Journal of Agriculture, Environmental Resource and Management
ISSN2245-1800(paper) ISSN 2245-2943(online)
4(2413-425; Dec.2019

www.saerem.com

YAM BASED FARMERS' RESPONSE TO CHALLENGES OF CLIMATE SMART AGRICULTURE IN KOGI STATE, NIGERIA

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Abstract

The study examined the response of yam based farmers to challenges of Climate Smart Agriculture in Kogi State, Nigeria. Agricultural Development Project (ADP) administrative Zoning was adopted for the study. A multi-stage random sampling technique was used for data collection. Structured questionnaires were used to collect data on socio-economic variables of the farmers, effects of climate change on yam production, copping strategies and limitations to adaptation of the copping strategies. Descriptive statistics were used to analyze the data collected. The result shows that the yam farmers are smallholders, but young and well experienced. The result also indicates that the majority of the farmers are aware of the effects of climate change and as such adopt various coping strategies, but not without limitations. The study recommended improvement on extension services for dissemination of information on Climate Smart Agriculture (CSA), provision of incentives, compensation for loss of revenue and training and re-training of yam based farmers on CSA.

Keywords: Climate Smart Agriculture, climate change, Coping Strategies

Introduction

Climate change caused by human activities constitutes a very serious threat to sustainable agricultural production and food security in Nigeria (Adebayo; Onu; Adebayo; Anyanu, 2012). It has multiplied the challenges of achieving the needed growth and improvements in agricultural systems for food security. The effects climate change are already being felt because farming practices are strongly influenced by long term mean climate state (Ibitoye, Ogunyemi and Ajayi, 2014). In fact it has been projected that crop yield in Africa would fail by 10% to 50% by 2050 due to climate change (Jones and Thornton, 2003). This disruption of food and water system has devastating implications for development, livelihood and poverty eradication (De wit and Stankiewicz, 2006). Again, climate change and its perceived effects cannot be stopped, it can only be mitigated, thus the need for adaptive strategies. The adoption of the copping strategies in agricultural production is what is referred to as Climate Smart Agriculture (CSA). CSA provides the means to help stakeholders from local to national and international levels identify agricultural strategies suitable to their local conditions in the face of climate change. CSA deals with these interlinked challenges in a holistic and effective manner (FAO, 2010). More so, it is an approach to help guide actions to transform and re-orient agricultural systems to effectively and sustainably support development and food security under a changing climate (FAO, 2013). Different elements of CSA include: management of farms, landscape or ecosystem management, services for farmers and land management and changes in the wider food system. Other ingredients of CSA are climate information services, financial services and social protection.

However, it should be noted that; CSA is not a new production system; it is rather a means of identifying which production systems and enabling institutions are best suited to respond to the challenges of climate change for specific locations and to maintain and enhance the capacity of agriculture to support food security in a sustainable way (Ibitoye et. al.; 2014). Furthermore, among the specific objectives of CSA are; increasing agricultural productivity and incomes, sustainably increasing food security, reducing costs through increased resource-use efficiency and eliminating yield gaps, building resilience and adapting to climate change and developing opportunities for reducing greenhouse gas emissions (FAO, 2013). These aims are obtained by enhancing the productivity of agro-ecosystems and increasing the efficiency of soil, water, fertilizer, livestock feed and other agricultural inputs (Adejuwon, 2014). Generally, these ensure higher returns to agricultural producers, reducing poverty and increasing food availability and access, reducing risk exposure through diversification of production or incomes, and building input supply systems and extension services that support efficient and timely use of inputs (Jones and Thornton, 2013). These same measures can often result in lower greenhouse gas emissions (Shehu A, 2014). Reducing emission is one key strategy for agricultural mitigation; by enhancing the efficiency of input use so that the increase in agricultural output is greater than the increase in emissions (FAO, 2013). These can only be achieved in Africa and Nigeria in particular if local institutions support CSA by facilitating the capacity of farmers to work together on land and water resources across landscapes; increasing the flow of information between national and local levels through extension and weather information services; increasing access to credit for investing in sustainable land and water management; improving timely access to the type and amount of inputs and supporting effective risk management at the farm level through insurance, safety nets, income diversification and storage capacity (Obioha, E (2008). All these apply to agriculture in Nigeria since it is mostly rain-fed and any change in climate is bound to impact on its productivity (Shehu (2014) especially crop and in particular yam production which is the focus in this study. It is therefore, important to examine the yam based farmers' response to challenges of climate change and their limitations in adopting copping strategies.

Yams are tropical region crops (Aquaah, 2000) and Nigeria is located in this region. Nigeria is the leading yam producer in the world and produced about 71% of the global output (ITTA, 2002). Yam has socio-economic and socio-cultural values as it plays a vital role in Nigeria's economy and culture. It also contributes to local and foreign earnings and serves as staple and rural food security as a result of its physical and physiological properties (Zannou, 2009). However, yam production is labour and capital intensive, but with low returns to labour and capital. This is as a result of problems of tedious operations that are involved, poor soil fertility, occurrence of pests and diseases, unavailability of improved seeds especially to smallholders, weed infestation, vagaries of weather, unavailability of soil water, and unfavourable natural occurrences (for examples; erosion, drought, forest fire, flood, extreme weather conditions and events) (Asiedu and Alieu, 2010 and Simpa, 2014). This implies that there is 'Yield Gap'; which means that; there is negative difference between the actual yield and technically feasible yield. This difference has led to high prices of yam especially in urban areas and even in rural areas during off-season (Sullivan *et. al*., 2008 and Simpa, 2014). From the foregoing, it can be deduced that most of the causes, if not all of low yam production are consequences of the changing climate due human activities. Therefore, the objectives of this study include: to determine the socio-economic characteristics of the yam farmers, examine levels of awareness of climatic change by the farmers, examine the impacts of climatic change on yam production, and determine the copping strategies adopted by the farmers and limitations to climate smart agriculture as par yam production in the study area.

Methodology

The study area is Kogi State. The predominant occupation of the rural populace who are the majority is farming and yam production is one of the staple crops they produce (Kogi ADP, 1995). This is the reason for the choice of this study area. The State has population of 3,314,043 (NPC, 2006) and a land area of 30,554.74 Square Kilometres (Wikipedia, 2012; KOSEEDS, 2004). The State enjoys tropical climate with two distinct seasons; which are rainy and dry with high relative humidity and wide range of temperature (22.6 – 33.2ºC) (Simpa,2014)..

A multi-stage random sampling technique was used for the data collection from the yam based farmers as follows: First stage; one zone was randomly selected from the four ADP administrative zones and this happened to be Koton Karfe Zone. Second stage; two Local Government Areas (LGAs: Adavi and Okehi) were randomly selected from among the LGAs in the zone. Third stage; the farming settlements in these LGAs were enumerated to be thirty six and twelve settlements were randomly selected from among the settlements. Fourth stage; Ten yam farmers each were randomly selected from the listed yam farmers for responses. The total number of respondents is 120yam farmers.

Structure questionnaires were used to collect data on socio-economic variables of the farmers, impacts of climate change on yam production, copping strategies and limitations to adaptation of the copping strategies for the study. Descriptive statistics such as percentage, charts and Likert Scale were the analytical techniques used for the data analysis.

Result and Discussions

Socio-economic Characteristics of the Respondents

Table 1 shows the economic characteristics of the yam farmers that influence their responses to climate change and limitations they encounter in CSA. Age, educational level, years of experience, access to climate change information, membership of a social group and number of extension visits influence individual farmer's action either positively or negatively in CSA. Farm size, access to credit facilities, source of labour, cropping system, and landownership type might affect mode of farm operations in CSA. Yam production being their major occupation might influence their commitment to adoption of coping strategies.

Table 1: Description of Socio-economic Variables of Yam Based Farmers in Kogi State

Descriptive Variables	**Mean**	**Standard Deviation**	**Maximum**	**Minimum**
Age (Years)	45.51	12.22	70	24
Farming Experience (Years)	14.51	9.65	40	6
Educational Level (Years)	8.65	5.11	17	0
Farm Size (Hectares)	0.75	0.54	3.5	0.1
Extension Visits (Numbers)	2.27	1.86	6	0

Dummy Variables	**Percentage**
Access to Credit: (Yes = 1, No = 2)	Yes = 48, No = 52
Source of Labour: (Family = 1, Hired = 2)	Family Labour = 69, Hired Labour = 31
Cropping System: (Sole = 1, Mixed =2)	Sloe cropping = 62, Mixed cropping = 38
Membership of social Group (Yes = 1, No =2)	Yes = 45, No = 55
Major Occupation, farming? (Yes = 1, No =2)	Yes = 72, No = 28
Land ownership: (Inheritance = 1, Purchased = 2, Tenancy = 3)	Inheritance = 50, Purchased = 20, Tenancy = 30
Access to climatic information:(Yes =1, No =2	Yes = 55. No = 45

Source: Field Survey, 2019

Level of Awareness of Climate Change by the Respondents

Figure I reveals the level of awareness of the respondents to the effects of climate change and the result shows that majority of the farmers are aware of the climatic change and its effects and consequences. This invariably makes them to think of ways of mitigating its effects and consequences

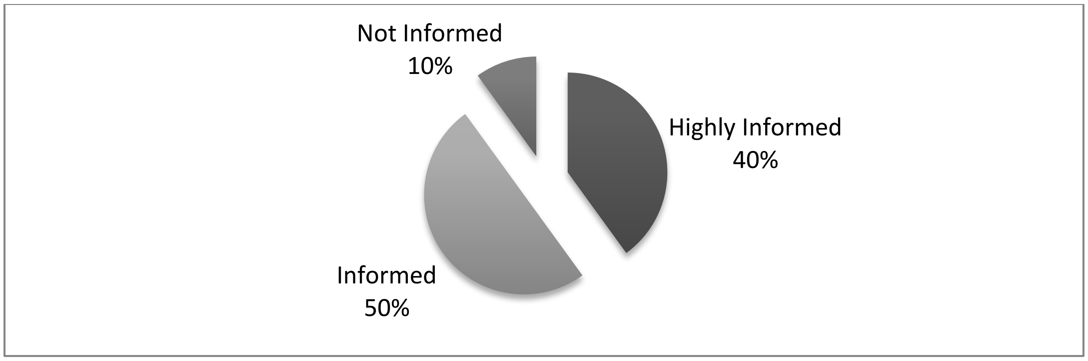

Fig. 1: Level of awareness of influences of climate change on Yam production in Kogi Sttate

Effect of Climate Change on Yam Production

Table 2 shows the perceptions of the farmers to the various impacts of climate change on yam production. Though the effects are ranked, there is none of the impacts that are not important to yam productivity as shown by the mean score of the responses.

Table 2: Impacts of Climate Change on Yam Production in Kogi State

Perceived effects on Yam production	Mean Score	Remarks	Rank
Loss of Revenue	4.9	Strongly Agree	1st
Poor Germination of Seedlings	4.8	Strongly Agree	2nd
Crop Failure/Reduction in yield	4.6	Strongly Agree	3rd
Early yellowish of leaves	4.3	Agree	4th
Early hardened of heaps/Difficulty at harvesting	4.1	Agree	5th
Pests infestation and disease infection	3.8	Agree	6th
Drying of tendrils (sprouting seedlings)	3.6	Agree	7th
Loss of Soil Fertility due to Erosion and Leaching	3.3	Undecided	8th
Wilting of tendrils	3.2	Undecided	9th
Falling/dropping leaves	2.6	Undecided	10th
Incessant flooding on yam plot	2.4	Disagree	11th
Burning of leaves	2.2	Disagree	12th

Source: Field Survey, 2019

Strongly Agree = 4,5 – 5,0, Agree = 3.5 – 4.49, Undecided = 2.5 – 3.49, Disagree = 1.5 – 2.49, Strongly Disagree = < 1.5

Yam Farmers coping Strategies to Challenges of Climate Change

Table 3 shows the various coping strategies the yam based farmers in the area do adopt in response to demand of CSA. Multiple responses were collected and ranked and these reveal that the farmers are making serious efforts to adapt to CSA. Adoption of multiple of these strategies rather than a sole strategy might imply that it is the combinations that work more effectively in CSA.

Table 3: Climate Change Coping Strategies adopted by Yam Based Farmers in Kogi State

Variables	Frequency	Percentage	Rank
Change of planting date	115	95.83	1st

Mixed cropping	110	91.66	2nd
Migration from yam to other crops	105	87.50	3rd
Crop diversification	102	85.00	4th
Alteration of heaps/mound size	100	83.33	5th
Movement to different sites	95	79.16	6th
Use of pesticides	91	75.83	7th
Soil/Water Conservation Techniques	90	75.00	8th
Crop rotation	90	75.00	8th
Change time/pattern of land preparation	85	70.83	9th
Mulching/change of mulching materials	80	66.66	10th
Early harvest of yam	78	65.00	11th
Application of farmyard manure /fertilizer	75	62.50	12th
Agro-forestry	60	50.00	13th
Movement to non-farming economic ventures	55	45.83	14th
Construction of bond across the flood plain	50	37.72	15th
Change in weeding pattern	40	33.33	16th
Irrigation/Diseases/Drought resistant variety	30	25.00	17th

Source: Field Survey, 2019

Limitation to Adoption of coping Strategies by Yam Farmers in CSA

Figure II indicates the limitations to farmers' efforts in coping with the demand of CSA. Some limitations are as result of unavailable information, lack of credit, poor technical know-how, unavailable cultivar and poor extension services. All these hindered the yam farmers from achieving maximum efficiency in CSA.

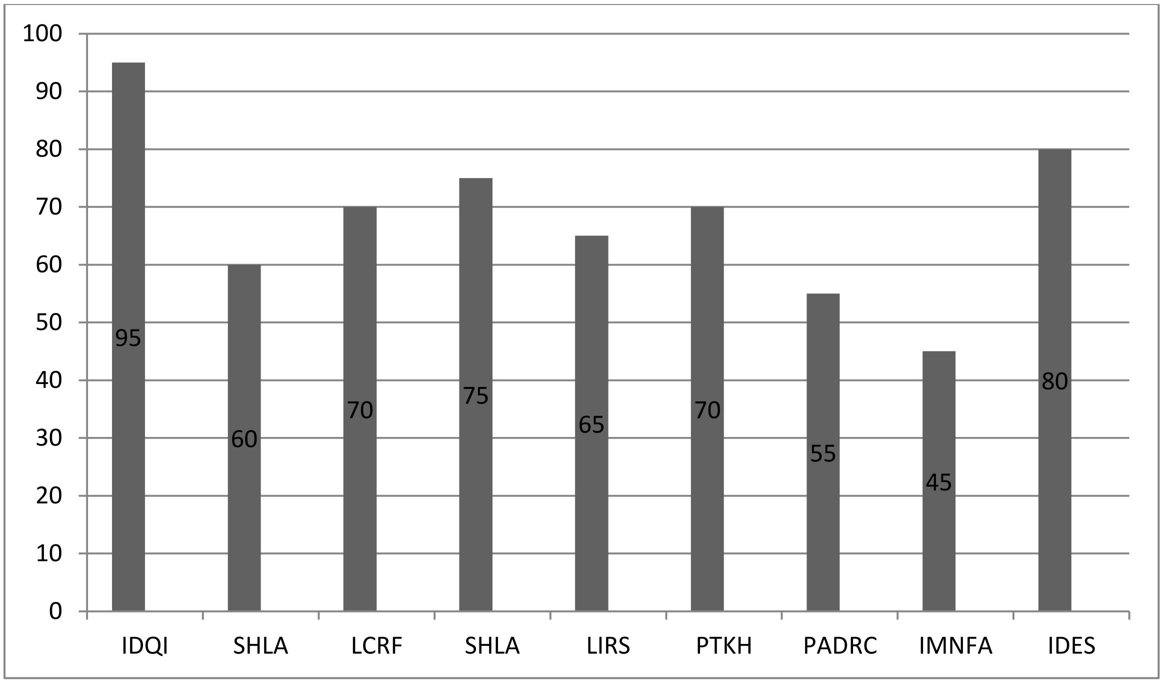

Figure 2: Showing Limitations to Coping Strategies in CSA

Table 4: Full Meaning of Abbreviations to Variables in Figure 2

Variable	Abbreviation
Inadequate Information	IDQI
Shortage of Labour	SHLA
Lack of Credit Facilities	LCRF
Shortage of land	SHLA
Lack of Irrigation System	LIRS
Poor Technical Know-how	PTKH
Poor Access to Drought Resistant cultivars	PADRC
Inability to move to Non-farm activities	IMNFA
Inadequate extension Services	IDES

Source: Field Survey, 2019

Conclusion

The study examined farmers' responses to challenges of CSA in Kogi State. The result shows that the majority of the farmers are smallholders and possess some socio-economic attributes for example youthful age, many years of experience, few years of education, landownership by inheritance) that enable them to positively respond to climate change challenges). Majority of the farmers are also aware of the impacts (for example, loss of revenue, yield reduction, poor germination, erosion and flooding) of climate change and as such they adopt various coping strategies (which include change of planting date, mixed cropping, crop rotation, change of mulching materials and land tillage pattern). However, they were faced with various limitations (for example, inadequate information, shortage of labour, lack of credit facilities, poor technical know-how) in practising CSA.

Recommendations

Based on the findings of the study, the following are recommended:

1. There is need for improvement on extension services for wider dissemination of information on Climate Smart Agriculture.
2. Incentives such as access to credit and land, resistant cultivars and of irrigation system should be provided for the farmers so that they can increase their farm size.
3. The loss of revenue by farmers due to climate change should be compensated by the provision of social welfare nets, minimum guaranteed price and subsiding farm inputs.
4. Negative coping strategies such as migration to non-farming activities and migration from yam production to other crops should be discouraged.
5. Training on Climate Smart Agriculture should be organised to improve the technical know-how of the farmers.

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