Efficiency Analysis of the Food and Beverage Industry in Tanzania: A Comparative Analysis

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Abstract

Purpose: This study examined the performance of food and beverage industries in Tanzania in terms of productive and technical efficiency. The specific objectives of the study were to evaluate the productive efficiency performance of food and beverage industries in Tanzania, to determine the level and trend of efficiency of food and beverage of food and beverage industry in Tanzania, and to assess the levels of productive efficiency performance in the food and beverage subsectors in Tanzania

Methodology: The study used secondary data to achieve its objectives. The study employed a Panel data analysis technique using 40 companies in the manufacturing sector over a period of three years, 2018-2020. A stochastic frontier production model was applied using a linearized Translog production function to determine the performance elasticity coefficients of inputs and technical efficiency. The study used production theory advanced by Koutsoyiannis (1979) to explain the relatonship between input and output factors.

Findings: One of the key findings was that the level and trend of efficiency in food and beverage industry demonstrated an upward trend for the period between 2018 and 2020 as evidenced by the changes in average in both food and beverage sub-sector which grew from 0.776 in 2018 to 0.7557 in 2019 and finally to 0.7746 in 2020. Another finding of the study was that, the individual productive efficiency distribution between food and beverage sub-sector revealed that beverage sub-sector performs much better than food sub-sectors, with an average technical efficiency of 77.85% and 81.36% for both food and beverage sub-sectors, respectively.

Unique Contribution to Theory, Practice and Policy: The study's unique contributions to theory include its assessment of efficiency levels, analysis of efficiency trends, and exploration of sector-specific variations. Its practical contributions encompass policy recommendations, guidance on modernization and technology adoption, and the importance of skills development and export promotion. These insights have direct implications for policymakers, industry stakeholders, and practitioners in Tanzania's food and beverage sector, aiding in the formulation of effective strategies to enhance efficiency and competitiveness.

The study recommends that the government and other stakeholders comes up with policy reforms to address the underlying factors contributing to the underutilization of each firm's production capacity. This includes reforming the input market in the manufacturing sector in order to increase the level of efficiency to 100%. There should be establishment of an efficient marketing mechanism that reduces the involvement of many parties in the supply chain and hence high transaction costs.

Keywords: *Technical Efficiency, Comparative Analysis, Food and Beverage Industry*

INTRODUCTION

The food and beverage industry plays a pivotal role in the economic development of nations across the globe. In Tanzania, this industry represents a significant portion of the manufacturing sector, contributing to economic growth, job creation, and food security. However, to ensure its sustained growth and competitiveness, it is crucial to evaluate the efficiency of the food and beverage industry in Tanzania. Efficiency, in the context of this study, refers to the optimal utilization of resources to produce the highest quality output. This study aims to conduct a comparative analysis of the efficiency levels within the Tanzanian food and beverage industry to assess its performance and identify areas for improvement.

Concept and Definition of Efficiency and Food Processing

Efficiency as defined by the Food and Agriculture Organisation of the United Nations (2021b), is the pinnacle of performance, characterized by the utilization of the highest quality inputs to yield the desired output. It is a measurable concept, often expressed as the ratio of useful output to total input. This study adopts the perspective that efficient performance in the food and beverage industry involves the establishment of a code of conduct to monitor and enhance economic sector progress. Efficiency, as articulated by (Čechura, L., & Kroupová, Z. Ž, 2021), encompasses comparisons between optimal values and expected values in production and production line positioning. These comparisons can take the form of minimizing input quantities while extracting materials or maximizing output from given inputs.

Economic performance, in the context of this study, relates to the value of all inputs utilized in producing a specific output. A production process is considered economically efficient when no alternative method for producing the same output uses fewer total input values (Durand, Fitoussi, & Stigli, 2018). Efficiency, in this study, is not only about quantity but also quality, focusing on eliminating wastefulness and optimizing resource utilization.

Efficiency is a fundamental aspect for companies, as it impacts costs, competitiveness, and productivity. Improved efficiency reduces costs and enhances competitiveness, provided that productivity is also a focus. Technology is a key driver of efficiency and growth in the food processing sector, which is vital for addressing food security and nutrition challenges in sub-Saharan Africa (Forrest, Ying, & Gong , 2018).

Food processing encompasses a wide array of activities involved in transforming agricultural products into various forms of food. This includes everything from basic grain grinding to complex industrial methods used in creating convenience foods. Food processing techniques are essential for reducing food waste, improving food preservation, and, consequently, enhancing food security and sustainability (European Food Information Council, 2017)

The food-processing industry in Tanzania has immense potential for value addition and high growth. While Tanzania is among the largest agricultural producers globally, its food-processing sector is still underdeveloped, presenting a significant area for economic expansion (USAID, 2021). In recent years, the sector has demonstrated growth, but there is room for improvement in terms of efficiency and productivity. This study seeks to explore the efficiency levels in the Tanzanian food and beverage industry, identifying the factors that influence its performance and competitiveness.

Profile of the Food-Processing Industry

The food-processing industry encompasses a range of activities involved in the processing, conversion, preparation, preservation, and packaging of food products. Despite its diversity,

the preparation processes can be categorized into several phases, including the handling and storage of raw materials, extraction, processing, preservation, and packaging (Food and Agriculture Organisation of the United Nations, 2021b). This sector plays a crucial role in the economies of many countries, contributing significantly to turnover, value addition, and employment (Food Drink Europe, 2016).

The global food processing industry has experienced significant diversification, from small, traditional, labour-intensive activities to large, capital-intensive, highly mechanized industrial processes. This transformation is driven by economic and marketing pressures, demographic changes, resource distribution, and the need to ensure food preservation for better distribution (Malagié, 2016). In the context of Tanzania, the food-processing industry is a vital component of the manufacturing sector, contributing to economic growth and job creation (Lubawa, 2021). However, despite its potential, the industry faces challenges related to efficiency, technology adoption, and modernization.

Situational Analysis of the Food Industry in Tanzania

In Tanzania, the food-processing industry is a key sub-sector within manufacturing, alongside textiles, chemicals, and others. The government has prioritized industrialization as a means to drive economic transformation, reduce poverty, and achieve sustainable growth (The United Republic of Tanzania, 2016). The industry has shown positive growth trends in recent years, with a focus on agro-processing of various products, including edible oil, cashew nuts, fruits, milk, and dairy products (Lubawa, 2021).

However, the sector faces challenges related to efficiency, with a significant portion of agricultural produce going to waste due to limited processing (Agro Food East Africa , 2022). While there have been efforts to promote investment and value addition in the industry, there is a need to assess the level of production efficiency to ensure competitiveness in both regional and global markets (Economic Report , 2022).

Statement of the Problem

Despite the potential of the food and beverage industry in Tanzania, its performance, particularly in terms of efficiency, remains a challenge. The sector's contribution to GDP and employment creation has been below expectations, and a substantial portion of agricultural produce is wasted due to inefficient processing. This inefficiency leads to high production costs and reduced competitiveness in both domestic and international markets. Despite government initiatives to promote industrialization and value addition and to attract both local and foreign investors, the sector's growth has been constrained by low productivity and limited adoption of modern technologies. As much as the number of industries have increased in the recent years, the sector is still underperforming since little attention being paid to the levels of technical efficiency in Tanzanian manufacturing firms. The high level of production inefficiency has led to increased cost of production and decrease in exports of manufactured goods from USD 1.2 billion in 2014 to USD 795 billion in 2018 thereby creating the need to assess the level of production efficiency in the sector. Although the sector has demonstrated an upwards trend in efficiency for the period between 2014 and 2014, the output is yet to match the required standards that can allow the industry to compete effectively in the regional as well as the global market since the low level of efficiency has translated to high cost of production thereby making the industry less competitive.

This study aimed to address these challenges by conducting a comprehensive analysis of the efficiency levels within the Tanzanian food and beverage industry. Through a comparative

analysis, the study identifies the factors influencing efficiency and provide recommendations for improving the sector's performance. In doing so, this research aimed at contributing to the development of strategies that can enhance the efficiency and competitiveness of the food and beverage industry in Tanzania.

Objectives of the Study

The overall objective of the study was to investigate the productive efficiency level of Tanzania's food and beverage industries for the period (2018-2020). The specific objectives of the study are:

To assess the productive efficiency performance of food and beverage industries in Tanzania.

To evaluate the technical efficiency performance of food and beverage industries in Tanzania.

To determine the level and trend of efficiency of food and beverage of food and beverage industry in Tanzania.

LITERATURE REVIEW

Theoretical Review

Production Economics Theory

Production theory, rooted in economic principles, is crucial for understanding the concept of efficiency in the food and beverage industry. It emphasizes the transformation of inputs into outputs and the efficient use of resources to maximize profitability. Efficiency in this case is measured by the correlation between objectives achieved and resources utilized. High efficiency leads to increased profitability, making it a vital consideration for organizations (Koutsoyiannis, 1979).

Productivity and efficiency measurements are essential for assessing various sectors, including manufacturing, as they help pinpoint gaps and areas for improvement. Productivity relates to the ratio of outputs to inputs, with efficiency encompassing both technical and allocative components. Technical efficiency focuses on using inputs efficiently, while allocative efficiency optimizes input-output combinations (Varian H. R., 2010; Uju, Obi, & Chine-cherem, 2019; Koutsoyiannis, 1979).

Stochastic Frontier Models

The application of stochastic frontier models in this study offers a robust method for evaluating technical efficiency. These models incorporate error components to measure technical inefficiency, capturing both random noise and one-sided inefficiency. Technical efficiency scores range between 0 and 1, with 1 representing perfect efficiency. Stochastic frontier models, such as the Translog production function, are employed to estimate efficiency and assess how various factors impact it (Coelli, T. J., Prasada Rao, D. S., O'Donnell, C. J., & Battese, G. E., 2005). For technical inefficiency, it gives a combination of outcome of various organizational characteristics that prevents a corporation from producing as much as it can give a combination of inputs and technologies. This inefficiency is captured by the one-sided inefficiency component.

Theory of Systems Efficiency

The theory of system efficiency emphasizes the synergy among different components of a production system, including capital, raw materials, and labour. These components must work together harmoniously to achieve optimal output quality and efficiency. Effective production

systems require machinery and equipment (capital), raw materials, and skilled labour to operate efficiently. Any weakness or inefficiency in one component can affect the entire system's performance (Sengupta J. K., 1995; Battisti , Del Gato, & Belloc , 2021). In achieving production efficiency, the components of the systems must be in their perfect conditions or state in order to give the desired quality output. To be efficient, a production system should have high level of endurance to intensity of operations and ability to operate optimally without necessarily breaking down.

Theory of Constraints Model

The theory of constraints, initially applied in manufacturing, identifies and addresses the weakest links or constraints within a system. It emphasizes improving the weakest aspects of a system to enhance overall efficiency. This theory guides organizations in recognizing constraints, exploiting them, subordinating other decisions to constraint management, elevating constraints, and continuously monitoring and improving efficiency (Agro Food East Africa , 2022). The theory argues that every chain has a weak link at the end. Similar to this, in each complex system, at any one time, there is typically just one aspect of that system that restricts its potential and prevents it from accomplishing a goal. This limitation is then gradually improved until it ceases to be the limiting factor. The same holds true for a company. Therefore, the restriction must be discovered and the entire system must be managed with that constraint in mind for any organization to significantly improve.

Adaptive Structuration Theory

Adaptive Structuration Theory explores the interplay between information technology, social structures, and human interaction within organizations. It is particularly relevant in the context of advancing technologies, as it examines how technological advancements influence organizational structures and behaviours. This theory highlights the transformative impact of information technology on business processes, communication, and decision-making.

These theoretical frameworks provide a solid foundation for addressing the objectives of this study, which aim to assess and evaluate the efficiency performance of the food and beverage industry in Tanzania from multiple perspectives, including production, system efficiency, and the influence of technology. The following sections will delve into empirical research and findings related to these theoretical constructs, shedding light on their practical applications in the context of the food and beverage industry in Tanzania (Giddens , 1984; SAIF , 2019; Zahid, 2021).

Empirical Review

The food processing industry plays a crucial role in the economic growth of nations worldwide, contributing significantly to GDP and employment (Baliyan, 2015). In the Czech Republic, for example, the food processing sector contributed 2.19% of GDP and generated 2.53% of jobs in 2019 (Eurostat , 2020). However, there are challenges and inefficiencies within this industry that need to be addressed.

Náglová & Pechrová (2021) conducted a study in the Czech Republic, revealing that the country's food industry faces challenges in the European Union market, requiring a comprehensive evaluation of its efficiency to identify determinants of its competitive position. The study emphasized the need to improve economic performance through efficiency measures such as Technical Efficiency (TE) and productivity.

Research Gaps

While the empirical review provides insights into the challenges and issues facing the food processing industry, there is a noticeable gap in terms of addressing the specific factors contributing to inefficiencies. The existing studies highlight the importance of improving efficiency but do not delve into the detailed determinants of this inefficiency.

Therefore, there is a research gap in understanding the specific factors that hinder the efficiency of the food processing industry in the Czech Republic and how these factors compare to other regions or countries. Investigating these determinants would provide a more comprehensive understanding of the industry's challenges and potential areas for improvement.

Additionally, the review primarily focuses on the Czech Republic, and there is a need for comparative research to understand how different countries or regions address similar challenges in their food processing sectors. Comparative studies could reveal best practices and innovative strategies for enhancing efficiency in this vital industry.

In summary, the research gap lies in the need for more detailed studies that explore the specific determinants of inefficiency in the food processing industry, compare these factors across different regions, and provide actionable recommendations for improving efficiency and competitiveness.

METHODOLOGY

Research Philosophy

This study adopted a pragmatist research philosophy which deals with facts. According to Alghamdi (2013), the choice of research philosophy is usually determined by the research problem. In this philosophy has been chosen for this study because the practical results of efficiency in food and beverage sub-sectors in Tanzania area considered important. Under this philosophy, the research has freedom of choice and allows them to choose the methods, techniques and procedures that best meets their needs and scientific research aims.

Research Design

This study employed a longitudinal research design. According to Ployhart & Vandenberg (2010), longitudinal research uses continuous measures in following up a particular individual of activities over a prolonged period of time often years or even decades. In this case, the researcher collected data over a period of 3 years i.e., from 2018 up to 2020. This design involved pooling cross-sectional and time series data, was utilized in this investigation. In the design, quantitative research approach was adopted since it is both time and money efficient and requires less time for data collecting and processing. Additionally, it enabled the researcher to gauge and examine the independent variable (the food processing business) and the dependent variable (market participation in our case) of the study.

Target Population

According to Tanzania Investment Centre (2022), there are a total of 60 regsitered food and beverage companies in the Republic of Tanzania which will form the target populatin of the study.

Sample and Sampling Procedures

This study therefore applied purposive sampling design to get 40 companies that had complete records and by asking questions on their market participation and food processing strategy

Description of Research Instruments

This study utilized secondary data which was collected from the individual company financial records for the period between 2018 and 2020. The information collected from the company records included the year, company capital, cost of raw materials, labor and the gross value.

Data Collection Procedures

SFA technique was used to calculate the performance levels of the various companies and the trend of the enterprise performance levels established during the study time. Secondary data for input and output variables were cleaned and analysed and diagnostic statistics, descriptive statistics, regression analysis, and SFA estimation employed. Non-parametric approaches were used to compare results between two industries and data management utilized spreadsheet software, while data analysis was carried out using STATA software. The diagnostic tests conducted on the data revealed that there is no multicollinearity among the input variables. It also showed that there is no heteroscedasticity issue in the data and the data is normally distributed, meeting the assumption of normality for statistical analysis

Descriptive Statistics

Table 1: Descriptive Statistics

Year	Unit	Gross Value	Capital	Raw materials	Labour
2018	Mean	2,155,806,000	1,407,197,000	1,742,334,000	509,715,200
	Std.Dev	2,189,375,000	1,590,776,000	1,743,326,000	665,237,700
	Min	397,923,900	124,827,400	302,512,700	34,038,630
	Max	9,321,582,000	6,615,824,000	7,437,830,000	3,355,812,000
2019	Mean	2,639,654,000	1,581,447,000	2,007,219,000	638,114,400
	Std.Dev	2,488,182,000	1,794,383,000	1,823,136,000	921,163,600
	Min	407,012,800	141,872,000	332,918,300	46,028,540
	Max	10,866,920,000	7,538,977,000	7,759,401,000	4,591,567,000
2020	Mean	3,281,296,000	1,795,458,000	2,391,651,000	753,931,600
	Std.Dev	2,739,146,000	2,145,205,000	2,158,199,000	1,101,179,000
	Min	630,341,200	143,028,800	340,624,100	54,983,210
	Max	11,658,920,000	8,649,036,000	8,991,891,000	5,000,427,000

From the descriptive statistics in Table 1, it is noted that some variables, such as Capital, Raw materials, and Labour, have higher standard deviations than the mean, indicating significant variability within these variables. This variability is expected due to the heterogeneity of the industries under study, which vary in terms of their capital investments. The Gross Value, which is the dependent variable, also shows large variation, with the standard deviation being larger than the mean. The minimum and maximum values for each variable highlight the range of values observed in the dataset, further emphasizing the diversity of the industries.

FINDINGS

The Efficiency Performance of Food and Beverage Industries in Tanzania

A likelihood ratio (LR) test can be employed to determine which model specification is better. In this study, the LR test was conducted to compare the Cobb-Douglas production function model against the Translog model. The null hypothesis of the test is that the appropriate model is Cobb-Douglas production function, while the alternative hypothesis is that the Translog model is more representative in explaining gross value of industrial revenue in Tanzania in all 40 industries.

Table 2: Generalized Likelihood-Ratio Tests of Null Hypotheses for Parameters in the Stochastic Frontier Production Function for Industries' Gross Value

Null Hypotheses	Test Statistics	Critical value	Decision
$H_0 = \beta_1 = \beta_2 = \beta_3 = 0$ (Cobb-Douglas function)	LR = 5.15	0.35	Reject

Critical values are obtained from the appropriate chi-square distribution table

From Table 2, the Cobb-Douglas function is rejected therefore trans-log model is chosen based on the LR value of 5.15 which is greater than the critical value of 0.35 based on a Chi-square distribution table, tested at 5% level of significant. The results of the Ordinary Least Square (OLS) and Maximum-likelihood Estimation (MLE) for the Translog production function are reported in Table 3. The adjusted R-squared for the ordinary least square estimates is 0.87, which indicates that 87 percent total variation of the output is explained by the input variables.

Table 3: Model Summary

Model	R	R2	Adjusted R^2	Std. Error of Estimate
1	.873	.762	.648	.7936
Predictors (Constant): Efficiency analysis				
b. productive efficiency, technical efficiency, level and trend of efficiency				

Table 4: OLS and MLE Estimates of Translog Stochastic Production Frontier Model

Variables	Parameters	Estimated OLS Coefficients	P-Value	Estimated MLE Coefficients	P -Value
Constant	β_0	1.513064	0.000	1.9347	0.000
Logcapital	β_1	0.0573	0.163	0.0661	0.071
Lograwmaterials	β_2	0.7014	0.000	0.6809	0.000
Loglabour	β_3	0.0995	0.005	0.08984	0.007
Variance parameters					
Sigma – squared	σ_s^2	0.3729		0.1457	
Log likelihood function				--7.414	

The result in Table 4 shows that, the value of log likelihood function for OLS and MLE allow to test whether technical inefficiency exists or not. In case technical inefficiency does not exist then technically there will be no difference in the parameters of OLS and MLE. From the analysis what we have observed that the coefficients of raw material) and labor are statistically significant. These results indicate that these input variables significantly affect the gross value of food and beverage industries in Tanzania. Reasonably enough, for a capital, has the positive output elasticity and is found to be insignificant in the gross value revenue. This implies that

capital does not affect the gross value of the food and beverage industries in Tanzania significantly. From the MLE analysis what we have observed independently that all the variables except capital are significant in affecting the gross value of food and beverage industries in Tanzania. Table 4 shows that the value of σ^2 is 0.3729, indicating that all firms in the sample are not fully efficient. The efficiency of industries' gross value is depicted in the Table 5.

Table 5: The Efficiency Estimates for Food and Beverage Industries in Tanzania

Subsector	Year	Efficiency estimate
Food	2018	0.8051
	2019	0.7557
	2020	0.7746
Mean		**0.7785**
Beverage	2018	0.776
	2019	0.7634
	2020	0.9013
Mean		**0.8136**
General Mean		**0.7961**

From the analysis it is observed that for gross value, the overall mean technical efficiency of Tanzania food and beverage industries during the period 2018 to 2020 is found to be 0.7961 and the technical efficiencies ranges from a minimum of 0.7557 to a maximum of 0.9013 for the selected food and beverage industries in Tanzania. This implies that the gross value of 79.61% has been achieved by the selected industries in Tanzania. In the present study none of the food and beverage industries had achieved 100% level efficiency for gross value. The findings also suggest that 20% technical inefficiency exists. There is wide variation in the technical efficiencies among the selected industries.
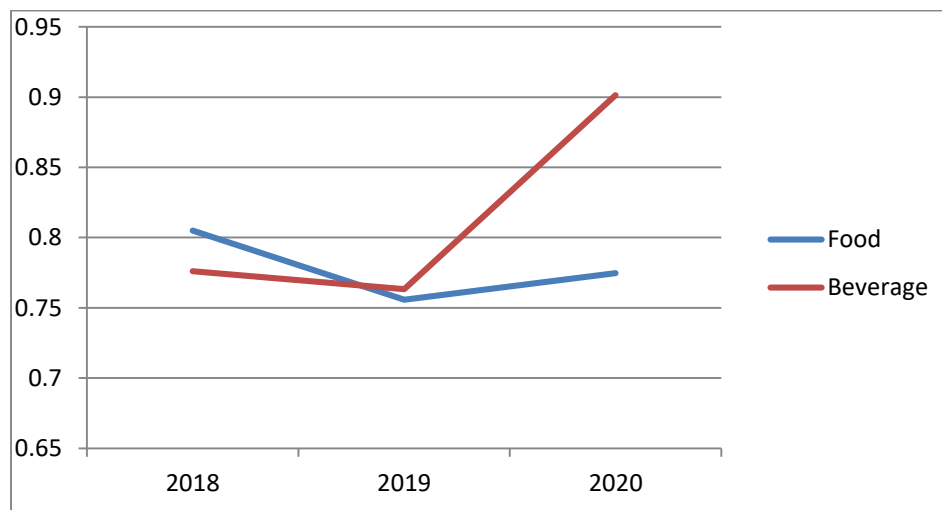

Figure 1: The Overall Efficiency Trend of Each Subsector from 2018 to 2020

Estimation of Inefficiency Effect (Gross Value) Model

To further test whether capital, raw materials, and labor have effects on technical inefficiency of the sector, the findings are presented in Table 6.

Table 6: Estimation of Inefficiency Effect (Gross Value) Model

Variable	Parameters	Estimated coefficients	P-Value
Constant	β_0	1.8335	0.000
Log(capital)	β_1	0.0364	0.475
Log(raw materials)	β_2	0.6924	0.000
Log(labour)		β_3	0.1231	0.007
Sigma-squared	σ^2	0.1409	
Gamma	γ	0.7219	

Overall, the joint effect of two variables raw materials and labor on the technical inefficiency are significant except capital, where the constant is 1.8335. The estimated coefficient associated with capital (0.0364) is positive and statistically insignificant, suggesting that capital does not contribute significantly to the technical inefficiency of food and beverage industries in Tanzania. Raw materials are also found to have a positive significant effect on technical inefficiency. Meanwhile, labor is found to have a positive effect on technical inefficiency and is statistically significant. On the other hand, the variance parameters, gamma (γ) and sigma-squared (σ^2), are all positive. The estimate for gamma is close to unity (0.7219) and very high. This result indicates that much of the variation in the composite error term is due to inefficiency effects (and not simply random errors) in this sector's data.

Table 7: Subsectors Rankings by Average Efficiency Scores, and Minimum and Maximum Efficiency Score by Subsectors and by Year

By Subsector					By Year		
Subsector	Minimum	Maximum	Average	Rank	Year	Minimum	Maximum
Food	0.7557	0.8051	0.7785	2	2018	0.776	0.8051
					2019	0.7557	0.7634
Beverage	0.7634	0.9013	0.8136	1	2020	0.7746	0.9013

Table 7 shows the beverage subsectors are more efficient than the food subsectors. Efficiency scores for beverage subsector were ranked the first in efficiency performance. Food subsector was found to be the second behind beverage subsector in generating industries gross value.

Discussion

Productive Efficiency

The study noted that there is significant relation between input and output when it comes to both technical and performance efficiencies. This is supported by the fact that 87 percent total variation of the output is explained by the input variables. These findings are consistent with the findings of a study conducted by Tatli & Bayrak (2019) which sought to analyze the total factor of productive analysis in the food sector in Turkey and which established that there is direct relationship between the quality of inputs and the quality of output. This means that the level of efficiency is also determined by how much the firm is willing to invest in its inputs in production. The study concluded that the distance QP, which is the amount by which all inputs could be proportionally lowered without a loss in output, could thus be used to illustrate the technical inefficiency of that firm. The study results also indicate that input variables significantly affect the gross value of food and beverage industries in Tanzania.

Technical Efficiency in Food and Beverage Sub-Sector

The study further noted that capital does not affect the gross value of the food and beverage industries in Tanzania significantly. In a study conducted by Durand, Fitoussi, & Stigli (2018)

which defined capital as the as the purchase of goods made with money in production and can include the inputs plus the equipment that are used in production. The findings of this study showed that the relationship between capital and efficiency was not significant although it existed. To maximize its profits, the firm should choose the production method that costs the least as this will enhance the level of efficiency. On average, the food and beverage sector produce 60 per cent of the total gross value output and therefore an indicator that the sector needs to increase their gross value output by 40 per cent to attain the optimal efficiency level.

Trend of Efficiency in Food and Beverage Sub-Sectors

Technical efficiency in 2020 was 0.9013 compared to 2019 at 0.7557 which shows that efficiency improves with time. This can be attributed to adoption of new technologies, innovation or improved quality of inputs. These findings are also consistent with the findings of a study conducted by Náglová & Pechrová (2021) which sought to examine the technical efficiency of the food and drink industry and its determinants. The study noted that technical efficiency improved over time due to technological advancement which makes to less costly for production to process the inputs at any given time. The beverage subsector was found to be more efficient compared to food subsector.

These findings are in line with the findings of a study by Zahid (2021) which sought to examine the level of efficient of the large-scale manufacturing sector in Pakistan using non-parametric frontier techniques. The study established that beverage subsector recorded higher efficiency compared to the food subsector due to the industrial process involved in conversion of the raw materials into finished products that can safely be consumed. This means that there is high investment in terms of plants and machinery in the beverage sub-sector compared to food subsector. This explains why efficiency in beverage sector was ranked first in generating industry's gross value compared to food subsector.

Level of Efficiency in Food and Beverage Sub-Sectors

The study compared the performance scores across the food and beverage subsectors for the given period during which it was established that there was significant variations over the time for each area. Additionally, there was significant variations in the level of efficient between food and beverage subsectors. These findings were found to be consistent with the findings of a study conducted by Muteshi, Awino, Kitiabi, & Pokhariyal (2017) which also noted that beverage subsector performed better than food subsector. The study also showed that there was significant variance in efficiency of all subsectors over a period of time.

CONCLUSION AND RECOMMENDATION

Conclusion

The general performance level based on the average technical efficiency level for the food and beverage industries was 79.61%. This result indicates the underperformance of the Tanzania's food and beverage industries because the average of 20.39% of the technical potentialities of food and beverage processing industries was not achieved for the period 2018-2020. This means that food and beverage industry in Tanzania is underperforming by not meeting the expected 100% level of efficiency and therefore more needs to be done to address the gap created by the difference of 20.39%.

The level of efficiency in food and beverage industry demonstrated an upward trend for the period between 2018 and 2020. This is evidenced by the changes in average in both food and beverage sub-sector which grew from 0.776 in 2018 to 0.7557 in 2019 and finally to 0.7746 in

2020. This upward trend shows that even though the level of efficiency has not yet reached the desired 100%, there is progress towards the optimum efficiency level and the same will be achieved with time. The individual efficiency distribution between food and beverage industries revealed that beverage industries perform much better than food industries, with an average technical efficiency of 77.85% and 81.36% for both food and beverage industries, respectively. With this fact it is evidence that, the performance of Tanzania's food processing industry is boosted by the beverage industry.

The trend of efficiency in food and beverage sub-sectors in the Tanzanian manufacturing industry showed an upward trend for the period between 2018 to 2020 with the highest level of efficiency being achieved in 2020. The growth with progressive in nature and therefore showed a consistent upward trend.

The fact that the level of efficiency is still below optimum; means that the government and other stakeholders need to work together to streamline the sector to make it more productive, efficient and profitable. More investment in machinery, skilled labor and quality raw materials is needed to ensure that the end-products are competitive in the domestic, regional and international market. This will ensure that the cost of production in the local industry is minimized to reduce the amount of imports that floods the market and instead increase the volume of exports.

Recommendations

The study recommends that the government and other stakeholders comes up with policy reforms to address the underlying factors contributing to the underutilization of each firm's production capacity. This includes reforming the input market in the manufacturing sector in order to increase the level of efficiency to 100%. There should be establishment of an efficient marketing mechanism that reduces the involvement of many parties in the supply chain and hence high transaction costs would help ameliorate the problem.

The level and trend of efficiency of food and beverage industry in Tanzania has been in an upward trend for the period under study. The government and players in the manufacturing sector need to create an enabling environment for the manufacturing sector to invest in modern technology to enable the firms modernize their operations, reduce the cost of production and increase the level of efficiency.

There is significant variance in the levels of productive efficiency in the sub-sectors. This means that each sub-sector in the food and beverage industry need to invest in factors that improves efficiency such as modern technologies, product design, better management skills, exposure to international markets as well as production of more competitive products.

The role of the government in providing advisory support regarding training, market information, and technology choice is also recommended. The government need to work with various stakeholders to provide training service for players in food and beverage sub-sector to equip them with necessary skills to enable operate more effectively and efficiently. Relevant agencies also need to work together and provide market information for both local and international markets to the players in the sub-sectors so that they are able to compete more effectively.

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