



# SOCIO-ECONOMIC FACTORS AFFECTING ADAPTATION STRATEGIES OF SELECTED HORTICULTURAL FARMERS TO CLIMATE CHANGE IN OSUN STATE, NIGERIA

Adebisi-Adelani O.<sup>1</sup> and O. B. Oyesola<sup>2</sup>

<sup>1</sup>National Horticultural Research Institute (NIHORT), Jericho, Idi-Ishin, Ibadan, Nigeria

<sup>2</sup>Department of Agricultural Extension and Rural Development, University of Ibadan, Oyo state, Nigeria

E-Mail: [adelanidotol@yahoo.com](mailto:adelanidotol@yahoo.com)

## ABSTRACT

Climate change is a reality and of truth farmers all over the world are adapting to changes in climate to get better production and to better their livelihood option. Therefore, the study was carried out to investigate the socio-economic factors influencing the adaptation strategies of selected horticultural farmers in Osun state Nigeria. Data for the study was collected with the aid of both qualitative and quantitative instruments. Data was analyzed using both descriptive and inferential statistics. A multi-stage sampling technique was employed in which sixty farmers were sampled. The results showed that 96.8% of the horticultural farmers are married and 93.3% are male with family size (46.7%) of 9-12 members. Also 63.3% are to be classified as better-off while 76.7% practiced mixed cropping. Furthermore the results showed that shading and shelter (93.3%), altering the timing and location of cropping activities (90%), different planting dates (80%), use of varieties and species resistant to pest and diseases (76.6%) and change use of chemicals, fertilizers and pesticides (66.6%) are the order of adaptation strategies. Linear regression model showed that there is significant relationship between farmers' income, and adaptation strategies at  $p < 0.05$ . The study concluded that farmers under consideration due to their age and the nature of the study still have large family size. It is recommended that there is the need for serious awareness campaign on the causes of climate change in the study areas and several adaptation strategies that can be put in place.

**Keywords:** adaptation strategies, climate change, horticultural farmers.

## INTRODUCTION

Horticultural crops represent a very reasonable amount of agricultural crop production in Nigeria with different spatial aggregation among agricultural zones (Babatola, 2005). A sectoral analysis in 2006 of the real Gross Domestic Product (GDP) indicated that the agricultural sector contributed about 42 percent of the GDP compared to 41.2 percent in 2005 (CBN, 2010). Furthermore, Horticultural crops are widely consumed globally and they are gaining more prominence as a result of the roles of fruit and vegetables in solving nutritional problems. Many people now go into horticultural production these days. It provides twice the amount of employment per hectare of production compared to cereal crop production (Ali, Farooq and Shih, 2002). Besides creating jobs on the farm, the horticultural sector also generates off-farm employment. In addition, horticultural crops plays a vital role in solving the global micro-nutrient crisis of over two billion people, the vast majority of whom are women and children suffering from micro-nutrient deficiencies (UN/SCN, 2004) This is because vegetables and fruits are the most sustainable and affordable sources of micro-nutrients in diets (UN, 2004).

For successful production, horticultural crops require resources like land, water, sunshine, air, temperature, soil, labour, capital, and management or entrepreneur (man - made). Among the natural resources, climate is a predominant factor that influences horticultural production; climate is the atmospheric condition which is created by weather events over a period

of time. The production of vegetables is highly sensitive to water availability and even to minor stress related to temperature outside the optimal range, making this type of production highly vulnerable to climatic changes. Olufolaji (2009) further stressed that the domestication and massive cultivation of fruits in Nigeria have always been impeded by several factors, which include unsuitable soil, climatic conditions and diseases caused by viruses, micro bacteria, fungi, insect, nematodes and pests. The impact of climate change can be vast in Nigeria; this means that some stable ecosystems such as the Sahel Savanna may become vulnerable because warming will reinforce existing patterns of water scarcity and increasing the risk of drought in Nigeria and indeed most countries in West Africa. As well, the country's aquatic ecosystems, wetlands and other habitats will create overwhelming problems for an already impoverished populace.

Nigeria is one of the expected to be most affected by the impacts of climate through sea level rise along our 800km long coast line, intensified desertification, erosion and flooding disasters and general land degradation. One prediction is that "Nigeria will lose close to 9 million as a result of the catastrophe while at least; 80percent of the inhabitants of the Niger Delta will be displaced due to low level of the oil rich region (Oyelakin, 2008).

However, there is no doubt that farmers are facing a changing context, with rainfall and temperature patterns moving outside the regular variability ranges; adaptation to climate changes is thus a major concern.



Several efforts are underway to reduce vulnerability of rural communities to its impact.

The term adaptation include the actions of adjusting practices, processes and capital in regions to the actuality or threat of climate change as well as responses in decision environments such as changes in social and institutional structures or altered technical options that can affect the potential or capacity for these actions to be realized (Howden *et al.*, 2007). These adaptations strategies according to Howden *et al.*, (2007) includes:

- a) Altering inputs such as varieties/ species to those with more appropriate thermal time and vernalization requirements and/or with increased resistance to heat shock and drought altering fertilizer rates to maintain grain or fruit quality consistent with the prevailing climate, altering amounts and timing of irrigation and other water management.
- b) Wider use of technologies to harvest water, conserve soil moisture (e.g. crop residue retention) and use and transport water more effectively where rainfall decreases.
- c) Managing water to prevent water logging, erosion and nutrient leaching where rainfall increases.
- d) Altering the timing or location of cropping activities.
- e) Diversifying income through altering integration with other farming activities such as livestock production.
- f) Improving the effectiveness of pest, disease, and weed management practices through wider use of integrated pest and pathogen management, development and use of varieties and species resistant to pest and diseases and monitoring or improving quarantine capabilities and monitoring programs.
- g) Using climate forecasting to reduce production risk.

If widely adopted, these adaptations singly or in combination have substantial potential to offset negative change impacts and to take advantage of positive ones.

However, since socio-economic factors are among the factors that are capable of influencing adaptation strategies to climatic changes. Thus, there is the need to study socio-economic factors affecting the adaptation strategies of horticultural farmers in the study area to climate change. The specific objectives are:

- (i) Identify the socio-economic characteristics of horticultural farmers in the study area
- (ii) Ascertain the adaptation strategies of horticultural farmers in the study area due to climate change.

### Hypothesis of the study

There is no significant relationship between selected socio-economic characteristics and adaptation strategies use by the farmers.

### METHODOLOGY

The study was carried out in Osun State. One agricultural zone (Iwo) out of the three zones in the state was randomly selected. Iwo zone consists of six blocks

namely; Iwo, Ayedire, Irewole, Ejigbo, Isokan and Olaoluwa. Iwo is urban in nature while the other blocks are rural and agricultural activities are paramount. Iwo is situated in the North east of Osun state. According to Iwo Local Government Planning Authority, the geographical location of Iwo is on latitude 7.58°N and longitude 4.28°E. Agricultural activities in the area include production of crops such as maize, cassava, cowpea, rice, and vegetables; Perennial crops such as cocoa, mango, cashew and citrus are also cultivated. Livestock production activities involve keeping of animals like cattle, sheep and goat, however piggery is very low in population because most of the people living in the zone are predominantly Muslims which do not consume pork due to their religion. Multi-stage sampling technique was used in getting to the unit for the study. In the first stage, two blocks were randomly selected from the six blocks. Finally, two cells each were randomly chosen from the cells on each of the selected blocks. Then from each of the cells, 15 respondents were randomly selected from a comprehensive list containing the names of up to 60 selected horticultural farmers. The lists of horticultural farmers were collected from the Farmers' Association in the community. A total of 60 horticultural farmers were interviewed and using interview schedule. The information collected were on socio-economic characteristics of the respondents, cropping system, varieties of horticultural crops being grown, and various adaptation strategies. The data were analyzed using descriptive and inferential statistics such as frequency tables, percentages and linear regression model. The adaptation strategy score is calculated and the mean value gotten. Scores between mean and above were categorized as high while those below the mean was categorized as low.

## RESULTS AND DISCUSSIONS

### Socioeconomic characteristics of respondents

The results in Table-1 showed that 10% of the respondents fell between ages 30-40 years, 16.7% fell between 41-50 years, 53.3% were between the ages of 51-60 years, and 13.3% were between 61-70 years while 6.7% were above 70 years. This finding is in agreement with Oyedele (2005) who stated that majority of citrus farmers' falls within the age range of 40 to above 60 years. Earlier findings by NIHORT (1995) revealed the average age of existing citrus trees ranges between 40 and 45 years. This implies that farmers who planted such trees are already old; it further implies that the youths are not actively involved in citrus production in the area. The Table further revealed that majority (93.3%) were males. This implies that despite the fact that women play prominent roles in the production fruit trees since it is related to direct ownership of lands Women in Nigeria do not own land. This finding is corroborated by Oyedele, 2005 who reported involvement of more males in citrus production than females. Added to this is gender discrimination in respect of land holdings in most communities where women do not have ownership rights



over land, although they may have user rights (Manyong *et al.*, 2005). Ninety six percent of the respondents were married. This could mean a sense of responsibility meaning that the farmers have responsibilities for their families hence the need to seek information about climatic change and various adaptation strategies that can be put in place to combat its menace on their production and entire livelihood. Also this result could be ascertained in the area of family labour which could be provided by family members. According to Oyedele (2005), citrus is perennial in nature with potentials for revenue generations, it will require continuous and constant management which the family labour can supply. Among the respondents, 46.7% had no formal education, 40% had primary education 10% had secondary education, 3.3% went to Koranic School. This results implies that majority of the respondents were literates which will eventually affect their knowledge and information about their environment. Table-2 further revealed that majority of the respondents (63.3%) was better off. Social status is an important tool in technology acceptability. Forty-six percent of the farmers use the combination of both hired, family and self as labour which can be linked to the issue of their being old and they needs helping hands. Though majority of the farmers are self financed (70%) with 46.7% having an average income of more than ₦100000.00 annually. Finally, the Table shows the farm size which gives the total land area of each farmer measured in hectare under the cultivation of horticultural crops. Table-1 reveals that majority (63.3%) of the horticultural farmers have between 1-3 hectares, 10.0% had less than 1 ha. This implies that farmers are smallholders and it is due to the fact that Spencer (1990) put the upper limit of small scale farming at three hectares. This shows the dominance of small farm size holdings in the study area. This is consistent with the findings of Daudu *et al.*, (2009) in a related study who asserted that in terms of farm size, most (37.17%) of the respondents had small farm size of less than two hectares.

**Table-1.** Distribution table showing personal characteristics of respondents.

Variables	Frequency	percentage
<b>Age</b>		
30-40	6	10
41-50	10	16.7
51-60	32	53.3
61-70	8	13.3
Above 70	4	6.7
<b>Sex</b>		
Female	4	6.7
Male	56	93.3
<b>Marital status</b>		
Married	58	96.8
Single	2	3.3
<b>Family size</b>		
1-4	6	10.0
5-8	18	30.0
9-12	28	46.7
13-16	6	10.0
17 and above	2	3.3
<b>Education</b>		
Koranic	2	3.3
No formal education	28	46.7
Primary	24	40.0
Secondary	6	10.0
<b>Religion</b>		
Islam	34	56.7
Christianity	26	43.3

Source Field survey, 2010

**Table-2.** Distribution table showing economic characteristics of respondents.

Variables	Frequency	Percentage
<b>Social status</b>		
Better -off	20	63.3
Average	38	33.3
Poor	2	3.3
<b>Source of labour</b>		
All combined	28	46.7
Family	2	3.3
Hired	2	3.3
Self	2	3.3
Self + hired	26	43.3
<b>Source of financial capital</b>		
Cooperative	6	10
Cooperative+ self	4	13.3
Coop, friends and relations	2	3.3
and relations	4	13.3
Self financed	42	70
Self financed + bank loan	2	3.3
<b>Cropping system</b>		
Intercropping	4	13.3
Mixed cropping	46	76.7
Sole cropping	10	16.7
<b>Farm size (ha)</b>		
<1	6	10
1-3	38	63.3
4-6	10	16.7
7-9	6	10.0
<b>Income</b>		
.00	2	3.3
>20000	4	6.7
21000-40000	6	10.0
41000-60000	8	13.3
61000-80000	6	10.0
81-000-100000	6	10.0
>100000	28	46.7

No response 2 3.3

Source Field survey, 2010

**Adaptation strategies of respondents**

The result (Table-3) revealed that the highest adaptation strategy adopted by the respondents is prayer (100%). This is because on the course of FGD they stated that the problem of climate change can be mainly adduced to God in which they have no much power over it and all they could do is to pray. This result is an indication that farmers in Osun state particularly in the study area still believe that God is the one responsible for change in weather because of our sins towards him and therefore the only way out is to pray to Him. This is in line with the findings of Apata (2009) who in his study of Analysis of Climate Change Perception and Adaptation among Arable Food Crop Farmers in South Western Nigeria stated that 95% of the respondents were convinced that the vagaries of the climate are a sign of divine anger 'as there are many sinners in our midst and God is trying to punish us like floods with serious consequences.

Other forms of strategies which are scientific and tenable include shading and shelter (93.3%), altering the timing or location of cropping activities (90%), different planting dates (80%) among others.

The result in Table-4 showed that 53.3% of respondents have low adaptation strategy while 46.7% belongs to high adaptation group. This is an indication that there is low level of adaptation strategy among the respondents in the study area. This is not good enough as it has serious implication for the future if something is not done to encourage the farmers at both the state and national level to strengthen farm level adaptation strategies.

The result showed that total income (0.011), marital status (0.027), are positive and statistically significant to adaptation strategies while ethnic background (0.004), age (0.007) and religion (0.000) are negative but statistically significant to adaptation strategies (Table-5). This is an indication that those that are married and possess better income adapted better to climate change. This is because adaptation sometimes can be costly. The study is not in line with that of Apata (2009) who stated that farming experience and age influences adaptation. On the other hand the result implies that ethnic background, age, and religion had a negative relationship with adaptation strategies. For example the more religious they are the less the adaptation strategies they put in place.

**Table-3.** Distribution showing adaptation strategies of respondents.

Adaptation strategies	Frequency	Percentage
<b>Crop management</b>		
Altering inputs such as varieties/ species	46	76.6
Monitoring or improving quarantine capabilities	16	26.7
Use of varieties and species resistant to pest and diseases	46	76.7
Altering the timing or location of cropping activities	54	90.0
Different planting dates	48	80.0
Shorten length of growing period	28	46.7
Crop relocation	20	33.3
Planting drought resistant varieties	26	43.3
<b>Soil fertility management</b>		
Barriers hedges along contours to the soil erosion.	44	73.3
Change amount of land	30	50.0
Soil protection through tree planting	26	43.3
Soil conservation	38	63.3
<b>Water management</b>		
Expansion of rainwater harvesting	2	3.3
Water storage and conservation technique	4	6.6
Water re-use	0	0.0
Desalination	0	0.0
Wider use of technologies to harvest water, conserve soil moisture	24	40.0
Managing water to prevent water logging, erosion and run-off	32	53.3
Increase irrigation	10	16.7
Planting flood resistant varieties	22	36.7
Increase water conservation	8	13.3
<b>Pest and insect management</b>		
Planting pest and diseases resistant varieties	32	53.3
Wider use of integrated pest and pathogen management, development	10	16.7
<b>Diversification</b>		
Move to different site	32	53.3
Changes from crops to livestock	2	3.3
Farming to non-farming	2	3.3
Diversifying income through altering integration with other farming activities	26	43.3
<b>Others</b>		
Prayer	60	100.0
Change use of chemicals, fertilizers and pesticides	40	66.7
Use of weather insurance	0	0.0

Source Field survey, 2010

**Table-4.** Distribution showing categorization of adaptation strategies into high and low.

Category	Frequency	Percentage
Low	32	53.3
High	28	46.7
Total	60	100.0

Source Field survey, 2010

**Table-5.** Simple linear regression showing significant distribution of the effect of selected socio-economic characteristics on adaptation strategies.

Variables	B	Std. Error	Beta	t	Sig.
Total income	1.174E-5	.000	.494	2.881	0.011
Social status	2.161	1.329	.266	1.626	0.123
Educational qualification	.078	.886	.015	.088	0.931
family size	.096	.176	.105	.546	0.593
ethnic background	-9.085	2.721	-.774	-3.339	0.004
Age	-.220	.071	-.601	-3.119	0.007
Marital	10.225	4.209	.466	2.429	0.027
Religion	-7.822	1.610	-.890	-4.858	0.000

Source Field survey, 2010

## CONCLUSIONS AND RECOMMENDATIONS

The study concluded that majority of the respondents were male, married and older in age. Therefore adaptation strategies that will empower female and youths should be encouraged. Also they should further be empowered to go into horticulture this can be achieved by taking horticultural trainings to their doorstep if the future of horticultural industry is to be protected. There should be serious awareness campaign about the causes of climatic change and its implications through radio, television and other communication channels so as to disabuse farmers mind from the spiritual angle. It is from this point that policy of reliable and effective measures of adaptation need to be implemented and must be accessible to the end users. Looking at the issue of climate change adaptation, the major role of agricultural extension which is transfer of appropriate technology and acting as link to both researchers and farmers will come into play here in various form like provision of adequate information about weather, transfer of varieties of horticultural crops that are drought, flood and disease resistance to farmers. More importantly extension workers are to facilitate early warning alerts and interpretation in the language useful to farmers and the entire rural populace. Also extension personnel as facilitators should bring together other stakeholders in agricultural sustainability in relation to climatic change: like the farmers, government, non-governmental organizations (with their interest in farmers), agricultural research institutions, Agro climatologist, Meteorologists, Agricultural economists,

agricultural extensionists and Rural Sociologists for early warning alerts and interpretations in the language useful to farmers/rural communities. This will help them to be able to sustain their major livelihood which is farming through higher productivity.

## REFERENCES

- Apata T.G., K.D. Samuel and A.O. Adeola. 2009. Analysis of Climate Change Perception and Adaptation among Arable Food Crop Farmers in South Western Nigeria. Contributed Paper prepared for presentation at the International Association of Agricultural Economists'2009 Conference, Beijing, China, August 16-22, 20.
- Ali M., Farooq U. and Shih Y.Y. 2002. Vegetable research and development in the ASEAN region: a guideline for setting priorities. In: C.G. Kuo (Ed). Perspectives of ASEAN cooperation in vegetable research and development Ashanhua, Taiwan: Asian Vegetable Research and Development Centre. pp. 20-64.
- Babatola J.O. 2005. Export Promotion of Horticultural Crops. Nigeria Journal of Horticultural Science. 9: 74-78.
- Howden S., Soussana M.J., Francon J., Francesco T., Chhetri Ntra N., Michael D. and Meinke. 2007. Adapting Agriculture to climate change edited by William Easterling, Pennsylvania State University Park P.A.





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Manyong V. M., A. Ikpi, J. K. Olayemi, S. A. Yusuf, B. T. Omonona, V. Okoruwa and F. S. Idachaba. 2005. Agriculture in Nigeria: identifying opportunities for increased commercialization and investment. IITA, Ibadan, Nigeria. pp. 107-110.

National Horticultural Research Institute (NIHORT). 1995. National Agricultural Project (NARP). External Review of Research Institutes. National Horticultural Research Institute. p. 239.

Olufolaji A. O. 2009. Country Report in Nigeria; National Horticultural Research Institute. A report submitted to Food and Agriculture in Nigeria.

United Nations. 2004. Billions Suffer from lack of vitamins and minerals in diets. <http://www.avrdc.org/news/04UNreport.html>>.

UN/SCN. 2004. 5<sup>th</sup> Report on the world nutrition situation. Nutrition for improved development outcomes. Geneva: World Health Organization. United Nations System Standing Committee on Nutrition.

Oyedele. 2005. Information and Training Needs for Improved Technique of Citrus Production among Farmers in Southwestern Nigeria. Unpublished PhD theses submitted to the Department of Agricultural Extension and Rural Development University of Ibadan, Nigeria. p. 211.