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Extension and advisory services roles in creating resilient value chain of smallholder rural farmers in Imo State, Nigeria

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Abstract
Smallholder farmers are most affected by climate change shocks and weather related disasters the world over, and they are also vulnerable to market fluctuations and poor governance, conflicts and even diseases. Extension and advisory services provide an opportunity for strengthening resilience of rural farming households by increasing their access to both material and non material resources. This paper sought to explain how Extension Services Providers build resilience of rural farmers in Imo State, Nigeria. The researcher selected 120 Extension workers and 230 rural farmers for interview. Questionnaire was given to both respondents, and complimented by oral discussion. Data collected were analyzed descriptively. With a discriminating mean (M) score of 2.0, it was seen that climate change affects the farmers adversely. Climate change damages crops in farm and field (M=2.50), reduced quality/quality of crops(M=2.45), leads to sudden death of crops(M=2.70) among others. To build resilience of rural farmers, extension workers promoted the following resilient approaches - diversification of income sources (M=2.81), market information provisioning (M=2.79), behavioural change campaigns(M=2.54), crop diversification (M=2.67), among many others. The farmers face the challenge of insufficient incomes, poor monitoring, low understanding of climate change, resilient options etc.

Keywords: Climate change, extension service, resilient, value chain, crops

Introduction

Today, because of increased globalization and urbanization, African smallholder farmers face challenges greater than those faced by Asian farmers during the Green Revolution. Increased urban demand for more and better food can provide opportunities to increase and diversify food production in rural areas (Graziano da Silva & Fan, 2017) [8]. African smallholder farmers not only need to produce more efficiently, but also to face far more complex and competitive markets. Growing specialization, rapidly changing consumer preferences, and increasingly intricate technical specifications place significant demands on the average smallholder. Institutional and technical innovations, including better access to input and output markets, and enhancing rural–urban linkages constitute key components of future agricultural transformation strategies.

A successful agricultural and livelihood transformation depends on the effective and inclusive integration of smallholder farmers in value chains. Such integration, up and down the value chain, will increase productivity and value; increase diversity in the chain; reduce risks and greater resilience. Physical goods flow down the chain until they reach consumption, in exchange for financial flows that flow up the chain from the final consumer back to the original producer (Conway, 2012) [3]. Each actor along the chain retains a share of the final price, which is necessary to make his/her business profitable and sustainable.

According to The Montpellier Panel, (2012), resilience is the capacity of an agricultural value chain and its elements to withstand or recover from stresses and shocks and thus bounce back to the previous level of growth and development.

Agricultural extension, the bridge between research and farmers plays key roles in agriculture by providing farmers with information, new technologies and education on how to mitigate GHGs and cope with climate change so as to increase production and ameliorate living standards (Singh and Grover, 2013) [14]. Extension's major activities over time has been dissemination of useful information from research to farmers and taking farmer's problems to researchers and this is even more important in the light of climate change and its impact on agriculture (Obiora, 2013) [13]. Exposure to extension services influence the capacity of farmers to adapt to climate change (Maponya and Mpandeli, 2013) [12] because they educate farmers for example on how to develop and disseminate local cultivars of drought resistant crop varieties with information about the crops' advantages and disadvantages.

According to Maponya and Mpandeli, (2013) [12], climate change and its associated uncertainties implies that agricultural extension services need to regularly access new knowledge and disseminate it in an adequate and timely manner to the farmers. Extension has the advantage over other sources of information on adaptation that it

necessitates follow-up from the sender to receiver and feedback mechanism. The role of Agricultural extension in adaptation cannot be under-estimated as they initiate changes in knowledge, attitudes, resilience capacities and skills of the people.

However why some studies have shown that extension is effectively carrying out this role of information dissemination (Maponya and Mpandeli, 2013) [12] others have simply stated that is not doing enough especially in providing farmers with resilient and adaptation information (Ugwoke *et al*., 2012) [15]. A value chain can be defined as the process of transformation of a physical product from input and production through processing and consumption (Conway, 2012) [3]. This research therefore seeks to ascertain the role of agricultural extension in building resilient capacity of farmers to ensure their livelihood in the face of climate change event.

Methodology

The study was conducted in Imo State Agricultural Development Programme (IMO ADP). Imo State lies between latitude 5°12′ and 5°56′ North of the Equator and between longitudes 6°38′ and 7°25′ east of the Greenwich meridian. It is bordered by Abia State on the east, by the River Niger on the West, by Anambra State to the north and River State to the south. (IMSG, 2001). Imo State occupies a land mass of about 5,530 km2 with a total population of approximately 5,275,703 persons in 2019, projected from 2006 census figure (NPC, 2006). The State has two dominant seasons, that is, rainy and dry seasons. Rainfall is between April and October, while the dry season starts from November to early March. Purposive sampling technique was employed to select the respondents. A sample size of 120 extension agents available in Imo State, as obtained from the ADP staff list and 230 smallholder farmers were selected for the study. The two main sources of data collection used in this research were the primary data and the secondary data. The primary data was collected from the field survey, using questionnaires. The secondary data were collected from books, reports, journals, existing literature review, information from library, ADP etc. Basically, descriptive statistics were used to analyze most of the data. This involves the use of percentages and frequency counts, presented in tabular form to achieve objective 3. While objective 1 was analyzed using a 3-point likert type scale of strongly agree, agree and disagree to rate the effects of climate change on farmers value chain. The responses were assigned weight of 3, 2 and 1 respectively and added to give 6 divided by 3 to give a mean of 2.0. A mean score of 2.0 and above indicated effect, while a mean score lower than 2.0 indicated no effects. While objective 2 was analyzed using a 4-point likert scale of strongly agree, agree, disagree and strongly agree to rate roles of extension in building resilient strategy of farmer. The responses were assigned weight of 4, 3, 2 and 1 respectively and added to give 10 divided by 4 to give a mean of 2.50. A mean score of 2.50 and above indicated resilient approach, while a mean score lower than 2.50 indicated none.

Effects of Climate Change on Smallholder Farmers' Value Chain

Climate change impact smallholder farmers' in the area as shown in Table 1. With a discriminating mean index of 2.00, climate change damages crops in field/farm (M=2.50), reduced the quality/quantity of crops (M = 2.45), higher prices of crops (M=2.81), reduced consumption (M=2.58), loss of income (M=2.41), sudden death of crops in field/farm (M=2.70), delayed seed germination (M=2.60), switch to cheaper crop production (M=2.30) and damages to infrastructure (M= 2.30).

Based on stakeholder discussions, drought affects all crop and animal value chains in different ways. For example, drought affects availability and quality of seed, reduced dairy production and breeding, leads to poor quantity and quality of pasture and fodder, and increased costs in buying feed. In terms of the production stage, crops suffer from low germination rates, hardened soils and increased incidence of pests and diseases; animals become emaciated and lose resistance to pests and diseases. Drought most adversely affects production activities in crops: planting requires more time and labor due to hard soils; low germination increases the need for irrigation; and water stress leads to greater crop susceptibility to pest and diseases, low yields and poor quality produce.

Table 1: Effects of Climate Change on Smallholder Farmers' Value Chain

Effect	Mean	SD
Damages to field crops	2.50	0.09
Reduced quality/quantity of crops	2.45	0.48
Higher prices of crops	2.81	0.07
Reduced consumption	2.58	0.08
Switch to cheaper crop production	2.31	0.24
Loss of income	2.41	0.41
Reduced capacity to purchase food	2.30	0.59
Crop failure/quantity/quality deterioration	2.14	0.91
Reduced available water to crops	2.30	0.81
Shorter/irregular growing seasons	2.14	0.67
Increased farm/labour migration	2.18	0.24
Damages to infrastructures	2.30	0.43
Increase soil salinity	2.22	0.69
Increase heat stress	2.41	0.58
Delayed seed germination	2.60	0.71
Sudden death of crops in field	2.70	0.60

Mean 2.0 and above accepted

Resilient Approaches Promoted by Extension and Advisory Services Providers

Climate resilience is the capacity of a socio-ecological system to (a) absorb stress and maintain function in the face of external stresses imposed upon it by climate change, and (b) adapt, reorganize, and evolve into more desirable configurations to improve the climate impacts (Folks, 2006; Nelson, *et al*., 2002) Based on these definitions, the extension and advisory services providers were asked to rate their agreement on the resilient strategies promoted by them. The promoted strategies were divided into 4 areas namely agricultural market development, behavioural change, biodiversity management, and social safety nets. The agricultural market development resilient strategies promoted included facilitating access to financial services (M = 2.80), diversification of income sources (M = 2.81), cluster/cooperative farming (M=2.67), and market information provisioning (M=2.79).

Behavioural change strategies were character adjustment

(M=2.74), adjustments in cultural attachment (M=2.71), change in attitude (M=2.67), change in taste/preferences (M = 2.91) and behavioural change campaign (M = 2.54). Biodiversity management resilient strategies promoted included crop diversification (M = 2.67), changing crop mix (M=2.64), crop rotation (M=3.01), use of low water consuming crops (M=2.84), agro forestry practices (M=3.70), organic farming (M=3.70), water harvesting (M=3.54), minimizing water loss (M=3.24), minimum/zero tillage (M=3.01), cover cropping (M=3.04), appropriate application of fertilizer (M=3.01), provision of weather information (M=3.05). Social safety net strategies were borrowing from family/friends (M=3.51), sale of family assets (M=2.89), collective provision of farm inputs (M=2.90), investing in farm products (M=3.01), food preservation/storage (M=2.70), use of resistant crop varieties (M=2.97).

Table 2: Resilient Approaches Promoted by Advisory Workers

Approaches/Strategies	Mean	SD
Agricultural Market Development		
Facilitate access to financial service	2.80	0.40
Market information provisioning	2.79	0.52
Investment in agric business	2.50	0.66
Diversification of income sources	2.81	0.45
Cluster/cooperative farming	2.67	0.49
Behavioural change		
Adjustments in characters	2.74	0.61
Adjustments in cultural attachment	2.71	0.73
Change in attitude/live style	2.67	0.72
Changing tastes/preferences	2.91	0.78
Behavioural change campaigns	2.54	0.64
Biodiversity management		
Crop diversification	2.67	0.10
Change of cropping mix	2.64	0.43
Crop rotation	3.01	0.10
Use of strong indigenous crops	2.01	0.06
Use of low-water consuming crops	2.84	0.54
Shelter belts/windbreaker	2.65	0.81
Agroforestry practices	3.70	1.05
Use of Improved fallow	2.50	0.62
Improved natural resources management	2.74	0.34
Organic farming	3.70	0.66
Sustainable land management	2.61	0.70
Water harvesting/irrigation	3.54	0.81
Moisture conservation measure	2.78	1.01
Minimizing water loss	3.24	1.04
Conservation agriculture	2.80	0.76
Soil fertility management	2.69	0.58
Improved timing of farm operations	2.81	0.64
Minimum/zero tillage	3.01	1.02
Cover cropping	3.04	1.03
Appropriate application of fertilizer	3.01	0.49
Provision of weather information	3.04	1.04
Social Safety nets		
Borrow from family/friend	3.51	0.68
Sale of family assets	2.89	0.79
Collective provision of farm inputs	2.90	0.94
Investing in family tools/social networks	2.78	0.88
Collective marketing of farm products	3.01	0.92
Food preservation/storage	2.70	0.64
Training/education of farmers	3.54	0.51
Use of resistant crop varieties	2.97	0.81

Mean 2.50 and above accepted

Impediments to Use of Resilient Strategies by Farmers

Table 3 revealed the challenges smallholder farmers face in the use of climate resilient strategies promoted by extension and advisory services providers in the study area. The challenges included lack of understanding of climate change by the farmers with a percentage response of 91.3, lack of understanding of resilient options (89.1%), low awareness of resilient options (98.2%), insufficient finances (91.3%) among others. Other barriers are insecure land tenure; limited access to information; lack of financing support, delayed returns on investment; labor constraints; and climate-driven uncertainty (Adger *et al*., 2009; Deressa *et al*., 2009; Moser and Ekstrom, 2010; Nielsen and Reenberg, 2010; Crane, Roncoli, and Hoogenboom, 2011; Gifford, 2011; Biesbroek *et al*., 2013) [1, 5, 11, 10, 4, 9, 2]

Table 3: Impediments to Use of Resilient Strategies

Impediments	Percentage
Lack of understanding of climate change	91.3
Lack of understanding of resilient options	89.1
Low awareness of resilient options	98.2
Low understanding of climate, responses	84.0
Insufficient finances	91.3
Failure to engage relevant stakeholders	35.2
Poor targeting of beneficiaries	35.2
Poor monitoring & evaluation of programs	52.2

Multiple responses*

Conclusion

Climate change is a global issue with serious implications. It damages field crops, reduces their quantity and quality, delays seed germination, increases stress, damages infracstructure and so on. Extension workers have introduced and promoted several resilient strategies such as crop rotation, crop diversification, organic farming, sustainable land management, cover cropping, access to market and finances to help farmers cope. The challenges faced were low understanding of resilient options, climate change responses among others.

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