Capability of fabricators in fabrication of special palm oil equipment in Nigeria

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Abstract: This study assessed some fabricators' technical know-how in the production or fabrication of machines used for the production of special palm oil (SPO). The study also examined facilities possessed by the fabricator with the aim to providing intervention that would abridge the widening demand gap between the demand and supply of SPO for domestic and industrial applications. Multistage sampling technique was used to select 98 fabricators as respondents across four geopolitical zones where palm oil is produced in Nigeria. A well-structured questionnaire and an observant check list were used to collect data relevant to the objectives of the study from the respondents. The collected data were collated with Epidata application and analyzed with the Statistical Package for the Social Sciences (SPSS). Descriptive statistics such as frequency distribution and mean were used to summarize the data while inferential statistics such as Chi-Square and multiple regression were used to make deductions. Findings of the study showed that majority of the respondents were within the age of bracket of 40 and 49 and had West African Examination Certificate or its equivalent as major educational qualification. Average income generated per year based on their primary occupation and other occupation were $718.01 and $658.18 respectively. There was a highly significant relationship between membership of organization and the information received at p = 0.05 probability level. Majority of the respondents said they learned the art of fabrication informally from someone. They had limited and dysfunction number pieces of equipment for bending, rolling and lathing, which hindered, the fabrication of machines involved in the production of SPO.

Keywords: special palm oil, low-supply, appropriate- technology, fabricator, technical-know, capacity

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1 Introduction

Two types of palm oil produced in Nigeria are technical and special oil. Both forms of palm oil find applications at domestic and industrial levels in the country. The Technical palm oil is relatively of low quality oil with high free fatty acid content and moisture content. It is used mainly in many households for cooking food and in some cottage for soap making etc. The use of this oil has influence on the cost of production and final quality of products. Special palm oil (SPO) is of high quality. The oil has less than 3%

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free fatty acid content and less than 1% moisture content. This oil is used by many large-scale food and agro-allied industries. Considering the structure of the Nigerian food and agro-allied industries, both types of oil are in a huge demand. There are persistent demand gaps for the both forms of oil. The demand gap for SPO is, however, relatively higher. As a result, most industries utilizing SPO in Nigeria rely mainly on importation (Elekwachi et al., 2012).

The low production of SPO in Nigeria has been traced to lack of appropriate technologies for small and medium scale mills who are responsible for more than 80% of the Nigerian palm oil. Large-scale mills involved in the production of SPO source nearly all the sets of equipment and spares outside the country. The initial cost of procurement of these machines as well as the maintenance cost are beyond the reach of the small scale and medium scale processors. Furthermore, some medium and large-scale mills that dabbled into the production of SPO folded up due lack of spare parts and huge maintenance cost (Owolarafe et al., 2021). According to the United States Department of Agriculture (2021), the supply gap for palm oil would increase in subsequent years if appropriate technologies are not put in place to increase the cultivation and processing of palm oil.

Considerable research efforts have been made in some Research and Development institutions in Nigeria and outputs deployed for the use of local processors in the palm oil industry (Owolarafe et al., 2002, 2007, 2009; Badmus et al., 2019; Morakinyo and Bamgboye, 2016, 2019). Reports had it though the extraction efficiencies of the technologies developed by these researchers are very high, the quality of the oil produced fall short of that of SPO. However, each of the unit operation in pam fruit processing (viz: fruit sterilization, fruit stripping, fruit digestion, oil extraction, oil clarification) have been mechanized. The gap observed to produce SPO is having bunch sterilization system as against stripping of fruit from fairly fermented bunches (such that the action of lipolytic enzyme can be curtailed and hence reduce the FFA content of the oil) as well as having other accessories such as decanter, drying unit etc. It is opined that the local fabricators that have been trained and engaged in the production of these unit operations' machines should be amenable to upgrading of their facilities to that of production of SPO production equipment. It therefore become imperative to assess the capability of these fabricators in terms of knowledge and fabrication equipment to provide an insight on how they can be elevated to production of the SPO and sustainability of this system.

2 Methodology

To assess the technological capabilities of one of the fabricators in palm oil production in Nigeria, a team of experts examined the research proposal and designed questionnaires. After sampling techniques and sample sizes for each study area (Akwa Ibom, Edo, Imo, Kogi, Ondo, and Osun States; with latitudes and longitudes of 5.0 and 7.8, 6.3 and 5.6, 5.5 and 7.0, 7.8 and 6.7, 7.3 and 5.2 and 7.6 and 4.2, respectively) were critically examined, appropriate sampling sizes were adopted. Selection of the respondents was made using a multi-stage sampling procedure (stage 1 – zoning, stage 2 – available processors in each state, stage 3 – application of Slovin's formula to select respondents).

$$n = \frac{N}{1+Ne^2} \quad (1)$$

Where n = sample size, N = population of processors. and e = error margin which is usually about 0.05 (Indarti et al., 2017).

The sample size of respondents was adopted as Akwa Ibom (18), Edo (22), Kogi (9), Imo (20), Osun (14), and Ondo (15). The field survey was conducted within two months (spanning January and February, 2021). The fabricators were interviewed on their demographic characteristics, equipment for fabrication of machines, average income per annum, rate of knowledge of fabrication of oil palm fruit processing machine, fabrication of machines for production of SPO among others.

The data obtained from the questionnaires (a total of 98) was analyzed using Statistical Package for the Social Sciences (SPSS) software v26 (2021), and

inferences were provided.

3 Results and discussion

3.1 Socio-demographic characteristics of the fabricators

The mean age of the respondents was 44.1 years while the majority of the respondents were in the age range of 40 and 49 just as many were in the age bracket of 30 and 39 years. This implies that a significant number of the fabricators were still in active age bracket, often characterized with high productivity and innovation adoption proneness. As such, they were still energetic. It is known that as age increases, activity declines. So, fabricators in the age bracket of 51 years and above are already getting old with regards to fabrication works. Majority (88.8%) of the respondents were married. The respondents' average household sizes for male and female members were three apiece. This equal distribution of male and female genders in the respondents' households indicates that nature has given each gender equal opportunity to be socialized in fabrication of machines. Since in African context, household members are often socialized in the livelihood activities of their respective household heads. The equal distribution also suggests that the extant gender disparity (male 98.8% and female 1.2%) in genders' involvement in the fabrication of machines are not biologically determined, as the proponents of the ideas that 'anatomy is destiny' would argue.

Many (83.7%) of the respondents were full-time fabricators. However, the respondents had limited formal education. Only 16.6% of the respondents had post-secondary education, 46.1% and 29.2% had WAEC/NECO and FSLC, respectively. This level of education may influence the respondents' adoption of new technologies. Majority (71.9%) of respondents were member of an organization. Association membership has high influence on technology adoption in agriculture. Such membership offers an effective platform for information dissemination and inculcating adoption inclined behaviors with respect to innovations on machines fabrication.

The average staff strength was 4. Majority (74.5%) of the respondents had staff in the range of 1 and 5 while 17% had between 6 and 10 staff members. Majority of the respondents had average annual income within the range of $239.34 and $1196.69 while many were in the income bracket of $119.67 and $1196.69 from their primary occupation and fabrication palm oil equipment as occupation, respectively.

3.2 Effect of membership of any organization on taking fabrication as occupation

Findings in Table 1 showed that many (75.81%) of the respondents learned skills for fabrication through apprenticeship. Only 11.36% of the respondents claimed to have been born with the skills. This finding is consistent with the view of Peil (1979), who suggested that about 90% of the fabricators acquired skills through apprenticeship. Lundvall (1985) posited that those who acquired fabrication skills through university education learned through codified modes of learning and maybe orientated towards scientific-based methods of fabrication. Training is highly important for acquisition of improved skills in fabrication of machines. Innovations on machine fabrication may be disseminated through further training and retraining of apprentices and masters who always learn by observing and doing.

Table 1 Membership of any organization and fabrication as occupation

Membership of organization		Fabrication as occupation		
		No	Yes	Total
I was born with the skill of fabrication	No	20(80.00)	5(20.00)	25
	Yes	58(92.06)	5(7.94)	63
	Total	78(88.64)	10(11.36)	88
I learned from School	No	23(92.00)	2(8.00)	25
	Yes	55(87.30)	8(12.70)	63
	Total	78(88.64)	10(11.36)	88
I learned informally from someone	No	9(36.00)	16(64.00)	25
	Yes	15(24.19)	47(75.81)	62
	Total	24(27.59)	63(72.41)	87

Table 2 Membership of any organization and how frequent information received

Membership of organization		How frequent information is received						
		Never	Rarely	Occasional	Often	Very Often	Always	**Total**
Family member	No	14(56.00)	5(20.00)	3(12.00)	1(4.00)	2(8.00)	0(0.00)	**25**
	Yes	20(31.25)	10(15.63)	20(31.25)	5(7.81)	4(6.25)	5(7.81)	**64**
	Total	34(38.20)	15(16.85)	23(25.84)	6(6.74)	6(6.74)	5(5.62)	**89**
Neighbors	No	14(56.00)	2(8.00)	5(20.00)	3(12.00)	0(0.00)	1(4.00)	**25**
	Yes	9(14.29)	17(26.98)	18(28.57)	8(12.70)	4(6.35)	7(11.11)	**63**
	Total	23(26.14)	19(21.59)	23(26.14)	11(12.50)	4(4.55)	8(9.09)	**88**
Extension agent	No	11(45.83)	5(20.83)	5(20.83)	1(4.17)	2(8.33)	0(0.00)	**24**
	Yes	24(40.00)	7(11.67)	20(33.33)	6(10.00)	2(3.33)	1(1.67)	**60**
	Total	35(41.67)	12(14.29)	25(29.76)	7(8.33)	4(4.76)	1(1.19)	**84**
Radio	No	15(60.00)	5(20.00)	3(12.00)	2(8.00)	0(0.00)	0(0.00)	**25**
	Yes	24(38.71)	8(12.90)	22(35.48)	6(9.68)	2(3.23)	0(0.00)	**62**
	Total	39(44.83)	13(14.94)	25(28.74)	8(9.20)	2(2.30)	0(0.00)	**87**
Television	No	13(52.00)	5(20.00)	4(16.00)	3(12.00)	0(0.00)	0(0.00)	**25**
	Yes	23(37.10)	12(19.35)	18(29.03)	7(11.29)	1(1.61)	1(1.61)	**62**
	Total	36(41.38)	17(19.54)	22(25.29)	10(11.49)	1(1.15)	1(1.15)	**87**
Social media	No	18(72.00)	1(4.00)	3(12.00)	1(4.00)	2(8.00)	0(0.00)	**25**
	Yes	20(32.79)	12(19.67)	17(27.87)	6(9.84)	3(4.92)	3(4.92)	**61**
	Total	38(44.19)	13(15.12)	20(23.26)	7(8.14)	5(5.81)	3(3.49)	**86**
Newspaper	No	22(88.00)	0(0.00)	1(4.00)	1(4.00)	1(4.00)	0(0.00)	**25**
	Yes	31(50.00)	17(27.42)	7(11.29)	4(6.45)	3(4.84)	0(0.00)	**62**
	Total	53(60.92)	17(19.54)	8(9.20)	5(5.75)	4(4.60)	0(0.00)	**87**
Cooperatives	No	18(75.00)	1(4.17)	3(12.5)	1(4.17)	1(4.17)	0(0.00)	**24**
	Yes	9(14.06)	8(12.50)	17(26.56)	17(26.56)	6(9.38)	7(10.94)	**64**
	Total	27(30.68)	9(10.23)	20(22.73)	18(20.45)	7(7.95)	7(7.95)	**88**
Religious groups	No	19(79.17)	3(12.50)	0(0.00)	1(4.17)	1(4.17)	0(0.00)	**24**
	Yes	25(40.32)	17(27.42)	11(17.74)	2(3.23)	0(0.00)	7(11.29)	**62**
	Total	44(51.16)	20(23.26)	11(12.79)	3(3.49)	1(1.16)	7(8.14)	**86**

Table 3 Probability table of membership of any organization and how frequent information received

Membership of organization	How frequent information is received	
	Pearson chi2(6)	Probability
Family member	8.087	0.152
Neighbors	17.9962	0.003
Extension agent	4.0483	0.542
Radio	6.6822	0.154
Television	2.9709	0.704
Social media	13.2335	0.021
Newspaper	12.3212	0.015
Cooperatives	31.3293	0
Religious groups	16.3537	0.006

3.3 Membership of any organization and how frequent information received

Findings in Table 2 show that neighbor was the source of relevant information used most frequently by the respondents whereas religious organization was the rarest used source. Majority of the respondents received relevant information from the following sources: family member, neighbors, extension agent, radio, television, social media, newspaper, and cooperatives. Of the sources, neighbor (p = 0.003), social media (p = 0.021), newspaper (p = 0.051), and cooperative (p = 0.006) had significant association with machines fabricated (Table 3) .

Similarly, findings in Table 4 show the relationship between respondents' level of knowledge of the fabrication of palm fruit processing equipment and the equipment fabricated. Of ten major components of palm fruit processing equipment, association between self-perceived level of knowledge and the actual equipment fabricated of the following machines: whole bunch sterilizer (p = 0.007) , palm fruit sterilizer (p = 0.015), palm fruit sterilizer (p = 0.02), hydraulic press (p = 0.02) and press digester (p = 0.05) as shown in Table 5.

Table 4 Effect of rate of knowledge of palm fruit processing on equipment fabricated

Equipment		Rate of Knowledge of Palm Oil Processing					
		Excellent	Very Good	Good	Fair	Poor	Total
Stripper for Palm Fruit	No	9(42.86)	28(68.29)	14(60.87)	3(100.00)	2(100.00)	56(62,22)
	Yes	12(57.14)	13(31.71)	9(39.13)	0(0.00)	0(0.00)	34(37.78)
	Total	21	41	23	3	2	90
Whole Bunch Sterilizer	No	8(40.00)	28(71.79)	20(86.96)	3(100.00)	2(100.00)	61(70.11)
	Yes	12(60.00)	11(28.21)	3(13.04)	0(0.00)	0(0.00)	26(29.89)
	Total	20	39	23	3	2	87
Palm Fruit Sterilizer	No	3(15.00)	19(48.72)	5(21.74)	1(3.33)	2(100.00)	30(34.48)
	Yes	17(85.00)	20(51.28)	18(78.26)	2(66.67)	0(0.00)	57(65.52)
	Total	20	39	23	3	2	87
Vertical Digester	No	2(11.11)	1(2.78)	4(21.05)	0(0.00)	0(0.00)	7(9.46)
	Yes	16(88.89)	35(97.22)	15(78.95)	1(100.00)	0(0.00)	67(90.54)
	Total	18	36	19	1	0(0.00)	74
Horizontal Digester	No	3(17.65)	17(58.62)	9(64.29)	0(0.00)	0(0.00)	29(47.54)
	Yes	14(82.35)	12(41.38)	5(35.71)	1(100.00)	0(0.00)	32(52.46)
	Total	17	29	14	1	0(0.00)	61
Hydraulic Press	No	3(14.29)	4(10.00)	6(27.27)	3(100.00)	1(50.00)	17(19.32)
	Yes	18(85.71)	36(90.00)	16(72.73)	0(0.00)	1(50.00)	71(80.68)
	Total	21	40	22	3	2	88
Screw Press	No	2(9.52)	6(15.00)	3(14.29)	3(100.00)	1(50.00)	12(13.79)
	Yes	19(90.48)	34(85.00)	18(85.71)	0(0.00)	1(50.00)	75(86.21)
	Total	21	40	21	3	2	87
Digester Screw Press	No	6(30.00)	14(41.18)	12(63.16)	2(100.0)	2(100.0)	36(46.75)
	Yes	14(70.00)	20(58.82)	7(36.84)	0(0.00)	0(0.00)	41(53.25)
	Total	20	34	19	2	2	77
Know Crude Palm Oil Clarifier	No	6(30.00)	25(59.52)	16(69.57)	2(66.67)	1(50.00)	50(55.56)
	Yes	14(70.00)	17(40.48)	7(30.43)	1(33.33)	1(50.00)	40(44.44)
	Total	20	42	23	3	2	90
Number of Crude Palm Oil Clarifier	0	8(44.44)	9(52.94)	4(66.67)	0(0.00)	1(100.00)	22(51.16)
	(1-4)	7(38.89)	7(41.18)	2(33.33)	1(100.00)	0(0.00)	17(39.53)
	(5-9)	0(0.00)	1(5.88)	0(0.00)	0(0.00)	0(0.00)	1(2.33)
	10+	3(16.67)	0(0.00)	0(0.00)	0(0.00)	0(0.00)	3(6.98)
	Total	18	17	6	1	1	43

Table 5 Probability table of rate of knowledge of palm fruit processing and equipment

Equipment	Pearson chi2(6)	Probability
Stripper for Palm Fruit	7.0466	0.133
Whole Bunch Sterilizer	13.9533	0.007
Palm Fruit Sterilizer	12.3134	0.015
Vertical Digester	5.02	0.17
Horizontal Digester	9.9992	0.019
Hydraulic Press	17.2	0.002
Screw Press	3.0602	0.548
Digester Press	9.2891	0.054
Know Crude Palm Oil Clarifier	7.5611	0.109
Number of Crude Palm Oil Clarifier	8.517	0.744

These results suggested that the respondents' innovative capabilities were limited to the knowledge imparted by their masters and interactions with significant others. It also implies that the knowledge and skills acquired by the respondents have been built over time through direct instruction, practice, and interactions with these aforementioned actors. This may be referred to as learning and innovating through DPI (Jensen et al., 2007).

3.4 Effect of rate of knowledge of palm fruit processing and number of sets of complete palm fruit processing machine

Table 6 shows the relationship between the rate of knowledge of palm oil processing and the number of sets of complete palm fruit processing machines fabricated so far by the fabricators, it can be seen that majority of the fabricator fabricated sets of complete palm fruit processing machines efficiently within the range of 1-4 and 10+ sets of machines. The probabilities outcome from Table 7 shows that there is no clear

relationship between the rate of knowledge of palm oil processing equipment and the number of sets of complete palm fruit processing machine produced except for rolling machine. Most of the equipment such as cutting machine, welding machine, and drilling machines were available and working perfectly, while rolling machine, bending machine, and lathe machine were either available but dysfunction or not available at all. This implies that maintenance culture is highly needed among the respondents.

Table 6 Effect of rate of knowledge of palm oil processing and number of sets of complete palm fruit processing machine

Equipments		Sets of Complete Palm Fruit Processing				
		Not Avail.	Avail. But dysfunction	Avail. But not working	Avail. And Working	Total
Cutting Device	**0**	2(50.00)	0(0.00)	4(44.44)	11(14.67)	17(19.32)
	(1-4)	1(25.00)	0(0.00)	3(33.33)	28(37.33)	32(36.36)
	(5-9)	0(0.00)	0(0.00)	0(0.00)	8(10.67)	8(9.09)
	10+	1(25.00)	0(0.00)	2(22.22)	28(37.33)	31(35.23)
	Total	4	0	9	75	88
Welding Machine	**0**	1(100.00)	0(0.00)	4(44.44)	12(15.38)	17(19.32)
	(1-4)	0(0.00)	0(0.00)	3(33.33)	29(37.18)	32(36.36)
	(5-9)	0(0.00)	0(0.00)	0(0.00)	8(10.26)	8(9.09)
	10+	0(0.00)	0(0.00)	2(22.22)	29(37.18)	31(35.23)
	Total	1	0	9	78	88
Drilling Machine	**0**	1(12.50)	0(0.00)	4(28.57)	12(18.46)	17(19.32)
	(1-4)	4(50.00)	0(0.00)	7(50.00)	21(32.31)	32(36.36)
	(5-9)	1(12.50)	0(0.00)	0(0.00)	7(10.77)	8(9.09)
	10+	2(25.00)	1(100.00)	3(21.43	25(38.46)	31(35.23)
	Total	8	1	14	65	88
Rolling Machine	**0**	8(20.51)	2(50.00)	1(20.00)	4(11.43)	15(18.07)
	(1-4)	12(30.77)	1(25.00)	1(20.00)	16(45.71)	30(36.14)
	(5-9)	1(2.56)	1(25.00)	0(0.00)	6(17.14)	8(9.64)
	10+	18(46.15)	0(0.00)	3(60.00)	9(25.71)	30(36.14)
	Total	39	4	5	35	83
Bending Machine	**0**	9(22.50)	1(25.00)	3(33.33)	2(6.25)	15(17.65)
	(1-4)	13(32.50)	1(25.00)	4(44.44)	13(40.63)	31(36.47)
	(5-9)	1(2.50)	1(25.00)	0(0.00)	6(18.75)	8(9.41)
	10+	17(42.50)	1(25.00)	2(22.22)	11(34.38)	31(36.47)
	Total	40	4	9	32	85
Lathe Machine	**0**	8(14.55)	0(0.00)	4(44.44)	4(21.05)	16(18.60)
	(1-4)	16(29.09)	1(33.33)	4(44.44)	11(57.89)	32(37.21)
	(5-9)	4(7.27)	1(33.33)	0(0.00)	2(10.53)	7(8.14)
	10+	27(49.09)	1(33.33)	1(11.11)	2(10.53)	31(36.05)
	Total	55	3	9	19	86

Table 7 probability of the rate of knowledge of palm oil processing and number of sets of complete palm fruit processing machine

Equipment	Pearson chi2(1)	Probability
Cutting Device	2.3467	0.504
Welding Machine	2.3467	0.504
Drilling Machine	1.0667	0.785
Rolling Machine	21.68	0.01
Bending Machine	6.6667	0.353
Lathe Machine		

3.5 Indication of equipment status vs fabrication of palm fruit processing machine

Findings in Table 8 show the relationship between the equipment status at the respondents' workshops and the fabrication of palm fruit processing machines. The pieces of equipment that were verified at each workshop were cutting device, welding machine, drilling machine, rolling machine, bending machine, and lathe. Table 8 shows that none of the respondents had lathe machine. Cutting device was available and in good working condition in the workshops of some (37.63%) of the respondents.

Table 9 shows the relationship between the equipment status and the fabrication of a whole bunch sterilizer, 20 (30.3) on average, out of the total respondents have all the equipment available and working perfectly, while 44 (68.75) out of the total respondents did not have those machines available and

working but available and dysfunction or not available at all. The decrease in the number of respondents in the availability of the equipment is due to the fact the price of rolling and bending machines is more than others above. The heat during sterilization will inactivate the thermolabile lipase or fruit enzyme, coagulate the nitrogenous and mucilaginous matters to prevent the formation of emulsion in the crude oil during purification, and improve extraction by proper stripping of the bunches as well as the breaking up of the oil-carrying cells of the mesocarp (Owolarafe and Faborode, 2008). Nevertheless, Table 10 shows the relationship between the equipment status and the fabrication of vertical digester, 66 (90.41) out of the total respondents fabricate vertical digester with cutting device, welding machine, drilling machine, bending machine, lathe and rolling machine available and working. It can be derived that the respondents have a passion for fabricating vertical digesters more than sterilizers. Similarly, Table 11 shows the relationship between the equipment status and the fabrication of horizontal digester, 31 (51.67) on average out of the total respondents fabricate horizontal digester with all the equipment available and working perfectly. The relationship between the equipment status and the fabrication of hydraulic press and screw press is shown in Tables 12 and 13, respectively, in which, 71 (81.61% on average) out of the total respondents fabricate the machines with cutting device, welding machine, drilling machine, rolling machine, bending machines and lathe available and working perfectly. While others have them available but dysfunction and not available.

Table 8 Indication of equipment vs fabrication of stripper for palm fruit

Equipment		Fabrication of Stripper for Palm Fruit				
		Not Avail.	Avail. But dysfunction	Avail. But not working	Avail. And Working	Total
Cutting Device	No	2(50.00)	1(100.00)	6(54.55)	49(63.64)	58(62.37)
	Yes	2(50.00)	0(0.00)	5(45.45)	28(36.36)	35(37.63
	Total	4	1	11	77	93
Welding Machine	No	1(100.00)	5(45.45)	0(0.00)	52(64.20)	58(62.37)
	Yes	0(0.00)	6(54.55)	0(0.00)	29(35.80)	35(37.63)
	Total	1	11	0	81	93
Drilling Machine	No	6(85.71)	0(0.00)	9(52.94)	43(63.24)	58(62.37)
	Yes	1(14.29)	1(100.00)	8(47.06)	25(36.76)	35(37.63)
	Total	7	1	17	68	93
Rolling Machine	No	26(66.67)	2(50.00)	2(28.57)	25(67.57)	55(63.22)
	Yes	13(33.33)	2(50.00)	5(71.43)	12(32.43)	32(36.78)
	Total	39	4	7	37	87
Bending Machine	No	26(65.00)	2(50.00)	5(45.45)	23(65.71)	56(62.22)
	Yes	14(35.00)	2(50.00)	6(54.55)	12(34.29)	34(37.78)
	Total	40	4	11	35	90
Lathe Machine	No	37(67.27)	1(33.33)	6(54.55)	13(59.09)	57(62.64)
	Yes	18(32.73)	2(66.67)	5(45.45)	9(40.91)	34(37.36)
	Total	55	3	11	22	91

Table 9 Indication of equipment vs fabrication of a whole bunch sterilizer

Equipments		Fabrication of a Whole Bunch Steriliser				
		Not Avail.	Avail. But dysfunction	Avail. But not working	Avail. And Working	Total
Cutting Device	No	3(100.00)	0(0.00)	3(60.00)	40(68.97)	46(69.70)
	Yes	0(0.00)	0(0.00)	2(40.00)	18(31.03)	20(30.30)
	Total	3	0	5	58	66
Welding Machine	No	0(0.00)	0(0.00)	3(50.00)	43(71.67)	46(69.70)
	Yes	0(0.00)	0(0.00)	3(50.00)	17(28.33)	20(30.30)
	Total	0	0	6	60	66
Drilling Machine	No	5(83.33)	0(0.00)	5(62.50)	36(70.59)	46(69.70)
	Yes	1(16.67)	1(100.00)	3(37.50)	15(29.41)	20(30.30)
	Total	6	1	8	51	66
Rolling Machine	No	27(90.00)	2(66.67)	1(20.00)	14(56.00)	44(69.84)
	Yes	3(10.00)	1(33.33)	4(80.00)	11(44.00)	19(30.16)
	Total	30	3	5	25	63
Bending Machine	No	25(86.21)	2(66.67)	4(50.00)	13(54.17)	44(68.75)
	Yes	4(13.79)	1(33.33)	4(50.00)	11(45.83)	20(31.25)
	Total	29	3	8	24	64

Lathe Machine	No	31(73.81)	1(33.33)	3(60.00)	10(66.67)	45(69.23)
	Yes	11(26.19)	2(66.67)	2(40.00)	5(33.33)	20(30.77)
	Total	42	3	5	15	65

Table 10 Indication of equipment vs fabrication of vertical digester

Equipments		Fabrication of Vertical Digester				
		No Avail.	Avail. But dysfunction	Avail. But not working	Avail. And Working	Total
Cutting Device	No	0(0.00)	0(0.00)	2(66.67)	5(7.35)	7(9.33)
	Yes	3(100.00)	1(100.00)	1(33.33)	63(92.65)	68(90.67)
	Total	3	1	3	68	75
Welding Machine	No	0(0.00)	0(0.00)	1(33.33)	6(8.33)	7(9.33)
	Yes	0(0.00)	0(0.00)	2(66.67)	66(91.67)	68(90.67)
	Total	0	0	3	72	75
Drilling Machine	No	1(14.29)	0(0.00)	1(12.50)	5(8.47)	7(9.33)
	Yes	6(85.71)	1(100.00)	7(87.50)	54(91.53)	68(90.67)
	Total	7	1	8	59	75
Rolling Machine	No	2(5.71)	0(0.00)	0(0.00)	4(12.12)	6(8.22)
	Yes	33(94.29)	1(100.00)	4(100.00)	29(87.88)	67(91.78)
	Total	35	1	4	33	73
Bending Machine	No	2(5.71)	1(33.33)	1(25.00)	3(9.38)	7(9.46)
	Yes	33(94.29)	2(66.67)	3(75.00)	29(90.63)	67(90.54)
	Total	35	3	4	32	74
Lathe Machine	No	3(6,12)	0(0.00)	2(50.00)	2(11.11)	7(9.59)
	Yes	46(93.88)	2(100.00)	2(50.00)	16(88.89)	66(90.41)
	Total	49	2	4	18	73

Table 11 Indication of equipment vs fabrication of horizontal digester

Equipment		Fabrication of Horizontal Digester				
		No Avail.	Avail. But dysfunction	Avail. But not working	Avail. And Working	Total
Cutting Device	No	1(50.00)	0(0.00)	2(66.67)	26(46.54)	29(47.54)
	Yes	1(50.00)	0(0.00)	1(33.33)	30(53.57)	32(52.46)
	Total	2	0	3	56	61
Welding Machine	No	0(0.00)	0(0.00)	2(66.67)	27(46.55)	29(47.54)
	Yes	0(0.00)	0(0.00)	1(33.33)	31(53.45)	32(52.46)
	Total	0	0	3	58	61
Drilling Machine	No	2(40.00)	0(0.00)	3(75.00)	24(47.06)	29(47.54)
	Yes	3(60.00)	1(100.00)	1(25.00)	27(52.94)	32(52.46)
	Total	5	1	4	51	61
Rolling Machine	No	18(64.29)	1(100.00)	0(0.00)	9(32.14)	28(46.67)
	Yes	10(35.71)	0(0.00)	3(100.00)	19(67.86)	32(53.33)
	Total	28	1	3	28	60
Bending Machine	No	16(59.26)	0(0.00)	2(50.00)	10(37.04)	28(46.67)
	Yes	11(40.74)	2(100.00)	2(50.00)	17(62.96)	32(53.33)
	Total	27	2	4	27	60
Lathe Machine	No	23(54.76)	0(0.00)	3(75.00)	3(25.00)	29(48.33)
	Yes	19(45.24)	2(100.00)	1(25.00)	9(75.00)	31(51.67)
	Total	42	2	4	12	60

Table 14 shows the relationship between the equipment status and the fabrication of crude palm oil clarifier, 41 (45.56) on average out of the total respondents fabricate crude palm oil clarifier with cutting device, welding machine, drilling machine, bending machine, lathe and rolling machine available and working perfectly and the proportion of those that didn't have is 51 (54.84). It can also be deduced that the facility for their fabrication is not well equipped and conducive, there should be a need for proper workshop standard for the appropriate technology in which this research is all about.

All the probability tables show that the relationships are spurious because most of the aforementioned equipment should all be available for fabrication irrespective of any machine to be fabricated. However, with the rural continuum, a well-programmed training of Nigerian artisans in small and diesel engines repair, fabrication of whole equipment, and critical parts may provide a necessary bedrock of reliability, economic

wellbeing, and sustainability of rural agro-enterprises (Faborode, 1997).

Table 12 Indication of equipment vs fabrication of hydraulic press

Equipment		Fabrication of Hydraulic Press				
		Not Avail.	Avail. But dysfunction	Avail. But not working	Avail. And Working	Total
Cutting Device	No	2(66.67)	0(0.00)	3(30.00)	12(15.79)	17(19.10)
	Yes	1(33.33)	0(0.00)	7(70.00)	64(84.21)	72(80.90)
	Total	3	0	10	76	89
Welding Machine	No	0(0.00)	0(0.00)	2(20.00)	15(18.99)	2(12.50)
	Yes	0(0.00)	0(0.00)	8(80.00)	64(81.01)	14(87.50)
	Total	0	0	10	79	89
Drilling Machine	No	2(28.57)	0(0.00)	2(13.33)	13(19.70)	17(19.10)
	Yes	5(71.43)	1(100.00)	13(86.67)	53(80.30)	72(80.90)
	Total	7	1	15	66	89
Rolling Machine	No	7(18.42)	1(25.00)	2(33.33)	6(16.67)	16(19.05)
	Yes	31(81.58)	3(75.00)	4(66.67)	30(83.33)	68(80.95)
	Total	38	4	6	36	84
Bending Machine	No	8(20.51)	1(25.00)	3(30.00)	4(12.12)	16(18.60)
	Yes	31(79.49)	3(75.00)	7(70.00)	29(87.40)	70(81.40)
	Total	39	4	10	33	86
Lathe Machine	No	7(12.96)	1(33.33)	3(30.00)	5(25.00)	16(18.39)
	Yes	47(87.04)	2(66.67)	7(70.00)	15(75.00)	71(81.61)
	Total	54	3	10	20	87

Table 13 Indication of equipment vs fabrication of screw press

Equipment		Fabrication of Screw Press				
		Not Avail.	Avail. But dysfunction	Avail. But not working	Avail. And Working	Total
Cutting Device	No	0(0.00)	0(0.00)	2(20.00)	10(13.33)	12(13.64)
	Yes	3(100.00)	0(0.00)	8(80.00)	65(86.67)	76(86.36)
	Total	3	0	10	75	88
Welding Machine	No	0(0.00)	0(0.00)	1(10.00)	11(14.11)	12(13.64)
	Yes	0(0.00)	0(0.00)	9(90.00)	67(85.90)	76(86.36)
	Total	0	0	10	78	88
Drilling Machine	No	0(0.00)	0(0.00)	2(13.33)	10(15.38)	12(13.64)
	Yes	7(100.00)	1(100.00)	13(86.67)	55(84.62)	76(86.36)
	Total	7	1	15	65	88
Rolling Machine	No	5(13.16)	1(33.33)	1(16.67)	5(13.89)	12(14.46)
	Yes	33(86.84)	2(66.67)	5(83.33)	31(86.11)	71(85.54)
	Total	38	3	6	36	83
Bending Machine	No	8(21.05)	0(0.00)	2(20.00)	2(6.06)	12(14.12)
	Yes	30(78.95)	1(100.00)	8(80.00)	31(93.94)	73(85.88)
	Total	38	4	10	33	85
Lathe Machine	No	5(9.43)	0(0.00)	2(20.00)	5(25.00)	12(13.95)
	Yes	48(90.57)	3(100.00)	8(80.00)	15(75.00)	74(86.05)
	Total	53	3	10	20	86

3.6 Average processors patronized vs order to fabricate machines for customer

Table 15 shows the relationship between the average processors that patronizes the fabricators and the number of order to fabricate machines for the customer, it can be extrapolated that 53 (94.64) out of the total respondents received an order while the majority of the fabricators has fabricated more than 10 machines from the perspective processors. The probability shows that there is no clear relationship between the average processors that patronized and the number of orders the fabricators have received because the fabricator can fabricate for processors in another state outside the study area probably based on the individual professional standard. There is a need for the development of simple, low-cost, but efficient, technology for producing good quality palm oil in small-scale enterprises since they constitute the majority of palm oil processors (Babatunde et al., 1988; Eggleston et al., 1992).

3.7 Fabrication as occupation and production of boiler for steam production

Table 16 shows the relationship between production of boiler for steam production and how the fabricators

choose the fabrication as an occupation whether the fabricator was born with the skill, or learned the skill from school, or learned the skill informally from someone. Table 17 shows the probability distribution of the relation. Table 17 shows that out of the 91 total respondents, only 10 (26.93%) were born with the skill and learned the skill from school while 47 (73.44%) learned informally from someone. The probabilities of 0.066, 0.066, and 0.256 for born with the skill, learned from school and learned informally from someone, respectfully shows that there is no relationship between the production of boiler for steam production and fabrication as occupation.

Table 14 Indication of equipment vs fabrication of crude palm oil clarifier

Equipment		Fabrication of Crude Palm Oil Clarifier				
		Not Avail.	Avail. But dysfunction	Avail. But not working	Avail. And Working	Total
Cutting Device	No	3(75.00)	1(100.00)	6(54.55)	41(53.25)	51(54.84)
	Yes	1(25.00)	0(0.00)	5(45.45)	36(46.75)	42(45.16)
	Total	4	1	11	77	93
Welding Machine	No	0(0.00)	0(0.00)	6(54.55)	45(55.56)	51(54.84)
	Yes	1(100.00)	0(0.00)	5(45.45)	36(44.44)	42(45.16)
	Total	1	0	11	81	93
Drilling Machine	No	3(37.50)	0(0.00)	10(58.82)	38(56.72)	51(54.84)
	Yes	5(62.50)	1(100.00)	7(41.18)	29(43.28)	42(45.16)
	Total	8	1	17	67	93
Rolling Machine	No	26(65.00)	2(50.00)	4(57.14)	15(41.67)	47(54.02)
	Yes	14(35.00)	2(50.00)	3(42.86)	21(58.33)	40(45.98)
	Total	40	4	7	36	87
Bending Machine	No	29(70.73)	1(25.00)	5(45.45)	14(41.18)	49(54.44)
	Yes	12(29.27)	3(75.00)	6(54.55)	20(58.82)	41(45.56)
	Total	41	4	11	34	90
Lathe Machine	No	32(58.18)	1(33.33)	6(54.55)	10(45.45)	49(53.85)
	Yes	23(41.82)	2(66.67)	5(45.45)	12(54.55)	42(46.15)
	Total	55	3	11	22	91

Table 15 Average processors patronized and order to fabricate machines for customer

Average Processors Patronized	Order to Fabricate Machines for Customer		
	No	Yes	Total
0	1(33.33)	2(66.67)	3
(1-4)	4(19.05)	17(80.95	21
(5-9)	0(0.00)	11(100.00)	11
10+	3(5.36)	53(94.64)	56
Total	8(8.79)	83(91.21)	91

Table 16 Boiler for steam production and fabrication as occupation

Fabrication as Occupation		Boiler for Steam Production		
		No	Yes	Total
I was born with the Skill of Fabrication	No	21(25.93)	60(74.07)	81
	Yes	0(0.00)	10(100.00)	10
	Total	21(23.08)	70(76.92)	91
I Learned from School	No	21(25.93)	60(74.07)	81
	Yes	0(0.00)	10(100.00)	10
	Total	21(23.08)	70(76.92)	91
I Learned Informally from Someone	No	4(15.38)	22(84.62)	26
	Yes	17(26.56)	47(73.44)	64
	Total	21(23.33)	69(76.67)	90

Table 17 Probability for boiler for steam production and fabrication as occupation

Membership of Organization	Pearson chi2(6)	Probability
I was born with the Skill of Fabrication	3.3704	0.066
I Learned from School	3.3704	0.066
I Learned Informally from Someone	1.2914	0.256

4 Conclusion

The respondents were within the active age. The mean age of the respondents was within high adoption propensity bracket. As such they might have high innovation adoption receptivity. The level of knowledge of some fabricators was assessed. There was an association between knowledge and number of machines fabricated, which implied that training and other programs that improve productive capacity would invariably lead to the fabrications of more relevant machines. Such fabrication would boost the development of SPO technology for small and medium processors. The intervention programs must be enacted in informal settings. This is because majority of the respondents said they learned the art of fabrication informally from someone. Therefore, programs to hone skills of the fabricators may take a form of town-gown collaboration.

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