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Adaptation Strategies to Climate Change by Food Crop Farmers in Oke-Ogun Area of South Western Nigeria

Sangotegbe N. S.
Department of Agricultural Extension and
Rural Development, University of Ibadan
siji004@yahoo.com, *Tel*: 07032077856.
Odebode S. O.
Department of Agricultural Extension and Rural Development
University of Ibadan
mrsdrodebode@yahoo.com, *Tel*. 08034891880
Onikoyi, M. P.
Agricultural and Rural Management Training Institute, Ilorin.
onikoyipeju@yahoo.com, *Tel.* 08037631394

Abstract

The study examined the adaptation strategies to climate change in Oke Ogun Area of South Western Nigeria. A multi-stage sampling technique was used to select two of the ten local government areas in the area, two wards in each LGA,6 communities in each ward, from which a total of 160 out of 800 food crop farmers were randomly sampled. Data were subjected to statistical analysis using frequency counts and percentages. Pearson product moment correlation (PPMC) and chi-square were used to determine the relationship between variables. Majority of the respondents were males (77.5%), having low level of education (68.7%). Also, majority were aged 41 to 60 years, with farming experience ranging from 11 to 50 years (59.3%). Majority (90% and 58.8%) of respondents had access to credit facilities and extension contacts respectively. Majority (60%) of the respondents had an unfavourable perception of climate change effects. Ninety nine percent of the respondents practised multiple cropping under dry land and crop rotation, while 10.6% adopted agricultural insurance as parts of their adaptation strategies to climate change. Crop rotation (mean = 2.77). Invasion of cattle and herdsmen (mean = 2.50) inadequate supply of agricultural inputs (mean = 2.41) and lack of access to credit facilities (mean = 2.33) were the important constraints to farmers adaptation strategies. Inputs supply to the local farmers should also come with government subsidy. This will go a long way in alleviating the sufferings of the farmers, as regards inadequate supply and delivery of agricultural inputs.

Key words: *Adaptation, Strategies, Climate, Change, Food, Crop, Farmers, south-western*

Introduction

Different authors have come up with different definitions of adaptation to climate change. Burton, Smith, and Lenhart (1998) define it as all those responses to climate change that may be used to reduce vulnerability. According to Burton (1992) Adaptation to climate is the process through which people reduce the adverse effects of climate on their health and well-being and take advantage of the opportunities that their climatic environment provides. Downing *et al.* (1997) assert that adaptation is synonymous with "downstream coping" Füssel and Klein (2002) defined it as all changes in a system, compared to a reference case, that reduce the adverse effects of climate change. IPCC (2001) defines adaptation to climate change as adjustment in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. This term refers to changes in processes, practices, or structures to moderate or offset potential damages or to take advantage of opportunities associated with changes in climate. It involves adjustments to reduce the vulnerability of communities, regions, or activities to climatic change and variability. It involves adjustments to enhance the viability of social and economic activities and to reduce their vulnerability to climate, including its current variability and extreme events as well as longer term climate change (Smith, 2000).

Oke-ogun, renowned for intensive food crop production activities, is experiencing a direct impact of climate change on agriculture, ranging from pronounced seasonality of rainfall, to severe and recurrent droughts, which disrupt the usual pattern of seasonal water availability (Mortimore and Adams, 2001). This has therefore put the activities of food crop farmers in Oke-Ogun area of Oyo State, Nigeria in a precarious situation. Consequently, there have been repeated crop failures and declining yields which have led to malnutrition and impoverishment of local inhabitants due to the extended effects of climate change on their livelihood (Mortimore and Adams, 2001).

Much has been done in the area of climate change, especially on the perception of the farmers and indigenous people. In separate studies by Ishaya and Abaje (2008) and Apata, Samuel and Adeola (2003), it was revealed that many of the rural people are well informed about climate change and therefore have positive perception towards the realities. However, not much has been done on adaptation to climate change at the farm level of the food crop farmers in Oke-Ogun area of Oyo state, with a view to understanding the rationales behind the continuous decrease in food crop production, in spite of their strategies to reduce climate change effects. Therefore, there is the need to understand the position of the food crop farmers in this area with respect to their adaptation strategies to climate change. The study therefore looked into the following objectives: These were to:

(i) determine the socio-economic characteristics of the food crop farmers in the study area;

(ii) examine the constraints farmers face while adapting to climate change;

(iii) assess their perception of climate change effects on food crop production; and

(iv) determine their adaptation strategies to climate change.

Methodology

The study was carried out in Oke-Ogun area of Oyo State. The area is located within the Guinea savannah zone. It shares borders with Kwara, Niger, Ogun and Osun states, as well as Niger Republic (a neighbouring country). The area is recognized as the 'food basket' of the Southwestern Nigeria, having an annual rainfall ranging between 700-1100mm. The landmass of Oke-Ogun is about 13,537 Sq. Km. This is about 60% of the total land mass of the present Oyo State, Nigeria. The population of the study comprised of all the food crop farmers in Oke-Ogun area of Oyo State. A multi-stage sampling technique was used to select two (Saki-West and Kajola) of the ten LGAs, two wards in each LGA, 6 communities in each ward. The list of the food crop farmers was then generated from where 20% of a total of 800 food crop farmers were selected through a simple random sampling technique as the unit of analysis. This gave a total of 160 respondents for the study. The Data for the study comprised of primary data and it was collected using interview schedule, which was administered to food crop farmers.The interview schedule used was made up of different questions for collecting information as follows: Socio-economic information, food crop farmers perception of climate change effects**,** constraints faced by the farmers in adapting to climate change effects and their adaptation strategies to climate change effects. The following variables were measured:

Constraints to adapting to climate change: This was measured as the farmers listed such constraints, and level of severity was scored as very severe (3), severe (2), not severe (1) and not a constraint (0). The maximum score was 24 (8 items), while the minimum was 0. A weighted mean was generated for each item to determine the level of importance of each of the constraints.

Perceived effects of climate change on food crop production: A list of 28 negative and positive perception statements were generated and the level of agreement of the respondents to each was indicated as Strongly agreed (SA), Agreed (A), Undecided (U), Disagreed (D) and Strongly Disagreed (SD), assigning scores of 5, 4, 3, 2 and 1 for positive statements and reversed for negative statements. The maximum score obtainable was 140 (28 items), while the minimum was 28. Each of the items has a mean of rating. The overall mean score was obtained and use to categorize farmers into having unfavourable (≥ mean) and favourable (< mean) perceptions.

Adaptation strategies to climate change: Farmers listed their adaptation strategies to climate change and frequency of use was indicated as always, occasionally, rarely and never, with scores of 3, 2, 1, and 0 assigned to each respectively.The Data were subjected to statistical analysis using frequency counts and percentages.

Results and discussion

A. Personal characteristics of respondents

Table 1 shows that a large number (45%) of the respondents fell within the age range of 41-60 years. Twenty eight percent (28%) and24.1% of them were 61-80 and 21-40 years old respectively. This implies that majority of the respondents are active economically. Majority (73.1%) of the famers were married while 7.5% were divorced. The educational level of the majority of respondents was low, with 68.7% of the respondents having either non-formal education or primary education. Only 18.8% of them attained tertiary educational level. The study shows that more men (77.5%) than women (22.5%) engaged in food crop farming. The most experienced farmers (71-80 years) were 1.3% of the entire population. Most (59.3%) of the population have between 11-50 years of experience. Ninety percent of the respondents had access to credit facilities. Most (38.1%) of the respondents obtained credit facilities from cooperative societies. Respondents also obtained loans from friends (13.1%) and informal savings (11.3%).

About 6% of the respondents had access to extension contacts as against94% with no extension contact. As a result of this, many of the farmers may be poor in their adaptation strategies.

TABLE 1
Distribution of respondents according to their socio-economic characteristics

Variables	Frequency	Percentage	Mean
Age			
≤20	2	1.3	52.03
21-40	39	24.4	
41-60	72	45.0	
61-80	45	28.1	
81-100	2	1.3	
Level of Education			
No formal education	61	38.1	
Primary education	49	30.6	
Secondary education	20	12.5	
Tertiary education	30	18.8	
Sex			
Male	124	77.5	
Female	36	22.5	
Farming experience			
≤ 10	22	13.8	32.14
11-20	26	16.3	
21-30	40	25.0	
31-40	29	18.1	
41-50	19	11.9	
51-60	14	8.8	
61-70	8	5.0	
71-80	2	1.3	
Access to and sources of credit facilities	144	90	
Access	16	10.0	
No access to credit facilities			
Access to extension contacts			
Extension contacts	10	6.0	
No contacts	150	94	

Source: Field Survey, 2011

B. Food crop farmers' perception of climate change effects on crop production

Majority (66.3%) as shown in Table 2 of the crop farmers strongly agreed that rising annual temperature reduces the production of common food crops, while exactly half (50.0%) of them strongly agreed that crop farming is becoming more tedious due to the changing climate. This implies that respondents have unfavourable perception to climate change in the study area. This suggests that they would also have positive attitude to adapting to climate change with a view to increasing their level of food crop production. This further attests to the

unfavourable perceptions that farmers have of the various effects of climate change on food production in the area. These agree with findings of Molua (2008) who reported that performance of the agriculture sector depends largely on the return of good rains.

Meanwhile, majority (60%) of the respondents had unfavourable perception of the effects of climate change, while 40% of them had favourable perception of climate change effects. This result corroborates those of Ishaya and Abaje (2008), and Apata, Samuel and Adeola (2003).

TABLE 2
Distribution (%) of respondents according to their perceptions of climate change effects (n = 160)

Statements	SA	A	U	D	SD	Mean
Continuous rise in annual temperature reduces production of common food crops	66.3	18.1	5.0	8.8	1.9	4.38
Yearly rains are not supporting food crop production as before	35.0	44.4	10.0	5.6	5.0	3.99
Infestation of crops by pest is common due to climate change	33.8	31.3	18.1	12.5	4.4	3.78
Climate change reduces working hours of food crop farmers	35.6	43.8	13.1	6.9	0.6	4.07
There is a rapid loss of soil nutrients to erosion due to climate change	28.1	29.4	23.8	11.3	7.5	3.59
Labour availability is being reduced due to climate change	26.9	35.6	15.0	19.4	3.1	3.64
There is poor germination rate of food crops due to climate change	40.6	34.4	10.0	8.8	6.3	3.94
Poor harvest of food crops cannot not be due to climate change	26.9	29.4	13.8	15.6	14.4	3.39
Climate change will make food available the more	22.5	30.0	15.0	16.9	15.6	3.27
Farming operation is becoming more tedious because climate is changing	50.0	18.1	13.1	13.8	5.0	3.94
Climate change does not lead to prevalence of crop disease	19.9	34.4	23.8	15.6	14.4	3.17
High cost of food cannot be traced to climate change	19.4	30.0	14.4	18.1	18.1	3.14
No food Farmers are quitting farming due to climate change	16.9	25.0	19.4	20.0	18.8	3.01
Occurrence of flood in the recent days is not traceable to climate change	13.1	26.9	31.3	16.9	11.9	3.12
Climate change does not force food crop farmers into planting different crops	14.4	38.8	10.0	18.8	18.1	3.12
Climate change does not lead to high production cost of food crops	19.4	37.5	16.3	17.5	9.4	3.40
Farmers are losing interest in farming due to climate change	29.4	29.4	10.6	17.5	13.1	3.44
Incidences of drought during the rainy season cannot be due to climate change	21.9	39.4	16.4	11.9	10.6	3.50
Climate change will lead to larger farm size of farmers	26.9	43.9	13.1	14.4	18.8	3.29

Climate change cannot lead to malnutrition	23.8	31.3	16.9	16.9	11.3	3.39
Climate change has nothing to do with food crop production	32.5	35.0	13.1	8.8	10.6	3.70
Degradation of land is more pronounced due to climate change	13.1	20.6	36.3	17.5	12.5	3.04
Climate change will continue to affect storage of food crops	28.1	26.3	25.6	15.0	5.0	3.58
Access to usable water for farming activities is gradually decreasing and this is due to the ever rising annual temperature	33.8	34.4	13.1	14.4	4.4	3.79
Climate change has led to an increased demand for irrigated farming	30.0	30.6	14.4	15.0	10.0	3.56
Climate change is not a problem because it is long way off the future. No cause for alarm.	26.9	22.5	11.9	16.9	21.9	3.16
With this trend in rainfall pattern, we may be forced to permanently change the type of crops being grown, as time goes on.	23.8	13.8	25.0	18.8	18.8	3.05
Increasing annual rainfall increases the quality of crops produced.	18.1	18.8	21.3	11.9	30.0	2.83

Source: Field survey, 2011

TABLE 3
Distribution of respondents according to their level of perception

Category of perception	Frequency	Percentage	Range of scores	Mean
Favourable	64	40.0	34-94	94.89
Unfavourable	96	60.0	95-125	

Source: Field Survey, 2011

C. Food crop farmers' adaptation strategies to climate change effects

A list of adaptation strategies by the respondents is presented in table 4. The mostly practised adaptation strategies include mulching (81.3%), crop rotation (78%), planting of different crops (78.1%), and planting of different crop varieties (75%), as majority of the respondents always practised them. More than half of the population claimed to practise cereal/legume intercropping (56.3%), ridges across the slope (61.9%), and shifting cultivation (53.1%). However, majority of the respondents, on the other hand, claimed not to practise use of agricultural insurance (89.4%) and mounding (90.0%). This result implies that farmers were only able to put up adaptation strategies that are accessible and affordable.

The mean distribution of the various adaptation strategies by the farmers indicated that the most commonly adopted adaptation measure to climate change are: practice of crop rotation (2.77), mulching (2.76) planting different crops (2.71),

changing planting dates (2.69) and planting different crop varieties (2.69). The least adopted adaptation measures include: use of agricultural insurance (0.13), mounding (0.25) and zero tillage (0.93). These results are in line with Molua (2008) Rudolf and Hermann (2009) and Apata *et al* (2009) who reported that main strategies for reducing climate risk is to diversify production and livelihood systems such as soil and water management measures, and plant protection measures that varied to maintain adequate crop yields.

TABLE 4Distribution (%) of respondents according to their adaptation strategies (n=160)

Adaptation Strategies	Always	Occasionally	Rarely	Never	Mean
Cereal/legume intercropping	56.3	25.6	13.8	4.4	2.34
Ridges across the slope	61.9	23.8	11.9	2.5	2.45
Planting different crop varieties	75.0	19.4	5.0	0.6	2.69
Use of organic fertilizers	33.8	25.6	21.9	18.8	1.74
Fadama/irrigation	31.9	18.8	20.6	28.8	1.54
Mixed farming	72.5	13.1	10.6	3.8	2.54
Changing planting dates	74.4	21.3	3.1	1.3	2.69
Soil protection through Planting trees	30.0	23.8	20.0	26.3	1.58
Planting different crops	78.1	15.6	5.0	1.3	2.71
Zero tillage	10.0	13.8	35.0	41.3	0.93
Mulching	81.3	14.4	3.8	0.6	2.76
Use agricultural insurance	0.6	1.3	8.8	89.4	0.13
Crop rotation	78.1	20.6	1.3	-----	2.77
Multiple crops under dry land to conserve moisture	38.1	45.0	15.6	1.3	2.20
Shifting cultivation	53.1	26.3	18.1	2.5	2.30
Mounding	5.0	5.0	------	90.0	0.25

Source: Field Survey, 2011

D. Constraints faced in a adapting to climate change Shortage of water

One of the constraints to adaptation strategies in the area is the prolonged shortage of water. The result shows that the shortage of water is a serious constraint, as 41.3% of the farmers described the constraint as very severe; and a minority (9.4%) of the population considered shortage of water as no constraint. The implication is that farmers are facing challenges due to the ever increasing average annual temperature, and any attempts to provide an artificial means of supplying water will be embraced by them.

Lack of credit facilities

Lack of credit facilities is also seen as a serious constraint by them. This is indicated in table 2. Majority (51.3%) of the farmers considered lack of credit facilities as very severe in their quest to adapting to the effects of climate change on food crop production. This is in agreement with Hassan and Nhemachena

(2008) that availability of credit facilities to farmers will make it easy for farmers to adapt to climate change. The implication of this is that farmers are facing difficulties accessing credit facilities in the study area, and this may make it difficult for them to adapt to climate change with relative ease.

High cost of inputs

This has a direct link with lack of credit facilities. A large proportion (52.2%) of the farmers view high cost of inputs as a very severe constraint, while a minority (2.5%) opined that it is not a constraint at all.

Lack of knowledge of adaptation strategies

Lack of knowledge of adaptation strategies is another constraints mentioned by the respondents. About 43.8% of the respondents considered lack of knowledge on adaptation strategies as severe, while a small proportion (6.9%) of the respondents' population viewed it as not a constraint. Lack of adaptive knowledge is a limiting factor to adaptation strategies to climate change by food crop farmers. This is in agreement with kandlinkar and Risbey (2000) that agricultural information helps farmers make comparative decisions among alternative crop management practices. Hence, they choose the ones that enable them to cope better with changes on climate

Lack of information on weather incidences

About half (48.8%) of the respondents opined lack of information on weather incidence as a severe constraint, while minority of the population considered it as not a constraint. This implies that there is inadequacy of information on the on climate as required for effective adaptation measures in the study area.

Lack of improved seeds

Even though, not many of the respondents, 34.4% (very severe), and 25.0 % (severe), viewed lack of improved seeds as a serious constraints, efforts should be made to provide (through a well intensified extension programme) improved varieties of crops, which are not only disease and drought resistant, but are weed resistant. This will help farmers adapt to the effects of climate change caused by pests, diseases, prolonged drought and multiplication of stubborn weeds, all of which characterize climate change.

Lack of access to organic fertilizers

Lack of access to organic fertilizer was considered a very severe constraint by most (44.4%) of the respondents, while minority (20%) of them opined that it was not a serious constraint. Since organic fertilizer help improve yields, it therefore implies that farmers are at the mercy of level of soil fertility.

Invasion of the herdsmen and their cattle

A large proportion (70%) of the respondents considered invasion of the herdsmen and their cattle a very severe constraint, while a small proportion (5.0%) considered it as no constraint. The mean of rating places this constraint as most important (2.50) to farmers' adaptation strategies. This implies that no matter how effective any strategy to adapt to climate change might prove to be, as long as there are no modalities to curb the excesses of the pastoralists in the study area, there cannot be any success. This is in agreement with Ofuoku and Isife (2009) that farmers output will continue to decline unless there is a measure on ground to stop the pastoralists from depending on farmers crops for feeding their livestock.

TABLE 5
Distribution of respondents based on constraints faced in adapting to climate change

Constraints	Very severe	Severe	Not Severe	Not a constraint	Mean	Rank
Shortage of water	41.3	28.8	20.6	9.4	2.02	4rd
Lack of credit facilities	51.3	34.4	10.0	4.4	2.33	3nd
High cost of inputs	52.2	38.8	10.0	2.5	2.41	2st
Lack of knowledge of adaptation strategies	23.8	43.8	25.6	6.9	1.84	7th
Lack of information on weather incidences	30.0	48.8	16.9	4.4	2.05	6th
Lack of improved seeds	34.4	25.0	23.8	16.9	1.77	8th
Lack of access to organic fertilizers	44.4	25.0	11.9	20.0	1.93	5th
Invasion of the herdsmen and their cattle	70.0	23.8	10.0	5.0	2.50	1st

Source: Field Survey, 2011

Conclusion and recommendations

The study established that food crop farmers in Oke-Ogun area of South Western Nigeria are experiencing various devastating effects of climate change on food crop production, directly and indirectly. This is indicated as they unfavourably perceived the effects on their productivity. Furthermore, they were able to put up various adaptation measures that enable them cope with the various adverse effects of the climate on food crop production. However, such adaptation strategies employed by farmers to reduce climate change effects were those within their economic reach, while those requiring some levels of financial commitments were scarcely employed, and this may not be unconnected with the constraints to adapting to climate change, which mainly bothers on financing and

access to inputs. The study also established the importance of invasion of the herdsmen and their cattle, being the most important constraints in the quest of farmers to adapting to climate change.

Efforts should therefore continue to improve the awareness and understanding of rural communities and farmers about the impact of climate change on food crop production. Small scale irrigation projects are of more sustainable nature that show a promising effect on climate change, income and risk reduction; therefore, deliberate government policies that encourage off-season irrigated farming should be formulated and implemented towards reducing the suffering of the rural farmers due to climate change. Input supply to the local farmers should also come with government subsidy. This will go a long way in alleviating the sufferings of the farmers, as regards inadequate supply and delivery of agricultural inputs.

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