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http://eoi.citefactor.org/10.11226/v23i2

Journal of Agricultural Extension
Vol. 23 (2) April, 2019
ISSN(e): 24086851; ISSN(Print); 1119944X
http://journal.aesonnigeria.org
http://www.ajol.info/index.php/jae
Email: editorinchief@aesonnigeria.org

Farmers Utilization of Existing and Emerging Technologies for Cassava Production in Enugu State, Nigeria

https://dx.doi.org/10.4314/jae.v23i2.5

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Abstract

The study determined the methods for improving capabilities of farmers' utilization of existing and emerging technologies for cassava production in Enugu State. Multi-stage sampling procedures was used to select a sample size of 300. Questionnaire was used for data collection which was developed on a 4-point rating scale with reference mean of 2.50. Data were analysed using descriptive statistic: frequency, mean and inferential statistic as the Z-test at 0.05 level of significance. The finding showed that existing technologies were available but emerging technologies were not available for improving farmers capabilities in cassava production with pooled $\bar{x}$ *= 3.28 and* $\bar{x}$ *= 1.40 respectively. Secondly, the farmers utilized existing technologies in cassava production with the pool* $\bar{x}$ *= 2.86 and coul d not utilize emerging technologies for cassava production with the pooled* $\bar{x}$ *= 1.60. It was recommended among others that the emerging technologies that were not available for cassava should be provided to enable the farmers to ease of the stress in the use of obsolete existing technologies and also increase cassava production and well-being of the farmers.*

Key words: Improving, Cassava farmers, Technologies, Enugu State.

Introduction

Nigeria is agrarian nation that has potentials of becoming giant in food production in Africa. Nigeria remains one of the leading countries in cassava production in the world. In Nigeria cassava production is in the hand of small holder farmers on marginal and sub marginal lands in the humid and sub humid tropics (Okoedo-Okojie and Ikhorea, 2014). This means that the production of cassava is still on subsistence level with existing rudimentary technologies such as bush fallowing, use of tools such as machetes and hoes. Cassava that have long maturity period, low yield and susceptible to diseases and pests are the cultivars that were used for planting. It was observed that greater percentage of cassava produced in Nigeria are utilized locally (Ekweanya, 2018).

Technology is the application of scientific and practical knowledge and skill to use the tools of the environment to produce goods and services for the society (Ansah and Gyoung-Rae, 2014). The emerging technologies are improved scientific and practical knowledge applied to make production of the producers much easier in quality and quantity. The development of appropriate technologies (in cassava production) is the pre-requisite for sustainable agriculture. The emerging

technologies for cassava production are as follows; the use of tractor driven implements such as, ploughs, harrows, ridgers and planters. Others include selection of hybrids of high yielding cultivars of cassava: stems that are early maturing, resistant to diseases, pest and adaptation to climate change. Improving capabilities of farmers in cassava production implies that farmers should be properly informed, taught, trained and educated by extension workers to use emerging technologies to increase profit and enhance food security. Notwithstanding, Vaughan, Afolabi *et al* (2014) revealed that the number of tractors in Nigeria per 100^2 km was 6.56 compared to United State of America 272.81 per 100^2 km and India 186.9 per 100^2 km and fertilizer up take in Nigeria stood at 2.12 kilogramme hectare compared to USA 109.45 kg/ha, Thailand 118.94kg/ha and India 167.21kg/ha. Ansah and Gyoung - Rae (2014) indicated that sustainable agricultural development will continue to elude Nigeria unless appropriate innovations are effectively communicated to the farming population.

Cassava famers need agricultural extension to educate, inform and train them to use emerging technologies to improve their technical knowhow, income, standard living and food security (Ansah and Gyoung - Rae 2014). It is the responsibility of Agricultural Development Programme (ADP) to disseminate emerging technologies to farmers and motivate them to utilize them in cassava production.

Cassava (*Manihot esculenta*) ranks very high among crops that convert the highest amount of solar energy to soluble carbohydrate per unit area. Ekweanya, (2018) indicated that cassava root compose of (70%) moisture, 24% starch, (2%) fibre and (1%) protein among others. Cassava accounts for 70% calorific intake of more than half of the population in Africa and Nigeria in particular. Cassava is low in saturated fat, cholesterol, sodium but high in Vitamin C, manganese and potassium. The dietary fibre content is capable of lowering the risks of cardiovascular diseases, colon cancer and control of diabetes (Shokunbi 2012).

Cassava production is constrained by limited supply chain structure as raw materials for agro-based and allied industries, high cost of emerging technologies, low quality and quantity yield, susceptibility to rapid deterioration of harvested tubers due to lack of proven technologies for storing the fresh tubers before processing (Ghorbani *et al* 2012)).

Considering the various efforts of the Federal Government of Nigeria through Presidential initiatives that was geared towards commercialization of cassava products. It has potentials of balancing her terms of trade, increase foreign exchange earnings, reduction of poverty and ensuring food security. It is not certain whether existing and emerging technologies were used by extension workers to improve the capabilities of farmers in cassava production. Therefore, this study was geared towards determining the extent extension methods are used in improving capabilities of farmers' utilization of existing and emerging technologies in cassava production in 2017 cropping season in Enugu State.

Purpose of the Study

The main objective of the study was to determine the extent of farmers' utilization of existing and emerging technologies for cassava production in Enugu State. The specific objectives of this study were to:

- determine the extent existing and emerging technologies are available to improve capabilities of farmers in cassava production in Enugu State;
- ascertain the extension methods used by extension workers in improving the capabilities of farmers utilization of existing and emerging technologies in cassava production in Enugu State; and

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- determine the extent of farmers' utilization of existing and emerging technologies for cassava production in Enugu State.

Hypothesis of the Study

Ho_1: There is no significant mean difference between the existing and emerging technologies available for improving the capabilities of farmers in cassava production in Enugu State.

Methodology

The study adopted descriptive survey to conduct this study. This region is located in a mixed vegetation belt of Nigeria, which spans from rain forest to guinea savannah. The area is naturally favoured with optimum temperature, rainfall, relative humidity and good soils that sustain cassava production. Enugu State has 17 local government areas and 3 Agricultural zones which are made up of Enugu North, Enugu East and Enugu West. The population of Enugu State is 3,751,140 (Federal Government of Nigeria, (2006) and all the registered cassava farmers in Enugu State constituted the study population.

Enugu is made up of three agricultural zones and Multi- stage sampling procedure was adopted to select a sample size of 300 in this study. First, simple random probability sampling procedure was used to select Enugu North agricultural zone out of the 3 Agricultural Zones in Enugu State. Secondly, simple random sampling procedure was used to select 5 extension blocks was selected out of 8 in the zone. Thirdly simple random sampling procedure was used to select 6 circles from each of the sampled blocks and finally 10 cassava farmers were randomly selected from each of the circles sampled. This gave a total of 300 respondents.

The structured questionnaire was the instrument for data collection. The questionnaire was titled Farmers and Utilization of Existing and Emerging Technologies in Cassava Production in Enugu State (FUEETCPES). The instrument was developed on a 4-point measuring scale to collect data from the respondents. Specifically, objective one measured the extent of availability of existing and emerging technologies on the scale: Highly Available (HA=1), Moderately Available (MA=1), Slightly Available (SA=1) and Not Available (NA=1). Objective two measured extent extension methods were used for improving farmers' utilization of existing and emerging technologies in cassava production on the scale: Highly Utilized (HU=2), Moderately Utilized (MU=2), Slightly Utilized (SU=2) and Not Utilized (NU=2). Finally, objective 3 measured the farmers' utilization of existing and emerging technologies for cassava utilization: Highly Utilization (HU=3), Moderately Utilization (MU=3), Slightly Utilization (SU=3), No utilization (NU=3). The instrument was validated by research experts in the Department of Rural Sociology and Extension, Michael Okpara University of Agriculture, Umudike. Their suggestions and correction were considered in the final production of the questionnaire for the pilot study.

The instrument was pre-tested in Abia State which was not part of the study area, a random sampling procedure was adopted to select Umuahia agricultural zone out of the three agricultural zone in the state, Ibeku east extension blocks was randomly selected and two circles from the block were selected randomly, five farmers from each circle were selected from the two circles which gave rise to ten cassava farmers. Contact farmers were used as a search assistant for the pilot study. The reliability of the instrument was established by subjecting the data collected from the pilot study to Cronbach's alpha ($r\propto$) which was suited for analysing data collected from instrument developed on a 4-point or Likert-type scale. The analysis yielded reliability co-

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efficient of r$\propto$ = 0.79 indicating that the instrument had high reliability. The researcher trained 5 extension agents in each of the block selected who trained 6 contact farmers in each of the extension areas sampled. These 5 extension agents trained the 6 contact farmers in each of the extension areas on how to help the farmers to respond to the items of the questionnaire. Finally, each of these contact farmers administered and retrieved questionnaire to the 10 cassava farmers sampled in the area. Data collected were analysed using both descriptive and inferential statistics. Z- test model was used to test the hypothesis of the study at 0.05 alpha level.

Results and Discussions

Existing technologies for cassava production

Table 1 shows that existing technologies available for pre planting operations in cassava productions were machetes, burning of bush, cleaning of farm refuse, making of mounds and heaps with hoes, use of organic manure ($\bar{x}$=3.33),. Existing planting technologies include selection and harvesting of local stems and inter-planting with maize, vegetables, yams, coco-yams were available ($\bar{x}$=3.40), while the existing post-planting technologies such as weeding with hoes, earthling up the mounds and heaps and use of organic matters were available at ($\bar{x}$=3.10). The emerging technologies used for pre-planting operations such as surveying equipment, tractor driven implements were not available to farmers for cassava production ($\bar{x}$=1.25), for planting technologies: selection of improved varieties planting the cuttings at 45^0 slanting, 1m spacing per-cutting, use of planters were not available ($\bar{x}$ =1.51) and post planting technologies: use of fertilizers, herbicides, pesticides and irrigation equipment were not available ($\bar{x}$ =1.84). Comparing the results in available existing technologies, planting technologies were more available than pre-planting and post-planting technologies for cassava production. While for emerging technologies: post-planting technologies were available more than planting and pre-planting technologies. This implies that emerging technologies were not within the reach of the cassava farmers. Vaughan *et al*, (2014) indicated that the availability of tractor in Nigeria was 6.56 per 100^2 kilometres compared to USA 272.81 and India 186.90 per 100^2 kilometre respectively.

Table 1: Existing and emerging technologies available to farmers in cassava

Item Statement	$\bar{x}$
Existing technologies	
Pre-planting technologies such as cutting grass and shrub machetes, burning and cleaning the farm, making of heaps/mounds with hoes and use of organic manure.	**3.33**
Planting technologies like selecting and harvesting leave stems, cutting the heap and mounds, and inter-planting with maize vegetables yams and cocoyam.	**3.40**
Post-planting technologies as weeding with hoes, earthen up the mounds/heaps flats and use of organic manure.	**3.10**
Emerging technologies	
Pre-planting technologies, mapping out the land with survey equipment, ploughing harrowing and ridging with tractor.	**1.25**

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Planting technologies like selecting improved varieties TMS 30573, TMS 4(2)1425, NRSD82,yellow roots (UMUCAS36,37 and 38) among others and laying stem cutting at 45^{o} each at 1 metre spacing and use of planters as sole cap.	**1.51**
Post planting technologies weeding with herbicides, application of fertilizer 15:15:15, rodenticides and irrigation– sprinklers. drips and centre pivot	**1.84**

Production in Enugu State.
Source: Field Survey, 2017

Extension Methods Used in Improving Farmers Utilization of Existing and Emerging Technologies in Cassava Production

Table 2 shows that the extension methods used were the individual methods ($\bar{x}$=3.10), the group methods ($\bar{x}$=2.59), and the mass media method ($\bar{x}$=2.88). The results indicate that extension methods were not significantly used to improve capabilities of farmers using emerging technologies ($\bar{x}$=1.60).

Table 2: Extension methods used for improving capabilities for the utilization of existing and emerging technologies

Item Statement	$\bar{x}$
Existing technologies	
The extent individual methods are used to improving capabilities of farmers in cutting the bush with machete making mounds with hoes planting with local stems weeding the farm with hoes and use of organic manure application.	3.10
The extent group methods are used to improving capabilities of farmers in cutting burning and clearing the farm, making mounds planting with local stems weeding with hand and hoes and organic manure application.	2.59
The extent mass media are used in improving capabilities of farmers in cutting burning and clearing the farm, making mounds planting with local stems weeding with hand and hoes and organic manure application.	2.88
Pooled mean	**2.56**
Emerging technologies	
The extent individual methods are used to train famers with survey equipment, ploughs, harrows ridgers, planting with hybrids cultivars using planters, use of herbicide pesticides liquid and granulated fertilizers sprinklers, drips and center pivot irrigation.	1.43
The extent group methods are used to train of famers with survey equipment, ploughs, harrows ridgers, planting with hybrids using planters, use of herbicides, pesticides liquid and granulated fertilizers, sprinklers, drips and center pivot irrigation.	1.55

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The extent mass media are used to train of famers with survey equipment, ploughs, harrows, ridgers, planting with hybrids using planters, use of herbicides, pesticides liquid and granulated fertilizers sprinklers, drips and center pivot irrigation.	1.83
Pooled mean	**1.60**

Source: Field Survey, 2017.

Extent of Farmers' Utilization of Existing and Emerging Technologies in Cassava Production

The extent of farmers utilization of existing technologies such as machete, hoes, bush burning, making of mounds in pre-planting operations was high ($\bar{x}$=3.55), (Table 3). The extent farmers select planting materials and preparing cutting of 4 to 6 knots and planting of 2-3 stem cutting (mounds, heaps, and flats) as planting technologies were high $\bar{x}$=2.98. the extent of utilization of hand and hoe to weed the farm and use of organic manure was high. The extent emerging technologies utilization such as survey equipment such as ploughs, harrows, ridges for pre-planting was low $\bar{x}$=1.22. the extent of emerging technologies utilization for planting cassava high breed such as TMS 3573, Rn8082, TMS 4(2)1425, yellow roots UmuCass36, 73×38, use of planters at spacing of 40^0 was low $\bar{x}$=2.06 and extent of utilization of post planting technologies as knapsack and motorised sprayers for the application of herbicides, pesticides, fungicides and among others, some irrigation equipment had low score $\bar{x}$=1.92. This results implies that farmers utilise technologies they were used to more than the emerging technologies that appear strange and also most of the farmers lack technical know-how and training to use these technologies.

Table 3: Extent of farmer's utilization of existing and emerging technologies in cassava production

Extent of farmers' utilization of existing and emerging technologies	$\bar{x}$
Existing technologies	
The event farmers utilize machetes and hoes to clear burn the bush, hoes to mounds , heaps till the flat in pre-planting technologies	3.55
The extent farmers select mature weed stems, cut at 4-6 nodes and plant 2-3 stem cutting per mound, heap or flat as planting technologies	2.98
The extent farmers use hands, hoes and machetes to weed the farm and use of organic manure as post-planting technologies	3.16
Pooled mean	3.32
Emerging technologies	
The extent famers use ploughs, harrows, ridgers as pre-planting operations.	1.22
The extent farmers use hybrids TMS30575 RN8082, TMS 4 (2)1425, yellow roots UMUCASS36,37x38 planters at a stem cutting per meter.	
Spacing at angle of 40^oas planting technologies the extent farmers use krap sacks and moton sprayer applies.	2.06
Herbicides, insecticides fungicides liquid fertilizers sprinklers, drip and center pivot irrigation and use of granulated NPK 10:10:12, 15:15:15 and 12:12:15:2	1.92
Pooled mean	1.67

Source: Field Survey, 2017.

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Difference between Existing and Emerging Technologies Used in for cassava production

Table 4 revealed that there is no significant difference between existing and emerging technologies for improving capabilities of farmers' utilization for cassava production (Z= 0.25). This result shows that existing technologies were available such that machetes, hoes and local stems among others were available for improving farmers' capabilities in pre-planting, planting and post-planting operations in cassava production. Comparatively, emerging technologies such as hybrid cultivars, herbicides and fertilizers were available for improving farmers' capabilities for cassava production except for pre-planting technologies such as surveying equipment and tractor driven equipment.

Table 4: Difference between the existing and emerging technologies used in improving the capability of farmers' utilization for cassava production

Farmers utilization of	n	$\bar{x}$	SD	DF	Z-cal
Existing Technologies	300	3.28	0.78		
Existing Technologies	300	1.41	0.32	2.88	0.25*

***P≤0.05. Source: Field Survey, 2017.**

Conclusion and Recommendations

Emerging technologies were not available for pre-planting operations such as the use of machines like tractors, plough, harrows and ridgers for improving capabilities of farmers' utilization for cassava production. The extension methods that were used in improving capabilities of farmers' utilization of existing technologies were individual, group and mass methods because these were available to extension workers since they cannot gain access to some of the emerging technologies especially in pre-planting operations and the farmers have no option than to utilize existing available technologies for cassava production. The study therefore recommended as follows:

The extension workers should be trained and retrained regularly by subject master specialist in their zone, with emerging technologies so that they can effectively improve farmers' capabilities through training using various extension methods in the utilization of emerging technologies in order to increase cassava production. The extension workers should integrate both individual, group and mass method in improving capabilities of farmers in the utilization of emerging technologies in cassava production as this will make their work easy, increase their production capacities and income.

Cassava farmers should form cooperative societies to enable them pool their resources together to purchase emerging technologies such as tractors, ploughs, harrows and ridgers to facilitate the elimination of fatigue and drudgery associated with the use of existing and crude implements in pre-planting operations in cassava production.

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