STATUS OF CLIMATE CHANGE ADAPTATION OF RICE AND YAM FARMERS IN SHENDAM LGA, PLATEAU STATE

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Abstract
Studies (e.g. Lobell et al., 2008) have been conducted on prioritizing climate change adaptation needs for food security in 2030 and arrived at probabilistic projections of production impacts from climate change (expressed as a percentage of 1998 to 2002 average yields) had found yam and rice as important crops within West Africa being a food-insecure region hence, the reason for this study. One Hundred and Twenty questionnaires were purposively distributed to yam and rice farmers in Shendam LGA, Plateau State, being a major producer of the two crops in question. The questionnaire elicited information on socioeconomic characteristics, production capacities and years of farming experience, perceived climate change effects and adaptation strategies and other cultural practices in farming. Collated results were computed using descriptive statistics and Pearson Chi-Square to test for independence between the various variables on SPSS (17.0) at 5% level of significance. In each case, a null hypothesis was adopted as a basis for decision-making. Results showed that on the one hand, climate change perception and cultural practices are independent of socioeconomic characteristics while on the other hand, cultural practices are dependent on climate change. This made possible the conclusion that while the study population may have a superficial knowledge about climate change, adaptation is still largely subconscious, lacking in the root causes of the problem hence no conscious effort made at mitigation measure. More expensive but enduring options of developing newer and more resilient crop varieties and the establishment and elongation of irrigation schemes have been recommended against just switch from the traditional planting date and use of more tolerant crop varieties.
Keywords: Climate change, adaptation, mitigation, Chi-Square

Introduction

Climate Change is regarded as a long term trend which brings about changes between extremes of environmental conditions such as drought, flooding, inconsistent and shortened rainfall patterns, depletion of biodiversity, etc. These catastrophes have been attributed to certain astronomical variables such as precession of the equinoxes or solstices and the eccentricity of the orbit. However, it has been widely agreed that the most daunting causes of climate change are anthropogenic (human-induced) in nature (Lowe & Walker, 1997). Such anthropogenic causes include the burning of fossil fuel such as in transportation, use of wood as fuel, bush burning and other industrial activities which produce carbon emissions. The carbon so produced combines with methane formed by ruminant animals and insects and rice paddies during anaerobic fermentation and nitrous oxide from the intensive use of agrochemicals to produce a *greenhouse effect* over the surface of the earth thereby steadily increasing global temperatures (Obadiah, 2010). That is to say, these gasses which are emitted into the atmosphere act as a *greenhouse*. They allow short wave infrared radiation to pass through them during the day time but are opaque to long wave nocturnal or terrestrial radiation at night thereby trapping heat to the surface of the earth. This is how environmental extremes are brought about thereby creating imbalances in the ecosystem and the depletion/extension (in the tropics/higher latitudes respectively) of biodiversity and further food shortages especially in the most vulnerable (so called third world) parts of the world that are least responsible for the problem due to their low levels of industrialisation. This lately, has been observed to be the major cause of conflicts between communities and sovereign states over the control of space and natural resources.

Agriculture places a heavy burden on the environment in the process of providing humanity with food and fibre, while climate is the primary determinant of agricultural productivity. Given the fundamental role of agriculture in human welfare, concern has been expressed throughout the world regarding the potential effects of climate change on it. The interest in this contemporary issue has generated a substantial amount of research and literature over the past decade (e.g. Rosenzweig & Parry (1994), Rosenzweig & Hillel (1998) etc). The main drivers of agricultural responses to climate change are biophysical effects and socio-economic factors. Crop production is affected biophysically by meteorological variables, including rising temperatures, changing precipitation regimes, and increased atmospheric carbon dioxide levels. Biophysical effects of climate change on agricultural production will be positive in some agricultural systems and regions, and negative in others, and these effects will vary through time. Socio-economic factors influence responses to changes in crop productivity,

with price changes and shifts in comparative advantage (Parry *et al.,* 2003).

The International Food Policy Research Institute (IFPRI) (2011) has estimated that, by 2050, the effects of climate change on agriculture will add 25 million children to the total of those suffering from malnutrition. The bulk of this figure, if not all, shall come from developing economies whose populations are mostly agrarian.

Due to the effects of climate change in the area of study, vis-à-vis the very minimal coping strategy of its farmers, it has become important to examine the status of all well-articulated and conscious efforts aimed at mitigation/adaptation to environmental extremes which checkmates the full potentials of the farmer within the study population.

Objectives

1. To identify the socio-economic characteristics of the respondents
2. To examine the status of climate change adaptation in the study area
3. To examine the relationship between the variables in the study

Study background

Shendam Local Government Area in Plateau State, central Nigeria has four districts namely: Dorok, Derteng, Dokan Tofa and Shendam. The LGA occupies a total land area of 2,477km^2 with a population of 208,017 people (2006 NPC census figures). It lies on latitude $8^0$53′N and longitude $9^0$32′E with mean annual rainfall of 57in and annual average temperature of 22^0C. Shendam LGA is bounded in the north by Mikang LGA, Quan Pan LGA in the west, Langtang South in the east and Taraba State in the south. The hottest months are normally March and September while the coldest months occur between December and January with a lot of harmattan haze. The rainy season is normally between the months of May to October while the other months remain dry.

The population within the LGA is majorly agrarian. Rice and yam form the major food crops produced within this lower Benue basin having soils ranging from rich silt deposits to a sandy-loamy texture.

Methodology

Data was collected from primary and secondary sources. The primary sources included the administration of questionnaires and oral interviews in some cases while the secondary sources of data and other relevant information were obtained from textbooks, journals and the internet.

One hundred and twenty questionnaires were purposively and randomly administered to rice and yam farmers in June 2013 to elicit information on average cultural practices, cropping systems, perceived climate change effects, and adaptation and mitigation measures. 30 questionnaires were administered in each of the four districts of the LGA. Only 102 questionnaires out of the total of 120 copies administered were returned.

The collated results were analysed using simple percentages for socioeconomic characteristics and Pearson chi square to test for independence between the various variables at 5% level of significance on *SPSS (17.0)*. A null hypothesis is used for each analysis as a basis for decision making as stated under each table for results.

Results

Table 1: Socioeconomic characteristics of respondents

Sex	Frequency	Percentage	Cumulative Percentage
Male	69	67.6	67.6
Female	33	32.4	100
Total	102	100	100
Age			
20-29	14	13.7	13.7
30-39	37	36.3	50.0
40-49	35	34.3	84.3
50-59	11	10.8	95.1
60-69	5	4.9	100
Total	102	100	100
Marital Status			
Single	4	3.9	3.9
Married	82	80.4	84.3
Divorced	11	10.8	95.1
Widow	4	3.9	99.0
Widower	1	1.0	100
Total	102	100	100

Educational Status			
Primary	30	29.4	29.4
Adult Education	17	16.7	46.1
Secondary	38	37.3	83.3
Diploma	10	9.8	93.1
HND	6	5.9	99.0
Degree	1	1.0	100
Total	102	100	100

Source: Field survey (2013)

Table 2: Chi-Square analysis for socioeconomic characteristics and climate change perception

Variables	X^2 value	X^2 critical value	P value	Decision
Age	26.851	32.67	0.140	NS
Sex	8.394	18.31	0.590	NS
Educational status	22.818	37.67	0.620	NS

Note for all tables: NS: Not significant
S: Significant
Hypothesis: HO: Climate perception is independent of socioeconomic characteristics
H1: Climate perception is dependent on socioeconomic characteristics
Decision: HO is accepted.

Table 3: Chi-Square analysis for cultural practices and causes of climate change

Variables	X^2 value	X^2 critical value	P value	Decision
Farming method	42.435	55.76	0.366	NS
Adaptive measure	59.023	25.00	0.000	S

Hypothesis: HO: Cultural practices are independent of the causes of climate change
H1: Cultural practices are dependent on climate change
Decision: HO is accepted for variable 1, i.e. farming method
H1 is accepted for variable 2, i.e. adaptive measure

Table 4: Chi-Square analysis for cultural practices and climate change perception

Variables	X^2 value	X^2 critical value	P value	Decision
Farming method	49.994	59.34	0.238	NS
Adaptive measure	50.038	25.00	0.000	S

Hypothesis: HO: Cultural practices are independent of climate change perception
H1: Cultural practices are dependent on climate change perceptions
Decision: HO is accepted for variable 1, i.e. farming method
H1 is accepted for variable 2, i.e. adaptive measure

Discussion and Summary

It appears certainly that farming activities in the study area are male-dominated. Although questionnaires were not equally distributed between the sexes, the percentages of the two sexes involved were calculated and treated as 100% in each case, making possible, a statistical comparison. The test of independence at 5% level of significance between socioeconomic characteristics and climate change perception has proven to be not significant within the stated area of study. Based on the foregoing, it is therefore acceptable on a face value that the awareness level of the respondents in question is high. Expectedly, majority of the respondents are within the most productive age bracket of 30-49 years of age.

While the study has shown that cultural practices such as shifts in planting dates and switch to more tolerant crop varieties are dependent on climate change, on the other hand, it has shown that same cultural practices are independent of the causes and perception of climate change. This may be interpreted as the level of awareness on climate change being superficial and adaptive practices are therefore symptomatic only, without any conscious effort made at addressing the causes of the problems hence no mitigative measures put in place. It may therefore be concluded that most of the adaptive responses by the respondents are subconsciously achieved, not arising from a well rooted level of information. This is in agreement with IFPRI (2011) which agrees that a highly educated, healthy and skilled workforce is needed to combat climate change. Also, Adger *et al.,* (2003) agrees adaptation at a minimal level as a natural response to extreme climatic and weather events has been observed throughout human history as a coping strategy based on structural and other socio-economic factors.

In summary, all of the objectives of the study have been achieved. The socioeconomic characteristics of the respondents have been examined and tested against climate change perception and found to be independent of one another while cultural practices of the farmers have been found to be dependent on climate change.

Recommendations

- ✓ It is recommended that concerted efforts be made by relevant authorities at a wider and deeper education of the farmers not only for adaptation strategies, but mitigation measures.
- ✓ Although relatively inexpensive changes such as shifts in planting dates and a switch to more tolerant crop varieties may moderate impacts of climate change, more costly measures such as the development of new crop varieties and the establishment and expansion of irrigation schemes is recommended.

References

Adger, N. W., Hug, S., Brown, K., Conway, D. and Hulme, M. (2003). Adaptation to climate change in the developing world. *Progress in Development Studies* **3**, 3,179-195.

IFPRI (2011). Climate Change and Poverty. www.oneworld.net

Lobell, D. B., Burke, M. B., Tebaldi, C., Mastrandrea, M. D., Falcon, W. P. & Naylor, R. L. (2008). Prioritizing Climate Change Adaptation Needs for Food Security in 2030. *Science* **319**, 607-610

Lowe, J. J. & Walker, M. J. C. (1997). Reconstructing Quaternary Environments (2nd Ed.) Longman Group Ltd., 12 – 16

Obadiah, F. V. (2010). Climate Change: The fundamentals. *New Environment International* **2**, 8, 42-43

Parry, M. L., Rosenzweig, C., Iglesias, A., Livermore, M. and Fischer, G. (2003). Effects of climate change on global food production under SRES emissions and socio-economic scenarios. *Global Environmental Change* **14**, 53-57

Rosenzweig, C. and Parry, M. L. (1994). Potential Impact of Climate Change on World Food Supply. *Nature* **367**, 133-138

Rosenzweig, C. and Hillel, D. (1998). Climate Change and the Global Harvest: Potential Impacts of the Greenhouse Effect on Agriculture. *Agricultural and Environmental Ethics* **11**, 1, 71-74