

AGRICULTURAL EXTENSION AND CLIMATE CHANGE: BUILDING ADAPTIVE CAPACITY TOWARDS AGRICULTURAL IMPACTS IN NIGER STATE

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Abstract

This study appraises the agricultural extension and climate change adaptive capacity towards agricultural impacts in Niger state, Nigeria. A multistage cluster sampling technique was used to randomly select 250 respondents. Data were analyzed using descriptive statistics. The results showed that the majority of the respondents were male 95.10%. Out of the 250 respondents, 51% had their ages ranging from 30 to 40 years and 60% had formal education and 80.4% had access to extension services. The majority of the respondents were married 95.5% and their sources of information were mainly radio, extension agents, and fellow farmers. Respondents' awareness of climate change adaptation strategies was at low and moderate levels. Planting of improved crop varieties and change in planting dates were some strategies adopted to overcome climate change. The respondents' climate change perception on high temperature was at (M=5.34), low rainfall (M=4.82), and land degradation (M=4.66). Therefore, the study concludes that extension services were the appropriate means of improving climate change adaptation strategies. It also recommends that extension agents should visit farmers more often to raise awareness and to increase the knowledge of farmers on adaptation strategies.

Keywords: Adaptation, agriculture, awareness, climate change, extension service

1. Introduction

Agriculture's contribution to Gross Domestic Product (GDP) was 19.79 % in the first quarter (Q1) of 2015, compared to 23.86 % in the fourth quarter (Q4) of 2014 (Ijirshar, 2015). Agriculture is the main source of food, engages 70-80% of the workforce, while the rest of the sector's activities rely on the weather and climate for their maximum effectiveness (Ozor, 2010). Notwithstanding its contributions to the economic development of the country, the sector is been threatened by numerous problems. The International Panel on Climate Change Assessment Report indicated that the predicted impact of climate change is a growing demand for action in order to reduce extreme poverty. Such efforts may be futile if farmers are not supported by the agricultural extension service program in implementing more successful reform strategies.

Without a doubt, climate change has increasingly become a global concern. The upsurge of fossil fuel burning and inappropriate land use continue to emit greenhouse gases into the atmosphere. This certainly has serious implications for the environmental sustainability and human wellbeing (Nightingale, Gonda, & Eriksen, 2022). Climate change impacts ecosystems, livelihoods, human security and socio-economic development of societies, and has been defining the direction of human wellbeing and development (Lioubimtseva & Da Cunha, 2020). The myriad effect of environmental degradation ranges from excessive torrents and floods, down to dearth of food and agric produce. It has been forecasted that in the coming decades, billions of individuals across the world, especially in the developing parts of the world would be faced with shortages of necessities of life such as water and food.

They will also be faced with climate related diseases and other life threatening challenges (Howarth, Morse-Jones, Brooks & Kythreotis, 2018). Climate change affects shelter, health, livelihood and life in general. The negative impacts of climate change currently reflect on the dwindling natural resources, including food, which generally affect human environment, economy, and health (Pörtner, Roberts, Adams, Adler, Aldunce, Ali, & Ibrahim, 2022). Pisor, Basurto, Douglass, Mach, Ready, Tylianakis, (2022) notes that as the planet gets warmer, the pattern of rainfall alters, extreme weather events such as floods, droughts, and forest fires turn out to be recurrent. The world economy, ecosystem, and healthy environment are at the mercy of variations of the earth's climate, which is moving at a pace that seems beyond recovery.

A study by Nnadi et al. (2013) reported that a larger proportion of crop farmers are conservative and remain unaware of the negative impact of climate change while others have established the capacity to overcome the negative impact of climate change in the region. However, the pace and intensity at which the changes take place outstrips their adaptability. Most of the studies in agriculture on climate change tend to concentrate more on assessing the vulnerability of different crop system attributes without assessing the role of the extension services (Mesike et al. 2015; Mustapha 2013; Ozor et al. 2010). This work aims at addressing the gap. The objectives of the study is to assess the socio-economic characteristics of the respondents; to determine the respondent level of extension awareness and level of farmers perception of climate change impact.

(75.2%) of the sampled farmers were married. Educational attainment of the respondents revealed that (13.3%) of the sample did not go to school, whereas, (6.5%) had other forms of education, while respondents with one form of formal education constituted the majority (80.2%) of the respondents. The result indicates that (35%) of the farmers had more than 20 years of farming experience. This finding supports the work of Ironkwe et al. (2007).

Table 1: Respondent's Socio-demographic Profiles

Variables	Frequency	%
Age (years)		
(21-30)	6	5.4
(31-40)	128	51
(>51)	116	43.6
Gender		
Male	245	95.1
Female	5	4.9
Marital status		
Single	20	25.1
Married	230	75.2
Education level		
Did not go to school	52	13.3
primary school	104	35.4
Secondary school	68	24.6
Tertiary	15	20.2
Others	11	6.5
Experience (years)		
1-10	22	11
11-20	37	15
21-30	101	35
31-40	55	22
>41	35	17

Table 2 indicated that majority of the respondents had moderate level of extension awareness on planting of improved varieties ($M = 3.474$), Change in planting date ($M = 3.349$), use of mulching / cover cropping ($M = 3.232$), Mixed farming ($M = 3.205$) than planting of early maturing varieties ($M = 2.545$), crop rotation ($M = 2.017$), use of irrigation ($M = 2.067$), manure application ($M = 2.345$), use of inter cropping ($M = 2.074$). It can be attested that crop farmers in the study area are moderately aware of the adaptation strategies. This result is consistent with previous findings of Below et al. (2010) and Jha et al. & Amarayil et al. (2018) on the use of adaptation strategies to cope with climate change impacts. The ability to adapt to climate change can be affected in particular by the degree of awareness among farmers in the region.

Information through extension services on climate change enable farmers to make better decisions, for example, choice of crop varieties, mode of production, and adjustment of planting dates, and these can improve farm productivity (de Bruijn, Buurman, Mens, Dahm & Klijn, 2017). Climate education services provide knowledge to farmers about potential avenues to cope better in the presence of climate change. This new knowledge has the potential to

improve willingness to access to credit facilities and enable farmers to adopt better farm technologies that improve farm productivity. This has the potential to add to economic resilience by compensating farmers in the event that adverse weather events disrupt crop production (de Bruijn et al., 2017).

Table 2: Farmers' level of extension awareness

Adaptation strategy	Mean	Level
Planting of early maturing varieties	2.545	Low
Planting of improved varieties	3.474	Moderate
Change in planting date	3.349	Moderate
Use of weather forecasting	3.122	Moderate
Crop rotation	2.017	Low
Use of mulching / cover cropping	3.232	Moderate
Soil conservation	3.094	Moderate
Use of Irrigation	2.067	Low
Mixed farming	3.205	Moderate
Crop diversification	3.059	Moderate
Manure application	2.345	Low
Use of inter cropping	2.074	Low

Table 3 indicates that the majority of the respondents had a high level of perception on high temperature ($M = 5.340$), low rainfall (4.820), and land degradation ($M = 4.660$). However, a moderate level on damage to crops ($M = 3.143$), increases in draught ($M = 2.828$), increase the rate of soil erosion ($M = 2.829$), increase in pest attack ($M = 2.705$) and reduction in income ($M = 2.674$). According to Kihupi et al. (2015) farmers who perceived the climate change impacts are more likely to support adaptation strategies.

These changes have affected agricultural productivity through crop failures thereby decreasing agricultural productivity, increased food shortage and increase poverty. The climate change, has increase cost of production and hunger in the society. The result of which is rural urban migration for white-collar jobs, leaving fewer people in agricultural production.

Table 3: Levels of Perception of Impact

Perception of climate change Impact	Mean	Level
Causes land degradation	4.660	High
Causes damages to crops	3.143	Moderate
Causes increase draught	2.828	Moderate
Causes poor fertility of soil	2.392	Moderate
Climate change impact causes increase in disease	2.200	Moderate
Causes increase in pest attacks	2.705	Moderate
Causes high temperature	5.340	High
increase the rate of soil erosion	2.829	Moderate
Causes reduction in income	2.674	Moderate
Causes rapid growth of weeds	2.226	Moderate
Causes desertification	2.317	Moderate
Courses low rainfall	4.820	High

4. Conclusion

This research centered on the role of Agricultural Extension Services' in helping farmers respond to climate change in the state. This is because climate change is probably the most significant environmental challenge, in Niger state, which affect agricultural productivity. Such variations were noticed by temperature increase, reduced rainfall, and low production. Crop farmers avert these changes through certain preventive techniques, such as planting improved crop varieties, adjusting planting dates, crop diversification, off-farm revenue, and using irrigation that the respondents understood moderately. It was found that the level of understanding for the adaptation strategies is not high.

It can be argued that extension awareness is an important contributor to climate change impact adaptation strategies.

5. Recommendations

Based on the findings of this study, the following recommendations were made so as to improve:

1. Climate scientists and extension educators may be more effective if they tailor their messages in ways that reduce threats to individual viewpoints and increase dialogue among those with differing views.
2. Extension meetings and workshops to farmers and advisers on Climate change may be more effective when the message focuses on adapting to increased weather variability, extreme weather, agricultural vulnerability, and related risks.
- 3 It is important to develop strategies to communicate the science of climate change and its predicted impacts and the relevant adaptive actions.

5.1 Encouraging adaptive capacity

- 4 Develop strategies to help extension agents better understand the science on climate change and to recognize that farmers need to take adaptive actions.
- 5 Successful use of adaptive practices require science and experience-based knowledge. Farmers and advisers trust extension, suggesting that extension can play a role in changing attitudes and motivating adaptive management of agricultural crops.
- 6 Farmers have a great deal of experience with variability in weather and many are Engagement strategies that appeal to confidence and capacity to adapt are likely to increase stakeholder interest.
- 7 Encourage farmers to use a combination of practices and customize management to their own field and farm conditions, observing how climate change affect soil loss, water drainage, and productivity.
- 8 Encourage cropping practices that reduce soil erosion and enhance productivity. More timely and accurate local weather/climate information would help farmers make better decisions.

5.2 Institutional Action

- 9 Integrate information about climate change impacts and the need for adaptation into programming for both farmers and extension agents. Extension is uniquely positioned to help the agricultural sector to improve resilience and adaptive capacity.

References

- Below, T., Artner, A., Siebert, R., & Sieber, S. (2010). Micro-level practices to adapt to climate change for African small-scale farmers. *A Review of Selected Literature*, 953.
- de Bruijn, K., Buurman, J., Mens, M., Dahm, R., & Klijn, F. (2017). Resilience in practice: Five principles to enable societies to cope with extreme weather events. *Environmental Science & Policy*, 70, 21-30.
- Howarth, C., Morse-Jones, S., Brooks, K., & Kythreotis, A. P. (2018). Co-producing UK climate change adaptation policy: an analysis of the 2012 and 2017 UK Climate Change Risk Assessments. *Environmental Science & Policy*, 89, 412-420.
- Ijirshar, V. U. (2015). The empirical analysis of agricultural exports and economic growth in Nigeria. *Journal of Development and agricultural economics*, 7(3), 113-122.
- Ironkwe, A. G., Asiedu, R., & Unamma, R. P. A. (2007). Adoption of yam minisett technology by women farmers in Abia State, Nigeria. *Journal of Agriculture and Social Research (JASR)*, 7(2), 95-105.
- Jha, C. K., Gupta, V., Chattopadhyay, U., & Sreeraman, B. A. (2018). Migration as adaptation strategy to cope with climate change. *International Journal of Climate Change Strategies and Management*.
- Kibue, G. W., Pan, G., Joseph, S., Xiaoyu, L., Jufeng, Z., Zhang, X. & Li, L. (2015). More than two decades of climate change alarm: Farmers knowledge, attitudes and perceptions. *African Journal of Agricultural Research*, 10(27), 2617-2625.
- Lioubimtseva, E., & Da Cunha, C. (2020). Local climate change adaptation plans in the US and France: Comparison and lessons learned in 2007-2017. *Urban Climate*, 31, 100577.
- Nightingale, A. J., Gonda, N., & Eriksen, S. H. (2022). Affective adaptation= effective transformation? Shifting the politics of climate change adaptation and transformation from the status quo. *Wiley Interdisciplinary Reviews: Climate Change*, 13(1), e740.
- Mesike, C. S., Ugwa, I. K., & Esekhide, T. U. (2015). Adaptation to climate change among rubber farmers in delta state, Nigeria. *Clim chang*, 1(2), 98-104.
- Mustapha, B., Salau, E. S., Galadima, O. E., & Ali, I. (2013). Knowledge, perception and adaptation strategies to climate change among farmers of Central State Nigeria. *Sustainable Agriculture Research*, 2(526-2016-37766).
- Ndagi, I., Oduwole, O., Taiwo, O., Muhammed, I., & Rahman, S. (2013). Socio-economic factors affecting use of information sources among cashew farmers in Niger State, Nigeria. *American-Eurasian Journal of Agricultural & Environmental Sciences*, 13(6), 769-773.
- Nnadi, F. N., Chikaire, J., Nwakwasi, R. N., & Ukpongson, M. N. (2013). Analysis of the effects of climate change on agricultural extension services in Delta State, Nigeria. *Peak J. Agric. Sci*, 1(2), 33-41.
- Ozor, N., Madukwe, M. C., Enete, A. A., Amaechina, E. C., & Onokala, P. (2010). Barriers to climate change adaptation among farming households of Southern Nigeria. *Journal of Agricultural Extension*, 14(1).
- Pisor, A. C., Basurto, X., Douglass, K. G., Mach, K. J., Ready, E., Tylianakis, J. M., ... & Jones, J. H. (2022). Effective climate change adaptation means supporting community autonomy. *Nature climate change*, 12(3), 213-215.
- Waziri, A., Tsado, E. K., Likita, T., & Gana, A. S. (2014). Socio-economic factors influencing adoption of yam minisett technology in Niger State of Nigeria. *Journal of Biology, Agriculture and Healthcare*, 4(5), 98-105.