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Assessing Socio - Economic Benefits and Challenges of Climate - Smart - Agriculture on Perishable Food Crop Production System in Southwest Nigeria

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Abstract*: Farming is predominant occupation of peasant rural dwellers in Nigeria. It is characterised as small-scale. Small-scale system is prune to climate change due to highly depended on climate and rainfed. Climate-Smart-agriculture is a transformation that brings about intensification, adaptation and mitigation using climate responsiveness in vegetable crop production system. The objective is to achieve sustainable production of tomatoes and peppers (perishable crops). The farmer in South - west Nigeria may not possess adequately the domestic resources required to match climate change adaptation activity, but adoption of Climate-Smart-Agriculture will position the farmers well in the vegetable crop production system. This study targets questions as: i. Is Climate-Smart-Agriculture the most efficient practice to alleviate shortage of tomato/pepper production in the region? ii. Does the Climate-Smart-Agricultural technique acceptable to farmers in the region? About 100 respondents is selected purposively for adopting the C-S-A techniques from 5 villages selected from Ede North local government area of the Osun state being one of the major producers of tomato and pepper crop in the state. Structured questionnaire adopted to source relevant data that will enhance sustainable crop production system. Data collected is analysed using descriptive and multiple regression model to determine contributing factors influence adoption. Climate resilient agriculture is known to have transformed the tomatoes/pepper production system in the North Nigeria, and the southern farmers could perform magic toward sustainable production and growth with efficient climate resilient practices. The findings revealed 53.1% farmers were young and well educated as 81.3% had tertiary education, and majority (78.1%) were male farmers. About 46.9%, 37.5% and 0.9% already adopted intercropping, crop rotation and irrigation system respectively. Also, age, educational level, farm distance and years of experience were determinant factors to adoption. The t-value (t=3.084) and p-value (p=0.003) which is less than 0.05 significant level revealed significant different in the crop yield produced by the farmers. The adoption in the Southwestern region will strengthen vegetable crop production system that brings increased yield.*

Keyword*: Climate resistance agriculture, Perishability, Perishable, Subsistence and Sustainability*

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INTRODUCTION

Things are getting out of hand for the masses in Nigeria, and it's becoming very hard to afford basic ingredients for our meals. The high cost of perishable crops particularly tomato and pepper are beyond an ordinary control measure. According to Punch (2024), prices of tomato and pepper in the North have continued to soar despite the items being in their season. In Nigeria, perishable crop farming (tomato and pepper) is predominantly peculiar with the northern farmers of the country, and most states are Kano, Jigawa, Plateau, Benue, Kaduna, Gombe, Bauchi, Sokoto, Kebbi, Nasarawa, Zamfara and Kogi having huge tomato and pepper plantations. Horticultural production largely takes place in Northern Nigeria where farmer cultivates tomato, pepper and onion often with irrigation in open field production system.

In the past, tomato varieties grown in the Southwest had dominance over all other varieties but as the economy expanded in Nigeria, the globe-like type of tomato grown in the Northern part of the country suddenly dominating southern markets and became acceptable and popular variety across the country. Horticulture crop production creates twice the amount of employment per hectare of production compared to cereal crop production (*Ali et al., 2002*). It is a known fact that over 80.0% of tomatoes farmers in Nigeria still cultivate in the old and outdated ways. Though the climate in southwest is less suitable for open field production system but the renewed interest in increasing investment in vegetable production through hydroponic system (tomato and pepper) across the region is therefore a positive development. However; the pattern of present land - use varies with climate, soil and location of markets, the consequence has been loss of between 25.0 - 40.0% fruit vegetables after harvest and poor post - harvest handling in Nigeria (*Olayemi et al., 2012*).

Climate change is expected to hit developing countries hardest and vegetables crops production could be better enhanced to face this threat in the future by implementing Climate - Smart - Agriculture which transform agriculture and food system towards sustainable production, and economic growth. Agriculture resilient practices boost production aimed at the current economic hardship that has forced food prices rise astronomically by over 100% in Nigeria. The core North where the bulk of food comes from, the bandits are still held farmers into incommunicado as the level of insecurity keeps rising every day. This is most serious challenge along with the outbreak of diseases (Ebola), drought and lack of technology transfer, and it has severely affected perishable crop production systems in Nigeria.

Climate - Smart - Agriculture and Water Resources Management Irrigation is a key tool for intensifying agricultural output, but it is still little used in southwest Nigeria. Building large dams to harness surface water and set up irrigation systems especially on a small - scale for tackling climate uncertainty and ensuring food security. According to spore (2010); rain represents a vast supply of under - uses fresh water, about 4,430 km^3 of fresh water is drawn worldwide each year but almost half is lost through evaporation or poor management. About 86.0% of water taken from the Earth is used for agriculture in Africa. There are a number of techniques both manure and mechanical for harvesting water from roofs or rainwater run - off for agricultural purposes but all these techniques are still relatively little used in southwest

region of Nigeria. Even so, rainwater harvesting is becoming more common in the Northern part.

Investing in simple and low - cost irrigation schemes has had a significant impact on food security and adaptation to climate change. Climate - Smart - Agriculture intensifying output and promoting harvests in the dry season in a sustainable manner. The World Vegetable Centre and International Crops Research Institute for Semi - Arid Tropics (ICRISAT) have teamed up to develop and distribute improved local vegetables with simple and inexpensive irrigation systems that use little water. The system has made improved variety of high yielding tomato and pepper becoming widely grown in Northern Nigeria. Biotechnology introducing drought - resistance genes into genetically modified plants as a supportive strategy and hydroponic system of growing vegetable plants on nutrient solutions (substrate) targeting for producing much healthier plants and bigger yields.

The system in Nigeria presently has drawn many of over 10,000 small - scale farmers and new entrants who have abandoned farming years back and now venturing into vegetable production. With this, the small - scale farmers in Nigeria will put an end to the escalating price increases of perishable foods crops. It is apparent that, the Climate - Smart - Agriculture system plays a critical role in implementing interventions that promote sustainable production practices, improving soil health, water management, and enhancing the resilience of perishable crops to climate change effects. Though it may not be easy to convince small - scale farmers to try the Climate - Smart - Agriculture but with the right encouragement and assurance, they will soon start participating, and once they are successful there will be a surprising multiplier effect.

MATERIAL AND METHOD

The study was carried out in Ede Local Government Area of Osun state, five villages were purposively selected which include: Araromi, Agodo, Apena, Oke pupa and Orisunbare, and the villages covered for this study have both agro - climatic and soil structure conducive to the cultivation of Tomato or Pepper crops. Purposive sampling technique was adopted in selecting 5 villages noted for the crop production in Osun state. Equal number of ten farmers each were purposively selected from 5 villages being adopters of Climate - Smart - Agriculture practices and another ten non - adopter farmers randomly selected from each village given 100 sample sizes. Data used for the study mainly obtained through the use of a structured questionnaire and direct farmers' contact (Primary source). Relevant information gathered were subjected to descriptive statistic for the analysis of socio - economic characteristics of farmers, and multiple regression analysis to determine the pressing variables on the adoption and T - test for the difference exists between the adopters and non - adopters of C-S-A in respect to their crop yields.

RESULTS

The socio - economic profiles of the respondents were examined under variables of age, gender, marital status, level of education attained, household size, farm distance from residence, and years of experience with C-S-A practices. The result - a good number (53.1%) farmers were young between 31 - 40 years, well-educated as 81.3% had tertiary education.

Majority (78.1%) were male farmers with household size of 2 - 7 members. This result substantiates the findings of Ike (2012) and *Danjuma et al. (2016)* in their respective study of the analysis of FADAMA III on poverty in Delta state and socio - economic impact of the FADAMA III in Taraba state, Nigeria. However, majority (61.6%) attested that Climate - Smart - Agriculture practices have increased their crop output significantly as 46.9% adopted intercropping, 37.5% crop rotation, and 0.9% irrigating their farms, while significant proportion (60.0%) lack resources and technical knowledge of various C-S-A practices. Other important constraints are farm distance from residence of farmers, lack of training, and financial incapability of many farmers. It was also observed that, 32.0% focused mainly on high-yielding variety seed for cultivation while 60.0% farmers have been depended on wider variety as planting materials. A multiple regression result of variables measured revealed that age in year (t = 1.112), level of education (t = 2.446), farm distance (t = 1.499), and years of experience with C-S-A (t = 1.114) were significant variables that influence adoption.

$Y = f(X_1 + X_2 + X_3 + X_4 + X_5 \ldots\ldots\ldots e)$ where X_1 = age, X_2 = level of education attained, X_3 = farm distance, X_4 = years of experience, X_5 = household size, and X_6 = farm size in acre.

The mathematical equation derived from regression:

$Y = 4.840 + 0.079\ X_1 + 0.164\ X_2 + 0.124\ X_3 + 0.147\ X_4 - 0.016\ X_5 - 0.064\ X_6$

Table 1: Regression Analysis Result

Socio-economic	Reg Coeff	T	Standard Error	Remark
Constant	4.840	-	-	-
Age	0.079	1.112	0.001	S
Edu Level	0.164	2.446	0.000	S
Farm Distance	0.124	1.499	0.003	S
Years of Experience	0.147	1.963	0.000	S
Farm Size	- 0.016	1.114	0.134	NS
Household Size	- 0.064	1.963	0.050	NS
n = 100, P = 0.05				

The result in the Table 2 revealed a significant relationship between adoption of C-S-A and crop yield at 1% level of significance. It implies that the more conversant the farmer is with the use of C-S-A practices the better for the crop yield both in quantity and quality.

Table 2: Test of Crop Yield Difference Between Adopters and Non - adopters of CSA

Variables C-S-A	Mean	Standard Deviation	Standard Error	Mean Diff	t	df	p	Remark
Adopters	604.48	3551.90	397.11	0.4846	3.084	79	0.03	S
Non-adopters								

Also, the result in the above table revealed the difference between the crop yield of adopter and non - adopter farmers in the study area. The value of t - test (t = 3.084) and p - value (p = 0.003) which is less than 0.05 level of significance revealed that there is significant different in the crop yield produced between the adopter and non - adopter farmers. It implies that, adoption of C-S-A in Tomato or Pepper production had significantly contributed to increase crop output. Therefore, *the adoption of C-S-A* in the South western region will strengthen vegetable crop

production system including the capacity of farmers enterprises and stakeholders to expand their operation sustainably

CONCLSION

Intensify adoption of C-S-A in the South western region will strengthen vegetable crop production system including the capacity of farmers enterprises and stakeholders to expand their operation sustainably. Based on the empirical evidence emanated from the study, adoption of Climate - Smart - Agriculture practices contribute significantly to increase crop yield and improve quality in the study area, its adoption is successfully enhanced Tomato or Pepper production in this part of Osun state, Nigeria. It could as well perform better in all agro - ecological zones in Nigeria.

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