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Determinants of Technical Efficiency of Small Scale Sunflower Oil Processing Firms in Tanzania: One Stage Stochastic Frontier Approach

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Abstract

Sunflower oil processing firms have recently captured the attention of many scholars due to their contributions along the value chain. Despite their contributions, 75% of them operate under capacity with steadily declining technical efficiency. This paper estimates the technical efficiency of sunflower oil processing firms in Tanzania and the factors contributing to their inefficiency. We used firm-level average production data for three years from 2013 to 2015 collected from a sample of 219 Sunflower oil processing firms. Data were analyzed using one Stage Stochastic Production Frontier with inefficiency effect model under the Maximum Likelihood Estimate (MLE) technique. We found that Capital and materials input factors of production contributed statistically significantly to the output of the firms under the study. In the same way, firm age, location, ownership type, age and education of the owner were found significant determinants of technical efficiency in sunflower oil processing firms in Tanzania. The findings in this paper imply that there is a need to adopt efficiency-enhancing measures including replacement of existing old machines since inefficiency increases with age; affordable industrial locations for easy accessibility and support services; and promotion of proper entrepreneurial education to owners.

Keywords: Determinants, Technical efficiency, Small-scale sunflower oil processing, Stochastic frontier analysis, Maximum likelihood estimate.
JEL Classification: C10; C40; C58; D22; D24; L25.

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Contents

1. Introduction

The agro-processing firms have captured the attention of many scholars due to their contributions along the value chain through expansion of forwarding and backward linkages in the economy (UNDP | United Nations Development Program, 2012; Ekblom, 2016). They particularly increase incomes, improve the living standards and create jobs (UNDP, 2012; Ekblom, 2016). They also generate higher added value for agricultural commodities by converting raw material from agricultural farm to intermediate inputs or readily consumed products (Yodfiatfinda, 2012).

Sunflower oil processing firms are ones of emerging agro-processing industries in Tanzania with great potentials in providing nutritious and cholesterol free oil in both rural and urban areas (Ekblom, 2016). Despite the remarkable potentials, the processed sunflower oil is inadequate to cover the increasing gap of oil demand stimulated by population growth, township creation, increased awareness and improved standards of living (Haggblade *et al*., 2010). As a result, Tanzania continues to be a net importer of oil to cater for existing high demand. It is currently reported that 75% of sunflower oil processing firms operate under capacity with steadily declining technical efficiency in Tanzania (Tisimia, 2014). Additionally, most sunflower oil processing firms are mainly of small-scale, they often sell their products locally along highways as their products are of a low standard in suiting international market (Mpeta, 2015). Moreover, there is limited empirical evidence in the academic literature on determinants of technical efficiency in sunflower oil processing firms. This is because of most of the previous studies on technical efficiency focused on other manufacturing sub-sector other than sunflower (Admassie and Matambalya, 2002; Wu *et al*., 2006; Niringiye *et al*., 2010; Charoenrat, 2012). In addition, previous studies on technical efficiency generalized their findings while efficiency is relative and specific to firm group and country (Ahmed *et al*., 2010). The applicability and generalization of their findings are questionable to other countries and sectors due to contextual differences in infrastructure, cultural, general economic environment and digital divide of which sunflower oil processing firms in Tanzania is of no exception.

From the production theory point of view, firms are not fully efficient in maximizing outputs from factors of production hence low level of production is attained with varying efficiency levels among them. There exists a large gap between actual and expected production output level of sunflower oil. This is because of losses which might be due to random errors out of the control of the firm and possibly inefficiency use of the firm' resources. In the same vein, the resource-based theory of the firm assumes that resources are always applied in the best way by the firm for the superior performance, ignoring how this is actually done. This claim of the theory has remained at the conceptual level as few empirical studies (Faruq and David, 2010; Ahmed and Ahmed, 2013) are based on different manufacturing subsectors other than sunflower processing firms. As a result, there is inadequate knowledge about the postulation to small-scale firms, particularly sunflower oil processing firms in Tanzania. This paper therefore, estimated the technical efficiency levels and their determinants to identify how well the firms utilize their scarce resources to maximize output focusing on sunflower oil agro-processing firms in Tanzania.

2. Literature Review

The conception of technical efficiency has been explained by many scholars in various fields and sub-sectors in different ways, but the main idea is centred on the input-output relationship. It is either when the maximum quantity of output is obtained for a given set of inputs or when the minimum quantity of inputs is used to produce a given output level (Debru, 1951; Koopmans, 1951) and Farrell (1957); Kumbhakar and Lovell (2000); Coelli *et al.* (2005); Charoenrat (2012) and Ngeh (2014). In this paper, technical efficiency has been considered as the ability of the firm to produce maximum quantity of output measured as the ration of unit produced in litres (output) to a set of inputs capital, labour and material given a production technology.

The input-output relationship has been grounded from production theory which assumes full technical efficiency while specifying the production function of firms, but in reality, a gap exists between theoretical assumption of full technical efficiency and empirical reality. It represents the level of achievement by the firm in utilizing the available inputs resources (capital, labour, and material) for maximum outputs. Although the importance of efficient use of resources has long been recognized by firms, the actual output is less than what is postulated by the production function. They perform at their best practice (a frontier) which is used to emphasize the idea of the maximality of the firm reflecting the current state of technology in the industry. Frontier defines the best combination of inputs that can be used to produce a maximum output. For this case, firms that operate on the frontier are considered technically efficient and those beneath the frontier are technically inefficient. These differences might be due to technical inefficiencies or some unanticipated exogenous shocks outside the control of the firm.

The resource-based theory of the firm perceives organizations as bundles of resources which are combined to create organizational capabilities for superior performance (Barney, 1991). In this light, we believe that effective utilization of input resources (capital, labour and materials) of the firm for maximum output depends on skills and capabilities possessed through firm-specific factors like size, age, location, experience, age and education of the owner, ownership type and training of employees.

Most of the previous studies on technical efficiency used capital, labour, and material as input factors of production and found statistically significant contribution on the output of the firm, measured in annual sales turnover (Admassie and Matambalya, 2002; Memon and Tahir, 2011). However, the sales turnover of the firm is the function of many factors like price, advertisement and other marketing issues, thus it is not directly related to the technical efficiency of the firm. Contrary to previous studies, this study used the unit processed of sunflower oil as a proxy measure of output with similar input factors of production (capital, labour, and material) to determine the technical efficiency level in sunflower oil processing firms. The levels of technical efficiency of sunflower oil processing firms anticipated will indicate whether there would be losses in oil production that could be attributed to inefficiencies due to differences in firm-specific factors or not. Next section presents some firm-specific factors that may affect technical efficiency as reported in previous studies.

2.1. Firm-Specific Factors and Technical Efficiency of the Firm

2.1.1. Firm Size

Theoretically, firm size influences technical efficiency. The theory of the passive learning model of firm dynamics by Jovanovic (1982) predicts that larger firms are more efficient than smaller ones due to more acquired competence and experience in management. Empirically, the firm size is found previously to have a significant and positive relationship with firms' technical efficiency (Admassie and Matambalya, 2002; Amornkitvikai and Harvie, 2011; Charoenrat and Harvie, 2013). On the other hand, Le and Harvie (2010) found a significant and negative relationship of firm size with firms' technical efficiency. There are still mixed results depending on countries and sectors analyzed. In this study, we investigate the influence of firm size on the technical efficiency of Small Scale Sunflower Oil Processing Firm (SSSOPF).

2.1.2. Firm Age

Firm age is believed to influence technical efficiency. Older firms are considered more efficient than younger ones due to gained experience from past operations. Empirically, a positive relationship between age and technical efficiency is noted due to learning acquired through production experience (Admassie and Matambalya, 2002; Batra and Tan, 2003; Amornkitvikai and Harvie, 2011). In contrary, firm age was reported being negatively related to technical efficiency (Le and Harvie, 2010). For example, Niringiye *et al.* (2010) pointed out that, young firms are more proactive, flexible and aggressive compared to old firms. This study was meant to establish the applicability of these findings in SSSOPF.

2.1.3. Ownership Structure

Ownership type especially sole proprietorship and partnership are reported previously to have a positive relationship with the firm's technical efficiency (Ha, 2006; Liao *et al.*, 2010). However, government and state-owned firms were found negatively associated with the firm technical efficiency (Le and Harvie, 2010; Charoenrat, 2012). Regardless of the positive and negative association found previously, scholars failed to recommend the most suitable and efficient type of ownership. Where do these findings stand on SSSOPF? This study was meant to bridge this knowledge gap.

2.1.4. Location of the Firm

Different locations may affect the technical efficiency of the firm due to transport costs, infrastructure, spillover effects and natural resources (Niringiye *et al.*, 2010). Firms located in the urban area perform better than those in rural areas (Charoenrat, 2012). This is because they are likely to have greater market and credit facilities access, higher managerial training and greater market opportunities. These views are supported empirically in the previous studies. For example, Le and Harvie (2010) revealed that firms located in urban centres had lower technical efficiency compared to the ones in rural areas. Tran *et al.* (2008) likewise found that firms located in metropolitan areas are more technically efficient than their counterparts located in less developed areas. Since there is a noted inconclusive result on the influence of firm location on technical efficiency. This study determines the influence that location may have on technical efficiency.

2.1.5. Age of the Owner

It is believed that, as the person grows older, his/her sense of obligations also gains maturity and resultantly the individuals in the high age group possess more performance (Khan *et al.*, 2013). This is theoretically supported by the decremental theory of aging which establishes the relationship between age and performance (Giniger *et al.*, 1983). Older owners of the firm are therefore expected to display more technical efficiency in their firms than younger ones. Empirically, age is positively and significantly related to work performance in other sectors than sunflower oil processing firms (Amangala, 2013; Met and Ali, 2014). On the other hand, Birren and Schaie (2001) did not find the significant positive relationship between age and work performance. Though conflicting results are previously found in other sectors, age was also considered as a variable of interest in this study.

2.1.6. Experience of the Owner

It is believed that owners with high working experience perform better than the ones with low/no working experience something applicable also in sunflower oil processing firms. As one acquire more work experience, s/he acquires more skills, techniques, and methods, that improve performance capabilities (Katozai, 2005; Nsubuga, 2009). This means that an increase in work experience results in higher job knowledge and task performance. Literature also reports that the performance of individuals differs from culture to culture and country to country depending upon the knowledge and experience of the firm owner (ibid). Experience of the owner was also considered as one of the factors that could influence the technical efficiency of Sunflower oil processing firms.

2.1.7. Education Level of the Owner

An education level of the owner is expected to influence the technical efficiency of the firm including sunflower oil processing firms. When an owner increases his/her education level, s/he gains more stock of human knowledge which consequently increases efficiency. This is even supported previously by Jude (2007) who revealed that education of an individual plays a significant role in improving the efficiency of the firm by aiding adoption of requisite technologies. Thus, we considered that the education level of the owner influence technical efficiency in sunflower oil processing firms.

2.1.8. Training of the Employees

Firms with well-trained work-force are likely to be more efficient because of their greater capability in absorbing and effectively utilizing new technology (Admassie and Matambalya, 2002; Zahid and Morkhtar, 2007;

Amornkitvikai and Harvie, 2011; Charoenrat, 2012). Could this be the case in SSSOPF? This study investigated the influence of training employees on the technical efficiency of sunflower oil processing firms.

3. Methodology

3.1. Study Area

Dodoma and Singida regions were purposely selected as the study area to represent a major central agricultural corridor and processing potential of sunflower oil in Tanzania. The highest produced amount of sunflower seeds in this area led to the predominance of processing firms along Dar-es-salaam to lake zones and Arusha highways. However, they are of small-scale and 75% of them operate under capacity despite their big number utilizing only 29% of their installed capacity (Tisimia, 2014). The selection of Dodoma and Singida region was also guided by a study by Mpeta (2015) which revealed that the technical efficiency of sunflower seeds producers and processors in this area is inconclusive with steadily declining technical efficiency.

3.2. Data

A set of primary cross-sectional firm-level average data was collected from 2013 to 2015 for 219 sunflower oil processing firms by using a questionnaire. The owner-managers were purposely selected and interviewed on important data particularly on the quantity produced on litres, price per litre, a quantity of raw materials used and the price per bag, average daily wages for labour and the number of personnel in their respective firms as they deal with the business daily.

3.3. Model Specification

One stage stochastic production frontier with inefficiency effect model under a Maximum Likelihood Estimate (MLE) technique was used in estimating both technical efficiency and their determinants for sunflower oil processing firms simultaneously (Battese and Coelli, 1995). The MLE approach chooses those values of the parameters of the likelihood function that maximize the probability of observing the most precise estimates sample values of the random variables.

It is more suitable for efficiency analysis in a developing country like Tanzania where there are serious issues with data quality and accuracy. Small-scale firms do not keep records and thus data are based on estimates. The model decomposed error term into inefficiency and measurement errors for the purpose.

Importantly, a series of hypothesis tests were conducted to specify the model that fit the data well either Cobb-Douglas or translog, the distribution of one-sided error term, whether half normal or exponential and the presence or absence of inefficiency by using the generalized likelihood ratio statistic (LR) given by:

$$\lambda = -2\left[\ln\{L(H_0)\} - \ln\{L(H_1)\}\right] \qquad (1)$$

Where $\ln\{L(H_0)\}$ and $\ln\{L(H_1)\}$ are the values of the log-likelihood function under the null (H_0) and alternative (H_1) hypotheses. The results of LR values computed from Equation (1) above were compared with critical values from Kodde and Palm (1986) table for valid and reliable model decision. This suggested that Cobb Douglas production function fit the data well and thus we fail to reject the null hypothesis, a frontier is Cobb-Douglas. Thus, Cobb Douglas stochastic frontier functions being a suitable production function, its operational model has been specified as:

$$\ln Y_i = \beta_0 + \beta_1 \ln x_1 + \beta_2 \ln x_2 + \beta_3 \ln x_3 + V_i - U_i \qquad (2)$$

Where

Y_i = Total output of sunflower oil originally captured in Liters, transformed into *ln*

X_1 = Total Capital invested originally captured in Tshs, transformed into *ln*

X_2 = Total Materials used originally in Tshs, transformed into *ln*

X_3 = Labour cost used originally in Tshs, transformed into *ln*

V_i = random error term with normal distribution N (0, $\sigma 2$)

Ui = a non- negative random variable called technical inefficiency associated with the processing firm

ln = the natural logarithm

$\beta 0 - \beta 1$ = coefficients to be estimated

The deviation from the actual maximum output (Ui) in Equation 2 above became the measure of inefficiency, which is the point of interest for this empirical work. It is measured as the function of firm-specific factors as specified in the operational equation below.

$$U_i = \alpha_0 + \alpha_1 Z_1 + \alpha_2 Z_2 + \alpha_3 Z_3 + \alpha_4 Z_4 + \alpha_5 Z_5 + \alpha_6 Z_6 + \alpha_7 Z_7 + \alpha_8 Z_8 \qquad (3)$$

Where Ui = the inefficiency term

Z1 = Firm age measured in number of years since the establishment

Z2 = Firm size measured in number of employees

Z3 = Ownership type dummy whether sole proprietor (1) or partnership (0)

Z4 = Experience measured in years (prior and current industrial work experience)

Z5 = Education of the owner in a number of schooling years.

Z6 = Location of the firm dummy whether in Singida (1) or Dodoma (0)

Z7 = Training of employees whether trained (1) or not trained (0)

Z_8= Age of the owner in years

α_0-8 = estimated inefficiency model coefficients.

Parameters in Equation (2) and (3) were jointly estimated in a single stage under Maximum Likelihood Estimate technique, indicating the frontier model for the contribution of input to output (a measure of technical efficiency) of the firm and the inefficiency model for inefficiency factors simultaneously.

4. Empirical Results and Discussion

Prior to the main findings of the study, the LR summary results of the hypothesis tested on the selection of suitable production function whether Cob Douglas or Translog, the distribution of one-sided error term whether half normal or exponential and presence or absence of inefficiency in sunflower oil processing firms are presented in Table 1 below.

Table-1. Log-likelihood Test for underlying Hypothesis

Null Hypothesis	df	λ	Critical Values	Decision
1. **H_0:** βij=0 (frontier is Cobb Douglas)	**6**	**10. 014**	**11. 911**	**Do not reject**
2. **H_0:** μ = 0. (Half Normal)	**1**	**6. 034**	**3. 841**	**Rejected**
3. **H_0:** γ = 0, γ = δ_0 = δ_1 =.... = δ_6 = 0 (no inefficiency effect)	**6**	**38. 982**	**11. 911**	**Rejected**

Source: Researcher, 2018

The results on Table 1 indicate that hypothesis 1 was not rejected to mean that Cobb Douglas production function fits the data well. Hypothesis 2 was rejected to imply that inefficiency effect is stochastic with an exponential distribution. Finally, hypothesis 3 was also rejected to imply the presence of inefficiency in sunflower oil processing firms.

4.1. Determinants of Technical Efficiency

Table 2 shows the parameters of the stochastic frontier and inefficiency effect model simultaneously estimated under the Maximum Likelihood Estimate (MLE) technique. The upper part represents the frontier model parameters revealing the contribution of inputs (capital, labour, and material) to the output of the firms while the lower part indicates the inefficiency model parameters for inefficiency/efficiency factors respectively.

Table-2. Maximum Likelihood Estimates of the parameters for both stochastic Production frontier and Inefficiency effect model**.**

Log Unit Produced	Parameter	Coefficient	Std. Err	z	P>|z|
Frontier model					
Constant	β_0	4. 563	2. 252	2. 03	0. 043 **
Log Capital	β_1	0. 792	0. 048	16. 60	0. 001**
Log Materials	β_2	- 0. 126	0. 052	- 2. 43	0. 015**
Log Labour	β_3	0. 179	0. 128	1. 39	0. 164
Technical Eff. Scores	**Mean**	**0. 529**			
	Mini	0. 032			
	Max	0. 792			
Inefficiency model					
Constant	α_0	-31. 061	15. 007	- 2. 07	0. 038**
Location(Singida)	α_1	-9. 438	4. 708	-2. 00	0. 045**
Firm Size	α_2	- 0. 279	0. 441	- 0. 63	0. 527
Firm Age	α_3	2. 205	1. 024	2. 15	0. 032**
Experience	α_4	- 0. 235	0. 361	-0. 65	0. 514
Ownership(Sole proprietor)	α_5	-11. 399	5. 692	-2. 001	0. 047**
Education Level	α_6	-11. 420	5. 584	-2. 04	0. 041**
Training of Employees(Trained)	α_7	- 48. 56217	867. 727	-0. 06	0. 955
Age of owner	α_8	0. 309	0. 150	2. 06	0. 039**
#observations		219			
Wald chi2(4)		11. 48			
Prob. > chi2		0. 0094			
Log-likelihood		-294. 882			
Variance parameters					
	σu^2	0. 889			
	λ	0. 769			
	γ	0. 744			

Source: Researcher, 2018 ** Significant at 5% level

4.1.1. Frontier Model

The results in Table 2 above indicate that capital contributes positively and significantly to the output of the firms at 5% while material contributes negatively but significantly. A positive direction of capital implies that it is an important determinant of the output in sunflower oil processing firms. An increase in capital will result in an increase in output level by 0. 792%. On the other hand, a negative coefficient of material implies over commitment of materials by sunflower oil processing firms in the production. An increase in material will result in a decrease in output. That is, in where there is inefficiency, firms with more materials perform poorly in output. This is due to seasonality nature of harvested seeds revealed from the field. Sunflower seeds are reserved to the farmers before even ready for harvest and purchased during harvesting season regardless of their quality. We also found that sunflower oil processing firms operate at a mean technical efficiency of about 53 % ranges from a minimum of 3. 2 % to a maximum of 79. 2 %. This implies that there is an opportunity for firms to increase their current level of output by 47 % on average at the same level of inputs and technology.

Additionally, the estimated variance parameters represented by sigma squared (σu^2), Lambda (λ) and gamma (γ) as indicated in Table 2 support the presence of inefficiency. The value of the sigma square (σu^2), is large of 0. 88 significantly different from zero to imply goodness of fit and correctness of the distributional form assumed for the composite error term. This is supported by the greater value of lambda (λ) of 0. 769 indicating the dominant share of the one-sided error term, u. Also, the quite large value of gamma (γ) of about 0. 744 justifies that a greater part

of the residual variation in output among small-scale sunflower oil processing firm is associated with the firm inefficiency rather than measurement errors. Thus, the dominance of the one-sided error component in the model means further that, the average production function (Ordinary Least Square, OLS) is inadequate in representing the data.

4.1.2. Inefficiency Model

Conversely, a negative sign on the inefficiency effect model parameter means that the variables reduce inefficiency while the reverse is true for a positive sign. The results in Table 2 above indicate that location of the firm, ownership type and education level of the owner related negatively while firm age and age of the owner related positively but significantly to the inefficiency model for sunflower oil processing firms as explained below:

4.1.2.1. Location of the Firm

Location of the firm contributes negatively and significantly to the inefficiency of sunflower oil processing to imply that technical inefficiency decreases with the location of the firm. Since the location was captured as dummy 1 for a sunflower oil processing firm operating in Singida and 0 for those located in Dodoma. Keeping Dodoma as a reference category, the negative sign with location implies that sunflower oil processing firms located in Singida are more likely to reduce inefficiency as compared to those in Dodoma. This is due to the high production of sunflower seeds across districts. This is in line with Tanzania Edible Oils Actors Association [TEOSA] (2012) ranking. One of the reason could be the existence of improved infrastructure and transport networks connecting districts for easy access and transport of raw materials and availability of electricity and water supplies to facilitate processing of sunflower oil as well. Likewise, these firms have greater access to labour, information and communication technology infrastructure. These study findings are in line with the study by Tran *et al.* (2008); Le and Harvie (2010) and Charoenrat (2012).

4.1.2.2. Ownership Type

The legal ownership of the firm was captured as dummy 1 for sole proprietorship and 0 for partnership, thus as compared to the partnership, sole proprietorship revealed a negative and significant relationship with the technical inefficiency of sunflower oil processing to imply that inefficiency of sunflower oil processing firms' decreases with being a sole proprietor. Although a partnership type of ownership, have the benefits of allowing the owner to draw on resources and expertise of co-partners, share risk and management skills and solve barriers to doing business collectively but a sole proprietor has a complete control within the parameters of the law and decision-making power over a business, which is crucial for small-scale firms. The findings are in line with the study by Ha (2006).

4.1.2.3. Education Level of the Owner

The education level of the owner revealed a negative and statistically significant relationship with the inefficiency effect model as theoretically expected. This means that technical inefficiency in sunflower oil processing firms decreases with the education level of the owner. This implies further that one additional year of schooling enhances the technical efficiency of the sunflower oil processor to great extent. In the same way, education level enhances the stock of human knowledge which consequently increases efficiency. This finding is in line with the study by Jude (2007) on technical efficiency of rice producers in Uganda which revealed that education of an individual plays a significant role in improving the efficiency of the firm by aiding adoption of requisite technologies. Well educated owners are expected to make rational decisions that improve efficiency. Most of the sunflower oil firms are owner managed with highly centralized decision-making power thus education of the owners positively influence the efficiency of the firm independently of the workforce capabilities.

4.1.2.4. Firm Age

The results indicate that firm age is positively and statistically significantly related to technical inefficiency in sunflower oil processing firms. This implies that inefficiency in sunflower oil processing firms increases with the age of the firm. Therefore, older processing firms are less efficient than younger firms. Older firms may have more experience but this can be offset by greater indifference through possession of older machinery as most of them own single refined machines rather than double refined ones. It becomes too expensive for them to fragment the old machines, for instance, single refined for a double refined one and hence efficiency decreases. old firms may not be willing to try new innovation and technology due to financial constraints. The findings of this study conform to the findings by Le and Harvie (2010); Niringiye *et al.* (2010) and Amornkitvikai and Harvie (2011) on the technical efficiency of other manufacturing firms while contrasting with the study findings by Admassie and Matambalya (2002); Batra and Tan (2003); Amornkitvikai and Harvie (2011). This might be due to differences in the nature of the firms involved in the study.

4.1.2.5. Age of the Owner

The age of the owner was included to control the age difference and found to be positively and statistically significantly related to the technical inefficiency in sunflower oil processing firms. This implies that inefficiency in sunflower oil processing firms increases with the age of the owner. This can be contributed by poor mobility and low production motives despite their greater practical problem-solving ability. In other words, they grow older and get past their productive age. Also their flexibility and willingness to make fundamental strategic changes of business directions diminishes. These results are also consistent with studies in other sectors conducted in Tanzania (Hawassi, 2006; Isaga, 2012; Tundui, 2012).

However, the experience of the owner, firm size and training of employees were not statistically significant determinants of technical efficiency but had a negative sign with inefficiency model.

5. Conclusion and Policy Implication

This study examined the determinants of technical efficiency among small-scale sunflower oil processing firms in Tanzania using a One-Stage Stochastic Production Frontier based on Cob-Douglas function under MLE. It was revealed that sunflower oil processing firms operate at the mean technical efficiency of about 53% with capital and materials input contributing significantly to the output. This implies that nearly 47 percent technical potentialities are not achieved, which means an opportunity that the level of sunflower oil can be improved under the same inputs and technology. Location of the firm, education level of the owners, ownership type, firm age, and age of the owner are significant determinants of technical efficiency in sunflower oil processing firms in Tanzania. Efficiency-enhancing measures can, therefore, be considered to bring a considerable gain in oil processing, particularly affordable industrial location areas may be designed to cluster sunflower oil processing according to their size for easy accessibility and support services, sole proprietorship form of ownership may be encouraged through credit empowerment with accessible and affordable loans to individuals due to collateral issues. Likewise, improvement of the capability of owner-managers through adult education, seminars, and training given their level of education they possess may also be thought. Entrepreneurial awareness may be natured from primary to higher level curricular for young and middle-aged since they have been identified as an investment group. Lastly, since an increase in the age of firms leads to a reduction in efficiency levels in Sunflower oil processing firms, the emphasis should be made on replacement of the existing capital. That is the processing machines for more aged firms. These would, in turn, create an enabling environment for sunflower oil processing firms and improved efficiency as the way forward to realize their full potentials.

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