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Economic Efficiency of Processed Hibiscus Sabdanriffa (*Roselle*) Drink in Imo State, Nigeria

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Abstract

The study developed a model to evaluate efficiencies of Zobo drink processors in Imo State using Data Envelopment Analysis (DEA). Data were collected from 163 Zobo drink processors across 36 markets in the study area and was analyzed under the constant returns to scale (CRTS) and variable returns to scale (VRTS) assumptions. Result showed that Zobo processing was highly profitable with about 44.34% net margin on total revenue generated. Mean economic efficiency scores estimated from the DEA frontier for both CRTS and VRTS were 0.537 and 0.683. Sex, educational level and alternative to income were most statistically significant factors. It was recommended that more male involvements are encouraged in Zobo drink; educated individuals particularly unemployed are advised to engage and create a cliché for themselves through the use of more innovative processing and packaging activities and adopting cost-minimizing input mixes of best-practice to enable them become fully efficient.

Keywords: Zobo drink, Processors, Efficiencies models, Data envelopment analysis, Net returns, Marginal value product.

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Contribution of this paper to the literature
The paper is of the view that Zobo processing is a promising business venture which is fast becoming lucrative with requisite economic returns. Furthermore, the study employed Data Envelopment Analysis in determining Technical, Allocative and Economic efficiencies of Zobo processors in the state.

1. Introduction

Hibiscus sabdariffa (Roselle) is a yearly spice of Malvaceae family, grown in the tropics and generally developed in Nigeria mostly in the North-Eastern and Middle-belt locales [1]. The calyces are known to be rich in anthocyanins containing a combination of citrus, malic and tartaric acids [2]. Three normal assortments of Roselle are grown in Nigeria: two of these assortments have red calyces and are predominately found in the Northern and Western, Nigeria and the last one is green and more overwhelming in the Southern part of Nigeria [3]. Among the various importance of Roselle is the production of Zobo drink, a red fluid beverage separated from the dried ruddy purple calyces by boiling in water for around 10-15 minutes and sifted to remove the shade or implanted flavor and taste like fruit juice [4]. Different therapeutic mixtures of leaves or calyces have been accounted for, for example, being a diuretic, cholerectic, febrifugal, hypertensive, against helminthic, and antimicrobial, diminishing thickness of the blood and invigorating digestive peristalsis [5, 6]. Demand for Zobo drink is to a great extent dependent on its nutritive worth, flavor, fragrance and blending, low costs, wholesome and therapeutic properties [7]. The demand for Zobo in Nigeria has made the Zobo drink gain wide acknowledgment in various events, being devoured by a large numbers of individuals from various socio-cultural backgrounds. It is utilized as refreshment, entertainment in parties or as tidbits before the principle dish is served and it is additionally sold in market to different shoppers [2, 8]. Zobo drink portends a potential, ready local alternative to, alcoholic beverages in particular and imported red wines in general owing to the rising religious and health campaigns against alcoholic beverages. Indeed, Zobo drink can possibly dislodge other carbonated refreshments in the market because of advantages got from it which is inadequate in different refreshments taken for their extinguishing properties and invigorating impact [9]. Numerous other carbonated beverages contain high measures of sugar, calories and caffeine, and give no important sustenance and their expanding utilization had been connected to high predominance of overweight and obesity around the world [10, 11]. Owing to the simplicity of the production and availability of raw materials, Zobo drink has economic benefits of significant unemployment reduction among youthful populace and reducing the poverty incidence in many rural communities as a result of its commercialization of the production of Roselle and production of Zobo drink. However, at present the production processes of Zobo drink are very crude that is neither mechanized nor standardized due to poor hygienic practices thereby affecting the consumption rate of the drink [2]. As indicated by Adelekan, et al. [12] the jump from privately showcased item to business item is still moderately implausible because of its helpless timeframe of realistic usability of Zobo drink, which would require next to no stock and capacity time.

Production proficiency suggests accomplishment of creation objectives without wastage [13]. Proficiency shows the overall presentation of the cycles utilized in changing given inputs contribution to yield and framed the premise to gauge the exhibition of a creation unit [14]. It is upon the ability to quantify efficiency provides decision makers with a control mechanism with which to monitor the performance of the production system or units. Production effectiveness can be estimated allocatively and monetarily. These three proportions of production effectiveness give general outline of the farmers' general exhibition in asset usage in the creation cycle. Technical effectiveness is the capacity of a farmer to create on the greatest conceivable boondocks. A creation interaction might be actually wasteful, as in it neglects to deliver most extreme result from a given heap of information sources. Technical shortcoming brings about an equi-proportionate over-usage of inputs. Allocative effectiveness is the farmers' capacity to deliver a given degree of result utilizing the expense limiting information proportions. Constantly, a farm is considered to be allocatively efficient in the use of a given factor if the farm is able to equate the marginal value product (MVP) of the factor to the factor price (P). A creation interaction might be allocatively wasteful as in the minor worth item (MVP) of info probably won't be equivalent to the minimal component cost (MFC) of that information. Allocative shortcoming brings about use of contributions to some unacceptable extents, given input costs. Monetary effectiveness is the rancher's capacity to create a foreordained amount of result at least expense given the accessible innovation. Monetary effectiveness is the capacity of rancher to boost benefit [14]. Monetary effectiveness is the result of specialized and allocative productivity. It shows the expenses per unit of result for a firm which impeccably achieves both specialized and value efficiencies. Specialized and allocative efficiencies are important and, when they happen together, are adequate conditions for accomplishing monetary proficiency. This review utilizes the expense approach steady re-visitations of scale and variable re-visitations of scale information envelopment investigation models. The expense approach information envelopment examination model enjoys the benefit of permitting synchronous assessment of the specialized productivity, allocative effectiveness and monetary proficiency of people [15]. The utilization of the variable re-visitations of scale particular allows the estimation of specialized productivity without scale effectiveness impacts [15]. The information envelopment investigation (DEA) model offers an adaptable methodology with an impressive degree for the utilization of assorted information (genuine and financial). Besides, DEA is deterministic and licenses the decision between the steady re-visitation of scale (CRTS) particulars and the variable re-visitation of scale (VRTS) details relying upon whether all dynamic units (Dmu's) are working at the ideal scale and problematic scale individually.

The CRTS supposition that is possibly fitting when all DMU's are working at an ideal scale. Blemished contest, imperatives on finance, and so forth might make a DMU be not working at ideal scale. Coelli [15] proposed an expansion of the CRTS DEA model to represent variable re-visitations of scale (VRTS) circumstances. The utilization of the CRTS detail when not all DMU's are working at the ideal scale will bring about proportions of specialized proficiency (TE) which are puzzled by scale efficiencies (SE). The utilization of the VRTS detail will allow the computation of TE without these SE impacts. The focal point of this paper thusly, is to foster a model to assess ranchers' asset the board (proficiency) by utilizing Data Envelopment Analysis (DEA). The broad objective

of this study is to develop a model to evaluate Zobo drink processors' resource management efficiency by using Data Envelopment Analysis (DEA). The specific objectives of the study are to:

- Profile the socio-economic characteristics of Zobo drink processors.
- Estimates the costs and returns of Zobo drink processing.
- Evaluate the technical, allocative efficiency, scale and overall economic efficiencies levels of Zobo drink processors.
- Isolates the determinants of the inefficiencies levels of Zobo drink processors under the CRTS and VRST assumptions.

2. Materials and Methods

This study was carried out in Imo State. The state is located in the South-Eastern Zone of Nigeria (within the rainforest zone) and lies within latitudes $5^{0}40^{1}$ and $7^{0}5^{1}$North and longitudes $6^{0}35^{1}$ and $8^{0}30^{1}$ east. The State covers a land area of 7,480km^{2} with a population of 3,939,899 people. The State is rapidly growing in population due to urbanization activities which involves movement of people from one rural and peri-urban settlement to the urban area particularly around municipals and the close proximate areas where there is large concentration of economic activities. Human activities in the study area supports the consumption of Zobo drink to a large extent as it as a perfect substitute to carbonated drinks given its health and refreshing benefits.

2.1. Sampling Techniques

The data used were collected through multi- stage sampling techniques. In the first stage, three Local Government Areas (L.G.As) were randomly selected from each of the three agricultural zones in the State to have 9 L.G.As for the selected for the study. In the second stage, a purposive selection of four commodity markets where Zobo drinks sellers could be found to have 36 markets for the study. Thirdly in each market, purposive selection of all the Zobo drink sellers was done to capture a large number of people involved in the enterprise. In all the 36 markets sampled, 178 Zobo drink sellers were interviewed and only 163 of them were involved in processing of the Zobo drinks and used for analysis. Data were collected on the socio-economic characteristics of the Zobo drink processors, as well as the quantity of inputs and unit prices such as Zobo dry leaf, ginger, garlic, water, sweeteners and water and quantity and unit price of output produced. Information about the quantity, purchase price, use-life span of fixed assets like polythene bags, cooking pots, sieve, water container, turning spoon, apron and charcoal pots were collected.

3. Method of Data Analysis

The data collected were analyzed using the Data Envelopment Analysis Programme (DEAP). Both the constant returns to scale (CRTS) and variable returns to scale (VRTS) DEA models were used to obtain the technical, economic and allocative efficiencies which are either overall or pure obtained under CRTS and VRTS respectively. It is noteworthy that Technical efficiency (TE) scores obtained from a CRTS and DEA could be decomposed into two components, one due to scale inefficiency and one due to "pure" technical inefficiency. This is obtained by subjecting same DMUs to both CRTS and a VRTS DEA and the difference in the two TE scores for a particular DMU, indicates that the DMU has scale inefficiency (SE) which is given as:

$$\text{Thus, } TE_{CRTS} = TE_{VRTS} \times SEI \quad (1)$$

Equation 1 presents the components of Technical Efficiency of constant returns to scale.

In addition, Tobit regression was used to isolate the determinants of the efficiencies indices of the DMUs under the CRST and VRTS conditions. Being a censored regression model, it is handy to measure the effect of changes in the explanatory variables (X) on the various degrees of the DMUs' efficiencies which range between a given index and censored to the upper limit of unity (1). The Tobit model is given as:

$$E_i = \alpha 0 + \alpha_1 GEN + \alpha_2 AGE + \alpha_3 MS + \alpha_4 EDU + \alpha_5 HHS + \alpha_6 PEXP + \alpha_7 MEMCOOP + \alpha_8 ALTINC + \alpha_9 EXTFIN + \varepsilon_i \quad (2)$$

Equation 2 presents the Tobit regression components which comprises of both dependent and independent variables.

Where, Ei is the technical, allocative and economic efficiency of the Zobo drink processors under CRTS and VRTS conditions, GEN = Gender of the processor (male=1, female=0), AGE= Age of the processor (years), MS=Martial Status (Single=0, Married=1, Divorced=3), EDU=educational level (years), HHS=Household size (number of persons), PEXP=Processing experience (years), MEMCOOP=Membership of cooperative (yes=1, No=0), ALTINC= Alternative income source (Yes=1, No=0), EXTFIN= External finance (Yes=1, No=0).

4. Results and Discussion

Socio- economic characteristics of the Zobo drink were presented in Table 1. The result shows that majority of the farmers were females (66.26%) and only 33.74% were females. This shows that female gender is predominant in Zobo drink processing in the study area. The highest proportions of the Zobo drink processors (30.67%) were within the age range of 26-31 years, while the least proportion (18.40%) were within the age range of 32-37 years and above and the mean age was 31.4 years. This shows that the population of Zobo drink processors is made of youthful individuals who are probably fresh graduates and school leavers that wish to create economic opportunities for themselves instead of waiting for non-existing white collar jobs. About 39.88% of them had between 6-10 years of processing experience with average value of 8.4 years. About 44.79% of them had 7-12 years of formal educational which is equivalent to secondary school level, the average years of education was 9.8 years which implies that they are mostly literate. Single individuals were about 41.72% followed by married individuals who were about 41.10%, about 63.19% of them had between 1-3 persons in their household with average was 4 persons which indicated that they are young people with little dependents to cater for.

Table 1. Socio-economics characteristic of Zobo drinks processors.

Variables	Frequency	Relative Frequency	Mean
Age			
20-25	38	23.31	31.5years
26-31	50	30.67	
32-37	30	18.40	
38-43	45	27.61	
Total	163	100.00	
Processing Experience			
1-5	55	33.74	8.4years
6-10	65	39.88	
11-15	19	11.66	
16-20	24	14.72	
Total	163	100.00	
Household size			
1-3	103	63.19	4persons
4-6	30	18.40	
7-9	25	15.34	
10-12	5	3.07	
Total	163	100.00	
Level of Education			
0	8	4.91	9.8years
1-6	30	18.40	
7-12	73	44.79	
13-18	52	31.90	
Total	163	100.00	
Sex			
Male	55	33.74	
Female	108	66.26	
Total	163	100.00	
Marital Status			
Single	68	41.72	
Married	67	41.10	
Divorced	28	17.18	
Total	163	100.00	

Source: Field Survey data, (2019).

It was shown in Table 2; that an average of 1,197.33 Liters' of Zobo at N105.67/Littre's were processed and sold which gave total revenue of N126, 521.86. The total cost of processing and marketing Zobo drink was N70,422.61 with amount of Zobo dry leaves bought as 53,856, other variable expenses includes firewood (N1220.83), Ginger (N1199.61), pineapple fruits (N541.32), sweeteners (N889.70) and this summed up to be N56,566.14. The total fixed cost was N10,856.47 and interest on loan (N4,583.33) was the major share followed by cost of fixed assets used per processing cycle captured as depreciating cost which was N3,569.8 and logistics (N2,703.33). The gross margin was N66, 955.72 and the net margin was N56, 099.25 respectively. The profitability index measured as percentage net margin to total return was 44.34% indicated that for every one naira accrued as earning from Zobo drink processing, 44.34k were net marketing margin respectively.

Table 2. Costs and returns of Zobo drink processing.

Items	Quantity	Unit price	Total value (₦)
Zobo dry leaf	3.96 bags	13600	53,856.00
Water	1205 liters'	0.57	686.85
Ginger	7.30 kg	164.33	1,199.61
Garlic	0.97 kg	83.33	80.83
Sweeteners	2.17 kg	410	889.70
Pineapple fruits	2.20 bunches	255	561.00
Firewood/Charcoal	2.50 bundles	488.33	1,220.83
Ice-blocks	2.80 kg	193.33	541.32
Empty bottles*	100	5.3	530.00
Total Variable Cost			59,566.14
Interest on capital			4,583.33
Polythene packs			271.94
Cooking pots			876.00
Sieve			244.83
Water cans			325.31
Turning spoon			252.83
Apron			972.22
Charcoal pots			626.67
Depreciation cost			3569.80
Logistics			2,703.33
Total Fixed Cost			10,856.47
Total Cost			70,422.61
Zobo drink output	1197.33	105.67	126,521.86
Gross margin			66,955.72
Net margin			56,099.25
% Net Margin			44.34

Note: * represents 5%.
Source: Field Survey data, (2019).

The result in Table 3 shows the overall, pure and scale efficiencies of Zobo drink processors. Majority of them (42.95%) operated within overall technical efficiency range of 0.80 and 0.99 with average of 0.819 which is under the CRTS, However, about 90.18% of them operated within over 0.99 pure technical efficiency which is under VRTS with average of 0.974. The difference between overall and pure technical efficiencies was explained by the scale efficiency of Zobo drink processors and 44.79% of them operated under scale efficiency of 0.80 and 0.99 with average value of 0.839. This implies that majority of them are not technically efficient in the use of input resources. This has ability to make them over-utilize their resources as it can result to an equi-proportionate over utilization of inputs (input congestion), and hence low productivity, low output and low income. This result indicated that the Zobo drink processors are not utilizing their resource inputs efficiently, indicating that they are not obtaining maximal output from their given quantum of inputs. In other words, technical efficiency results imply that Zobo drink processors could reduce the use of all inputs by an average of 18.1% and 2.6% under CRTS and VRTS models, respectively without a reduction in their output. It could be deduced that inefficiencies were higher under the CRST assumption because it is more restrictive in practice than the VRTS assumption. Also, the corresponding average scale efficiency of 0.839 suggests that by operating on an optimal scale, a further reduction in input usage by as much as 16.1%.

Table 3. Overall, pure and scale efficiencies of Zobo drink processors.

	OTE		PTE		SE	
Indices	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
0.40-0.59	31	19.02	0	0.00	18	11.04
0.60-0.79	24	14.72	11	6.75	34	20.85
0.80-0.99	70	42.95	5	3.07	73	44.79
>0.99	38	23.31	147	90.18	38	23.31
Total	163	100.00	163	100.00	163	100.00
Mean	0.819		0.974		0.839	
Min	0.456		0.678		0.456	
Max	1.000		1.000		1.000	

Source: Field Survey data, (2019).

In Table 4, the estimated mean allocative efficiency scores were 0.656 for CRTS and 0.683% for VRTS model, while the mean economic efficiency scores estimated from the DEA frontier for both CRTS and VRTS were 0.537% and 0.683% respectively. Since we assumed in our DEA estimations that cost minimization is the basis on which the processors' allocation decisions were made, therefore allocative efficiency indicates the proportion by which the costs of the levels of resources inputs can be reduced without any loss in output. Consequently, the estimated average allocative efficiency scores for CRTS and VRTS assumptions suggest that on average the Zobo drink processors could reduce their costs by 46.3% and 31.7% respectively, by choosing a more cost-efficient input mix, without any loss in output. In this wise, the result indicated that allocative inefficiency was higher in Zobo drink processing the area than technical inefficiency. Furthermore, the average level of Farrell's overall (economic) efficiency is 0.537 under CRTS and 0.664 assuming VRTS condition. This implies that, in principle, that the Zobo drink processors can potentially reduce their overall cost on average, by 46.3% and 33.6% for CRTS and VRTS respectively and still achieve the existing level of output. The measures of relative allocative and technical efficiency provide evidence as to the source of economic inefficiency (deviations from overall cost minimizing behavior). Undoubtedly, many Zobo drink processors employed the 'wrong' input mix, given input prices, such that, on average, their costs were 46.3% and 33.6% higher than the cost minimizing level under the two scale assumptions (CRTS and VRTS), respectively. Nonetheless, as has been noted earlier, farms have the potential to reduce their physical input, on average, by 15.5% and 7.6%, under the two scale assumptions, respectively and still produce the same level of output. It is evident and noteworthy that allocative inefficiency contributed more to overall inefficiency. This shows that many of the sampled farmers were not able to equate marginal value product of inputs to their prices indicating that they are utilizing the inputs in the wrong proportions, given input prices. Majority of the respondents (44.79%) operated within a scale efficiency range of 0.80 and 0.99. The implication of this result is that majority of the respondents are not scale efficient. Furthermore, scale efficiency among the respondents varied substantially ranging between 0.4 and 1.00, with a mean scale efficiency of 0.974 Table 4. This result suggests that the farmers are operating in less than optimal scale size. In other words, scale efficiency among the respondents can be increased by 2.6% by operating in optimal scale size, given the current state of technology. This would enable the farmers operate in optimal scale size, and hence increase their productivity and incomes from Zobo drink processing.

Table 4. Overall and pure allocative and economic efficiencies of Zobo drink processors.

	OAE		OEE		PAE		PEE	
Indices	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
0.20-0.49	37	22.70	82	50.31	36	22.01	44	26.99
0.50-0.69	56	34.36	53	32.52	22	13.50	50	30.66
0.70-0.89	59	36.20	16	9.82	44	26.99	36	22.09
0.90-0.99	4	2.43	4	2.45	21	12.88	21	12.88
>0.99	8	4.91	8	4.90	12	7.362	12	7.363
Total	163	100.00	163	100	163	100.00	163	100.00
Mean	0.656		0.537		0.683		0.664	
Min	0.378		0.254		0.381		0.381	
Max	1.000		1.000		1.000		1.000	

Source: Field Survey data, (2019).

The results of the tobit regressions shows the determinants of technical, allocative and economic inefficiencies under the CRTS and VRTS conditions, Based on the results shown in Table 5, the sigma (δ) values were 1.6211,

0.1396, 0.1681, 0.0753, 0.1706 and 0.1755 for the technical, allocative and economic inefficiency models of the CRTS and VRTS conditions respectively and were all significant at 1%. It implies that the model has a good fit to the data and that the model as specified explained significant non-zero variations in factors influencing inefficiencies indices of the Zobo drink processors in the study area. The value of log pseudo-likelihood is 47.932 ($p<0.00$) which is significant at 1%. The signs and significance of estimated coefficients had important implications on the inefficiency of the Zobo drink processors. A positive significant sign indicated that as the significant variable increases, the inefficiency of the Zobo drink processors increases while a negative significance sign implies that increases in the significance variable results in reduction in the inefficiencies levels of the Zobo drink processors. For technical efficiency under CRTS condition, age household size and membership of cooperatives were positive significant factors which indicated that increases in factors will increase the technical inefficiency of the Zobo drink processors. Sex and cooperative membership were also positive which implies that female gender that are members of cooperative societies have higher technical inefficiency than male and non-member of a cooperative society. Only alternative income sources had negative significant effect on technical inefficiency implying that increases in alternative incomes reduce the technical inefficiency significantly. Sex and processing experience had positive significant effects on allocative inefficiency of the Zobo drink processors while membership of cooperative and alternative income were negative significant factors of allocative inefficiency. Only sex has positive significant on economic inefficiency while educational level and alternative income were negative significant factors of economic inefficiency. However, under VRTS assumption sex, age and membership of cooperatives were positive significant factors of technical inefficiency while marital status, educational level and alternative to income were negative significant factors of technical inefficiency. For allocative inefficiency, sex and experience were positive significant factors while membership of cooperative, alternative income and external finance were negative significant factors. Sex, experience and external finance had positive significant effects on economic inefficiency while educational level, membership of cooperative and alternative to income had negative significant effects on the economic inefficiency of Zobo drink processors. From the above, it could be said that sex variable has positive significance relationship with inefficiencies levels under the CRTS and VRTS conditions. It implies that female individuals have lower efficiencies than the male individuals. This is because it is expected as male individuals are more energetic and proactive in their activities and could process more Zobo drink than female individual given the same circumstance. This is evident as low technical, allocative and allocative efficiency level were estimated in both CRTS and VRTS conditions in the study area. It is also noted that educational level has positive significant level with the inefficiency level of the Zobo drink processors particularly under the technical and economic inefficiencies levels of the CTS and VRTS conditions, this is expected because more educated Zobo drink processors are more likely to be efficient as compared to their less educated counterparts, perhaps as a result of their better skills, access to information and good planning which could increase their efficiency levels. Alternative of income has negative significance effects on the inefficiencies levels across the CRTS and VRTS conditions, it indicated that availability of alternative income source will be beneficial to the Zobo processors to expand their activities therefore increase their efficiency levels beyond the current conditions.

Table 5. Determinant of different efficiency indices under CRTS and VRTS conditions.

Constant Return to Scale	**TE**	**AE**	**EE**
Sex	0.3286**	0.8752**	0.2017**
Age	0.1805**	-0.0737	0.0038
Marital Status	-1.4824**	0.265	-0.071
Educational level	-1.1022**	-0.3424	-1.0833**
Household size	0.466**	0.174	-0.2224
Processing experience	0.0469	0.1633*	0.1777
Membership of Coop	0.8175*	-0.1568**	-0.628
Alternative Income	-1.3561**	-0.963**	-0.146**
External finance	0.2695	-0.213	-0.0068
Constant	1.0152	1.0742	1.0355
Sigma	1.6211**	0.1396**	0.1681**
Log-likelihood	19.044	75.4896	45.3427
LR(chi²)	84.982	76.59	58.15
PseudoR²	1.8151	-1.0296	-1.7869
Variable Return to Scale	TE	AE	EE
Sex	0.7293**	1.1579**	1.6172**
Age	-0.0268	-0.0682	-0.0832
Marital Status	-0.7439**	-0.1844	-0.4878
Educational level	-1.1368**	-0.56	-1.2157**
Household size	-0.1367**	-0.0742	0.1161
Processing experience	-0.015	0.3002**	0.312**
Membership of Coop	0.8971**	-1.809**	-1.2087*
Alternative Income	-0.8996**	-1.9696**	-2.5232**
External finance	-0.0093	-0.5494**	0.6022**
Constant	1.6074	1.1844	1.5096
Sigma	0.0753**	0.1706**	0.1755**
Log-likelihood	173.0140	49.8670	45.6486
LR(chi²)	75.77	68.32	77.50
PseudoR²	-0.2804	-2.1745	-5.6150

Note: **=significant @ 1% and *=significant @ 5%.
Source: Filed Survey data, (2019).

5. Conclusion and Recommendations

The Data Envelopment Analysis was employed to estimate the efficiency level of the Zobo drink processors under the CRTS and VRTS assumptions. The results indicated that the Zobo processing is predominated by female individuals whose efficiency level is below optimal performance. Though, Zobo processing is highly profitable with about 44.34% net margin on total revenue generated. However, overall technical efficiency under the CRTS was 0.819, pure technical efficiency under VRTS was of 0.974 and scale efficiency was 0.839 and the estimated mean allocative efficiency scores were 0.656 for CRTS and 0.683 for VRTS model respectively while the mean economic efficiency scores estimated from the DEA frontier for both CRTS and VRTS were 0.537 and 0.683 respectively. These result indicated gross over-utilize their resources as a can result to an equi-proportionate over utilization of inputs (input congestion) as they were 0.191, 0.344, 0.463 for CRTS and 0.026, 0.117 and 0.317 for VRTS, below what could be their technical, allocative and economic efficiencies respectively. Evaluating factors associated with inefficiency suggests that sex, educational level and alternative to income were most statistically significant factors associated with technical, allocative and economic inefficiency under the CRTS and VRTS assumptions. Therefore, more male involvements are encouraged in Zobo drink processing for more efficient processing activities, educated individuals particularly unemployed as advised to create a cliché for themselves through more innovative processing and packaging activities to generate greater market share for themselves and the business is equally open for individuals with stable employment to create another streams of income for themselves. In all, allocative inefficiency of Zobo drink processors could be alleviated by adopting cost-minimizing input mixes of their best-practice peers to enable them become fully efficient in their activities.

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