

Awareness and effects of climate change on cocoa production in Ondo State, Nigeria

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Abstract

According to estimates, the contribution of cocoa, which is the Nigeria's highest foreign exchange earner among all agricultural commodities, has dropped from 308,000 tonnes in the 70's to an average of 215,000 tonnes in recent years. This, according to reports, resulted from climate failure, among other factors. In the light of this, this study examined awareness and effects of climate change on cocoa production in Ondo State, the Nigeria's leading cocoa producing state. Specifically, the study described socio-economic characteristics of cocoa farmers in the study area, investigated the awareness and perceived effects of climate change on cocoa production by the farmers and identified the adaptation strategies practised by the farmers. Primary data obtained through a combination of purposive and random sampling techniques of 120 farming households from the six Local Government Areas noted for cocoa production in the state were used for the study. Descriptive statistics involving frequency distribution tables, mean, mode and percentages were used for the analysis. The results revealed that 80.8% of the respondents were aware of climate change. The general effects of climate change experienced by the farmers were excessive rainfall (23.3%), less rainfall (12.5%), irregular rainfall pattern (59.2%), delayed onset of rainfall (5.0%), high temperature (37.5%), drought (5.0%) and variation in sunshine hours (28.3%). The visible effects of climate failure on the farmer cocoa production were pest attack (35.8%), disease attack (44.2%), late ripening of cocoa pod (20.8%), reduced weight of cocoa bean (53.3%) and contaminated cocoa bean (45.0%). This is unfavourable to farmers and the Nigerian economy in general. Therefore, this study calls for dissemination of timely information on sound adaptation strategies to effects of climate change by agricultural development agencies and provision of training by relevant stakeholders to improve the technical knowledge and skills of the farmers on measures to mitigate effects of climate change on cocoa production.

Key words: Cocoa, climate change, effects, Nigerian economy

Introduction

The importance of cocoa (*Theobroma cacao*) to Nigeria's economy cannot be overemphasized. Though Nigeria gets her foreign exchange earning from crude petroleum, yet cocoa remains the Nigeria's highest foreign exchange earner among all agricultural commodities, of which the country is the fifth largest exporter of in the world (Oseni, 2011). However, the contribution of cocoa to Nigeria's total exports earnings during the last two decades has dropped considerably. In the 60s, the country produced about 15% of world cocoa annually and was the second largest producer of the crop in the world (Utomakili and Abolagba, 1996). In the

70's cocoa output peaked at 308,000 tonnes (Adeyeye, n.d). In recent years, however, cocoa output ranges between 185,000 and 215,000 tonnes (Oseni, 2011). Some of the reasons identified by previous authors include overdependence on petroleum as the Nigerian source of foreign exchange, small farm holdings, low yield, inconsistent production pattern, disease incidence, pest attack and climate change (Wood, 1985; Villalobos, 1989; Wright, 1993; Obatolu *et al.*, 2003; Oluyole and Sanusi, 2009).

The relevance of favourable climate condition to cocoa production cannot be understated. Cocoa is sensitive to changes in climate - from hours of sunshine, to rainfall,

soil conditions and particularly to temperature due to effects on evapotranspiration (Anim-Kwapong and Frimpong, 2005). According to Ajewole and Iyanda (2010), a rainfall of 900-1000mm and increased temperature is very important for cocoa production and better yield. Climate change could also alter stages and rates of cocoa growth, rates of development of cocoa pests and pathogens, modify host resistance and result in changes in the physiology of host-pathogen/pest interaction. This is of great importance as Ondo State, the Nigeria's leading cocoa producing state, is said to lose between 40 and 50 percent of cocoa to insect menace in recent days. Thus, awareness of climate change and adaptation strategies by cocoa farmers cannot be taken for granted.

Adaptation is defined as adjustment in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts (IPCC, 2001). The 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 climate change and variability and could come in a variety of forms (Jarungrattanapong and Manasboonphempool, 2009). However, the method adapted by a farmer is determined by his socio-economic characteristics (Deressa *et al.*, 2008; Yesuf *et al.*, 2008; Gbetibouo, 2009; Robert and Chinedum, 2010; Falola *et al.*, 2011). In the light of these, this study examined effects of climate change on cocoa production in Ondo State, Nigeria. Specifically, the study described the socio-economic characteristics of cocoa farmers in the study area, identified the general and visible effects of climate failure on cocoa production, and examined the adaptation strategies practised by the farmers towards mitigating effects of climate changes on cocoa production.

Methodology

The study was conducted in Ondo state, Nigeria, located at the southwestern part of the country. The state is bounded by Ekiti and Kogi State in the north; Edo State in the east;

Ogun and Osun States in the west and the Atlantic Ocean in the south. The state has a population of 3,441,024 (NPC, 2006). The state covers an area of 14,793sq.km at 120 kilometres North of the ocean and lies between longitude 4⁰31' and 6⁰00' East of the Greenwich Meridian and latitude 5⁰15' and 8⁰15' North of the Equator. The state is made up of 18 Local Government Area (LGAs) that are grouped into two zones.

The tropical climate of the state is broadly of two seasons: rainy season (April-October) and dry season (November-March). Temperature throughout the year ranges between 21⁰C to 29⁰C and humidity is relatively high. The annual rainfall varies from 2,000mm in the southern areas to 1,150mm in the northern areas. The state enjoys luxuriant vegetation with high forest zone (rain forest) in the south and sub-savannah forest in the northern fringe.

Agriculture is the mainstay of the state and 65% of the state labour force is in agricultural sub-sector (Folayan *et al.*, 2007). As regards cocoa production, Ondo State accounts for about 50% of Nigeria's annual cocoa production (Ajayi *et al.*, 2012; Ajobo, 1980). Other cash crops produced in large scale in the state include palm produce and rubber. Food crops like maize, yam and cassava are also produced in large quantities. The state is also blessed with very rich forest resources where some of the most exotic timber in Nigeria abound.

Both primary and secondary data were used for the study. Primary data were sourced from cocoa farming households while secondary data were obtained from published and grey literature. A three-stage sampling technique was adopted for the study. At the first stage, six LGAs noted for cocoa production: Idanre, Ondo-West, Ile-Oluji/Oke-Igbo, Odigbo, Akure South and Owo were purposively chosen. This was followed by random selection of four farming communities in each LGAs. Third, five farming households were randomly selected from each community, making a total of 120 respondents. Data collected were analyzed with descriptive statistics involving frequency distribution tables, mean, mode and percentages.

Results and Discussion

Table 1 shows the socio-economic characteristics of the respondents. Most (73.3%) of the respondents were male, implying that male were more involved in cocoa farming than female. About 76.7% of the respondents were married, 21.7% were single while 1.7% were divorced.

Household size of farmers significantly determines the the probability of uptake of adaptation measures to effects of climate, especially changing tillage operations which requires added labour from the farmer (Robert

and Chinedum, 2010; Falola *et al.*, 2012). Most (46.7%) of the respondents had a household size of 6-10 members. A mean household size of 8 persons was obtained in the study. All other things being equal, the respondents had a reasonable household size to assist in managing effects of climate change on cocoa production.

About 77% of the respondents were between the age of 20 – 50 years. Further analysis of the age distribution showed that the mean age of the respondents was 43 years. Thus, the bulk of

Table 1: Distribution of respondents by socio-economic characteristics

Characteristics	Frequency	Percentage
Sex		
Male	88	73.3
Female	32	26.7
Marital Status		
Single	26	21.7
Married	92	76.7
Divorced	2	1.7
Household size		
1 -5	34	28.3
6 – 10	56	46.7
11 – 15	18	15.0
>15	12	10.0
Age (years)		
20 - 30	10	8.3
30 – 40	31	25.8
41 – 50	51	42.5
51 – 60	13	10.8
≥ 61	15	12.5
Educational Level		
No formal	21	17.5
Primary	46	38.3
Secondary	37	30.8
Tertiary	16	13.3
Farm Size (ha)		
0.1 - 2.99	27	22.5
3.0 – 5.99	54	45.0
6.0 – 8.99	25	20.8
≥9.0	14	11.7
Farming experience (years)		
1 – 10	30	25.0
11- 20	56	46.7
21 – 30	28	23.3
>30	6	5.0
Access to extension services		
Yes	73	60.8
No	47	39.2

Source: Field Survey, 2012

the farmers are still energetic and should be enterprising and innovative, which according to Iheke (2006) has a lot of positive implications for agricultural production. *Ceteris paribus*, these farmers should be able to accept improved climate change adaptation strategies and farm innovations more easily and vigorously than their aged counterparts. As noted by Shiferaw and Holden (1998), Muhammad-Lawal *et al.* (2009) and Falola *et al.* (2012), the risk bearing abilities and innovativeness of a farmer, his mental capacity to cope with the daily challenges and demands of farm production activities and his ability to adopt land conservation technologies and mitigate effects of climate change decrease with advancing age.

Education is an important factor in mitigating effects of climate change on livelihood activities. Falola *et al.* (2012) asserted that more educated people are more aware of climate change, its causes, its effects, and the measures required to reduce exposure to its impacts than their uneducated counterparts. Only 17.5% of the respondents had no formal education while the remaining 82.5% of the respondents were formally educated at different levels. This suggests that the farmers would likely adapt measures to mitigate effects of climate change on their production.

The farm size of most of the respondents ranged between 3 – 5.99 hectares. An average farm size of 4.67 hectares was obtained in the study. Seventy-five percent of the respondents had been in cocoa farming for more than 10 years, signifying that cocoa production is an age-long venture in the area. A good number (60.8%) of the farmers had access to extension services.

Table 2 presents the awareness and effects of climate change on cocoa production as perceived by the farmers. The results indicate that most (80.8%) of the cocoa farmers were aware of the influence of climate change and its deleterious effects on their cocoa production. This agrees with World Bank (2007) which noted most farmers in Africa are aware of the effects and existence of climate change occurrence in their areas. Most of the respondents (59.2%) of the respondents perceived climate change effects in term of irregular rainfall pattern, 37.5% perceived the general effect of climate change in term of high temperature. This is in tandem with empirical findings from meteorological data by United Nations in Anuforum (2010) and NEST (2004) which indicated that there are established cases of rainfall variability and temperature increases of 1.2°C in the Niger Delta region, where Ondo State is situated.

Table 2: *Respondents' awareness and perception of the effects of climate change on cocoa production in the study area

Effects	Frequency	Percentage
Awareness of climate change		
Yes	97	80.8
No	23	19.2
General effects		
Excessive rainfall	28	23.3
Less rainfall	15	12.5
Irregular rainfall pattern	71	59.2
Delayed onset of rainfall	6	5.0
High temperature	45	37.5
Drought	6	5.0
Variation in sunshine hours	34	28.3
Effects of climate change on cocoa production		
Pest attack	43	35.8
Diseases	53	44.2
Late ripening of cocoa pod	25	20.8
Reduced weight of cocoa bean	64	53.3
Contaminated cocoa bean	54	45.0

* Multiple response, **Source:** Field survey, 2012

Others broad effects of climate change perceived by the respondents include variation in sunshine hours (28.3%), excessive rainfall (23.3%), less rainfall (12.5%), delayed onset of rainfall (5.0%) and drought (5.0%). As regards effects of climate change failure on cocoa production, 53.3% of the farmers perceived reduced weight of cocoa bean, 45% perceived

that it results in contaminated bean, 44.2% perceived disease attack, 35.8% noticed that it is pest attack while 20.8% reported late ripening of cocoa pods. The effects of climate change failure on cocoa production thus imply a threat to cocoa production in particular and the Nigerian economy in general.

Table 3: *Distribution of respondents by adaptation strategies

Adaptation Technique	Frequency	Percentage
Crop diversification	32	26.7
Mixed cropping	31	25.8
Using different crop varieties	12	10.0
Changing planting and harvesting dates	8	6.7
Spraying of cocoa with chemicals	77	64.2
Switching to other sources of income	54	45.0
Drought resistant varieties	22	18.3

* Multiple responses, **Source:**Field survey, 2012

Table 3 shows the strategies adapted by the respondents towards effects of climate change on cocoa production. Majority (64.2%) of the respondents used spraying, 45.0% adapted switching to other sources of income, 26.7% used crop diversification while 25.8% engaged in mixed cropping. Other methods of adaptations embarked on by the respondents include planting drought resistant varieties (18.3%), using different crop varieties (10%) and changing planting and harvesting dates (6.7%). These results show that spraying cocoa with chemicals and switching to other sources of income are the major adaptation strategies employed by the farmers.

Conclusions and Recommendations

Farmers are aware of climate change and adapt to its effects on cocoa production in Ondo State, Nigeria. The major general effects perceived by the farmers are irregular rainfall pattern, high temperature, variation in sunshine hours and excessive rainfall. The prominent visible effects of climate failure on cocoa production in the area are reduced weight of cocoa bean, contaminated cocoa bean, and pest and disease attack. The common adaptation practices used by the farmers are spraying cocoa with chemicals, switching to other

sources of income, crop diversification and mixed cropping.

The results of this research have some policy implications for development in cocoa production in Nigeria. Government policies should ensure that farmers have access to relevant information on climate changes in order to increase their ability and flexibility to change adaptation strategies in response to perceived climate change. Also, Ministry of Agriculture in collaboration with research institutes could collect, analyze and disseminate timely information on sound adaptation strategies to effects of climate change on cocoa production. This could be through radio, newspapers and bulletins. Also, agricultural extension providers should overhaul their services particularly in providing information and packages that will help cocoa farmers adjust and readjust to climate change. All these will improve the technical knowledge and skills of the farmers on causes of climate change, its effects, and measures to mitigate its effects.

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