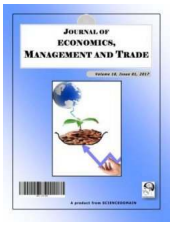

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Effect of Presidential Cassava Transformation Initiative on the Efficiency of Micro-scale Cassava Processing Enterprises in Southwest Nigeria

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Authors' contributions

This work was carried out in collaboration between the four authors. Author OTO performed the statistical analysis, wrote the study, wrote the prolix, the literature review and wrote the first draft of the manuscript. Author ZOO designed the study. Author OOA managed the analysis of the study. Authors OOA and OJO did the literature searches. All the authors read and approved the final manuscript.

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ABSTRACT

This study appraised the effect of 2003 Presidential Cassava Transformation Initiative (PCTI) on the efficiency of Micro-Scale Cassava Processing Enterprises in Southwest Nigeria. The study was carried out between April and December 2016. The study evaluated the efficiency of the MSCPEs before and after the initiative, with the help of survey design, and multi-stage sampling technique. These techniques include: purposive sampling, and proportionate stratified sampling techniques. Data were obtained from 251 respondents (86% of 292 retrieved questionnaires) in the six Southwest States, through structured questionnaire. The respondents were made up of the MSCPEs that participated in the initiative. Descriptive statistic (percentage, mean score) and

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inferential statistic (Data Envelopment Analysis) were used to analyze the data collected. The study revealed that, 25.9% of the respondents were male and 74.1% were female, 71.7% were within age 40 to 59 years, and 31.9% of the respondents were holders of Primary School Certificate, while and 35% were not educated. Also, the PCTI assisted in raising the average scale efficiency of the MSCPEs in all the Southwest states, 69.4% before the initiative, to 88.5% after the initiative. The study therefore recommended that, policy makers should make policies that will further help to raise the efficiency of the MSCPEs to optimum production frontier.

Keywords: Cassava transformation; initiative; efficiency; micro-scale; cassava processing; enterprises.

1. INTRODUCTION

Overdependence on crude oil over the past five decades, has resulted in the degeneration of the Nigerian economy. In order to remedy the situation, successive governments in Nigeria have made several attempt to diversify the nation's foreign earnings. One of such attempts was to develop the agricultural sector and increase the contribution of the sector to Nigeria's Gross Domestic Product (GDP). In acknowledgement of the importance of Cassava as one of the mostly cultivated crop by Nigerian farmers (at 54 million metric tonnes per annum, Nigeria is the highest producer in the world [1] and an essential source of food for Nigerians [2], the Nigerian government decided to develop the cassava industry. Also, to use cassava as a crop to fight poverty, and a source of the nation's foreign exchange earnings, with an estimated annual earnings of US $ 5 billion (about 675 billion naira) [3]. In addition, the government decided to decrease the amount spent on the importation of food, and use cassava products as substitute for imported cassava composite products (flour, starch, sweeteners, among others). To do this, the Nigerian government established the Presidential Cassava Transformation Initiative (PCTI) in the year 2003, and made policies to support cassava industrialization. Such policies included the inclusion of 10% cassava flour to wheat flour, for the production of bread, 10% bioethanol in gasoline and the use of paraffin with ethanol gel fuel as the cooking fuel [4]. Also, to expand the use of cassava locally, in form of starch, *gari*, *lafun*, tapioca [5,6] to livestock feed, household flour, starch, ethanol, and raw materials for industries [7].

In the past, several efforts were made to develop cassava farmers' productivity in Nigeria, without serious efforts towards the development of the cassava processing industry. Some of these efforts went back as far as 1940, when the Gold Coast hybrid cassava plants was introduced to Nigeria. This hybrid was intended to combat African Cassava Mosaic Virus. The Federal Institute for Industrial Research in Lagos, introduced another variety in 1968, while the International Institute of Tropical Agriculture (IITA) initiated the root and tuber improvement programme in 1971 at Ibadan. Also, the International Fund for Agricultural Development (IFAD) commenced Cassava Multiplication Project between 1987 and 1996. IFAD also aided the Roots and Tuber Crops Expansion in 2001 [8]. One of the reasons for the failure of these efforts was, lack of efficient utilization of resources. In order to realize optimum output and profit efficiency in the cassava industry, there is need to efficiently utilize resources [9]. The Nigerian cassava industry's competitiveness hinges on its ability to develop and keep up an edge over its market rivals. This competitiveness can be achieved through efficient cassava production [10].

Efficiency will help Nigerian cassava products to be competitive locally and internationally, and save Nigeria some money from importation of cassava products and earn foreign exchange. Also, efficiency is required in a developing country like Nigeria, who has little knowledge of technology, and where resources are inadequate, and the chances to develop and embrace enhanced technologies are decreasing. Countries like this, can gain from efficiency through the increase in output, without development new technologies or increasing resource base [11,6]. Unfortunately, available data reveal that the major challenge being encountered by the cassava sector in Nigeria, is low productivity, occasioned by the subsistence nature of the Nigeria's cassava production system [10,12]. This system is inefficient, underdeveloped, results to high ex-factory prices, and uncompetitive in the international market [10]. The inefficiency has impeded the enhancement of food production, and resulted to

low income among farmers in Nigeria [13]. The main objective of this study is to appraise the effect of the presidential cassava transformation initiative on the efficiency of Micro-scale cassava processing enterprises in Southwest Nigeria. The specific objectives are to examine the level of efficiency of these Micro-scale enterprise before the initiative, examine the level of efficiency of these Micro-scale enterprise after the initiative, and compare their levels of efficiency before and after the initiative in order to determine the effect of the initiative on the efficiency of these enterprises.

[14] defined technical efficiency as the measure of the success of an organization in producing maximum output from a given set of inputs, while [15] referred to technical efficiency as the ability of a farm or firm, to use a given set of resource inputs to maximize output. They further opined that, technical efficiency is the farmer's ability to produce on the maximum possible frontier, while allocative efficiency is the farmer's ability to use the inputs at his disposal in optimum proportions, given individual prices and available production technology. It is a farmer's ability to produce a given level of output at minimum cost, given the available technology. On the other hand, Ajibefun (2002) stated that, the technical efficiency of a specific farmer is defined in regards to the ratio of output observed to the corresponding frontier output, given the technology available. Initiative means, new strategy for dealing with a problem in order to achieve a specific purpose (Oxford Advanced Learner's Dictionary). Micro-scale enterprise are those enterprises that have less than 10 employees with Assets less than ₦5 million, excluding land and buildings. Small-scale enterprise are those enterprises that have 10 to 49 employees with Assets from ₦5 million to less than ₦50 million, excluding land and buildings. While Medium-scale enterprise are those enterprises that have 50-199 employees with Assets from ₦50 million to less than ₦500 million, excluding land and buildings (National Policy on MSMEs, 2012; Micro Small and Medium Enterprises (MSMES) Reports, 2012).

A lot of Studies have been carried out on the efficiency of small-scale farmers in Nigeria [16,9,17,18,12,19,6,20,21,22,15] among others. However, few studies have been carried out on the 2003 Presidential Cassava Transformation Initiative [8,23] among others. These studies have not sufficiently appraised the effect of the initiative on the efficiency of the Micro-scale cassava processing enterprises in Nigeria. They concentrated on the effect of the initiative on cassava farmers' production efficiency. This study addresses the insufficiencies in past literature, by appraising the effect of the initiative on the level of efficiency of the Micro-scale cassava processing enterprises in Southwest Nigeria before and after the participating in the initiative.

2. MATERIALS AND METHODS

2.1 Study Area

The study area is Southwest Nigeria. This area is made up of six States (Ondo, Oyo, Lagos, Osun, Ekiti and Ogun). The total population of Southwest Nigeria was 27,581,992 in the year 2006, and the total land area is 77,818 km2 (National Population Census (NPC), 2006). The region lies between longitude 2°311 and 6°001 East and Latitude 6°211 and 8° 371 North [24], and the area is bounded with Edo and Delta states in the East, Kogi and Kwara states in the North, Gulf of Guinea in the south, and Republic of Benin in the West. The study area is made up of 85 established forest reserves, which covers 842,499 hectares. The area is made up of wet and dry seasons, consist of a tropical climate with annual rainfall ranging between 150 and 3000 mm, and temperature ranging between 21 and 34℃ [24]. The climate in the Southwest zone is good for cultivating crops like cassava, maize, yam, plantain, cocoa, kola nut, cashew among others, and farming is the major source of their livelihood [25].

2.2 Sampling Procedure

Multi-stage (purposive and proportionate stratified sampling techniques) sampling technique was employed to select sample for the study. In the first stage, Southwest zone, being one of the three main agricultural zones [26] was purposively selected. The Southwest zone is made up of Oyo, Ogun, Lagos, Ondo, Osun, and Ekiti states. In the second stage, the Micro-scale cassava processors that partook in the Initiative, were purposively selected from the list of the Agricultural Development Projects (ADPs), one of the Agricultural Institutions that implemented the programme, in the six states. The population of the study was 1,083. This population comprised: Oyo State, 315 beneficiaries, Osun, 226, Lagos, 93, Ekiti, 104, Ondo, 226, and Ogun, 119) Micro-scale processing enterprises. Out of the 1,083 respondents, 27% (292) beneficiaries

of the programme were selected from each state (Oyo (85 beneficiaries), Ogun (32), Osun (61), Ekiti (28), Ondo (61) and Lagos (25), using proportionate stratified sampling technique.

2.3 Data Collection and Analysis

Structured questionnaire was used to collect data from the respondents. The questionnaire consisted of two sections, A and B. Section A was made up of questions relating to the socio economic characteristics of the respondents, while section B comprised questions that helped to appraised the effect of the presidential cassava transformation initiation of the efficiency of the processing enterprises in the study area, before and after the initiative. The Questionnaires were distributed 292 respondents, with the help of extension agents, research assistants and youth leaders who reside in the selected communities. 251 (86%) of the questionnaires were recovered from the Micro-scale enterprises. The collected data were analyzed with Data Envelopment Analysis.

2.4 Model Specification

DEA model was used to estimate the effect of the Federal Government cassava transformation initiative on the efficiency of the Micro-Scale cassava processing enterprises in Southwest Nigeria, by comparing the efficiency level of the enterprises before with their efficiency level after the initiative. The "DEA method was first introduced by [27] and was called CCR model [28]. This model is based on [29]'s theory of using a non-parametric piece-wise-linear technology and combined with mathematical programming for efficiency rating. The CCR model used constant returns to scale (CRS) concept to assess relative productive efficiencies of Decision Making Units (DMUs) with multiple inputs and outputs. The CCR model assumes *m* inputs, *s* outputs and *n* DMUs, respectively. The DMU_k is express as:

$$\text{Max} \quad h_k = \frac{\sum_{r=1}^{s} U_r Y_{rk}}{\sum_{i=1}^{m} V_i X_{ik}} \tag{1}$$

$$s.t. \quad \frac{\sum_{r=1}^{s} U_r Y_{rj}}{\sum_{i=1}^{m} V_i Y_{ij}} \leq 1 \quad ;j = 1, 2, \ldots, n \tag{2}$$

$U_r, V_i > 0$; $r = 1,2...,\ s;\ i = 1,2, ..., m;$

Where: h_k is relative efficiency of the *k*th DMU;

Y_{rj} is *r*th outputs (sales, quantity produced per week) of the *j*th DMU;

X_{ij} is *i*th inputs (cost of production, labour, equipment) of the *j*th DM

Ur is a weight of *r*th output;

V_i is a weight of *i*th input

According to equation (1), the relative efficiency scores of CCR model are the maximum of a ratio of weighted outputs to weighted inputs [27]. Since equation (1) is a linear fractional programming problem, it has a linear programming dual that can be transformed as follows:

$$\text{Min} \quad h_k = \quad \theta - \varepsilon \left[\sum_{r=1}^{s} s_r^+ + \sum_{i=1}^{m} s_i^- \right] \tag{3}$$

$$s.t. \quad \sum_{j=1}^{n} \lambda_j X_{ij} + s_i^- \leq \theta X_{ij} \tag{4}$$

$$\sum_{j=1}^{n} \lambda_j Y_{rj} \ - s_r^+ \geq Y_{rj}$$

$$\lambda_j \geq 0, s_r^+, \ s_i^- \geq \varepsilon \geq 0; \forall i, r, j$$

r = 1, 2, ..., *s*; *i* = 1, 2...., m; *j* = 1, 2, ...,*n*

ε is a small positive number;

λ_j is a weight of *j*th DMU;

s_r^+ is a slack variable of *r*th output;

s_i^- is a slack variable of *i*th input.

3. RESULTS AND DISCUSSION

3.1 Socio-economic Characteristics of Respondents

Table 1 reveals the socio-economic characteristics of the respondents. The distribution of socio-economic characteristics of the respondents shows that, 241(96 %) of the respondents are Nigerians, while the remaining 10 (4 %) are none Nigerians. Also, 4 (1.6 %) of the respondents, fell into the age group of 20-29 years, 20 (8.0%), 30-39 years, 107 (42.6%), 40-49 years, 73 (29.1%), 50-59 years, and 47 (18.7%), 60 years and above. This implies that,

most of the respondents 180 (71.7%) 40-59 were between 40 to 59 years. This age range is similar to those found out in the age of Cassava Processors in Kwara State, Nigeria, by [30] (within 40-59 years). This implies that, the processors are still within their productive age and participated actively in the initiative. Again, out of the 251 respondents, 65 (25.9%) were male and 186 (74.1%) were female. This result is similar to those of [31] who stated that, women are the main cassava processors in Southwest Nigeria, and [32], whose study concluded that, women constitute 90% of processors in Oyo state.

Table 1. Distribution of socio-economic characteristics of respondent

Personal characteristics	Frequency	Percentage (%)
Nationality		
Nigeria	241	96
Others	10	4
Age		
20-29	4	1.6
30-39	20	8.0
40-49	107	42.6
50-59	73	29.1
Above 60	47	18.7
Gender		
Male	65	25.9
Female	186	74.1
Year of experience		
1-10	53	21.1
11-20	148	59.0
21-30	38	34
31-40	8	3.2
Above 40	4	1.6
Education		
Primary School Cert	80	31.9
Secondary/O' Level	45	17.9
Vocational/Technical	20	8
Polytechnic/University	18	7.2
Not Educated	88	35
Location		
Ekiti	22	8.8
Lagos	24	9.6
Ogun	26	10.4
Ondo	60	23.9
Osun	49	19.5
Oyo	70	27.9

Source: Field Work 2016

In addition, 53 (21.1%) had 1-10 years of experience, 148 (59.0%), 11-20 years of experience, 38 (34%) 21-30 years, 8 (3.2%), 31-40 years and 4 (1.6%) above 40 years of experience. This shows that, a lot of the respondents were sufficiently experienced on the trade, to give useful responses. Furthermore, 80 (31.9%) of the respondents were holders of Primary School Certificate, 45 (17.9%), Secondary/O' Level, 20 (8%), Vocational/ Technical education, 18 (7.2%), Polytechnic/ University education, and 88 (35%) were not educated. This result shows that, a large number of the beneficiaries had Primary School Certificate or were not educated. This result is in accord with [32]. Whose study affirmed that, 80% of the cassava processors in Oyo State, did not read beyond primary school level. Once more, 22 (8.8%) resided in Ekiti State, 24 (9.6%), Lagos State, 26 (10.4%) Ogun State, 60 (23.9%), Ondo State, 49 (19.5%), Osun State, and 70 (27.9%), Oyo State. This implies that the beneficiaries in the six states were well represented.

3.2 Technical Efficiency of the MSCPEs in all the Southwest States in Nigeria, before and after the FGCTI, Using Constant Returns to Scale Technical Efficiency (Crste), Variable Returns to Scale Technical Efficiency (Vrste) and Scale Efficiencies

Table 2 shows the technical efficiency of the Micro-Scale cassava processing enterprises in all the Southwest states, before and after the PCTI. The table reveals that, before the initiative, none of the MSCPEs was 100% (1.000) technically efficient. The MSCPEs in Oyo state had approximately a mean efficiency level of 0.70, 0.88, and 0.79 crste, vrste and scale efficiency respectively. While those in Ondo state were, 0.35, 0.60 and 0.58, Osun, 0.59, 0.70, 0.85, Ekiti State, 0.29, 0.56, 0.51, Ogun state, 0.49, 0.68, 0.72, and Lagos state, 0.51, 0.71, 0.71, respectively. This implies that, majority of the states, recorded below 70% efficiency, before the PCTI. In addition, the MSCPEs were all operating at an Increasing Returns to Scale (irs). Meaning that, the more the number or quantity of input the more the number or quantity of output they produced. On the average, all the states were moderately efficient. The mean efficiency level for the MSCPEs in all the states before the initiative, were, 0.49, 0.69 and 0.69, in terms of crste, vrste and scale efficiency respectively. This means that, before the initiative, there was a scope of increasing processed cassava products between 31% and 51% in the short run, by adopting more efficient technologies and techniques used by the best cassava processing enterprise in Southwest states of Nigeria. This result is different from that of [16], who carried out a study on analysis of

Table 2. Technical efficiency for the MSCPES in all the southwest states of Nigeria, before and after the PCTI, using crste, vrste and scale efficiencies

MSCPEs in each state	Before				After			
	Crste	Vrste	Scale	RTS	Crste	Vrste	Scale	RTS
Oyo	0.697	0.878	0.794	Irs	0.891	0.901	0.989	Irs
Ondo	0.348	0.599	0.581	Irs	0.760	0.873	0.871	Irs
Osun	0.591	0.698	0.847	Irs	0.795	0.894	0.889	Irs
Ekiti	0.287	0.561	0.512	Irs	0.569	0.811	0.702	Irs
Ogun	0.487	0.676	0.720	Irs	0.810	0.899	0.901	Irs
Lagos	0.505	0.709	0.712	Irs	0.789	0.821	0.961	Irs
Mean	**0.486**	**0.687**	**0.694**		**0.769**	**0.867**	**0.885**	

Source: Field work 2016
Crste = Technical efficiency from CRS (constant return to scale) DEA;
Vrste = Technical efficiency from VRS (variable return to scale) DEA
Scale = Scale efficiency = crste/vrste
Irs = Increase return to scale
Drs = decrease return to scale
Note also that all subsequent tables refer to Vrste results

policy issues in technical efficiency of small scale farmers using the stochastic frontier production function: With application to Nigerian Farmers. This study, which was carried out before the PCTI, revealed that, there was a wide difference in the estimated technical efficiencies, varying between 0.18 and 0.91, with a mean value of 0.63. This implies that, there was a wide room for improvement in the technical efficiency of the farmers.

However, after the initiative, the MSCPEs in Oyo state, recorded a mean efficiency of approximately, 0.89, 0.90, and 0.99% efficiency, under crste, vrste and scale efficiency respectively. While those in Ondo state recorded, 0.76, 0.87 and 0.87, Osun, 0.80, 0.89, 0.89, Ekiti State, 0.57, 0.81, 0.70, Ogun state, 0.81, 0.90, 0.90, and Lagos state, 0.79, 0.82, 0.96, respectively. This means that, all the states, except Ekiti, recorded above 70% efficiency, under, Crste, Vrste and scale efficiency after the PCTI. Again, the MSCPEs were all operating at an irs. Meaning that, the more the number or quantity of inputs they used, the more the number or quantity of output they produced. The mean efficiency level for the MSCPEs in all the states, after the initiative were, 0.77, 0.87 and 0.89, in terms of crste, vrste and scale efficiency respectively. This implies that, although none of the states attained optimum (100%) level of efficiency, the MSCPEs in all the states were more efficient after the PCTI. The result shows that, after the initiative, the farmers' efficiency improved. Although the farmers still had room to increase their efficiency by 11% and 23%, via better use of available resources to them, and given the current state of technology. This result is in agreement with that of [23], who carried out a study on the effect of presidential initiatives on cassava production efficiency in Oyo State – Nigeria. The study employed the stochastic frontier function model. The findings revealed that the pilot phase of Presidential Initiative on Cassava (PIC) was successful. Farmers under PIC were young, educated, and they belonged to food crop organization. They also had linkage with extension services on cassava production and that there was a significant difference between the harvested output of cassava of PIC farmers and non-PIC farmers. Also, the harvested output of cassava roots per unit of land of the PIC farmers more than doubled that of non-PIC farmers and PIC famers were more efficient technically than non-PIC farmers. Consequently, the PIC programme positively improved cassava productivity and technical efficiency.

The result is also similar to that of [17], who carried out a study on the technical efficiency analysis of mechanized cassava farmers in Afijio Local Government Area of Oyo State, Nigeria. In the study, data was analyzed using descriptive statistics and Stochastic Frontier production function. The study disclosed that, the technical efficiency of the farmers ranged from 58 – 92% with a mean of 78%. Also similar to this study is that of [18]. This study was on productivity and technical efficiency involved in cocoa production in Nigeria. The stochastic frontier production function analysis was employed in the study. The study revealed that, that farmers experienced increasing returns to scale in the use of their resources. The efficiency level of the farmers ranged between 0.11 and 0.91 with a mean of 0.72 and a lot of the farmers had efficiency of between 51% and 80%. Again, [12] assessed the

technical, economic and allocative efficiency of Small Farms in Osun State of Nigeria. The study revealed that, the cost (economic efficiency) efficiency estimated among the farmers. varied between 0.325 and 0.952 with a mean value of 0.807. In addition, [6] examined the economic efficiency of small scale cassava farmers in Ogun State, Nigeria, and their results showed that, the efficiency of the cassava growers ranged between 88.69 and 100 with a mean of 89.4. They concluded that, there is sufficient room for the farmers to increase their efficiency with their current resource base and available technology.

Also, [20]'s analysis of technical efficiency of smallholder cocoa farmers in Cross River State, Nigeria, employed the stochastic frontier production function analysis in their study. The result of the analysis revealed that, the farmers experienced decreasing but positive returns to scale in the use of their farm resources, and their efficiency level was between 0.20 and 0.93 with a mean of 0.69. A lot of the farmers (79%) had efficiency of between 61% and 90% while a small number of them (21%) had efficiency of less than 60% in their production process. [22] carried out a study on the economic analysis of resource use efficiency among small scale cassava farmers in Nasarawa State, Nigeria: implications for agricultural transformation agenda. The used stochastic frontier production function to analyze the efficiency of inputs used by the farmers, in their production of cassava. Their findings revealed that, farmers were inefficient in the use of resources. The technical efficiency of the farmers ranged from 0.342 to 0.971 with mean value of 0.873, meaning that the farmers still had room to raise their efficiency in the use of inputs to fill the gap of 0.107, and attain 100% efficiency. These results are in accord with that of [16], whose study was carried out before the FGCTI. The study, revealed that the farmers have been operating within similar efficiency range with these studies, before the FGCTI, using rudimentary implements. This signifies that, the farmers may not largely have access to the improved technology provided by the initiative, otherwise, they may have attained 100% efficiency after the initiative. However, the result is different from that of [9], who carries out a study using estimated translog stochastic profit function and economic efficiency model for cassava based farmers in Southern Wetland region of Cross River State, Nigeria. The study revealed that, the cassava farmers had an average economic efficiency of about 0.58. This means that the farmers do not make efficient use of their resources. This result contradicts the result of the other studies that were carried out above, after the initiative.

Nonetheless, for the MSCPEs to become 100 efficient, they will need more improved method of processing cassava, including: peeling washing, drying, and frying. According to [33], bulk of the respondents (98.6%) under their study used manual peeling method (knives and short cutlasses) while only 1.4% used mechanical peeling device. Also, [2] affirmed that, productivity in agriculture is static, because of the inaccessibility of inputs and technologies and weak market linkages. Consequently, very little value is added to processing and there is high post-harvest losses. In agreement with [2,34] concluded that, low yields in arable crop production result from the use of inefficient production techniques, which is occasioned by labour-intensive agricultural technology, technical and allocative inefficiencies, and over-dependence on household resources. However, this has nothing to do with regional location because [20] who analyzed the technical efficiency of smallholder cocoa farmers in Cross River State, Nigeria, has similar results with others who carried out similar studies in other region in Nigeria. The Cronbach Alpha coefficient for the questions used to determine the effect of the initiative on the efficiency of the Micro-Scale cassava processing enterprises in the study area, is 0.774. That means, the reliability of the research instrument used is higher than 0.7, which implies that, the result is high and it is appropriate for social science.

3.3 Distribution of Average Slacks for Quantity of Outputs (kg) and Sales (naira) per Week of the MSCPEs in all the Southwest States in Nigeria, before and after the PCTI

Table 3 shows that, the average slack values for quantity of output and sales, before the PCTI were 31.99 kg and ₦11196.80 respectively, while the average slack values for quantity of output and sales, after the PCTI were 12.67 kg and ₦4434.5 respectively. This implies that the Micro–scale enterprises in Southwest Nigeria, on the average, needed to increase their quantity produced and sales per week, by these extra figures, in equal proportions, before and after the PCTI, in order to attain optimum technical efficiency and reach the production frontier. This

implies that, after the PCTI, the average slack of quantity of output and sales per week that need to be increased by the MSCPEs in all the states, in order to reach efficiency level, reduced. This shows that the efficiency level of the MSCPEs in all the states increased after the PCTI, and the MSCPEs were closer to reaching optimum production output and sales, after the initiative.

Table 3. Distribution of average slacks of quantity of outputs (kg) and sales (naira) per week for the MSCPEs in all the Southwest states in Nigeria, before and after the PCTI

Slack output	Before mean value	After mean value
Quantity of output	31.99 kg	12.67 kg
Sales	₦11196.80	₦4434.5

Source: Field work 2016

3.4 Distribution of Average Slacks of Inputs for Labour, Number of Equipment and Cost of Production of MSCPEs in all the States, before and after PCTI

Table 4, presented the average slack values for labour, number of equipment, and cost of production before and after the initiative. The table, reveals that, the Micro-scale enterprises in all the States, needed to reduce their number of labour, number of equipment, and cost of production, by 5 persons, 4.19 units and ₦12,061.98 respectively, in order to reach optimum technical efficiency before the PCTI. Also, the MSCPEs need to reduce their number of labour, number of equipment, and cost of production, by 2 persons, 1.01 units and ₦3,986.76 respectively, in order to reach optimum technical efficiency after the PCTI. Again this shows that, after the initiative, the MSCPEs moved closer to attaining optimum technical efficiency, since their slack values reduced.

Table 4. Average slacks of inputs before and after PCTI for labour, number of equipment and cost of production

Inputs	Before mean value	After mean value
Labour	5.02	2.12
Number of equipment	4.19	1.01
Cost of production (naira)	12,061.98	3,986.76

Source: Field Work 2016

3.5 Distribution of Peers and Weights of the MSCPEs before and after the PCTI

According to Table 5, it was indicated that for MSCPEs in each state to reach optimum production efficiency, the MSCPEs in the inefficient states, need to emulate those in the states with the highest peer weight as indicated by asterisk in the Table. That means, the MSCPEs in Ondo, Ekiti, Ogun and Lagos states, needed to emulate and peer with those in Oyo state (being those with the highest peer weight), before the PCTI, to be efficient. While after the PCTI, those MSCPEs in Ondo, Osun, Ekiti, and Ogun states, need to peer with those in Oyo States. Meaning that, before the PCTI, the MSCPEs in Oyo and Osun states were the most efficient peers and operating at the most productive scale size. While after the initiative, the MSCPEs in Oyo and Lagos states were the most efficient peers. This is because they had the highest peer weight among all the peers in any of the cases as depicted on the Table. Hence, they are the most suitable MSCPEs in the respective states, whose operating practices should be studied by the MSCPEs in the inefficient states.

Table 5. Peers and weights of the MSCPEs before and after the PCTI

Firm in each state	Before	After
	Peers (weight)	Peers (weight)
Oyo (1)	1	1
Ondo (2)	1(0.891*); 3(0.132)	1(0.452*); 6(0.023)
Osun (3)	3	1(0.075*)
Ekiti (4)	1(0.371*); 3(0.012)	1(0.871*); 6(0.432); 5(0.011)
Ogun (5)	1(0.891*)	1(0.102*)
Lagos (6)	1(0.761*)	6

Source: Field Work 2016

4. CONCLUSION

It can be inferred from the summary of findings above that the PCTI enhanced the efficiency of the MSCPEs. Their efficiency increased in each state after the initiative. Which implies that the PCTI helped to increase the efficiency of the MSCPEs in all the states, after the initiative. The result revealed that, the efficiency of the MSCPEs in all the States, after the PCTI was greater than the efficiency of the MSCPEs after the initiative. The average scale efficiency for all the states was observed to increase, from 69.4% before the initiative, to 88.5% after the initiative. The increase in efficiency of the MSCPEs in all the states shows that PCTI increased the efficiency of the MSCPEs in Southwest Nigeria.

Also, the average quantity of output of the MSCPEs in all the Southwest states in Nigeria, were lower than the quantity of outputs required to achieve their optimum production efficiency, while the average quantity of inputs that need to be utilized for the MSCPEs to obtain their optimum production efficiency were too high.

5. RECOMMENDATIONS

It is therefore recommended that, policies that will help to further reduce the proportion of the MSCPEs' inputs to outputs be initiated in order for them to attain optimum efficiency level of 100%. The MSCPEs in Southwest Nigeria, on the average, need to increase their average quantity of outputs in equal proportions, and reduce their average inputs in order to attain optimum technical efficiency and reach the production frontier. In addition, the MSCPEs in the inefficient states, need to emulate those in the states with the highest peer weight, in order to attain the higher level of average efficiency of the MSCPEs in those efficient states.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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