Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.9, No.18, 2018

Technical Efficiency of Coconut Sugar Agroindustry in Pangandaran District, West Java Province, Indonesia

Fitri Yuroh* Ida Maesaroh
Faculty of Agriculture, University of Galuh
Jl. R.E. Martadinata No. 150 Ciamis 46274

Abstract
The study was carried out with the aim to determine the factors that influence production, the level of technical efficiency achieved, and the factors that influence technical inefficiency in coconut sugar agroindustry in Pangandaran District, West Java Province, Indonesia. Research samples were 100 agroindustry. Data analysis was carried out using a stochastic frontier production function where data processing used Front41 with TE effect model. The results of the study show that raw materials, firewood and labor have a positive and significant effect on coconut sugar production in Pangandaran District. The efficiency level achieved ranges from 0.59 to 0.99 with an average of 0.70. Education, experience, family size, and number of tapped coconut trees have a significant effect on technical inefficiency; while age has no significant effect.
Keywords: Coconut sugar, Agroindustry, Technical Efficiency, Technical Inefficiency

1. Introduction

The sugar industry development program based on coconut plants is very appropriate and strategic to be developed in centers of coconut plants in all regions of Indonesia (Supomo, 2007). One potential of agroindustry in Pangandaran District is coconut sugar agroindustry. More than 70 tons of coconut sugar are sent to big cities on the island of Java (Anonymous, 2015). Coconut sugar agroindustry has a relatively simple technology characteristic, labor intensive and production does not depend on market demand but based on the availability of raw materials (Maharani, et al., 2011).

Some studies show that the factors that influence technical inefficiency are: education, age, off farm income (Diamini, et al, 2010), education, experience (Taru, et al, 2011), family income, education, experience (Saptana , 2012), age, education (Hussain, et al, 2014), farming size, education, age, extension (Supaporn, 2015).

The study was carried out with the aim to determine the factors that influence production, the level of technical efficiency achieved, and the factors that influence technical inefficiency in coconut sugar agroindustry in Pangandaran District, West Java Province, Indonesia.

2. Research Methodology

The study was carried out in Pangandaran District, West Java Province, Indonesia. Pangandaran District consists of 10 subdistricts, namely Parigi, Cigugur, Cijulang, Cimerak, Kalipucang, Langkaplancar, Mangunjaya, Padaherang, Pangandaran, and Sidamulih. The whole subdistrict has coconut sugar agroindustry. Each subdistrict took 10 coconut sugar agroindustry, so the sample size was 100.

The study utilized stochastic production frontier, and the model is defined by:

$$ln\ Y = \beta_0 + \beta_1 lnX_1 + \beta_2 lnX_2 + \beta_3 lnX_3 + v_i - u_i \quad (1)$$

where: Y = production (kg), X_1 = raw material (liter), X_2 = firewood (m^3), X_3 = labor (workday), β = 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:

$$\mu_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 D_1 + \delta_7 D_2 + \delta_8 D_3 \quad (2)$$

where: μ_i = technical inefficiency, Z_1 = age (years), Z_2 = education (years), Z_3 = experience (years), Z_4 = family size (persons), Z_5 = number of tapped coconut trees (trees), δ = regression coefficient.

3. Results and Discussion

Factors that influence production and the level of technical inefficiency in coconut sugar agroindustry in Pangandaran District can be seen in Table 1.

Table 1. Maximum Likelihood Estimates and Inefficiency Functions

Variable	Parameter	Coefficient	Standard Error	t-ratio
Production function				
Constant	β_0	0.4457	0.0763	5.8391[a]
Raw material	β_1	0.3550	0.0547	6.4948[a]
Firewood	β_2	0.1772	0.0351	5.0521[a]
Labor	β_3	0.6875	0.1333	5.1566[a]
Inefficiency function				
Constant	δ_0	-0.0309	0.2660	-0.1160
Age	δ_1	-0.1550	0.1359	-1.1401
Education	δ_2	-0.2539	0.1318	-1.9257[c]
Experience	δ_3	0.0495	0.0339	1.4583[d]
Family size	δ_4	-0.1182	0.0619	-1.9085[c]
Number of tapped coconut trees	δ_5	0.4099	0.1180	3.4721[a]
Sigma square	σ^2	0.0036	0.0006	6.2521[a]
Gamma	γ	0.3961	0.1548	2.5582[b]
Log likelihood function	= 151.7384*			
LR Test	= 13.7595*			

a,b,c,d significant at 1,5,10,15%

Sigma-square value (σ^2) more than zero indicates that the coconut sugar agro-industry in Pangandaran District has not yet reached full efficiency level. A value of γ more than zero indicates the effect of technical inefficiency in the model. Value of γ equal to 0.3961 indicates that the variation of error term values in the model of 39.61 is caused by technical inefficiencies.

Table 1 shows that raw materials have a positive and significant effect on coconut sugar production. The more raw materials used, the more coconut sugar is produced. The results of this study are consistent with the results of research from Suyudi et al (2007), Indarwati (2009), Rusmiati et al (2011), and Wibisono et al (2012).

Firewood has a positive and significant effect on coconut sugar production which shows that the more use of firewood, the more coconut sugar production. The results of this study are in accordance with the results of research from Aliudin et al (2011). Coconut sugar agro-industry in Pangandaran District uses firewood as fuel in the process of producing coconut sugar.

Labor has a positive and significant effect on coconut sugar production which shows that the labor used in the process of coconut sugar production is a workforce that has competence in the process of producing coconut sugar. The results of this study are in accordance with the results of research from Anggiadita and Sujarwo (2016), and Ali and Jan (2017).

Age has a negative but insignificant effect on technical inefficiency which indicates that increasing age causes more technically efficient. The results of this study are in accordance with the results of research from Ali and Jan (2017), and Ali et al (2013).

Education has a negative and significant effect on technical inefficiency which shows that the higher the level of education causes the higher level of technical efficiency achieved. The results of this study are in accordance with the results of research from Suharyanto et al (2013), Kune et al (2016).

Experience has a positive and significant effect on technical inefficiency which shows that increasing experience will increase technical efficiency. The results of this study are in accordance with the results of research from Isyanto et al (2013), Rivanda et al (2015), and Burhansyah (2016).

Family size has a negative and significant effect on technical inefficiency which indicates that increasing family size will increase technical efficiency. The results of this study are in accordance with the results of research from Yoko et al (2014), Thamrin et al (2015), and Yusuf and Isyanto (2017).

The number of tapped coconut trees has a positive and significant impact on technical inefficiency which indicates that the more number of tapped coconut trees will increase technical efficiency. The results of this study are in accordance with the results of research of Maemunah and Isyanto (2017) which shows that the greater the business scale, the higher the level of technical efficiency achieved.

The level of technical efficiency achieved in the coconut sugar agroindustry in Pangandaran District ranges from 0.59-0.99 with an average of 0.70. Frequency distribution of the level of technical efficiency can be seen in Table 2.

Table 2. Frequency Distribution of Technical Efficiency

Efficiency	Frequency	Percentage
0.41 – 0.50	2	2.00
0.51 – 0.60	20	20.00
0.61 – 0.70	38	38.00
0.71 – 0.80	18	18.00
0.81 – 0.90	16	16.00
0.91 – 1.00	6	6.00
Total	100	100.00

minimum = 0.59; maximum = 0.99, mean = 0.70

Table 2 shows that the efficiency level is 0.71 as much as 60%, while that above 0.71 is 40%. This shows that most of the agro-industries are not technically efficient in using production factors. Illustration of the level of technical efficiency achieved is presented in Figure 1.

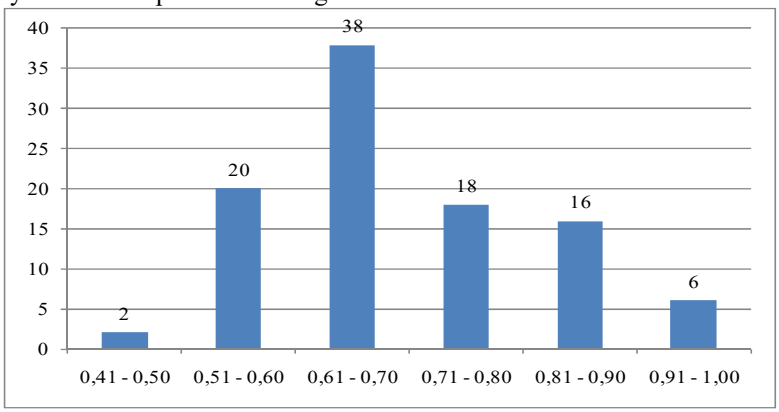

Figure 1. Technical Efficiency

4. Conclussion

Raw materials, firewood and labor have a positive and significant effect on coconut sugar production in Pangandaran District. The efficiency level achieved ranges from 0.59 to 0.99 with an average of 0.70. Education, experience, family size, and number of tapped coconut trees have a significant effect on technical inefficiency; while age has no significant effect.

5. Recommendation

Non-formal education through extension and technical assistance needs to be done in an effort to improve technical efficiency in the coconut sugar agroindustry in Pangandaran District. It is necessary to increase the number of coconut trees tapped through credit assistance from the government.

6. Acknowledgement

Authors 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 Penelitian Dosen Pemula of the fiscal year 2018.

References

Ali, A. and A.U. Jan. (2017). Analysis of Technical Efficiency of Sugarcane Crop in Khyber Pakhtunkhwa: A Stochastic Frontier Approach. *Sarhad J. Agric.,* 33(1): 69-79.

Ali, G. Shah, S.M.A. Jan, D. Jan, A. Fayaz, M. Ullah, I. and Khan, M.Z. (2013). Technical Efficiency of Sugarcane Production in District Dera Ismail Khan. *Sarhad J. Agric*., 29(4): 585-590.

Aliudin, Sariyoga, S. and Anggraeni, D. (2011). Efisiensi dan Pendapatan Usaha Gula Aren Cetak (Kasus pada Perajin Gula Aren Cetak di Desa Cimenga, Kecamatan Cijaku, Kabupaten Lebak, Provinsi Banten). *Jurnal Agro Ekonomi*, 29(1): 73-85.

Anggiadita, N. and Sujarwo. (2016). Technical Efficiency Analysis of Sugar Cane Production in Sutojayan Village, Pakisaji Sub-District, Malang, East-Java, Indonesia. *Agricultural Socio-Economics Journal*, XVI(02): 45-51.

Anoymous. (2015). Pangandaran Pasok 70 Ton Gula Kelapa. http://www.nolduanews.com/2015/10/ setiap-hari-pangandaran-pasok-70-ton.html. Accesed February 3, 2017.

Burhansyah, R. (2016). Efisiensi Teknis Usahatani Padi Tadah Hujan Di Kawasan Perbatasan Kabupaten Sambas Dengan Pendekatan *Stochastic Frontier* Fungsi Produksi (Kasus Di Desa Sebubus, Kecamatan

Paloh). *Informatika Pertanian*, 25(2): 163-170.

Diamini, S., Rugambisa, J.I., Masuku, M.B., dan Belete, A. (2010). Technical efficiency of The Small Scale Sugarcane Farmers in Swaziland: A Case Study of Vuvulane and Big Bend Farmers. *African Journal of Agricultural Research* 5(9): 935-940.

Hussain, N., Ali, S., Miraj, N., dan Sajjad, M. (2014). An Estimation of Technical Efficiency of Garlic Production in Khyber Pakhtunkhwa Pakistan. *International Journal of Foodand Agricultural Economics*, 2(2): 169-178.

Indarwati, I. (2009). Efisiensi Produksi pada Agroindustri Gula Kelapa di Kecamatan Cilongok Kabupaten Banyumas. *Majalah Ilmiah Ekonomika*, 12(3): 109-179.

Isyanto, A.Y. Semaoen, M.I. Hanani, N. and 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.

Kune, S.J. Muhaimin, A.W. and Setiawan, B. (2016). Analisis Efisiensi Teknis dan Alokatif Usahatani Jagung (Studi Kasus di Desa Bitefa Kecamatan Miomafo Timur Kabupaten Timor Tengah Utara). *Agrimor*, 1(1): 3-6.

Maemunah, S., and Isyanto, A.Y. (2017). Faktor Penentu Inefisiensi Teknis Pada Usaha Ternak Kambing Peranakan Ettawa (Studi Kasus di Kelompok Agribisnis As-Salam Kota Tasikmalaya). *Mimbar Agribisnis*, 3(2): 169-184.

Maharani, E., Edwina, S., dan Kusumawaty, Y. (2011). Pemasaran Gula Kelapa di Kabupaten Indragiri Hilir Melalui Pendekatan Struktur, Perilaku & Penampilan Pasar. *Indonesian Journal of Agricultural Economics (IJAE)* 2(1): 87-104.

Yusuf, M,N, and Isyanto, A.Y. (2017). Analisis Efisiensi Teknis Usahatani Padi pada Lahan Sawah Irigasi Teknis di Kabupaten Ciamis. *Prosiding Seminar Nasional Hasil Penelitian Agribisnis I*. Program Studi Agribisnis Fakultas Pertanian Universitas Galuh. Pp. 162-167.

Rivanda, D.R. Nahraeni, W. and Yusdiarti, A. (2015). 2015. Analisis Efisiensi Teknis Usahatani Padi Sawah (Pendekatan *Stohactic Frontier).* Jurnal AgribiSains, 1(1): 1-13.

Rusmiati, Bachri, S. and Rismawati. (2011). Analisis Usaha Pembuatan Gula Merah di Kecamatan Sukamaju. *Jurnal Equilibrium*, 1(1): 69-77.

Saptana. (2012). Konsep Efisiensi Usahatani Pangan dan Implikasinya Bagi Peningkatan Produktivitas. *Forum Penelitian Agro Ekonomi*, 30(2): 109-128.

Suharyanto, Mulyo, J.H. Darwanto, D.H. and Widodo, S. 2013. Analisis Efisiensi Teknis Pengelolaan Tanaman Terpadu (PTT) Padi Sawah Di Provinsi Bali. *SEPA*, 9(2): 219-230.

Supaporn, P. (2015). Determinants of Technical Efficiency of Sugarcane Production among Small Holder Farmers in Lao PDR. *American Journal of Applied Sciences*, 12(9): 644-649.

Supomo. (2007). Meningkatkan Kesejahteraan Pengrajin Gula Kelapa di Wilayah Kabupaten Purbalingga. *Jurnal Ekonomi Pembangunan* 12(2): 149-162.

Suyudi, A., Pujiharto and Utami, P. (2007). Efisiensi Penggunaan Faktor-faktor Produksi pada Usaha Pembuatan Gula Kelapa di Desa Gumelem Wetan Kecamatan Susukan Kabupaten Banjarnegara. *Agritech*, IX(1): 22-35.

Taru, V.B., Lawal, H., dan Tizhe, I. (2011). Technical Efficiency Of Sole Cowpea Production In Adamawa State, Nigeria: A Cobb-Douglas Stochastic Frontier Function. *Journal of Economics and International Finance* 3(8): 504-507.

Thamrin, S. Hartono, S. Darwanto, D.H. and Jamhari. (2015). Efisiensi Teknis Usahatani Kopi Arabika di Kabupaten Enrekang. *Ilmu Pertanian*, 18(2): 92-97.

Wibisono, G., Istiyanti, E. and Hasanah, U. (2012). Efisiensi Penggunaan Faktor-faktor Produksi Gula Kelapa di Desa Kunirejo Wetan Kecamatan Butuh Kabupaten Purworejo. *Surya Agritama*, I(2): 57-67.

Yoko, B. Syaukat, Y. and Fariyanti, A. (2014). Analisis Efisiensi Usahatani Padi di Kabupaten Lampung Tengah. *Jurnal Agribisnis Indonesia*, 2(2): 127-140.