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Analysis of Profit Efficiency among Palm Oil Marketers in Ondo State Nigeria

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Abstract

Few studies have examined the profit efficiency of palm oil marketing without taking into account other models, contrary to the majority of empirical work on palm oil in developing country that has focused on technical, allocative and economic efficiencies. The specific objectives of the study were to; identify the socio-economic characteristics, estimate the cost and returns of palm oil marketing estimate the profit efficiency and pinpoint obstacles to palm oil marketing in the study area. Descriptive statistics, budgetary analysis, and stochastic profit frontier were used to analyze the marketing data from 72 palm oil marketers in Ondo State. The study's conclusions showed that there were more women working in the marketing of palm oil in the study area. Marketers are overwhelmingly married and majority of them had formal education. The marketers were an average of 49 years old. Nearly all of the costs are variable in comparison to fixed costs, with the cost of palm oil accounting for 97.8% of the total variable cost (TVC). A higher benefit-cost ratio (BCR) means that marketers of palm oil in the research area should anticipate earning ₦1.15 for every ₦1.00 invested. Since the expense ratio was below 1, there was a significant impact on the net profitability of palm oil marketers. Both of the models used for this study demonstrate that the marketers' profit efficiency was high. Efficiency, which has a high mean efficiency of 79% in the trans-log model, dominated the variation around the profit function.

Keywords: Profit efficiency, stochastic frontier, profitability, budgetary analysis
JEL Classification:

Contribution to/Originality Knowledge
The paper's contribution is its findings that palm oil marketers' net income was significantly impacted. Both models demonstrated the high profit efficiency of the marketers, and the trans-log model's high mean efficiency of 79% dominated the variation.

1.0 Introduction

Several industries that are involved in domestic manufacturing use palm oil as a source of raw materials. A strong marketing system is necessary for agricultural expansion in order to encourage consumers to purchase the product, reduce wastage, and maintain competitive prices. The most popular edible oil in the world is palm oil. Boyce (2017) reports that data on all edible oils in 2015 reveals that palm oil is the most widely used than every other type of edible oil. The fruit flesh and seeds of the oil palm are used to produce palm oil and palm

kernel oil, respectively. Consequently, it serves as a feedstock for biofuels and a source of ingredients for a wide range of food and personal care products (Indonesia Investment, 2016). In Nigeria and other countries throughout the world, palm oil is becoming more and more popular as a cooking component. In addition to being used locally for cooking, it is also used to make candles, margarine, and soap (Akangbe *et al*., 2011).

In Nigeria, palm oil is marketed through booths, local/occasional market locations, residences, and the sides of roads. In both rural and urban markets, they might be both wholesale and retail varieties (Nwauwa, 2011). The production or output of palm oil during the year as well as the country's overall inflation rate has a significant impact on the price of palm oil. Distribution to the location(s) where the commodity is required comes next after processing. Packaging and delivery to numerous locations are used to achieve this. Since the majority of the population purchases its food there, the market is a good place to start. Larger containers like tins and drums are used to dispense smaller packs (like bottles and gallons) right away.

The purchaser supplies his own container and only pays for the contents. Household sizes often apply to these pack sizes. Market booths, wholesale locations, palm oil warehouses or beaches, and supermarkets are just a few of the major distribution hubs for palm oil. Each of these instances is defined by the actions of trading groups or unions that, depending on the situation, prohibit free entry into the palm oil marketing industry. This makes it necessary for distributors to join the union, pay a large sum of money to register, and purchase kola and alcoholic beverages before they are permitted to sell their products there. As a result, the union sets the price for palm oil, and the members are compelled to sell at that price.

There isn't a single definition of marketing that is acknowledged worldwide in the literature on the subject; instead, multiple academic disciplines or occupational specialties are used (Nwauwa, 2012). Such contrasting opinions on marketing may have been explained by the writers' viewpoints of the terminology (Adeleye, 2011). Marketing is an activity, a group of institutions, and a method for producing, disseminating, delivering, and exchanging goods and services, according to the American Marketing Association (AMA) (2013).

A country's capacity to industrialize and achieve greater economic growth is significantly influenced by the development of rural industries and the agro-industrial sector. It is critical to assess these industries' efficacy and efficiency in order to establish their profitability and sustainability. It's crucial to assess these industries' profitability, efficiency, and difficulties in order to suggest appropriate legislative changes and remain sustainable. Technical efficacy has been the subject of several investigations (Issahaku *et al.,* 2011). Increasing allocative efficiency will increase production efficiency without diminishing the significance of technical efficiency. Marketers' quality of life is greatly improved by the economic significance of palm oil as a source of income.

The motivation for this study is to investigate the profit efficiency of palm oil marketers in Ondo State and the relevance of profit efficiency in palm oil marketing to improve the living standards of palm oil marketers. This analysis gives an insight into what is happening and

explains the current situation in the State. The specific objectives are to; identify the socio-economic characteristics of the respondents, estimate the cost and returns of palm oil marketing, estimate the profit efficiency and identify the constraints affecting palm oil marketing in the study area.

This study aims to give a useful empirical analysis of the profit efficiency of palm oil marketers in Ondo State as well as a suitable contribution to the literature on the need to engage in palm oil marketing. The study's findings are anticipated to have policy implications that will support value chain management and governance in developing nations.

The rest of this research article is organized as follows. In section 2, we discuss the concept of efficiency measure using the profit frontier function. Section 3, discusses the research methodology and empirical model. Section 4 explains the socio-economic characteristics and descriptive statistics whilst the conclusion is discussed in section 5.

2.0 Literature Review

2.1 Concept of efficiency measure using profit frontier function

Efficiency is described in the original study by Farell (1957) as the ability to generate a specific level of production at the lowest possible cost. Technical and allocative efficiency are two of its constituents that can be used to study efficiency. Technical efficiency is the degree to which farmers employ an output-oriented metric to create the maximum feasible output from a given bundle of inputs or an input-oriented measure to use the fewest possible inputs to produce a given output. In contrast, allocative efficiency measures how well farmers use inputs in light of current input prices (Rahman, 2003). The frontier production function, which can be stochastic or deterministic, has been used to measure the efficiency's constituent parts. The stochastic frontier production function describes the ability to distinguish between random errors and changes in efficiency, in contrast to the deterministic frontier production function, which demonstrates that every deviation from the frontier is determined to be wasteful (Rahman, 2003).

Yotopoulos *et al*., (1970) suggested that it might not be acceptable to quantify efficiency using the production function technique because farmers deal with a variety of input costs and factor endowments (Ali & Flinn, 1989). To directly estimate farm-specific efficiency as a result, stochastic profit function models were applied (Ali & Flinn, 1989; Rahman 2003; Wang e*t al.,* 1996; Ogundari 2006; Ali *et al.,* 1994).

In their study, Ali *et al*., (1994) found that the profit function approach incorporates the technical and allocative efficiency principles in the profit association and that any type of production choice error is assumed to result in low profits or producer income.

Profit efficiency is a measurement of how well a farm can maximize profits given current market conditions and fixed costs. According to Ali and Flinn (1989), profit inefficiency is the loss of profit when a farm is not functioning on the frontier. Notably, Battese & Coelli (1995) expanded the stochastic production frontier model by proposing that the inefficiency

effects be expressed as a linear function of explanatory variables, which demonstrates farm-specific characteristics.

The benefit of Battese & Coelli's (1995) method is that it enables the estimation of farm-specific efficiency scores and factors that account for differences in efficiency among farmers using a single-stage estimation technique. The most often used approaches for estimating production efficiency or inefficiency are non-parametric methods like Data Envelopment Analysis (DEA) and parametric methods like Stochastic Frontier Analysis (SFA). However, SFA is typically preferred to DEA in efficiency estimation. Stochastic noise can be handled using SFA (Coelli *et al.,* 2005). Using maximum likelihood estimates, stochastic frontier models in the shapes of Cobb-Douglas or transcendental logarithms (trans-log) have been widely used to estimate production efficiency.

Although this study did not take into account the trans-log functional form, earlier studies on production efficiency (Aminu, Ayinde & Ambali, 2013; Shettima, Amaza & Iheanacho, 2015) used the Cobb-Douglas functional form to analyze tomato production inefficiency. The results from the estimation reveal differing technical efficiency in Ahmad & Bravo's (1996) study on the production efficiency of dairy farms utilizing the two functional forms. The average technical efficiency scores from the Cobb-Douglas function and the trans-log function are significantly different, according to Thiam *et al.,* (2001). Ahmad and Bravo-Ureta (1996) believed that although the results of the two functional forms differed less significantly, it was still crucial to compare the two functional forms when conducting efficiency studies. As a result, this study adopts a novel methodology by measuring profit efficiency.

3.0 Research Methodology

3.1 Study Area

The study was conducted in Ondo State, Nigeria. Ondo State is a state in South-Western Nigeria and it is made up of eighteen (18) Local Government Areas. The State lies between longitudes 4”30” and 6” East of the Greenwich Meridian, 5”45” and 8”15” North of the Equator. It is bounded in the north by Ekiti and Kogi States, in the east by Edo State, in the west by Osun and Ogun States and in the south by the Atlantic Ocean. It has a land area of 14,788.723 square kilometres with a population of 3,460,877 people comprising 1,745,057 males and 1,715,820 females (National Population Commission, 2006).

3.2 Sources of Data

Primary data was used for this study. Data were obtained from the palm oil marketers with the aid of a well-structured questionnaire which included interview open and close-ended questions of qualitative and quantitative data, accompanied with method to get the needed data for the study.

3.3 Sampling Procedure and Sample Size

A multi-stage sampling procedure was employed in selecting the respondents for the study.

Stage one involves the purposive selection of nine (9) Local Government Areas (Akoko South/West, Akoko North West, Owo, Ondo West, Ondo East, Idanre, Ileoluji/Okegbo, Irele, Okitipupa) based on the concentration of palm oil marketers from each Agricultural Development Zone. Stage two involves the purposive selection of two (2) markets (Ajoke, Iwaro, Oja-Oba, Osele, Obasoto, Ogbese, Moferere, Laje, Owena, Fagbo, Alade, Ododе, Odolua(illeoluji), Okeigbo, Irele, Ajagba, Okitipupa, Igbotako) from each Local Government Area. Stage three was a simple random sampling of seventy-two (72) palm oil marketers using the sample size determination formula to calculate the sample size as adopted by Lohr (2010).

3.4 Analytical Techniques

The marketing enterprise budgetary analysis

The budgetary analysis was done for this enterprise to determine the profit of the marketers of palm oil. The cost and return in palm oil marketing were estimated. Farayola *et al.,* (2012); Adegeye & Dittoh (1985) defined profit as the net flow of income. Implying that the measurement of profit depends on the chosen parameters used, this means that profit establishes whether a business is viable or not.

The benefit-cost ratio (BCR) and the rate of return on investment were used to measure the profitability and determine how worthy the enterprise of palm oil marketing is.

Profit = Total Revenue – Total Cost

Explicitly,

$$\pi = TR - TFC + TVC \quad (1)$$

Where π = Profit, *TR* = Total Revenue, *TFC* = Total Fixed Cost, *TVC* = Total Variable Cost

The Gross Margin equation is given as in equation (2):

$$GM = TR - TVC = P \times Q - TVC \quad (2)$$

Where *GM* = Gross Margin (₦), *Q* = Quantity of palm oil (litres), *P* = Price of palm oil (₦)

BCR is another measure used for profitability. This was adopted to confirm the profitability of the respondents of palm oil marketers.

This is stated as:

BCR = Total Revenue (Benefit) ÷ Total Cost. As confirmed by Issahaku *et al.,* (2011); Adegeye & Dittoh (1985), before an enterprise is said to be profitable, the criteria for

investment stipulates that BCR should be greater than one (BCR $>$ 1). The rate of return on investment is a measure also used to estimate the worthiness of an enterprise.

Rate of Return = $(TR - TC)/TC$; the rate of return has a direct link with the net gain. This implies that the higher an enterprise's rate of return, the more viable the enterprise is.

2.4 Empirical model

Stochastic profit frontier

Among these methods, data envelopment analysis (DEA) and the stochastic profit frontier are the most used. The DEA was introduced by Charnes, Cooper & Rhodes (1978) and uses linear programming techniques to estimate efficiency. However, the DEA is a nonparametric method that ignores prices and, therefore, can only measure technical efficiency. A second drawback of this method is that it does not take into account the possible existence of random errors. The Stochastic profit frontier is a methodology that uses econometric methods to estimate efficiency; Unlike DEA, the Stochastic profit frontier is a parametric technique that is better suited to the concept of profit efficiency.

Profit efficiency in this study is defined as profit obtained from operating on the profit frontier, considering palm oil prices and other identified factors. Considering a marketer whose aim is to maximize profit subject to perfectly competitive input and other output markets. The explicit Cobb-Douglas functional form and trans-log for the palm oil marketers in the study area is therefore specified as follows:

$$\ln Y_i = \lambda_0 + \Sigma 7_{i=1} \lambda_i \ln X_i + C_i \quad (3)$$

Where *Y* = normalised profit, *CP* = cost of palm oil, *TC* = transport cost, *PAC* = packaging cost, *LC* = loading cost, *RC* = rent cost, *MC* = market charge, *CL* = council levy, *Ln* = natural logarithm, $\lambda_0 - \lambda_7 =$ parameters to be estimated, $\mathcal{C}$ = composite of the error term

The Trans-log form of the stochastic profit frontier function applied in this study is given as

$$\ln Y_i = \lambda_0 + \Sigma 7_{i=1} \lambda_i \ln X_i + 0.5 \Sigma 7_{i=1} \lambda_{ii} \ln X_i + \ln X_i + \Sigma 7_{i=1} \Sigma 7_{i=j} \delta_{ij} \ln X_i X_j + C_i \quad (4)$$

$pi\ represents$ normalized profit computed as total revenue less variable cost divided by average palm oil price, *PC* represent average palm oil cost, *TC* represents average transport cost, *PAC* represents average packaging cost, *LC* represents average loading cost, *RC* represents average rent cost, *MC* represent market charge and *CL* represent council levy.

Where, $\lambda_{ii}\ and\ \lambda_{ij}$ are estimable parameters.

NB. The technical or allocative efficiency scores cannot be computed as the respondents were not involved in the production of palm oil but were only involved in buying and selling, this prompted our interest in profit efficiency using the model specified above.

4.0 Results and Discussion

4.1 Socio-Economic Characteristics of the Respondents in the Study Area

From Table 1, the study shows that 33%, 28% and 19.6% of the marketers were within 51-60, 41-50 and 31-40 years respectively with a mean age of 49 years. This mean age suggests that the marketing of palm oil in the study was relatively dominated by young and energetic people.

The distribution of the respondents by gender (Table 1) shows that the majority of the marketers were females with a percentage of 77.8% as against 22.2% per cent male marketers.

Table 1 shows that the majority of the marketers were married (86.1%). The high percentage of married respondents suggests that the marketing of palm oil can serve as a reliable source of income and livelihood for the family.

The educational background of the sampled marketers is believed to be a significant feature that determines the readiness of the palm oil marketers in accepting market information. The empirical results show the educational level of the respondents in Table 1 and it indicates that 9.7% had no formal education, 27.8% had primary education, 41.7% had secondary education and 20.8% had tertiary education. This result implies that the majority (90.3%) of the respondents in the study area had formal education.

The respondents had a mean marketing experience of 6 years and this implies that the palm oil marketers were experienced in their enterprise.

Table 1: Distribution of the Respondents by Socio-economic Characteristics

Variables	Frequency	Percentage	Mean
Age			
21-30	1	1.4	
31-40	14	19.6	49
41-50	20	28	
51-60	31	33	
61 and above	6	8	
Total	72	100	
Gender			
Male	16	22.2	
Female	56	77.8	
Total	72	100	
Marital Status			

Single	3	4.2	
Married	62	86.1	
Widow	7	9.7	
Total	72	100	
Education			
No formal education	7	9.7	
Primary	20	27.8	
Secondary	30	41.7	
Tertiary	15	20.8	
Total	72	100	
Household size			
1-5	46	64	5
6-10	25.9	36	
Total	72	100	
Marketing experience			
1-5	37	51.4	6
6-10	31	43	
11-15	3	4.2	
16 and above	1	1.4	
Total	72	100	

Author's estimates, 2022

Descriptive statistics of variables used in Cobb-Douglas and Trans-log frontier models

From the estimation in Table 2, the mean palm oil cost is N13,160 with a maximum value of N15,600, while the mean transportation cost for the respondents is N8,022 with a maximum cost of N10,930. The mean value for the cost of loading is N3, 370 with a maximum cost of N9, 680.

Table 2: Descriptive statistics of variables used in Cobb-Douglas and Trans-log frontier models

Variable	Minimum	Maximum	Mean	Standard deviation
Palm oil cost	11.13	15.16	13.16	1.09
Transport cost	1.00	10.93	8.22	2.94
Packaging cost	1.00	10.09	1.74	3.48
Loading cost	1.00	9.68	3.37	4.05
Rent cost	1.00	6.91	1.88	2.99
Market charge	1.00	6.91	4.88	1.61
Council levy	1.00	6.55	4.83	1.57

Author's estimates, 2022				

4.2 Cost and Returns components of palm oil marketing in the study area.

Table 3, depicts the cost and return components of palm oil marketing in the study area. The fixed cost accounts for 8% of the total cost of palm oil marketing, and palm oil cost is a major cost, which accounts for 97.8% of the total variable cost. The packaging cost (0.18%) is low since palm oil marketers spend less on packaging; this is because smallholder palm oil marketers operate on small-scale operations and would spend less in packaging their palm oil for sale.

The variable cost relative to the fixed cost contributes 99.7% of the total cost and 97.8% of the total variable cost (TVC) accounted for the cost of palm oil. This is following the fact that palm oil cost contributes to palm oil marketing. Another significant contributor to TVC is the cost of transport, which shows a 1.71% contribution. The cost of packaging is less significant to TVC. It indicates that palm oil marketers should increase the way palm oil packaging is done to attract more profit.

Table 3: Breakdown of the cost component in palm oil marketing

Items value to the total cost	**Value (₦)**	**Percentage contribution**	
Returns		**% of TC**	**% of TVC**
Total Revenue	73,240,000		
Total Gross Return	**73,240,000**		
Variable cost			
Palm oil cost	62,402,800	97.8	97.8
Transport cost	1,090,800	1.71	1.71
Packaging cost	117,760	0.18	0.18
Loading cost	133,600	0.21	0.21
Total variable cost	**63,744,960**	**99.73**	
Fixed cost			**% of TFC**
Rent	16,150		33.4
Marketing charges	16,850		34.9
Council levy	15,350		31.7
Total fixed cost	**48,350**	**0.08**	**100.00**
Total cost (TFC + TVC)	**63,793,310**	**100.00**	
Net return	**9,446,690**		

Author's estimates, 2022

4.3 Profitability indices in the marketing of palm oil

As shown in Table 4, the benefit-cost ratio (BCR) is greater than 1, this implies that the palm oil marketers expect ₦1.15 for every ₦1.00 invested in palm oil marketing in the study area. The indication is that the profit significantly outweighs the cost of palm oil.

The expenses' structure ratio is less than 1 or no cost at all, this implies that cost will be incurred on the net returns of the marketers. So for every ₦1.00 invested by the palm oil marketers, no other money will be paid as an expense ratio.

When the expense ratio is greater than 1.5% it is considered high, therefore it has a high impact on the net profitability. The gross ratio indicates that the palm oil marketers made up of 87% profit after paying the direct palm oil cost of investment. Palm oil marketers need to keep the overhead costs in control.

Table 4: Profitability indices in palm oil marketing

Model	**Computation**	**Ratio**
Benefit-Cost Ratio	TR/TC	1.15
Rate of Return	Net Return /TC	0.15
Gross Ratio	TC/TR	0.87
Expenses Structure Ratio	FC/TC	0.00

Author's estimates, 2022

4.4 Profit Efficiency of palm oil marketing

The maximum estimates of the Trans-log and Cobb-Douglas cost functions of palm oil marketers are summarized and presented in Table 5. The estimated variance sigma squared for these marketers is at 1% for the trans-log estimates and 10% for the Cobb-Douglas estimates, indicating that both profit efficiency functions are statistically significant showing goodness of fit and correctness of the specific distribution assumption of the composite error.

The coefficient of palm oil cost is statistically significant at 1%, this means the cost of palm oil improves the profit efficiency of palm oil marketers in the study area. The cost of palm oil should therefore be regulated properly through control price systems to boost palm oil marketing. The packaging cost as a component of labour cost is negative and statistically significant at 10%, this means that packaging cost reduces the profit efficiency of palm oil marketers. This is in line with Abdulrahman *et al.*, (2015), where there is a negative association between family and hired labour. This is a result of the cost of hired labour that consumes the resources of poor marketers when family labour is not available. The coefficient of the cost of palm oil and its packaging is significant at a 5% level of significance, this finding signifies that if palm oil is properly packaged, the sales will improve and increase the profit efficiency of the enterprise.

The coefficients of the packaging cost and loading cost are positive and significant at a 1% level of significance, this finding indicates that when the palm oil is well packaged, the people in charge of loading will charge less as it will not stain their clothes and the place of loading. The loading of the palm oil will be done with care because the product will be more attractive. The packaging of palm should be improved as the will also increase the profit efficiency of loading, which will be done in a proper and timely manner. The coefficients of packaging palm oil and the market charge are positive and significant at 1%. The implication of this finding indicates that the profit efficiency of well-packaged palm oil will improve with

a low market charge. This implies that the market authority will charge less for well-packaged palm oil. These results further reveal that for palm oil marketers to be profit-efficient proper care should be taken to present their products in a manner that will attract buyers and improve their profit efficiencies.

Table 5: Profit efficiency of palm oil marketers

	Maximum Likelihood Estimates (MLE)					
	Translog			**Cobb-Douglas**		
	Coefficient	Standard error	t-value	Coefficient	Standard error	t-value
Constant	-6.95	1.05	-6.63***	1.06	0.62	1.72
Palm oil cost	1.78	0.23	7.89***	0.83	0.05	0.00***
Transport cost	0.95	0.59	1.61	0.03	0.02	1.45
Packaging cost	-1.02	0.48	-2.12*	0.02	0.02	0.99
Loading cost	-0.03	0.30	0.12	0.01	0.01	0.66
Rent cost	-0.20	0.31	-0.64	-0.00	0.02	-0.28
Market charge	-0.98	0.83	-1.18	-0.07	0.04	-1.84
Council levy	0.01	0.88	0.01	-0.04	0.04	-1.18
Palm oil cost x Palm oil cost	-0.05	0.03	-1.92			
Palm oil cost x Transport cost	-0.04	0.03	-1.04			
Palm oil cost x Packaging cost	0.16	0.05	2.97***			
Palm oil cost x Loading cost	-0.06	0.03	-1.72			
Palm oil cost x Rent cost	0.05	0.04	1.39			
Palm oil cost x Market charge	-0.026	0.079	-0.33			
Palm oil cost x Council levy	0.043	0.095	0.464			
Transport cost x Transport cost	-0.02	0.02	-0.74			
Transport cost x Packaging cost	-0.02	0.02	-1.15			
Transport cost x Loading cost	0.05	0.03	1.94			
Transport cost x Rent cost	-0.01	0.04	-0.12			
Transport cost x Market charge	0.10	0.06	1.74			
Transport cost x Council levy	-0.18	0.11	-1.64			
Packaging cost x Packaging cost	-0.22	0.08	-2.84***			
Packaging cost x Loading cost	0.02	0.01	3.34***			
Packaging cost x Rent cost	-0.00	0.01	-0.48			
Packaging cost x Market charge	0.19	0.05	3.75***			
Packaging cost x Council levy	-0.22	0.05	-4.44***			
Loading cost x Loading cost	-0.00	0.04	-0.07			
Loading cost x Rent cost	0.00	0.00	0.26			
Loading cost x Market charge	0.03	0.02	1.27			

Loading cost x Council levy	0.02	0.02	0.92			
Rent cost x Rent cost	-0.17	0.04	-4.00***			
Rent cost x Market charge	-0.00	0.03	-0.05			
Rent cost x Council levy	0.03	0.03	0.79			
Market charge x Market charge	-0.10	0.08	-1.24			
Market charge x Council levy	0.16	0.10	1.57			
Council levy x Council levy	0.05	0.06	0.84			
Sigma squared	0.15	0.02	9.68***	0.23	0.09	2.49*
Gamma	1.00	0.00	0.00***	0.82	0.22	3.76***
Mean efficiency	**0.7938135**			**0.7268832**		

*** p < 0.001; ** p < 0.01; * p < 0.05

Author's estimates, 2022

The likelihood ratio test of the Trans-log and Cobb-Douglas model

The likelihood ratio test of the trans-log and Cobb-Douglas models is presented in Table 6. The trans-log profit efficiency model is better because it allows for the interaction of variables, unlike the Cobb-Douglas that is more restrictive and does not allow for the interaction of variables. The variation around the profit function is dominated by efficiency as the trans-log model has a high mean efficiency of 79%. The presence of noise observed in the trans-log model is not due to inefficiency but could be due to the misspecification of the model.

Table 6: Likelihood Ratio Test

	Trans-log model	Cobb-Douglas model
Df	38	10
Loglik	18.872	-21.796
Df	28	
Chisq	81.337	
Pr(>chisq)	$4.213e^{-06***}$	

Author's estimates, 2022

4.5 Constraints encountered in the marketing of palm oil

Table 7 presents the distribution of the respondents based on the constraints faced in palm oil marketing. Palm oil marketers in the study faced enormous challenges while marketing their products. The main constraints identified during the study are ranked and presented in the table. The results reveal that finance was ranked first as the main constraint faced in the study area. It can be inferred that most palm oil marketers in the study area do not enjoy financial support from formal financial agencies/institutions. As stated by the marketers, most of them started their enterprise with their savings and borrowing money from friends/relatives. The inability to secure loans/credit from a formal source such as commercial banks was due to the

lack of assets that could serve as collateral, the risk involved in the seasonality nature of palm oil and the unfriendly interest rate charged.

Again the second-ranked constraint was poor road network as shown in Table 7. It was observed that most roads that led to the markets are rough and bumpy. The bad road conditions coupled with the increase in fuel prices have led to the unbearable hike in the transportation fare. Investigations from Obasi & Njokuoma (2008); Obasi *et al*., (2014) affirmed that the high cost of transportation affects the marketers in performing well in the discharge of their marketing activities. The high cost of palm oil was noted to be the third most serious problem in the study area, this finding agrees with Obasi & Kalu (2015) where investigations reveal that the cost of palm oil is a problem for palm oil marketers.

Table 7: Constraints encountered by the respondents in the marketing of palm oil

Constraint	Percentages	Rank
Finance	68.1	1st
Poor quality oil	22.2	5th
Transport cost	30.6	4th
Poor road network	43.1	2nd
Leakage of gallons	11.1	6th
Cost of oil	40.3	3rd
Theft	5.6	7th
Tax	2.8	8th

Author's estimates, 2022

5.0 Conclusion

The palm oil marketers in Ondo State achieved profit efficiencies of 0.79 and 0.72 for the trans-log and Cobb-Douglas models, respectively. This shows that there is still plenty of room for them to increase profitability in their businesses. This study also demonstrates that the profitability of palm oil marketing in the study area is constrained by production costs, particularly those associated with palm oil.

In the study area, women (77.8%) dominated the marketing of palm oil. They ought to be inspired to take part in this activity more frequently. The average age of the marketers was 49 years, suggesting that they are still in their prime, which had a favourable impact on their ability to generate profits. Given that the majority of the marketers in the research area (90.3%) had some type of formal education, they may be better able to embrace marketing methods that will increase profitability. N63,744,960 was calculated as the whole variable cost, or roughly 99.73% of the total cost. It demonstrates that the primary cost is the price of palm oil. The profitability indices are positive.

Efficiency, which has a high mean efficiency of 79% in the trans-log model, dominates the variation around the profit function. With the trans-log model, which takes into account the interactions between the variables, the profit efficiency of the marketers is higher when

comparing the two methods. The three biggest problems the marketers had to deal with were finance, poor road system, and the price of oil.

Having shown that the selling of palm oil in the region is viable, its marketing and management systems should be developed to increase profits in contrast to its demanding outlook. Furthermore, based on the findings from the study, the following recommendations were made;

- Government should make sure that the roads are motorable to lessen the stress that palm oil marketers have while on the road and to lower the expense of carrying their goods.
- Palm oil marketers should come together to form a cooperative society to pool finances together to support each other.

REFERENCE

Abdulrahman, S., Yusuf, O., & Suleiman, A.D. (2015) Profit Efficiency of Cocoyam Production in Kaduna State, Nigeria. *American Journal of Experimental Agriculture, 7(4), 231-241.*

Adegeye, A.J, & Dittoh, J.S. (1985). Essential of agricultural economics. Impact publisher, Nigeria Limited, 210-226.

Adeleye, A. S. (2011). Marketing principles and practice (revised edition). Lagos, Nigeria: Pumark Nigeria ltd.

Ahmad, M. & Bravo-Ureta, B. E. (1996) "Technical efficiency measures for dairy farms using panel data: A comparison of alternative model specification". *J. Prod. Anal. 7,399-415*

Akangbe, J. A., Adesiji, G. B., Fakayode, S. B. & Aderibigbe, Y. O. (2011). Towards palm oil self-sufficiency in Nigeria: Constraints and Training needs Nexus of Palm oil extractors, *Journal of Human Ecology,33(2), 139-145.*

Ali, M. & Flinn, J.C. (1989). Profit efficiency among Basmati rice producers in Pakistan Punjab. *Am. J. Agric. Econ., 71, 303-310*

Ali, F., Parikh, A. & Shah, M.K. (1994). Measurement of profit efficiency using behavioural and Stochastic frontier approaches. Appl. Econ., 26, 181-188

American Marketing Association (AMA). (2013). Definition ofmarketing.Retrieved from:https://www.ama.org/AMA/Pages/Definition-of -marketing. aspx.

Aminu, F.O., Ayinde, I.A. & Ambali, O.I. (2013) "Effect of ill health on technical efficiency of dry-season vegetable farmers in Ojo LGA of Lagos State, Nigeria". *World Journal of Agricultural Research. 1(6), 108-113*

Battese, G.E. & Coelli T.J. (1995). A Model for Technical Inefficiency Effects in a Stochastic Frontier Production Function for Panel Delta. Economics, 20, 325-335.

Boyce, J. (2017, June 16). The palm oil debate: What you need to know. Nature's Path. https://www.naturespath.com/en-us/blog/the-palm-oil-debate-what-you-need-to-know/

Coelli, T.J., Rao, D.S.P., O'Donnell, C.J. & Battese, G.E. (2005). An Introduction to Efficiency and Productivity Analysis, 2nd Edition, 263-88. New York: Springer

charnes A., Cooper W. & Rhodes E.(1978). Measuring the efficiency of efficiency of decision-making units. *European Journal of Operational Research*. 2(6): 429-444.

Farayola, C.O., Okpodu, V. & Oni, O.O. (2012). Economic analysis of locust beans processing and marketing in Ilorin, Kwara State, Nigeria. *International Journal of Agricultural Research Innovation & Technology 2, 36-43.*

Farell, M.J. (1957). The Measurement of Productive Efficiency. *Journal of Royal Society, Series A (General), Part III, 120, 253-290.*

Indonesia Investments. (2016). Palm oil.https://www.indonesia-investments.com/business/commodities/palm-oil/item166?

Issahaku, H., Ramatu, A. & Sarpong, D.B. (2011). An analysis of allocative efficiency of shea butter processing methods in the northern region of Ghana. *Journal of Development and Agricultural Economics 3, 165-173.*

National Population Commission (N.P.C) (2006). Nigeria population census figures. Abuja, Nigeria: N.P.C. Publication.

Nwauwa, L. O. E. (2011). Economics of palm oil storage and marketing in Imo state, Nigeria. *African Journal of Marketing Management,3 (10), 253-260.*

Nwauwa, L. O. E. (2012). Palm oil marketing and distribution pattern in Imo State, Nigeria: An application of linear programming model. *Journal of Agricultural Research and Development, 2(1), 37 – 43.*

Obasi, I.O. & Njokuoma, C.E. (2008). Performance of rice market in Ebonyi State of Nigeria. *Medwell Journals,3, 2008.*

Obasi, I.O., Igwe, K.C., Ogbonna, C.E. (2014). Economics of Palm Oil Marketing in Bende Local Government Area of Abia State, Nigeria. *Adv. J. Agric. Res., 2(7), 104-108.*

Obasi, I.O. and Kalu, M. (2015). Profitability and Efficiency of Palm oil Marketing in Arochukwu Local Government Area of Abia State, Nigeria. *Research Journal of Agriculture and Environment, 4(9), 438-444.*

Ogundari, K. (2006). Determinants of profit efficiency among small scale rice farmers in Nigeria: a profit function approach. Poster paper prepared for presentation at the *International Association of Agricultural Economists Conference, Gold Coast, Australia, August 12-13, 2006*

Rahman, S. (2003). Profit efficiency among Bangladeshi rice farmers. *Contributed paper for the 5th conference of the International Association of Agricultural Economists, Durban, South Africa, p. 21.*

Shettima, B.G., Amaza, P.S. & Iheanacho, A.C. (2015). "Analysis of technical efficiency of irrigated vegetable production in Borno State, Nigeria". *Journal of Agricultural Economics, Environment and Social Science. 1(1), 88-97.*

Thiam, A., Bravo-Ureta, B.E. and Rivas, T.E. (2011) "Technical efficiency in developing countries' agriculture: A Meta–analysis". *Journal of Agricultural Economics. 25, 235-243.*

Yotopoulos PA, Lau LJ, Kutlu S (1970). Labour intensity and relative efficiency: Some further results. Am. Econ. Rev., 9, 43-56.

Wang J, Cramer GL, Wailes EJ (1996). Production efficiency of Chinese agriculture: Evidence from rural household survey data. Agric. Econ., 15, 17-28.