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Measures for Improving Harvesting and Cooking of Palm Fruits for Increased Palm Oil Production in Udi Agricultural Zone of Enugu State.

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ABSTRACT

The study determined the measures for improving the harvesting and cooking of palm fruits by farmers for increased palm oil production in Udi Agricultural Zone of Enugu State. Two research questions and two null hypotheses guided the study. Descriptive survey research design was adopted for the study. The population for the study comprised 250 respondents made up of 227 registered farmers and 23 extension workers in Udi Agricultural zone. There was no sampling because the population was manageable. The instrument used for data collection was a 17 item structured questionnaire developed by the researchers. The instrument was validated by three experts and Cronbach Alpha statistics was used to determine the internal consistency of the instrument. Reliability coefficient of 0.74 and 0.80 were obtained for the clusters and the overall coefficient of the entire instrument was 0.77. Out of 250 copies of the questionnaire distributed 237 copies were properly filled and used for data analysis representing 94.80% return rate. Mean was used to answer the research questions while t-test was used to test the null hypotheses at .05 level of significance. The study found out among others that timely harvesting of fresh palm fruits, using of fork machine to climb the palm tree and using boiler to cook palm fruits, soaking of palm fruits to soften it before mashing are measures that could be used to improve harvesting and cooking of palm fruits by farmers to increase palm oil production in Udi Agricultural zone. Based on the findings, it was recommended among others that the farmers should adopt the identified measures for harvesting of palm fruits for increased oil production. The government should build oil processing mill on the study area to make it cheaper for farmers to use the facilities for cooking of palm fruits for increased palm oil production

Keywords: Measures, Improvement, Palm Fruits, Farmers, Extension Workers, Harvesting, Cooking and Production.

INTRODUCTION

Oil palm (Elaeis guieneenis) is an African fruit which is found in Southern Nigeria as well as some States in Northern part of Nigeria. The palm fruits are small, ovoid oblong fruits that grow in clusters of several hundred or a thousand, depending on the size of the head bunch. Uguru (2011) posited that the fruits range in size, from less than one inch to two inches and are black red when ripe. According to Green (2013), each fruit is made up of an oily, fleshly outer layer, the pericarp; with a single seed (the palm kernel), rich in oil. Palm fruit has been providing oil and nourishment to Africans for the last 5,000 years (Kiple and Coneerornelas, 2013). Palm fruits are not seasonal because the oil palm trees produce fruits continuously all the year round. These fruits produce red palm oil which is rich in antioxidants and used in place of cord liver oil for correcting vitamin deficiency (Nwauwa and Abonyemi, 2011).

The uses of palm oil are many and vary from one place to another. It is used for cooking, soap making and lamp oil (Soyebo, farinde and Adetayo, 2015). Common with all fats, palm oil is a good source of energy, provides carotenoids (pro-vita min A.),

tocopherol or vitamin E., tocotreinel and lycopene (Basina 2014).

In addition to the industrial uses, in Udi agricultural zone of Enugu State which is the study area, palm oil plays a vital role in the economic and cultural life of the people. It is used for food, a means of getting income, raw material for soap making, lamp oil, treatment of dislocation and fracture and libation offering to spirits in idol worship. In spite of the endless array of uses to which the palm oil can be put, the harvesting and cooking of palm fruits for all production has remained difficult because the methods employed by farmers are still the traditional ones. As a result, harvesting and cooking of palm fruits for oil production in Udi Agricultural zone has remained unimpressive. Harvesting involves the cutting of the bunch from the tree and allowing it to fall to the ground by gravity. Harvesting is the act of cutting and gathering the matured palm fruits and trying not to damage the bunch (Agwu, 2016). Cooking on the other hand is the use of high temperature wet-heat treatment to loose fruits. Cooking weakens the pulp structure, softening it and making it easier to detach the fibrous material and its contents (Adeniyi Ogunsola and Oluwusi (2014). It seems the farmers in the study area have not realized the benefits of using measures that will help improve harvesting and cooking of palm fruits for increased oil production.

Measure is a plan of action or a stage approach intended to accomplish a specific task or goal. According to Longman (2018) measure is a plan used to achieve something. In the context of this study measures for improving harvesting and cooking of palm fruits for increased oil production involves timeliness of harvesting fresh fruit bunches (FFB), use of harvester robot, use of rotary saw cutting, use of reciprocating saw and integrated remote controlling machine which is similar to the climber robot (Shokripour, Ismaie, Morezkarimi, 2012). Cooking measures involves use of high-temperature wet heat, hot water, pressurized steam to soften the fruits. If these measures are adopted by farmers in Udi Agricultural Zone, it will help improve harvesting and cooking of palm fruits for increased oil production.

Improvement is making something become better than it was. Galasbury (2017), opined that improvement is an activity undertaken based on meeting the target proposal. This study regards improvement as adoption of methods or changing the old ways of harvesting and cooking palm fruits to make it better for increased oil production. Production is the process of transforming inputs into outputs. It also refers to all economic activities which result in the creation of goods and services (Iwena 2017). In the context of this study, production involves all the activities wherein something of value (palm oil) is created from palm fruits. It is farmers who can create and make all the necessary activities in order to make something of value to come out of palm fruits.

Farmers are people who manage plantations especially oil palm plantations. Longman (2014) opined that farmers really manage farms, improve and organize agricultural work. In order to help farmers increase their agricultural productivity, agricultural extension workers have been considered as a vehicle for bringing changes to farmers for sustainable development.

Agricultural extension workers are trained personnel's employed by the government with the aim of disseminating new research information on the improved techniques of farming to farmers, helping them to improve on their farming skills and general welfare, as well as the development of leadership qualities (Ugwuoke & Ejiofor, 2010). In the context of this study, an extension worker

will help to educate farmers and assist them in getting information on the appropriate technologies and methods to be used on improving harvesting and cooking of palm fruits for increased oil production in Udi Agricultural Zone of Enugu State.

Udi Agricultural zone in Enugu State which is the study area, has rich soil and enough land mass that favours the growth of many crops especially palm trees. But it has been observed that farmers in this zone still experience high cost of hired labourers and shortage of labour and use of traditional means of harvesting and cooking of palm fruits. This has caused harvesting and cooking of palm fruits to be very difficult and energy consuming. As a result some of the young people who may have picked interest in harvesting palm fruits migrate to urban cities in search of better paid employment. This has also made palm oil to be scarce and costly especially in the study area. This has equally led to waste and decrease in the quantity of oil produced in the study area. It seems that farmers in this study area are not aware of the measures that will encourage them harvest and cook palm fruits for increased oil production without drudgery. If these farmers are exposed to the measures that will improve harvesting and cooking of palm fruits, palm oil production will be increased. Upon this background, it becomes necessary to identify the measures for improving the harvesting and cooking of palm fruits for increased palm oil production in Udi agricultural zone of Enugu State.

Purpose of the Study

The major purpose of this study was to determine the measures for improving harvesting and cooking of palm fruits for increased palm oil production in Udi Agricultural Zone of Enugu State.

Specifically the study sought to determine the:

1. Measures for improving the harvesting of palm fruits by farmers for increased palm oil production in Udi Agricultural zone of Enugu State.
2. Measures for improving the cooking of palm fruits by farmers for increased palm oil production in Udi Agricultural zone of Enugu State.

Research Questions

The following research questions guided the study:

1. What are the measures for improving the harvesting of palm fruits by farmers for increased palm oil production in Udi Agricultural zone of Enugu State?
2. What are the measures for improving cooking of palm fruits by farmers for increased palm oil production in Udi Agricultural zone of Enugu State?

Hypotheses

The following hypotheses were tested at .05 level of significance:

Ho_1: There is no significant difference between the mean ratings of extension workers and farmers on the measures for improving the harvesting of palm fruits by farmers for increased palm oil production in Udi Agricultural zone of Enugu State.

Ho_2: There is no significant difference in the mean ratings of extension workers and farmers on the measures for improving the cooking of palm fruits by farmers for increased palm oil production in Udi Agricultural zone of Enugu State.

Research Method

Descriptive survey research design was used to carry out this study. Olaitan, Eyo and Sowoinde (2010) view descriptive survey research as a plan, structure and strategy that an investigator adopts in order to obtain

solution to research problems using questionnaire in collecting, analysing and interpreting the data. This design was used because the researchers used questionnaire to collect data from the farmers and extension workers on the measures for improving the harvesting and cooking of palm fruits by farmers for increased palm oil production in Udi Agricultural Zone of Enugu State. The study was conducted in Udi Agricultural zone of Enugu State. Udi Agricultural zone is located in Enugu West Senatorial zone of Enugu State. The zone was chosen because it is most notably known for its original palm wine, palm oil and other agricultural products. The population for the study consisted of 250 respondents made up of 227 registered farmers and 23 agricultural extension workers. The entire population was used because the size was manageable.

The instrument for data collection was a self-structured questionnaire developed by the researchers. The questionnaire contains a total of 17 items based on the research questions and hypothesis that guided the study. The instrument was structured on a four point rating scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD).

The instrument was face validated by three experts. Two experts from Agricultural Education from Department of Technology and Vocational Education, and one from Measurement and Evaluation of Mathematics and Computer Science Education Department, all from the Faculty of Education, Enugu State University of Science and Technology. The experts were required to examine the items in terms of relevance and appropriateness of the items of the instrument in addressing the research questions. The Cronbach alpha was used to determine the internal consistency of the instrument. It yielded reliability coefficients of 0.74 and 0.80 for clusters A and B respectively and overall coefficient of 0.77. This is line with Creswell (2009) who opined that coefficient value of 0.82 or above is adequate for establishing the reliability of research instrument. A total of 250 copies of the questionnaire were distributed to the respondents with the help of three research assistants who were properly briefed to ensure that the questionnaire were properly administered, filled, completed and retrieved. Out of the 250 copies of the questionnaire distributed 237 were properly filled, returned and used for data analysis representing 94.80% return rate.

Mean with standard deviation were used for answering the two research questions. The t-test statistics was used to test the null hypotheses of no significance at probability level of .05 and at the appropriate degree of freedom. The t-test was used because the researcher made use of two groups; farmers and agricultural extension workers. The decision on the research questions were based on the principle of real limits of mean, thus:

Strongly Agree (SA) - 3.50 – 4.00
Agree (A) - 2.50 – 3.49
Disagree (D) - 1.50 – 2.49
Strongly Disagree (SD) - 1.00 – 1.49

For decision on the null hypotheses, if t-calculated is equal to or greater than t-critical at 0.05 level of significance and the given degree of freedom, the null hypotheses is significant, but if otherwise, is not significant.

Results

The results were presented according to the research questions and hypotheses.

Research Question 1

What are the measures for improving the harvesting of palm fruits by farmers for increased palm oil production in Udi Agricultural zone of Enugu State?

Table 1: Mean ratings and standard deviation of farmers and extension workers on the measures for improving the harvesting of palm fruits by farmers for increased palm oil production in Udi Agricultural zone of Enugu State.

S/N	Harvesting measures for improving he harvesting of palm fruits by farmers for increased palm oil production include:	Farmers N = 218		Extension Workers N = 19		Overall		Decision
		x_1	SD_1	x_1	SD_1	x_1	SD_1	
1.	Timely harvesting of fresh palm fruits bunches	3.01	0.56	2.95	0.62	3.01	0.56	Agree
2.	Using of fork lift machine to climb palm tree	2.98	0.60	2.89	0.66	2.97	0.59	Agree
3.	adopting the use of adjustable harvester cutting machine	2.92	0.63	2.79	0.71	2.91	0.64	Agree
4.	Use of rotary saw with climber	2.93	0.63	2.78	0.71	2.92	0.63	Agree
5.	using pruning machinery for palm fruit harvesting	2.92	0.63	2.89	0.74	2.92	0.64	Agree
6.	Ensuring that ripe fruit, brunches are harvested	2.93	0.63	2.74	0.73	2.91	0.63	Agree
7.	Using of cutting system with climber robot	2.99	0.74	2.68	0.75	2.97	0.74	Agree
8.	Using a reciprocating saw with climber	2.94	0.70	2.68	0.74	2.92	0.71	Agree
9.	using of high volume processing machines	3.08	0.73	2.74	0.73	3.05	0.73	Agree
	Cluster Mean/SD	**2.96**	**0.65**	**2.79**	**0.71**	**2.95**	**0.65**	**Agree**

Note: x = mean, SD = Standard Deviation, N = Number of Respondents

The analysis of data presented in **Table 1** above shows that overall mean rating ranges from 2.91 to 3.05 indicating Agree. This means that the respondents agree to the items as measures for improving the harvesting of palm fruits for increased palm oil production in Udi Agricultural Zone of Enugu State. The overall cluster mean of 2.95 further indicates that the items are the measures for improving the harvesting of palm fruits for increased palm oil production in Udi Agricultural Zone of Enugu State. The low standard deviation of 0.65 indicates that the respondents have similar opinion to the items. The low standard deviation of 0.65 indicates that the respondents have similar opinion to the items.

Hypothesis 1:

There is no significant difference between the mean ratings of extension workers and farmers on the measures for improving the harvesting of palm fruits by farmers for increased palm oil production in Udi Agricultural zone of Enugu State.

Table 2: Summary of t-test analysis of extension workers and farmers on the measures for improving the harvesting of palm fruits by farmers for increased palm oil production in Udi Agricultural zone of Enugu State.

Variables	N	t	Df	Sig. (2 tailed)	Mean Difference	Std. Error Difference	Decision
Farmers	218						
Extension Workers	19	1.203	235	0.230	-1.54394	1.28353	NS

The result of t-test analysis in **Table 2** shows that the t-value at 0.05 level of significant and 235 degree of freedom for the nine items is 1.203 with a significant value of 0.230. Since the significant value of 0.230 is more than the 0.05 level of significant the null hypothesis is not significant. This means that there is no significant difference regarding the nine items on the mean responses of farmers and extension workers on the measures for improving the harvesting of palm fruits for increased palm oil production in Udi Agricultural Zone of Enugu State.

Research Question 2

What are the measures for improving the cooking of palm fruits by farmers for increased palm oil production in Udi Agricultural zone of Enugu State?

Table 3: Mean ratings and standard deviation of farmers and extension workers on the measures for improving the cooking of palm fruits by farmers for increased palm oil production in Udi Agricultural Zone of Enugu State.

S/N	Measures for improving the cooking of palm fruits by farmers for increased palm oil production include:	Farmers N = 128		Extension Workers N = 19		Overall		Decision
		x_1	SD_1	x_1	SD_1	x_1	SD_1	
10.	Using boiler to cook palm fruits	3.02	0.63	2.89	0.74	3.01	0.64	Agree
11.	Soaking of palm fruits to soften it before mashing	3.07	0.67	2.89	0.73	2.05	0.67	Agree
12.	Adopting dry heating without water on the palm fruits	2.97	0.66	2.84	0.76	2.96	0.67	Agree
13.	Sterilizing the fruits with the bunch particles	2.98	0.67	2.84	0.76	2.97	0.68	Agree
14.	Adopting palm fruit fermentation in order to soften the fruits	2.92	0.70	2.84	0.76	2.91	0.70	Agree
15.	Using electric heater in the cooking of palm fruits	2.91	0.70	2.84	0.76	2.90	0.71	Agree
16.	Regulating the temperature of the fruits during sterilization	2.91	0.70	2.84	0.76	2.91	0.70	Agree
17.	Using dryer to dry the fruits that have overstayed in water.	2.96	0.67	2.84	0.76	2.95	0.68	Agree
	Cluster Mean/SD	**2.97**	**0.68**	**2.85**	**0.75**	**2.96**	**0.68**	**Agree**

Note: x = mean, SD = Standard Deviation, N = Number of Respondents

The data presented in **Table 3** above shows that the overall mean ratings for the items ranges from 2.90 to 3.05 indicating agree. This shows that respondents agree to the

items as measures for improving cooking of palm fruits for increased palm oil production in Udi Agricultural Zone of Enugu State. The overall cluster mean of 2.96 further reveals that the respondents agree to the identified as the measures for improving cooking/sterilization of palm fruits for increased palm oil production in Udi Agricultural Zone of Enugu State. The low standard deviation of 0.68 shows that the respondent's do not differ remarkably on their opinions to the items. The standard deviation shows that the respondents have consensus opinion on their responses to the items.

Hypothesis 2

There is no significant difference in the mean ratings of extension workers and farmers on the cooking measures for improving the processing of palm fruits by farmers for increased palm oil production in Udi Agricultural zone of Enugu State.

Table 4: Summary of t-test analysis of mean responses of extension workers and farmers on the measures for improving the cooking/sterilization of palm fruits by farmers for increased palm oil production in Udi Agricultural zone of Enugu State.

Variables	N	t	Df	Sig. (2 tailed)	Mean Difference	Std. Error Difference	Decision
Farmers	218						
Extension Workers	19	0.714	325	0.476	0.90101	1.2191	NS

The result of t-test analysis in **Table 4** shows that the t-value at 0.05 level of significant and 235 degree of freedom for the items is 0.714 with a significant value of 0.476. Since the significant value of 0.476 is more than the 0.05 level of significant the null hypothesis is not significant. This means that there is no significant difference regarding the nine items on the mean responses of extension workers and farmers on the measures for improving the cooking of palm fruits for increased palm oil production in Udi Agricultural Zone of Enugu State.

Summary of Findings of the Study

Based on the results of data analysis, the following findings were made:

1. Measures for improving the harvesting of palm fruits by farmers for increased palm oil production in Udi Agricultural Zone of Enugu State include: timely gathering of fresh palm fruits, using of fork lift machines to climb the palm tree, adopting the use of adjustable harvester cutting machine, use of rotary saw with climber and using pruning machinery for palm fruit harvesting.
   The findings equally indicated that there was no significant difference on the mean ratings of extension workers and farmers on the measures for improving the harvesting of palm fruits by farmers for increased palm oil production in Udi Agricultural Zone of Enugu State.
2. The respondents indicated that using boiler to cook palm fruits, soaking of palm fruits to soften it before mashing, adopting dry heating without water on the palm fruits and sterilizing the fruits with the bunch particles are all among the measures for improving the cooking of palm fruits by farmers for increased palm oil production in Udi Agricultural Zone of Enugu State.

The findings further showed that there was no significant difference with respect to the items on the mean ratings of extension workers and farmers on the measures for improving the cooking of palm fruits by

farmers for increased palm oil production in Udi Agricultural Zone of Enugu State.

Discussion

The result of the study revealed that the measures for improving the harvesting of palm fruits by farmers for increased palm oil production in Udi Agricultural Zone of Enugu State include: timely gathering of fresh palm fruits bunches, using fork lift machine to climb the palm tree, adopting the use of adjustable harvester cutting machine, use of rotary saw with harvesting, ensuring that only ripe/fruit fallen bunches are harvested, using of cutting system with climber robot, using a reciprocating saw with climber and using high volume processing machines. This is in line with Aniagolu (2016) who itemized harvesting measures as identifying mature palm fruits, using forklifts and robotic climbers to harvest mature palm fruits. This implies that if farmers utilize these measures in harvesting palm fruits, palm oil production will be increased.

The findings of the study showed that there is no significant difference regarding the items on the mean ratings of extension workers and farmers on the measures for increasing palm oil production in Udi Agricultural Zone of Enugu State. The implication of the findings was that the status of the respondents has no significant influence on the identified measures for improving harvesting of palm fruits for increased palm oil production.

Furthermore, the result of the study indicated the measures for improving the cooking/sterilization of palm fruits by farmers for increased palm oil production in Udi Agricultural Zone of Enugu State are as follows; using boiler to cook palm fruits, soaking of palm fruits to soften it before mashing, adopting dry heating without water on the palm fruits, sterilizing the fruits with the bunch particles, adopting palm fruit fermentation in order to soften the fruits using electric heater in the cooking of palm fruits, regulating the temperature of the fruits during sterilization and using dryer to dry the fruits that have overstayed in water. The findings are in agreement with Mba, Dumount and Ngadi (2015) that sterilizing the fruits with the bunch particles and adopting palm fruits fermentation in order to soften the fruits improve the cooking of palm fruits for increased palm oil production. This implies that the identified measures need to be utilized by farmers for improving the cooking of palm fruits for increased palm oil production.

In addition to the above, the findings of the study depicted that there was no significant difference on the mean ratings of extension workers and farmers on the measures for improving the cooking of palm fruits by farmers for increased palm oil production in Udi Agricultural Zone of Enugu State. The meaning of no significant difference was that the responses of extension workers and farmers had no influence on the identified measures for improving the cooking of palm fruits oil production.

Conclusion

Measure is a plan of action or a stage approach intended to accomplish a specific task or goal. To improve the harvesting and cooking of palm fruits measures such as using adjustable harvester, using climber robot, adopting the use of circular/ reciprocating saw among others and cooking measures such as use of high temperature, wet heat treatment of loose fruits and use of pressured steam, should be adopted for increased oil production.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Farmers should adopt the identified measures for improving the harvesting of palm fruits for increased oil production.

2. Government should build oil processing mill in the study area to make it cheaper for farmers to use the facilities for cooking of palm fruits for increased oil production.

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