

UTILIZATION OF ADAPTATION STRATEGIES BY SMALLHOLDER FARMERS TOWARDS CLIMATE CHANGES ON AGRICULTURAL ACTIVITIES IN OGUN STATE, NIGERIA

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Abstract

The study focused on the utilization of adaptation strategies by smallholder farmers towards climate changes on agricultural activities in Ogun State, Nigeria. The populations of the study were arable crop farmers. A multi-stage sampling procedure was used to select 120 arable crop farmers. Structured interview schedule was validated and used to elicit information from the respondents. Data collected were analysed using descriptive and inferential statistics. Results reveal that most (75.0%) of the respondents were male. Majority (87.5%) of the respondents had formal education, most (79.2%) of the respondents were between the age of 40 – 70 years and 54.2% had been an arable farmer for above 10 years. Adaptive measures used to reduce the impact of climate changes were early harvesting (81.7%), irrigation and mixed farming (75.0%). The constraints faced were lack of fund, lack of knowledge on weather situation and no access to forecast technologies. Chi-square analysis showed that there is a significant relationship ($P < 0.05$) between level of education ($X^2 = 45.21$), marital status ($X^2 = 51.13$) and the extent of adaptive strategies used in the study area. The study recommended that most of the strategies/practices currently used should be improved upon to ensure appropriate sustainable agricultural development in response to changes in climate in the country.

Keywords: Climate change, constraints, adaptation, strategies, arable crop, farmers

Introduction

The prediction of climatic changes has the potential to severely affect countries highly dependent upon agrarian livelihoods, resulting in food shortages, among other consequences. Therefore, people who depend on farming activities will require a variety of adaptation strategies to mitigate the negative effects of climate change effects and maintain the livelihoods of farming families. Different modern technologies have been developed and introduced at the farm level in order to achieve target measures of the

Millennium Development Goals (Rosegrant, Ringler, Benson, Diao, Resnick, Thurlow & Orden, 2008).

Frequent natural hazards due to climate change affect agricultural enterprises and, subsequently, the key to agricultural production activities farm households are also severely affected. Proper management systems such as weeding, mulching, irrigation with fresh water, and thinning applied by the farmers can help overcome salinity and drought. Although climate change is not a new phenomenon, its recent

usage, especially in the context of development, refers to changes in the prevailing climate, particularly since the 20th century and the perceived impacts on the economy and livelihoods (Adebayo, Dauda, Rikko, George, *et al.*, 2011). Climate patterns play a fundamental role in shaping natural ecosystems, human economies and cultures that depend on them. Therefore, a change in climate has implications on the livelihoods of humans, animals, plants, and the ecosystems. According to the Fourth Assessment Report of the United Nation's Intergovernmental Panel on Climate Change (IPCC, 2007) over the last century, atmospheric concentrations of carbon dioxide increased from a pre-industrial value of 278 parts per million (ppm) to 379 ppm in 2005 and as a result the average global temperature rose by 0.74 °C. The IPCC report gives detailed projections for the 21st century and these show that global warming will continue and even accelerate. The best estimates predict that the earth could warm by 3°C by 2100. This warming is critical because even with a temperature increase of between 1- 2.5 °C serious effects are predicted which include reduced crop yields in tropical areas leading to increased risk of hunger, spread of climate sensitive diseases such as malaria, and an increased risk of extinction of around 20-30 per cent of all plant and animal species.

There is therefore a strong consensus among experts that climatic variability will have drastic consequences on agricultural production and productivity (Watson, 2010). Apart from oil exporting countries, most of sub-Saharan African countries rely on agriculture which contributes about 20-30% of its gross domestic product (GDP) and 55% of the total value of African exports. Even without climate change, Africa's agricultural development has been severely constrained by several multi-stressors that include: poverty, poor governance, underdeveloped

markets, lack of sufficient infrastructure, low technological capacity and adoption etc. Nevertheless, many African smallholder farming communities have thrived for decades and centuries even in the face of changing climate (Ozor, Madukwe, Onokala, and Enete *et al.*, 2010). Changes in climate are severely affecting agricultural production in many African countries (UNEP, 2007). Increased temperatures and accompanying decrease in water availability reduce the length of growing seasons and yield potential and hence the areas suitable for agriculture, further adversely affecting food security over the continent (Thornton, Jones, Owiyo, Krusta, Herero, and Kristyanso, 2006).

Adaptation is the adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderated harm or exploits beneficial opportunities (UNFCCC, 2007). The arable crop farmers, to a large extent have been able to develop their livelihood strategies in a way that enables them to constantly cope and adapt to the changing climatic conditions, pest attack and agricultural policies in the country. Arable crop farmers' ability to adapt to impacts of climate variation depends on factors such as wealth, technology, education, information, infrastructure, access to resources and management abilities. In making informed decisions about climate change, Olorunfemi (2009) is of the view that timely and useful information is necessary about the possible consequences of climate change, people's perceptions of those consequences, available adaptation options, and the benefits of slowing the rate of climate change. Similarly, Apata, Samuel and Adeola (2009) found that there is a need for agricultural economists and other stakeholders in environmental management and agricultural sustainability in developing countries to

come to terms with negative impacts of climate change and likely positive and beneficial response strategies to global warming. Against this background, this research was conceived to examine the utilization of adaptation strategies by smallholder farmers towards climate changes on agricultural activities in Ogun State, Nigeria. The specific objectives of the study were to:

1. ascertain the socio-economic characteristics of the arable crop farmers in the study area.
2. determine the level of awareness of climate changes by the arable crop farmers in the study area.
3. ascertain adaptation strategies adopted by the arable crop farmers in the study area.
4. determine the extent of use of adopted strategies by the arable crop farmers in the study area.
4. ascertain the constraint militating against the use of adopted strategies by arable crop farmers to climate changes in the study area.

Hypothesis of the Study

H₀₁: There is no significant relationship between socio-economic characteristics of arable crop farmers and the adaptation strategies used by the arable crop farmers in the study area.

Materials and Methods

The study was carried out in Ogun State, Nigeria. Ogun State covers a land area of approximately 16,409,26 square kilometres with a population of about 3,728,098 people (NPC, 2007) and is bounded in the west by the Republic of Benin, on the south by Lagos State and the Atlantic Ocean, and on the east by Ondo State and in the south by Oyo State. It falls between longitudes 2° 40'E - 6° 40'E and latitudes 4° 40'N -9° 15'N. Ogun state has a total of 20

local government areas. These are Abeokuta North, Abeokuta South, Ogun Waterside, Ijebu Ode, Ijebu North, Ijebu East, Ijebu North East, Odogbolu, Ikenne, Sagamu, Obafemi Owode, Odeda, Ado/Ota, Yewa North, Yewa South, Imeko Afon, Ipokia, Ewekoro, Ifo and Remo North (NPC, 2006). The state has a tropical climate with mean annual rainfall of about 1,500 millimetre and temperature range of 25°C – 35°C. The raining season runs between April and November, is characterised by two distinct raining seasons brought about by temporary cease of rain in August. Agriculture is the major occupation of the people of Ogun State, which is favoured by the climatic condition. Commonly crops cultivated are maize, yam, plantain, beams, cocoa, rubber, palm tree, sugar cane, and cassava. The commonly reared livestock in the State include sheep, goat, poultry, cattle, and local chickens. However, there is influx of pastoral Fulanis from the northern part of the country into the state probably due to climate change (Ayanda, Oyeyinka, Saliu & Ojo, 2013). Population of study were arable crop farmers in Ogun State. A multistage sampling technique was used. Ogun state has three (3) Senatorial districts which comprises of Ogun central, Ogun West and Ogun East. Agricultural Development Programme (OGADEP) has four operational zones that cut across all the senatorial district. 75% of the zones were selected purposively i.e Abeokuta, Ilaro, and Ijebu-ode which falls under the three senatorial districts of Ogun State. One block was randomly selected from the zones, these are Wasimi, Oke-odan, and Ijebu-ife. Furthermore, from the selected blocks purposive selection of 4 cells was selected making a total of 12 cells which cut across the senatorial district in Ogun State. Two villages were selected from each of the selected cells to make a total of 24 villages. Five (5) arable crop farmers were

purposively selected to make a total of 120 respondents for the study.

Adaptive strategies adopted by the arable crop farmers was measured using 2-point rating scale: of Yes (2) and No (1), while extent of adoption strategies were measured using 3 point rating scale of Always (3) Occasionally (2) Never (1). Level of awareness about climate changes was measured using 2-point rating scale: of Yes (1) and No (0). Constraints militating/encountered was measured with 3 points rating scale: major constraint (3), minor constraint (2) not a constraint (1). Data collected were subjected to descriptive statistics and inferential statistics. Descriptive statistics such as frequency count, percentage distribution and table were used. Chi-square and Pearson Product Moment of Correlation (PPMC) were used to test the hypotheses. Pearson Product Moment Correlation (PPMC) was used where the variables were measured at the interval level while for Chi-square was used for variables at nominal and ordinal level.

Results

Socio-Economic characteristics of the arable crop farmers in the study area

The result in Table 1, reveals that majority (79.2%) of the respondents were between the ages of 40 and 70 years, with the mean age of 51.9 years. Most of the respondents (75.0%) were male, suggesting that arable crop farmers are more practiced by males as a result of the drudgery and strenuous agronomic practices involved in its production. The result shows that the majority (83.3%) of the farmers were married, while very few 4.2% were widowed. Majority (87.5%) of the respondents had a form of formal education: primary, secondary or post-secondary education. Almost 13.0% had no formal education. The farming experience of the respondents shows that, majority of the respondents (88.3%) had been practicing arable crop farming for more than 10 years, while only 11.7% had been practicing arable crop farming

for period less than 10 years. The mean years of farming experience was 17.5 years. Also, Table 1 result further revealed that most (62.5%) of the arable crop farmers had between 1 to 3 hectares of farm land, 8.3% of the arable crop farmers had more than 7 hectares of farmland while those that had between 4 to 6 hectares accounted for 29.2%.

Level of awareness on climate changes by the arable crop farmers in the study area

This result revealed that arable crop farmers' level of awareness of climate change in Ogun state, Nigeria. Figure 1 reveals that majority (85.0%) of the respondents reported that they were aware of the ban on indiscriminate felling of trees: 82.5% were aware of ban on indiscriminate bush burning, while 80.2% knew of government's promotion of afforestation. About 59% of the respondents knew of the ban on gas flaring, and only 39.0% of the respondents were aware of a bill on climate change in the National Assembly.

Adaptation strategies adopted by the arable crop farmers in the study area

Based on multiple responses from the respondents, the result in Table 2 shows the various adaptation strategies employed by arable crop farmers to mitigate the impact of climate variation in the study area. All the respondents (100%) indicated planting of cover crops as a measure to mitigate climate changes, while majority employed the use of mulching (98.3%), mixed farming (95.8%), and movement to different site (93.3%), crop rotation (91.7%), and application of farmyard manure (83.3%). Other adaptation strategies recorded high percentage of usage except, changing in planting date (45.8%), bush fallowing (41.7%) and use of weather forecast which is non-cultural (37.5%) that recorded lower level of usage.

Extent of adaptation strategies used by the arable crop farmers

Result in Table 3 reveals that majority (75.0%) of the arable crop farmers always adopt planting of cover crop, 60.8% of them always adopt mixed farming and above half (58.3%) of the arable crop farmers always adopt mulching in the study area. Also, above half (54.2% and 56.7%) of the respondents always adopt moving to different site and crop rotation in the study area.

Constraint militating against the arable crop farmers to climate changes (n = 120)

Table 4 results shows the various climate related constraints, the arable crop farmers were faced in their production in the state. Majority (86.7%) of the respondents indicated limited income, 85.0% wind storm, 82.5% shortage of water and 80.8% pest and diseases as a major constraint while most (79.2%) of the respondents indicated erosion occurrences, 75.0% instability of planting calendar, 72.5% high cost of irrigation and 69.2% inadequate knowledge on how to cope or build resilience. Half (50.0%) of the respondents revealed that reduction in soil fertility was a minor problem militating against climate changes. Also, above half (52.5% and 50.8%) of the respondents revealed that lack of access to weather forecast technology and low yield were the major constraints confronting them to climate changes.

Hypothesis of the study

There is no significant relationship between socio-economic characteristics of arable crop farmers and the adaptation strategies used in the study area.

The result in Table 5 shows the result of the test of relationship between in the socio-economic characteristics of arable crop farmers and the extent of adaptation strategies used in the study area using Chi-square and Pearson's Product Moment Correlation (PPMC) analysis. Chi-square

analysis showed that there is a significant relationship ($P < 0.05$) between level of education ($\chi^2 = 45.21$), marital status ($\chi^2 = 51.13$) and the extent of adaptive strategies used in the study area. The implication of this is that level of education of the arable crop farmers will have effect on the adaptive measure used in the study area. Furthermore, the correlation analysis in Table 5 reveal that a significant relationship ($p < 0.05$) exist between household size ($r = 0.671$) and years of farming experience ($r = 0.282$) of the arable crop farmers and the extent of adaptive strategies in the study area.

Discussion

The result reveals that majority (79.2%) of the respondents were between the ages of 40 and 70 years, with the mean age of 51.9 years. This corroborates the findings of Oluwasusi and Tijani (2013) who opined that most of the farmers in the study area were old while young people prefer less climate risk business. Most of the respondents were male, suggesting that arable crop farmers are more practiced by males as a result of the drudgery and strenuous agronomic practices involved in its production. The results further show that 83.3% of the farmers were married, while very few were widowed. This means that married people were more involved in arable crop farming and may receive assistance from their spouses in carrying out some activities on the farm. In terms of educational requirement, majority (87.5%) of the respondents had a form of formal education ranging from primary, secondary or post-secondary education, 13.0% had no formal education. The farming experience of the respondents shows that, majority of the respondents (88.3%) had been practicing arable crop farming for more than 10 years, the mean years of farming experience was 17.5 years. This implies that the respondents had useful information and experiences of

variation in climate with coping mechanisms as it affects their farming practices and production.

Also, further result revealed that 62.5% of the arable crop farmers had between 1 to 3 hectares of farm land, 8.3% of the arable crop farmers had more than 7 hectares of farmland. The result shows that many of the respondents were small scale farmers and that farm size is a critical factor influencing the output of farmers in the study area. This is in consonance with similar result obtained by Olayide (1990) who categorized small scale farmers as ranging from 0.2 hectares to 9 hectares holding in Nigeria. This result revealed that arable crop farmers' level of awareness of climate change in Ogun state, Nigeria. Farmers' awareness of existing government policies was reveals that majority (85.0%) of the respondents reported that they were aware of the ban on indiscriminate felling of trees; 82.5% were aware of ban on indiscriminate bush burning, while 80.2% knew of government's promotion of afforestation.

Result reveals that majority of the respondents reported that they were aware of the ban on indiscriminate felling of trees, ban on indiscriminate bush burning, government's promotion of afforestation. It can be inferred from these findings that the arable crop farmers are ignorant of available mitigation measures for climate change impacts. The danger posed by this ignorance will exacerbate the impacts of climate change already been experienced by arable crop farmers in Ogun state, Nigeria. Based on multiple responses from the respondents'. Result in Table 2 shows the various adaptation strategies employed by arable crop farmers to mitigate the impact of climate variation in the study area. All the respondents indicated planting of cover crops as a measure to mitigate climate changes, while majority employed the use of

mulching, mixed farming, and movement to different site, crop rotation, and application of farmyard manure. This means that weather forecasts information is not readily accessible and available to the arable crop farmers to utilize. Ole *et al.*, (2009) validated the above findings that rural communities in Nigeria have always managed their resources and livelihoods in the face of challenging environmental and socio-economic conditions. Evidence from the extent of use of adaptive strategies showed that most of the arable crop farmers have moderate level of extent of use to adaptive strategies to their farming activities in the study area.

Results show the various climate related constraints the arable crop farmers were faced in their production in the state. Majority of the respondents indicated limited income, wind storm, shortage of water and pest and diseases as major constraints while most of the respondents indicated erosion occurrences, instability of planting calendar, and high cost of irrigation and adequate knowledge on how to cope or build resilience. Benhin (2006) reports that lack of access to credit or saving and adequate information about climate change are some of the major problems encountered by farmers in adapting to climate change in Africa. Deressa (2008) reported that most of the problems or constraints encountered by farmers in adaptation to climate change are associated with poverty. The result of inferential statistics shows that result of the test of relationship between in the socio-economic characteristics of arable crop farmers and the extent of adaptation strategies used in the study area using Chi-square and Pearson's Product Moment Correlation (PPMC) analysis. Chi-square analysis showed that there is a significant relationship ($P < 0.05$) between level of education, marital status and the extent of adaptive strategies used in the study area. The

implication of this is that level of education of the arable crop farmers will have effect on the adaptive measure used in the study area. Furthermore, the correlation analysis in Table 5 reveal that a significant relationship ($p < 0.05$) exist between household size and years of farming experience of the arable crop farmers and the extent of adaptive strategies in the study area. Therefore, it can be deduced that the household size and years of farming experience of the respondents will have greater influence on the measure used to combat climate changes over times.

Conclusion

Various adaptation strategies were used by arable crop farmers in response to altered farming resulting from experienced environmental degradation due to or similarly situated to events associated with climate change. Using an adaptation strategy, we ranked in the adaptation strategies in order by importance finding revealed that adaptation strategies employed by arable crop farmers to mitigate the impact of climate variation in the study area were planting of cover crops, use of mulching, mixed farming, movement to different site and crop rotation as a measure to mitigate climate changes in the study area. The constraints facing arable crop farmers were lack of fund, lack of access to credit or saving and adequate information about climate change are some of the major problems encountered by arable crop farmers in adapting to climate change.

Recommendations

1. Most of the strategies/practices currently used by arable farmers should be improved upon to ensure appropriate sustainable agricultural development to changes in climate in the country.
2. Adaptation strategies for climate change should be incorporated into all national policies and programmes related to food

security and agriculture in Ogun State, Nigeria.

3. Structural changes should be implemented in the design and implementation of adaptation programmes at country level to ensure adequate focus on food security by arable crop farmers in order to increase the resilience of small-holder and urban farmers by enhancing their capacity to practice sustainable agriculture and by developing safety nets for climate risk management.
4. Most of the strategies/practices currently used by arable farmers should be improved upon to ensure appropriate sustainable agricultural development to changes in climate in the State and in the whole country.
5. Finally, there is need for all stakeholders including researchers, policymakers, civil society groups, private sector actors, farmers and farmers' associations etc. to work together in designing effective and reliable climate change adaptation and mitigation strategies in an innovation systems approach.

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Table 1: Distribution based on socio-economic characteristics of respondents (n = 120)

| Variables | Frequency | Percentage | Mean (x) |
|-----------------------------------|------------------|-------------------|-----------------|
| Sex | | | |
| Male | 90 | 75.0 | |
| Female | 30 | 25.0 | |
| Age (years) | | | |
| ≤ 40 | 10 | 8.3 | |
| 41 – 50 | 25 | 20.8 | |
| 51 – 60 | 30 | 25.0 | 51.9years |
| 61 - 70 | 40 | 33.4 | |
| Above 70 | 15 | 12.5 | |
| Marital status | | | |
| Single | 15 | 12.5 | |
| Married | 100 | 83.3 | |
| Widowed | 5 | 4.2 | |
| Religion | | | |
| Christianity | 80 | 66.7 | |
| Islam | 38 | 31.7 | |
| Traditional | 2 | 1.7 | |
| Household Size (persons) | | | |
| < 3 | 11 | 9.2 | |
| 3 – 5 | 87 | 72.5 | 4persons |
| 6 – 8 | 16 | 13.3 | |
| 9& above | 6 | 5.0 | |
| Educational status | | | |
| No formal education | 15 | 12.5 | |
| Primary education | 60 | 50.0 | |
| Secondary education | 35 | 29.2 | |
| Tertiary education | 10 | 8.3 | |
| Farming experience | | | |
| Less than 10 | 14 | 11.7 | |
| 10 -19 | 70 | 58.3 | 17.5years |
| 20 – 29 | 21 | 17.5 | |
| Above 30 | 15 | 12.5 | |
| Total land size (hectares) | | | |
| 1 – 3 | 75 | 62.5 | 2.78 |
| 4 – 6 | 35 | 29.2 | |
| 7 – 9 | 10 | 8.3 | |

Field survey, 2015

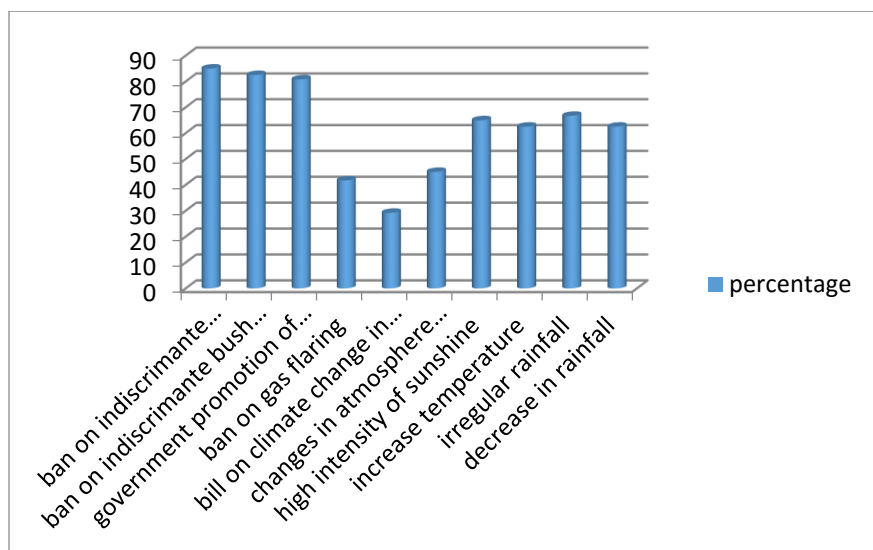


Figure 1: level of awareness on climate changes by the arable crop farmers

Table 2: Adaptive strategies by the arable farmer in study area (n = 120)

| Adaptation strategies | Yes | (%) |
|--------------------------------|-----|------|
| Planting cover crop | 120 | 100 |
| Mulching | 118 | 98.3 |
| Mixed farming | 115 | 95.8 |
| Movement to different site | 112 | 93.3 |
| Crop rotation | 110 | 91.7 |
| Application of farmyard manure | 100 | 83.3 |
| Increased land cultivated | 90 | 75.0 |
| Decreased land cultivated | 88 | 73.3 |
| Changing in planting period | 70 | 58.3 |
| Planting of tree | 65 | 54.2 |
| Minimum tillage | 60 | 50.0 |
| Changes in harvesting date | 55 | 45.8 |
| Bush fallowing | 50 | 41.7 |
| Use of weather forecast | 45 | 37.5 |

Field survey, 2015

Table 3: Extent of adaptive strategies used by the arable crop farmers (n = 120)

| Extent of use | A (%) | O (%) | N (%) | Mean |
|--------------------------------|-----------|----------|-----------|------|
| Planting cover crop | 90(75.0) | 30(25.0) | - | 2.75 |
| Mulching | 70(58.3) | 48(40.0) | 2(1.7) | 2.56 |
| Mixed farming | 73(60.8) | 42(35.0) | 5(4.2) | 2.57 |
| Movement to different site | 65(54.2) | 47(39.2) | 8(6.6) | 2.50 |
| Crop rotation | 68(56.7) | 42(35.0) | 10(8.3) | 2.48 |
| Application of farmyard manure | 65(54.2) | 35(29.2) | 20(16.6) | 2.37 |
| Increased land cultivated | 60 (50.0) | 30(25.0) | 30(25.0) | 2.25 |
| Decreased land cultivated | 55(45.8) | 33(27.5) | 32 (26.7) | 2.19 |
| Changing in planting period | 40(33.3) | 30(25.0) | 50(41.7) | 1.92 |
| Planting of tree | 20(16.6) | 45(37.5) | 55(45.8) | 1.71 |
| Minimum tillage | 45(37.5) | 15(12.5) | 60(50.0) | 1.88 |
| Changes in harvesting date | 40(33.3) | 15(12.5) | 65(54.2) | 1.79 |
| Bush fallowing | 40(33.3) | 10(8.3) | 70(58.3) | 1.75 |
| Use of weather forecast | 30(25.0) | 15(12.5) | 75(62.5) | 1.62 |

Table 4: Constraints to adaptation strategies in the study area (n = 120)

| Constraints | Major (%) | Minor (%) | Not a constraint (%) | Mean |
|---|-----------|-----------|----------------------|------|
| Instability of planting calendar | 90(75.0) | 13(10.8) | 17(14.2) | 2.60 |
| Reduction in soil fertility | 53(44.2) | 60(50.0) | 7(5.8) | 2.38 |
| Lack of access to weather forecast technology | 63(52.5) | 38(31.7) | 19(15.8) | 2.37 |
| Stunted growth | 59(49.2) | 25(20.8) | 36(30.0) | 2.19 |
| Shortage of water | 99(82.5) | 14(11.7) | 7(5.8) | 2.77 |
| Erosion occurrence | 95(79.2) | 7(5.8) | 18(15.0) | 2.64 |
| Wind storm | 102(85.0) | 6(5.0) | 12(10.0) | 2.75 |
| Pest and diseases attack | 97(80.8) | 12(10.0) | 11(9.2) | 2.72 |
| Low yield | 61(50.8) | 40(33.3) | 19(15.8) | 2.35 |
| Poor access to information sources | 58(48.3) | 27(22.5) | 35(29.2) | 2.19 |
| High cost of irrigation | 87(72.5) | 12(10.0) | 21(17.5) | 2.55 |
| Inadequate knowledge on how to cope or build resilience | 83(69.2) | 23(19.2) | 14(11.7) | 2.58 |
| Limited income | 104(86.7) | 6(5.0) | 10(8.3) | 2.78 |

Source: Field survey, 2015

Table 5: Chi-square analysis of socio-economic characteristics of the respondents and the extent of adaptation strategies used in the study area.

| Variables | χ^2 | Df | p-value | Decision |
|---------------------------|----------|----|---------|----------|
| Sex | 54.32 | 1 | 0.72 | NS |
| Marital status | 51.13 | 2 | 0.00 | S |
| Religion | 47.62 | 2 | 0.63 | NS |
| Educational level | 45.21 | 4 | 0.01 | S |
| Main occupation | 68.70 | 1 | 0.45 | NS |
| Ethnicity | 76.20 | 1 | 0.10 | NS |
| Membership of association | 21.3 | 1 | 0.21 | NS |

Source: Field survey, 2015. **Note:** S= Significant at 0.05 level, NS= Not significant at 0.05 level.

Table 6: Relationship between socio-economic characteristics of the respondents and the extent of adaptation strategies used in the study area.

| Variable | r | P-value | Decision |
|---------------------|-------|---------|----------|
| Age | 0.077 | 0.14 | NS |
| Household size | 0.671 | 0.01 | S |
| Years of experience | 0.242 | 0.03 | S |

Source- Field survey, 2015