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An Assessment of Innovation Capability of Artisanal Fabricators of Oil Palm Fruit Processing Machines in Nigeria

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ABSTRACT

This study assessed the innovation capability of artisanal fabricators of oil palm fruit processing machines in Nigeria with a view to developing policy mechanisms that will improve the quality of machines produced in the sector. The study was conducted in six States in Nigeria based on oil palm fruits production propensity. They are; Osun, Ondo, Kogi, Edo, Akwa-Ibom, and, Imo. Using appropriate research methods, the study revealed that the fabricators agreed (on a five-point Likert scale) that number of years spent learning machine fabrication (mean rating 4.3) and availability of training opportunities for fabricators (4.01) influenced the innovation capability of the artisans. The respondents also agreed that technical education (3.70), conducive and safe working environment (4.10), state of equipment and tools (4.4) and access to machine fabrication information (3.67) were other factors that enhanced innovation capability of the artisans. The respondents however, strongly agreed (4.5) that the availability of newly developed fabrication technology in the industry influenced innovation capability. The study concluded that attention should be given to enhanced technical training of the artisans and that efforts should be made to equip them with the latest and modern methods of fabrication. This may bring about standardization of the machines fabricated in the sector.

Keywords:
Innovation Capability, Artisanal Fabricators, Oil palm fruits, Processing

INTRODUCTION

There is no strategic planning aimed toward development that will not take into consideration the operational innovation capabilities of the workforce needed to steer such development. Global industrialization is a 'sine qua non' for the rapid competitiveness of any economy which depends on its level of innovation in science and technology (Malerba and Nelson, 2010; Feng *et al.*, 2020).

In a world of intense competition, where the technological prowess of firms primarily determines their leadership positions, it is of paramount importance for firm's capability to be amplified through persistent development.

Nigeria lost her position as the world's largest producer of oil palm to Malaysia and Indonesia due to the lack of dedication to oil palm cultivation (Teoh, 2002). The neglect of the agricultural sector for petroleum products is what led to the decline in ranking. In West Africa, where oil palm production is primarily at subsistence-level and small-scale, spanning less than 7.5 hectares, commercial large-scale oil palm plantation farming is a relatively new phenomenon. Dispersed smallholders who gather semi-wild plants and employ manual processing methods account for 80% of production in Nigeria (Obayelu *et al.*, 2020). According to Oyedeji *et al.* (2020), several million smallholders are spread over an estimated area of 1.67 million hectares in the Southern part of the Country. Among the small-scale producers, traditional or semi-mechanized methods are used for oil extraction from the fresh fruit bunch (Omereji, 2005; Olagunju, 2008). Additionally, processing frequently uses out-of-date machinery. The oil produced is often minimal, and this method of processing oil palm is laborious and time-consuming. Processing frequently results in the loss of between 25% and 75% of the potential oil that could be extracted from the oil palm fruits (Ogunmola *et al.*, 2019). Gourichon (2019) in a study revealed that cost of procurement of equipment is very high and it is a major problem of oil palm fruits extraction business in Nigeria (Gourichon, 2019).

Artisanal fabricators of the oil palm fruit processing machine sector have reached the point in its history where change is inevitable with the majority of small-scale producers in the Nation continuing to use conventional methods, while a select minority only use processing technology appropriate for a certain stage in the process (Adejuwon *et al.*, 2014). The sector needs this transition, mostly in the form of improved technological competence, to enter the global village that all nations are now finding themselves in. Thus, advancing oil palm fruits production in Nigeria and altering the decline from a previously highly-ranked position among the committee of nations in oil palm fruits production and palm oil extraction. Lack of distinctive artisanal fabricators of oil palm handling machines as far as innovative and capability ability is concerned locally has prompted high assembling costs, and importation of processing machinery from foreign countries.

Findings also point to the fact that the current artisanal workforce is getting older and young and able bodies are not interested in apprenticeship programs. All of these factors, along with the fact that Nigeria lacks adequate structures, are believed to be major factors in the Country's poor performance in providing artisans who are highly skilled. Currently, training is insufficient to keep pace with the demand for qualified artisanal fabricators. This situation is also aggravated by the high retirement rates of experienced workers (Shehu *et al.*, 2021). Aging and retirement have been repeatedly identified as a factor responsible for the shrinking pool of skilled and qualified fabricators in the oil palm industry (Shafee *et al.*, 2019). The authors also reported that the average age of skilled and qualified workers in the Nigerian oil palm fruits processing fabricating machines industry is not encouraging.

The problem is made worse by lack of deployment of technological innovation in the cultivation, production, and processing of oil palm in Nigeria, basically due to improper agricultural policies targeted at the sector. A study in this regard may therefore shed some light on policy mechanisms and management practices that may be applicable in enhancing innovation capability in the oil palm fruit processing machine fabrication industry; hence, this study.

LITERATURE REVIEW

Nigeria's economy suffers from structural flaws and continues to be a consumer-based economy as a result of the failure of indigenous engineering personnel to comprehend and assume the lead role in processing and utilizing the Country's abundant

natural resources for industrial development. Technological capability of most firms in the country is low and the chances of improving on the technological capability are also low. As Mahapatro (2022) considered, technical capability is actually a collection of skills that are manifested in a company's performance through various technological actions. Its main goal is to guide a firm against value management through fostering organizational skills.

Additionally, technological capability is to be viewed in the form of a broad range of qualities that support a firm's technological strategies has been proposed. Strategic technological capability is a term used to describe the ability to develop a new method or product combining value creation and competitive strategy. According to the vast majority of academic definitions, technological capability in this context refers to the capacity to significantly improve existing technologies, which will result in the development of new technologies. According to Lall (1992), technological capability is the set of abilities required to efficiently assimilate, master, and advance existing technologies before going on to develop new ones.

Numerous indicators that can be used to gauge over the years, the degree or extent of technological skills at the organizational level has been determined (Sobanke, 2012). These include the capacity for production, investment, technological, and connectivity. A number of these metrics fashioned after technological capability are based on the functionality and complexity of the four main technological capability types that have been recognized in the literature. These are production, investment, linkages and innovation capability (Lall, 1992; Biggs *et al*., 1995; Oluwale, Ilori, and Oyebisi, 2013; Fagbemiro *et al*., 2020).

Innovation capability means the capability to discover new methods or techniques of carrying out activities in a firm which includes inventing, producing, operating and supplying. Egbetokun (2009) expressed that innovation capability is an inquiry into capabilities and capacity of individuals or firms to achieve the specific purpose of exploring new ways of doing things to generate a new technologies (Romijn and Albaladejo, 2002). Lall (1992) maintains that innovation capability is the ability and experience appropriate for gripping, mastering and enhancing established technologies for progressing to advanced technologies. Various organizations have utilized innovation capability in the activities that cut across levels in discovering, inventing, innovating, and advancing in the available technology that surpasses previous design structures (Kim, 1997). It may also mean, according to Sobanke *et al.* (2012) the ability to effect change, improve or enhance and modify current technologies, and to develop or design new and effective technologies.

METHODOLOGY

The aforementioned has raised some inquiries regarding the operational innovation of artisanal fabricators of oil palm processing machines in six major oil-producing states in Nigeria.

This study was conducted in six states (Osun, Ondo, Edo, Kogi, Akwa Ibom and Imo) of Nigeria which are major producers of oil palm fruits. The study area is selected based on economic viability, productivity and accessibility. More importantly, Southern Nigeria was reported as an oil palm fruits belt with maximum activities of oil palm fruits processing at different levels of operations (Ini-mfon *et al*., 2013). Furthermore, these states were selected to capture succinctly the technological capability of the artisanal fabricators of oil palm fruits processing machines in Nigeria.

A set of structured questionnaire was used to collect primary data. The questionnaire was administered on artisanal fabricators. Twenty fabricators were selected randomly from each State making a total of 120 respondents for questionnaire administration. The study used a pre-test method, by using artisanal fabricator workshops in the selected states for the pilot testing study. Pilot testing of data collection instruments was carried out and reviewed to ascertain the validity and reliability of data collected and their operational effectiveness. Effort was made to ensure that the questionnaire was relevant to the research objectives of the study. The questionnaire also elicited information on the types of machinery produced by the artisans. It was also used to provide information on the innovation capability of the artisans such as staff strength, ability to interpret technical drawings, number of machines fabricated since inception of the company, precautionary measures taken while fabricating and perceived hazards associated with fabrication. A five-item agreement Likert scale was used to measure whether the respondents agreed that factors such as the ability

to effect change, improve or enhance and modify current technologies, and to develop or design new and effective technologies affected their ability to innovate. Effort was also made to explain to the respondents in their local languages where they did not understand the questions. Data were analyzed using descriptive and inferential statistical tools such as, frequencies, percentages, and mean ratings.

RESULTS AND DISCUSSION

Table 1 shows the basic characteristics and profile of the selected artisanal fabricators in the study area. About 99.06% of the respondents are male and only 0.94% are female. This shows that oil palm fruit processing machine fabrication in the study area is not gender balanced. Several reasons have been put forward in literature to unravel the mystery behind the reluctance of most African women to engage in machine fabrication. Some have alluded it to traditional beliefs that the god of iron forbids women to work on iron (Roberts and Berns, 2018). Similarly, there is a wrong notion that technology is masculine, and any woman seen to venturing into it, usually feels intimidated. This will not make any woman wanting to go into fabrication receive support from the community, particularly in Africa, where some old traditions limit the woman's role in the society to the kitchen and other household chores (Bassey and Bubu, 2019). African societies are patriarchal. Patriarchy is a hierarchical social system in which dominant males have control over females, children and other "weaker" and marginalized people. In a patriarchal society, this kind of social control penetrates all levels of society and all social institutions, including the institution of marriage (Bond *et al*., 2012). About 10% of the respondents are within the age brackets of 20-29 years, 18.87% are within the age bracket of 30-39 years, while 39.62% are within the age group of 40-49 years. Those within the age brackets of 50-59 years represent 21.69% of the total respondents while 9.44% were above 60 years old.

The results also revealed that 91.51% of the respondents were married, 7.55% were single, while only 0.94% were separated. Educational qualifications of the respondents showed that 8.49% of the respondents had no formal education. About 28.3% of the respondents had primary school education, 48.11% were secondary school graduates, 8.49% held National Diploma degrees, while 4.72% of the respondents were Higher National Diploma graduates. Only 1.89% of the respondents acquired University education. There was no respondent with a postgraduate degree among the respondents.

Table 1: Socio-economic Characteristics of Respondents (Fabricators)

Characteristics	Frequency (106)	Percentage %
Gender		
Male	105	99.06
Female	1	0.94
Age		
20 – 29	11	10.38
30 – 39	20	18.87
40 – 49	42	39.62
50 – 59	23	21.69
>60	10	9.44
Marital Status		
Married	97	91.51
Single	8	7.55
Separated	1	0.94
Educational Qualification		
None	9	8.49
Primary Education	30	28.3
Secondary Education	51	48.11
ND	9	8.49
HND	5	4.72
First Degree	2	1.89
Post Graduate	0	0

The results from Table 2 show that 88.68% of the respondents had no training after apprenticeship while 11.32% were exposed to training. About 84% of the fabricators could not interpret machine drawings while 16.04% could. Approximately 67% of the respondents had between 1 to 5 workers in their workshops, 29.25% had between 6 to 10 workers, while 3.77% of the respondents had more than 10 workers. About 14% of the respondents had completed between 1-5 oil palm fruit processing machines within their years of establishment while 62.26% of the respondents had completed between 6 to 10 machines since they began operations. About a quarter of the respondents had completed more than 10 machines since inception. Majority (96.23%) of the fabricators belong to a trade union or association. Also Majority (96.23%) of the fabricators had hazard prevention knowledge while only 3.77% of the respondents were not skilled in safety protocols. Majority (90.75%) of the fabricators acknowledged that fabrication is a profitable business while only 9.43% claimed it is not a profitable venture. The findings of this study are in line with the study of Shehu *et al.* (2021) and Owolarafe *et al.* (2023).

Table 2: Socio-economic Characteristics of Respondents (Fabricators) Contd.

Characteristics	Frequency (106)	Percentage (%)
Training Since Graduation		
Yes	12	11.32
No	94	88.68
Ability to interpret Drawing		
Yes	17	16.04
No	89	83.96
Staff in Workshop		
1 – 5	71	66.98
6 – 10	31	29.25
>10	4	3.77
Number of Machines Completed		
1 – 5	15	14.15
6 – 10	66	62.26
>10	25	23.59
Association Membership		
Yes	102	96.23
No	4	3.77
Knowledge of Fabrication Safety		
Yes	102	96.23
No	4	3.77
Is Fabrication Prosperous		
Yes	96	90.57
No	10	9.43

Table 3 shows the variables considered in the assessment of the factors that affect innovation capability of the artisanal fabricators of oil palm fruit processing machines in the study area. The number of years spent learning machine fabrication is the period a fabricator spends to learn how to fabricate machines. Based on ratings, it was observed that the respondents agreed that the number of years spent learning machine fabrication (mean rating 4.3) and availability of training opportunities for fabricators (4.01) influenced the innovation capability of the artisans. The respondents however, strongly agreed (4.5) that the availability of newly developed fabrication technology in the industry influenced innovation capability. The respondents also agreed that modification of technology adopted (3.99), technical education (3.70), conducive safe working environment (4.10), state of equipment and tools (4.4) and access to machine fabrication information (3.67) were factors that enhanced innovation capability. The fabricators strongly agreed (4.6) that presence of established precautionary measures for protection in the course of fabrication enhanced innovation capability.

Table 3: Innovation Capability Assessment of the Artisanal Fabricators of Oil Palm Fruits Processing Machines in Nigeria

DESCRIPTIONS	SD	D	U	A	SA	MEAN	SD
Years of Learning	0(0)	0(0)	0(0)	101(95.83%)	5(4.72%)	4.3	0.234
Training	0(0)	0(0)	6(5.66%)	95(90%)	6(5.66%)	4.01	0.094
New Technology Usage	0(0)	0(0)	0(0)	91(85.8%)	15(14.2%)	4.5	0.267
Technology Improvement	0(0)	0(0)	10(9.43%)	95(90%)	1(0.94%)	3.99	0.16
Technical Education	0(0)	8(6.79%)	0(0)	89(84.2%)	9(8.5%)	3.7	0.094
Health Safety and Environment	0(0)	0(0)	10(9.43%)	96(91.45%)	0(0)	4.1	0.231
Precautionary Measures	0(0)	0(0)	0(0)	9(8.49%)	97(91.51%)	4.6	0.098
State of Equipment and tools	0(0)	0(0)	0(0)	100(94.33%)	6(5.66%)	4.4	0.341
Information Accessibility	0(0)	20(16.7%)	0(0)	70(66.7%)	16(15.09%)	3.67	0.176

Key Note: SD= 1, D= 2, U= 3, A= 4, SA= 5 (SD= Strongly Disagree, D= Disagree, U= Undecided, A= Agree, SA= Strongly Agree)

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The artisanal fabricators of oil palm fruit processing machines in Nigeria are predominantly (99%) male and 90% are between 21 to 59 years of age. It is interesting to know that about 70% of the fabricators have either primary or secondary school education, while 13% have one form of tertiary education or the other. Also, about 98% of the respondents learnt how to fabricate by informal apprenticeship. The study concluded that perational factors influencing innovation capability were; years of learning and training, new technology for fabrication, technology improvement, technical education, healthy and safe work environment, presence of precautionary safety measures in working area, state of equipment and tools, and information accessibility.

The implication of these findings is that in order to assess the operational innovation of artisanal fabricators of oil palm fruit processing machines in Nigeria and to contribute meaningfully to the industrial and economic growth in the Country, the following policy recommendations are suggested: Attention should be given to technical training for the artisanal fabricators so that they will learn how to improve their profession regarding the categories of machines to produce.

In addition, a conscious effort is required to raise the bar regarding the factors impacting the innovation capability of the artisans in order to equip them with latest and modern methods of fabrication. This may bring about standardization of the machines fabricated.

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Jovic Mill at Ipetumodu, Osun State

Locally Fabricated Grinder by Mr. Nyabuk at Eket LGA, Akwa Ibom

An Artisanal Fabricator with a Locally Fabricated Oil palm fruits Boiler Tank by Dantale at Anyigba Dekina LGA, Kogi State

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