima</i>	168-174
<a href="#"><u>Exploring Patterns of Fiscal Policy Multiplier in Selected Countries</u></a>	<a href="#">PDF</a>
<i>Mustapha A. Akinkunmi</i>	175-183
<a href="#"><u>Conceptual Framework of Urban Farming:A Case Study in Denpasar-Bali-Indonesia</u></a>	<a href="#">PDF</a>
<i>Nyoman Yudiarini, Wayan Windia, Dwi Putra Darmawan, I Ketut Suamba</i>	184-189
<a href="#"><u>Risk Based Internal Audit Based on Culture (Case Study at LPD Desa Adat Pecatu in Bali)</u></a>	<a href="#">PDF</a>

<i>I Wayan Suartana, I Ketut Jati</i>	190-200
<u>The Structure of Society</u>	<u>PDF</u>
<i>Nor Azam Abdul-Razak, Roslan Abdul-Hakim, Mohd Zaini Abd-Karim</i>	201-211



# Determinants of Technical Inefficiency in Sentul Chicken Farming in Ciamis Regency, West Java Province, Indonesia

Sudrajat\* Muhamad Nurdin Yusuf

Department of Socio Economic, Faculty of Agriculture, University of Galuh, Indonesia

## Abstract

This study was conducted to identify determinants of technical inefficiency among Sentul chicken farmers. This was investigated using the stochastic frontier production function which incorporates a model for the technical efficiency effect. Farm level survey data from 100 Sentul chicken farmers were obtained using well structured questionnaire. The parameters were estimated simultaneously with those of the model of technical efficiency effects. The result showed that age, education, experience, family size, number of chicken ownership, extension and credit have significant effect on technical inefficiency, while gender has no significant effect on technical inefficiency.

**Keywords:** Sentul, chicken, technical inefficiency

## 1. Introduction

Poultry has become an important business for small farmers and has a high contribution to the country's economy (Aboki, et al, 2013). One type of poultry is broiler that has an important role in meeting the needs of the people against meat (Rohmad, 2013). Local chickens have the potential to be an alternative source of provision of meat and eggs (Awaluddin, 2012), have an important role in meeting the economic needs and sources of animal protein (Mariandayani, et al, 2013), maintained primarily for family savings that can be sold when requiring cash (Suhardi, 2011; Mutombo, et al, 2015; Zewdu, et al, 2013), is one of the biological riches that have long been cultivated so as to adapt to the surrounding natural environment (Meyliyana, et al, 2013; Olanrewaju, et al, 2015), have the advantages of having quick returns to investment and relatively simple management practices (Miriam, et al, 2015), but they have poor productivity under traditional or extensive production system (Islam, et al, 2015).

The production system of indigenous chicken is often characterized by low input-low output productivity and low commercialization of the enterprise (Justus, et al, 2013; Sulistyoningsih, et al, 2013). Low productivity as the major constraints in village chicken production (Chisango, et al, 2015) is partly attributed to poor management practices (Kingori, 2010) and due to their inherent low genetic potential (Islam, et al, 2014). The low productivity of local chicken does not reduce the community's interest to cultivate it because of its great potential, such as resistant to disease and tasty flesh (Daryono, et al, 2012).

Development of local chickens today is still experiencing barriers caused by lack of maintenance, both in terms of food, chicken and chicken (Alam, 2005). Farmers were constrained by high disease outbreak, lack of fencing and housing, high feed costs, lack of markets, low productivity, lack of credit access, poor growth and maturity and low market prices (Siyaya, et al, 2013). Farmers facing problems in terms of capital shortage, lack of institutional credit facilities, medicine and veterinary services Dutta, et al (2013).

One type of local chicken in Indonesia is Sentul chicken that has been recognized as local chicken of Ciamis Regency through the Decree of the Minister of Agriculture RI No. 689/Kpts.PD410 / 2/2013 on the Establishment of Sentul Chicken Clump as Chicken Local Family of Indonesia Origin Ciamis. According to Nataamijaya (2005), Sentul chicken can spawn up to 26 eggs per laying period, whereas according to Baktiningsih, et al (2013) as much as 16-25 eggs/spawning period or about 150 eggs/year.

Sentul chicken business activities are conducted to drive the local economy and increase the income of farmers. Sentul chicken population is currently around 30,000 head and tends to decline due to an increase in demand for meat so endangered (Hartono, et al, 2013).

Local chickens are generally still traditionally maintained (Dewanti and Sihombing, 2012) and require little skill (Huque, 1992 in Dutta, et al, 2013), so must be increased productivity and technical efficiency (Alabi and Aruna, 2005).

## 2. Theoretical Framework

Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977), in Coelli, et al (2005) proposed the stochastic frontier production function model as follows:

$$\ln q_i = x_i' \beta + v_i - u_i \quad (1)$$

The model of equation (1) is called the stochastic frontier production function because the output value is limited from above by the stochastic random variable (eg,  $\exp(x_i' \beta + v_i)$ ). A random error  $v_i$  can be either positive or negative so that the output of the stochastic frontier varies around the deterministic model,  $\exp(x_i' \beta)$ .

Much of the measurement of the output-oriented technical efficiency is the ratio of the observed output to

the frontier output of the stochastic:

$$TE_i = \frac{q_i}{\exp(x_i\beta + v_i)} = \frac{\exp(x_i\beta + v_i - u_i)}{\exp(x_i\beta + v_i)} = \exp(-u_i) \quad (2)$$

This technical efficiency measures the output of the *i* firm relative to the output that can be produced with a fully efficient company using the same vector input. The first stage in predicting technical efficiency (TE) is to estimate the parameters of the stochastic frontier production model (1).

If the technical efficiency of the *i*-th activity is defined as  $TE_i = \exp(-u_i)$ , it involves the effects of technical inefficiency,  $u_i$ , which can not be observed. Although if the true value of the parameter vector,  $\beta$ , in model equation (1) is known, only the difference,  $e_i \equiv v_i - u_i$ , can be observed. The best predictor for  $u_i$  is the conditional expectation of  $u_i$ , given by the value of  $v_i - u_i$ . This result was first applied by Jondrow, et al (1982) in Coelli, et al (1998) which produced:

$$E\langle u_i | e_i \rangle = -\gamma e_i + \sigma_A \left\{ \frac{\phi(\gamma e_i / \sigma_A)}{1 - \phi(\gamma e_i / \sigma_A)} \right\} \quad (3)$$

Where:  $E_i = \sigma_A = \sqrt{\gamma(1 - \gamma)\sigma_S^2}$ ;  $e_i = \ln(y_i) - x_i\beta$ ; and  $\phi(\cdot)$  is a density function of a standard normal random variable.

Battese and Coelli (1988) in Coelli, et al (1998) suggest that the best predictors of  $\exp(-u_i)$  are:

$$E\langle \exp(-u_i) | e_i \rangle = \frac{1 - \phi(\sigma_A + \gamma e_i / \sigma_A)}{1 - \phi(\gamma e_i / \sigma_A)} \exp(\gamma e_i + \sigma_S^2 / 2) \quad (4)$$

The model proposed by Battese and Coelli (1995) in Coelli, et al (1998) concerns the specific influence of technical inefficiency on the stochastic frontier model assumed to be free (but not identical) from non-negative random variables. For the *i*-th activity of the period *t*, the effect of technical inefficiency,  $u_{it}$ , is determined by the distribution of  $N(u_{it}, \sigma^2)$ , where:

$$\mu_{it} = z_{it}\delta \quad (5)$$

Where  $z_{it}$  is a vector (1xM) of the observed explanatory variable, which has a constant value, and  $\delta$  is a vector (Mx1) of unknown scalar parameters to be estimated.

The research of determinants of technical inefficiency was done by using TE Effect model developed by Battese and Coelli (1998) with the following equation:

$$\ln(Y_i) = \beta_0 + \beta_1 \sum_{i=1}^n \ln(X_i) + V_i - U_i \quad (6)$$

Where *Y* is the output and *X* is the input.

Several studies have shown that factors affecting technical inefficiency are: experience, education, marital status, access to education, access to credit and sex (Ashagidigbi, et al, 2011); breeding experience, age, marital status, gender, education, credit and family size (Oleke and Isinika, 2011); age, production systems, farming experience, and educational status (Ike, 2011); education, extension contact, household size and family labour (Ezeh, et al, 2012); bird stock, feed, education (Todsadee, et al, 2012); experience, membership of cooperative society (Olanrewaju, et al, 2015), gender (Aboki, et al, 2013); credit accessibility, education level, farming experience, flock size, extension contact and farmers' associations membership (Adedeji, et al, 2013); credit access, age, education, experience, flock size, extension contact and membership of farmers association (Ohajianya, et, 2013b); access to credit (Likita and Ngozi, 2015); labour, feed (Bethel, et al, 2016).

### 3. Research Methodology

The study was carried out in Ciamis District in West Java Province. Data used for this study are mainly primary and were obtained from 100 Sentul chicken farmers were randomly selected. The study utilized stochastic production frontier, and the model is defined by:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + v_i - u_i \quad (7)$$

where: *Y* = production (kg), *X*<sub>1</sub> = number of day-old chicken (tail), *X*<sub>2</sub> = labour (man-day), *X*<sub>3</sub> = feed (kg), *X*<sub>4</sub> = veterinary cost (Rp),  $\beta$  = coefficient of regression,  $v_i$  = random error, and  $u_i$  = technical inefficiency effects in the model.

Inefficiency model was defined to estimate the influence of some farmer's socio-economic variables on the technical efficiency of the farmers. The model is defined by:

$$\mu_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 D_1 + \delta_7 D_2 + \delta_8 D_3 \quad (8)$$

where:  $\mu_i$  = technical inefficiency, *Z*<sub>1</sub> = age (years), *Z*<sub>2</sub> = education (years), *Z*<sub>3</sub> = experience (years), *Z*<sub>4</sub> = family size (persons), *Z*<sub>5</sub> = number of chicken ownership (tail), *D*<sub>1</sub> = gender (dummy, 1 if man and 0, otherwise), *D*<sub>2</sub> = extension (dummy, 1 if involved and 0, otherwise), and *D*<sub>3</sub> = credit (dummy, 1 if has an access to credit and 0, otherwise),  $\delta$  = regression coefficient.

### 4. Results and Discussion

The model specification is estimated using the maximum likelihood method using Frontier 4.1 software as can be seen in Table 1.

Result on Table 1 shows ML estimates and inefficiency determinants. The sigma square 0.005 statistically

significant at the 1% level that indicates a good fit and correctness of the specified distribution assumption of the composite error term. The estimated value of the parameter ( $\gamma$ ) in the model of 0.950 is statistically different from zero at the 1% level. These results indicate a systematic effect that can not be explained by the production function in the form of the dominant sources of stochastic random error. Approximately 95.00% of the variation in the output level of Sentul chicken farming attributed to the presence of technical inefficiency in resource use. The generalized likelihood ratio test (307.633) is statistically significant at the 1% level indicating the present of a one-sided error component. The results of the diagnostic analysis therefore confirm the relevance of stochastic parametric production function and maximum likelihood estimation.

Table 1 shows that number of day-old chicken and labour are statistically significant at 1% and 5% levels and have positive signs. Feed is statistically significant at 5% levels and have negative signs, while veterinary cost are not significant and have negative signs.

The model employs a log linear equation so the regression coefficient showed the production elasticity of each input. For example, 1% increase in number of day-old chicken usage will increase production by 1.037%. The sum of the elasticities was 1.02, indicating that Sentul chicken farmers were operating in the region of increasing returns to scale.

Table 1. Maximum likelihood estimates and inefficiency functions

Variable	Parameter	Coefficient	Standard Error	t-ratio
<b>Production function</b>				
Constant	$\beta_0$	-0.030	0.012	-2.489**
Number of day-old chick	$\beta_1$	1.037	0.014	74.253*
Labour	$\beta_2$	0.033	0.014	2.282**
Feed	$\beta_3$	-0.041	0.013	-3.069**
Veterinary cost	$\beta_4$	-0.009	0.006	-1.421
<b>Inefficiency function</b>				
Constant	$\delta_0$	0.113	0.503	0.224
Age	$\delta_1$	-0.515	0.307	-1.676***
Education	$\delta_2$	0.515	0.276	1.869***
Experience	$\delta_3$	0.388	0.198	1.964***
Family size	$\delta_4$	0.328	0.128	2.562**
Number of chicken ownership	$\delta_5$	-0.699	0.156	-4.482***
Gender	$\delta_7$	0.038	0.163	0.234
Extension	$\delta_8$	-0.300	0.135	-2.222**
Credit	$\delta_9$	-0.252	0.060	-4.211*
<i>Sigma square</i>	$\sigma^2$	0.005	0.001	5.444*
<i>Gamma</i>	$\gamma$	0.950	0.013	73.077*
<i>Log likelihood function</i>		= 307.633*		
<i>LR Test</i>		= 21.281*		

(\*) significant at 1%, (\*\*) significant at 5%, (\*\*\*) significant at 10%

The estimated coefficients of the inefficiency function provide some explanations for the relative technical efficiency levels among the individual farms. Age, education, experience, family size, number of chicken ownership, extension and credit had significant effect on the level of technical inefficiency, while gender had no significant effect.

The estimate of the parameter for age variable have negative and significant effect to technical inefficiency. This suggests that older farmers are more technically efficient than younger farmers. This result is consistent with the findings by Oleke and Isinika (2011) and Bethel, et al (2016).

The estimate of the parameter for education variable have positive and significant effect to technical inefficiency. This suggests that the higher the formal education of the breeder will decrease the level of technical efficiency achieved. This result is consistent with the findings by Kiprop, et al (2015).

The estimate of the parameter for experience variable have positive and significant effect to technical inefficiency. This suggests that the longer the farmers experience in keeping Sentul chickens will decrease the level of technical efficiency achieved. This result is consistent with the findings by Haider, et al (2011), Ogunniyi and Ajao (2011), and Olanrewaju, et al (2015). Olanrewaju, et al (2015) stated that farmers who have more years in the farming business are more inefficient technically compares with the less experienced ones. This may be due to the fact that the younger farmers may tend to learn more and look forward to embracing the new technologies and ideas so may tend to be more efficient than the older respondents.

The estimate of the parameter for family size variable have positive and significant effect to technical inefficiency. The results show that farmers with more size of family achieved lower levels of technical efficiency. This result is consistent with the findings by Haider, et al (2011), Oleke and Isinika (2011), Ohajanya, et al

(2013) and Olanrewaju, et al. (2015). Mango, et al (2015) stated that smaller farming households are more efficient, possibly because, as noted, larger household sizes exert pressure on the limited resources available to the smallholder farmer and seem to exacerbate poverty. Poverty-stricken farmers are more likely to be inefficient, as they cannot afford to buy productivity-enhancing inputs such as certified seed and fertilizer.

The estimate of the parameter for number of Sentul chicken ownership variable have negative and significant effect to technical inefficiency. This results show that farmers who raised a higher number of Sentul chicken achieved a higher level of technical efficiency. This result is consistent with the findings by Isyanto, et al (2013) and Ohajianya, et al (2013). Omar (2014) stated that the large scale farms are more efficient than small and medium farms due to the least total costs and best management methods and recommended the small and medium farms to follow up feeding programs and veterinary services that applied in these farms that in turn decrease the total costs and increase profits.

The estimate of the parameter for gender variable has a positive but insignificant effect on technical inefficiency. This result shows that men are more efficient than women. This result is consistent with the findings by Addison, et al (2016). Hong and Yabe (2015) stated that in reality, women farmers lack access to inputs, credit, and extension training because most of their time spends on doing housework like cooking, cleaning, washing, and caring children, apart from plucking and weeding possible during the lean season. Most of work in cultivation re done by male farmers.

The estimate of the parameter for extension variable have negative and significant effect to technical inefficiency. These results indicate that farmers who follow extension activities can achieve a higher level of technical efficiency compared to farmers who do not follow extension activities. This result is consistent with the findings by Ezeh, et al (2012), Ohajianya, et al (2013), Begho and Ogisi (2014), Bethel, et al (2016) and Elias, et al (2017). Mango, et al (2015) stated that more frequent extension services tend to increase technical efficiency, as extension agents provide advice on issues such as new technologies and production-related information.

The estimate of the parameter for credit variable have negative and significant effect to technical inefficiency. This results shows that the farmer who obtains credit is higher in the level of technical efficiency compared to the non-credited farmer. This suggests that increasing credit use would enhance technical efficiency of sample farms. This result is consistent with the findings by Oleke, et al (2011), Javed, et al, (2012), Ohajianya, et al (2013), Bethel, et al (2016) and Elias, et al (2017). Isyanto, et al (2013) stated that access to credit permit farmers to enhance efficiency by overcoming liquidity constraints which may effect their ability to purchase and apply inputs and implement farm management decisions on time hence increasing efficiency.

## 5. Conclusion

The inefficiency model showed that age, education, experience, family size, number of Sentul chicken ownership, extension and credit have significant effect on technical inefficiency, while gender has no significant effect on technical inefficiency on Sentul chicken farming.

## 6. Recommendation

Number of Sentul chicken ownership, involvement in extension activities and access to credit have a significant effect in improving technical efficiency in Sentul chicken raising business. Therefore, it is necessary to consider increasing the number of Sentul chicken ownership through credit assistance to farmers supported by the implementation of extension activities to farmers in an effort to improve the technical efficiency and income of farmers.

## 7. Acknowledgement

Writers say thank you to Directorate of Research and Community Service, Directorate General of Strengthening Research and Development, Ministry of Research Technology and Higher Education, Republic of Indonesia, for funding this research through a scheme of applied product research of the fiscal year 2017. Also, writers say thank you very much to Sentul chicken farmers in providing data and facilitating the implementation of this study.

## References

- Aboki, E., Jongur, A.A.u., and Onu, J.I. (2013). Productivity and Technical Efficiency of Family Poultry Production in Kurmi local Government Area of Taraba State, Nigeria. *Journal of Agriculture and Sustainability*, 4(1): 52-66.
- Addison, M., Ohene-Yankyera, K., and Fredua-Antoh, E. (2016). Gender Role, Input Use and Technical Efficiency among Rice Farmers at Ahafo Ano North District in Ashanti Region of Ghana. *Journal of Food Security*, 4(2): 27-35.
- Adedeji, I.A., Adelalu, K.O., Ogunjimi, S.I., and Otekunrin, A.O. (2013). Application of Stochastic Production Frontier in the Estimation of Technical Efficiency of Poultry Egg Production in Ogbomoso Metropolis of

- Oyo State, Nigeria. *World Journal of Agricultural Research*, 1(6): 119-123.
- Alabi, R.A. & Aruna, M.B. (2005), "Technical Efficiency of Family Poultry Production in Niger-Delta, Nigeria", *Journal of Central European Agriculture* 6(4), 531-538.
- Alam, H.I.P. (2005). *Resistensi Ayam Lokal Jawa Barat: Ayam Sentul*. Lokakarya Nasional Inovasi Teknologi Pengembangan Ayam Lokal. Puslitbangnak. Bogor.
- Ashagidigbi, W.M., Sulaiman, S.A., dan Adesivan, A. (2011). Technical and Allocative Efficiency of Poultry Egg Producers in Nigeria. *Agricultural Journal*, 6(4): 124-130.
- Awaluddin. (2012). Strategi Pengembangan Ayam Biromaru dalam Upaya Penyediaan Bibit Ayam Pedaging Lokal. *IJAS*, 2(2): 64-70.
- Baktiningsih, S., Mugiyo, S., dan Saleh, D.M. (2013). Produksi Telur Berbagai Jenis Ayam Sentul di Gabungan Kelompok Tani Ternak Ciung Wanara Kecamatan Ciamis Kabupaten Ciamis. *Jurnal Ilmiah Peternakan*, 1(3): 993-1000.
- Begho, T. and Ogisi, O.D. (2014). Bayes Approach to the Estimation of Technical Efficiency and Returns to Scale in Agriculture: A Case of Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology*, 3(4): 275-284.
- Bethel, E., Fani, D.R., and Odufa, E.M. (2016). Analysis of Technical Efficiency of Poultry Farmers in Cross River State, Nigeria. *International Journal of Research Studies in Agricultural Sciences (IJRSAS)*, 2(4): 40-45.
- Chisango, F.F.T., Deliwe, T., and Obert, M. (2015). An Analysis of Factors Hindering The Development of Indigenous Chicken Production In Smallholder Farming Communities of Zimbabwe, A Case Of Ward 10 In Bindura District. *International Journal of Management and Economics Invention*, 1(5): 230-243.
- Coelli, T., Rao, D.S.P., dan Battese, G.E. (1998). *An Introduction to Efficiency and Productivity Analysis*. Kluwer Academic Publishers, Boston-Dordrecht-London.
- \_\_\_\_\_. (2005). *An Introduction to Efficiency and Productivity Analysis*. Kluwer Academic Publishers, Boston-Dordrecht-London.
- Daryono, B.S., Satriya, R., Rohmah, Z., dan Erwanto, Y. (2012). Penguatan Industri Bibit Unggas Nasional Melalui Produksi Indukan Gama Ayam Lokal Unggul. *Jurnal Ilmu Pengetahuan dan Teknologi Tepat Guna Universitas Gadjah Mada*, 1(2): 95-103.
- Dewanti, R., dan Sihombing, G. (2012). Analisis Pendapatan Usaha Peternakan Ayam Buras (Studi Kasus di Kecamatan Tegalombo, Kabupaten Pacitan). *Buletin Peternakan*, 36(1): 48-56.
- Dutta, R.K., Islam, M.S., and Kabir, M.A. (2013). Production Performance of Indigenous Chicken (*Gallus domesticus* L.) in Some Selected Areas of Rajshahi, Bangladesh *American Journal of Experimental Agriculture*, 3(2): 308-323.
- Elias, S., Worku, A. and Mathewos, N. (2017). Technical efficiency of smallholder coffee farmers in Gedeo Zone, Southern Ethiopia: A Stochastic Frontier Approach. *Agricultural Science Research Journal*, 7(4): 147-153.
- Ezeh, C.I., Anyiro, C.O. and Chukwu, J.A. (2012). Technical Efficiency in Poultry Broiler Production in Umuahia Capital Territory of Abia State, Nigeria. *Greener Journal of Agricultural Sciences*, 2(1): 001-007.
- Haider, M.Z., Ahmed, M.S. and Mallick, A. (2011). Technical Efficiency of Agricultural Farms in Khulna, Bangladesh: Stochastic Frontier Approach. *International Journal of Economics and Finance* 3(3), 248-256.
- Hartono, E.H., Hidayat, N.N., dan Roesdiyanto. (2013). Kinerja Ekonomi Usaha Ayam Sentul di Kabupaten Ciamis. *Jurnal Ilmiah Peternakan*, 1(3): 865-873.
- Hong, N.B. and Yabe, M. (2015). Technical Efficiency Analysis of Tea Production in the Northern Mountainous Region of Vietnam. *Global Journal of Science Frontier Research: (D) Agriculture and Veterinary*, 15(1): 31-42.
- Ike, P.C. (2011). Resource Use and Technical Efficiency of Small Scale Poultry Farmers in Enugu State, Nigeria: A Stochastic Frontier Analysis. *International Journal of Poultry Science*, 10 (11): 895-898.
- Islam, F., Sarker, S.C., Ibrahim, M.N.M., Okeyo, A.M., Jianlin, H., Hoque, M.A., and Bhuiyan, A.K.F.H. (2015). Effect of Breeding Strategies to Increase Productivity of Indigenous Chicken *in-situ* in Bangladesh. *Tropical Agricultural Research*, 26(3): 517-527.
- Islam, R., Kalita, N., and Nath, P. (2014). Comparative Performance of Vanaraja and Indigenous Chicken Under Backyard System of Rearing. *Journal of Poultry Science and Technology*, 2(1): 22-25.
- Isyanto, A.Y., Semaon, M.I., Hanani, N. dan Syafrial., (2013). Measurement of Farm Level Efficiency of Beef Cattle Fattening in West Java Province, Indonesia. *Journal of Economics and Sustainable Development*, 4(10): 100-104.
- Javed, M.I., Khurshid, W., Hassan, I., Ali, A. and Nadeem, N. (2012). Impact of Institutional Credit and Extension Services on Productive Efficiency of Farms: Evidence from Irrigated Punjab, Pakistan. *J. Agric. Res.* 50(1), 145-153.
- Justus, O., Owuor, G., Bebe, B.O. (2013). Management Practices and Challenges in Smallholder Indigenous

- Chicken Production in Western Kenya. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, 114(1): 51-58.
- Kingori, A. M., Tuitoek, J. K., Muiruri, H. K., Wachira, A. M. (2010). Effect of Dietary Crude Protein Levels on Egg Production, Hatchability and Post-Hatch Offspring Performance of Indigenous Chickens. *International Journal of Poultry Science*; 9(4):324-329.
- Kiprop, N.I.S., Hillary, B.K., Mshenga, P. and Nyairo, N. (2015). Analysis of Technical Efficiency among Smallholder Farmers in Kisii County, Kenya. *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*, 8(3):50-56.
- Likita, T., and Ngozi, O. (2015). Technical Efficiency of Small-Scale Broiler Production in the Federal Capital Territory, Abuja, Nigeria: Data Envelopment Analysis Approach. *International Research Journal of Agricultural and Aquatic Sciences*, (2): 098-104.
- Mango, N., Makate, C., Hanyani-Mlambo, B., Siziba, S., and Lundy, M. (2015). A stochastic frontier analysis of technical efficiency in smallholder maize production in Zimbabwe: The post-fast-track land reform outlook. *Cogent Economics & Finance*, 3(1): 1-14.
- Mariandayani, H.N., Solihin, D.D., Sulandari, S., dan Sumantri, C. (2013). Keragaman Fenotipik dan Pendugaan Jarak Genetik pada Ayam Lokal dan Ayam Broiler Menggunakan Analisis Morfologi. *Jurnal Veteriner*, 14(4): 475-484.
- Meyliyana, Mugiyono, S., dan Roesdiyanto. (2013). Bobot Badan Berbagai Jenis Ayam Sentul di Gabungan Kelompok Tani Ternak Ciung Wanara Kecamatan Ciamis Kabupaten Ciamis. *Jurnal Ilmiah Peternakan*, 1(3): 985-992.
- Miriam, K.N., Agnes, N.O., and Jacob, K.J.J.O. (2015). Performance and Constraints of Indigenous Chicken Rearing Among Small Scale Farmers in Mau-Narok Ward, Njoro Sub County, Nakuru County, Kenya. *International Journal of Advanced Research*, 3(3): 283-289.
- Mutombo, P.K., Orenge, C.O., Kanui, T.I., and Wambua, S.M. (2015). An Assesment ff Natural and Socio-Economic Impacts on Indigenous Chicken Production: A Case Study of Katangi and Ikombe Divisions of Yatta Sub-County. *International Journal of Education and Research*, 3(8): 53-62.
- Nataamijaya, A.G. (2005). Karakteristik Penampilan Pola Warna Bulu, Kulit, Sisik Kaki, dan Paruh Ayam Pelung di Garut dan Ayam Sentul di Ciamis. *Buletin Plasma Nutfah*, 11(1): 1-5.
- Ogunniyi, L.T. and Ajao, A.O. (2011). Investigation of Factors Influencing the Technical Efficiencies of Swine Farmers in Nigeria. *J. Hum Ecol* 35(3), 203-208.
- Ohajianya, D.O., Onu, P.N., Ugwu, J.N., Osuji, M.N., Nwaiwu, I.U., Orebiyi, J.S., Godson-Ibeji, C.C., and Enyia, C.O. (2013). Technical Efficiency of Table Egg Producers in Imo State, Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology*, 2(2): 118-127.
- Ohajianya, D.O., Onu, P.N., Ugwu, J.N., Osuji, M.N., Nwaiwu, I.U., Orebiyi, J.S., Godson-Ibeji, C.C., and Enyia, C.O. (2013). Technical Efficiency of Table Egg Producers in Imo State, Nigeria. *Asian Journal of Agricultural Extension, Economics & Sociology*, 2(2): 118-127.
- Olanrewaju, O.A., Gbemisola, A.A., and Moses, B.O. (2015). Technical Efficiency of Poultry Egg Production in Ibadan Metropolis, Oyo State, Nigeria. *Economics*, 4(3): 50-56.
- Oleke, J.M. and Isinika, A.C. (2011). Assessing The Technical Efficiency of Commercial Egg Production in Tanzania for Improved Livelihoods. *Journal of Development and Agricultural Economics*, 3(8): 343-352.
- Omar, M.A.E. (2014). Technical and Economic Efficiency for Broiler Farms in Egypt: Application of Data Envelopment Analysis (DEA). *Global Veterinaria*, 12 (5): 588-593.
- Rohmad. (2013). Analisis Produktivitas Usaha Peternakan Ayam Pedaging Pola Kemitraan Perusahaan Pengelola di Kecamatan Kandat Kabupaten Kediri. *Jurnal Manajemen Agribisnis*, 13(1): 71-82.
- Siyaya, B.J., and Masuku, M.B. (2013). Factors Affecting Commercialisation of Indigenous Chickens in Swaziland. *Journal of Agricultural Studies*, 1(2): 86-101.
- Suhardi. (2011). Karakterisasi Ex Situ Ayam Lokal Khas Dayak bagi Pengembangan Plasma Nutfah Ternak Unggas Nasional. *Jurnal Teknologi Pertanian*, 7(1): 36-41.
- Sulistyoningsih, M., Sunarti, D., Suprijatna, E., and Isroli. (2013). Performance of indigenous chicken under intensive rearing with various litter materials. *Internat. J. of Sci. and Eng.*, 4(2): 52-56.
- Todsadee, A., Kameyama, H., Ngamsomsuk, K., and Yamauchi, K. (2012). Production Efficiency of Broiler Farming in Thailand: A Stochastic Frontier Approach. *Journal of Agricultural Science*, 4(12): 221-231.
- Zewdu, S., Kassa, B., Agza, B., and Alemu, F. (2013). Village Chicken Production Systems in Metekel zone, Northwest Ethiopia. *Wudpecker Journal of Agricultural Research*, 2(9): 256-262.