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RESEARCH ARTICLE

Women Farmers Adaptation Mechanisms against Climate Change in Delta State

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ABSTRACT

This study examined women farmers' survival strategies against climate change in Delta State. The specific objectives were to: identify the adaptation strategies used by them to mitigate the effects of climate change, discover the challenges to adaptation strategies used and determine if the demographic characteristics of the women farmers influence their choice of adaptation strategies. Proportional sampling method was used to select 215 women farmers from the three Agricultural Zones of Delta State. The study revealed that the women farmers' employ different strategies to mitigate the effect of climate change on their agricultural practices. Among the strategies include reduced use of chemical fertilizers (89 %), use of organic fertilizers (88.25 %), integrated pest management (85 %), shifting cultivation (89.75 %), crop rotation (75.50 %), mulching (90.75 %), cooling of pens (76.75 %), tree planting (85.11 %), change of crop varieties (75.75 %), use of animals and birds that are more heat tolerant (88.25 %). The most important challenge to adaptation strategies identified is lack of information (79.08 %).However, lack of money (49.52 %) and inadequate labour (48.43 %) constitute some hindrances. In spite of the fact that farmers' have other information sources apart from extension service, extension has been institutionalized to provide information and other agricultural services to farmers, therefore it needs to be well positioned and better equipped in the state to be relevant in meeting the needs of farmers.

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INTRODUCTION

Agricultural based livelihood systems that are already vulnerable to climate change risk increased crop failure and destruction of productive assets. The effect of climate change is currently being felt in rural areas (LEISA, 2008). The rain - fed farming systems and forest - based systems are currently experiencing the effect of climate change. FAO (2008) states that rural people inhabiting coast, flood plains and low-lying river deltas, mountains, dry - lands as well as the arctic are more at risk. Among those that are at risk, per - existing socio - economic discriminations are likely to be aggravated, causing deterioration in nutritional status for women, young children and elderly, ill and disabled people.

Although rural women and men play complementary roles in guaranteeing food security, women tend to play a greater role in natural resources management and ensuring good nutrition (FAO, 2008). Generally women are fully involved in growing, processing, managing and marketing food and other natural resources; and constitute greater manpower in raising small livestock, managing vegetable gardens and collecting fuel and water (FAO, 2003). For example, in sub - Sahara Africa they are responsible for 80 percent of food production (Institute of Development Studies, IDS, 2008). Women involvement in agricultural capacity is most common in regions likely to be most adversely affected by the impacts of climate change, particularly, sub Sahara Africa and Asia (IDS, 2008). Considering the above facts, responsibility for adapting to climate change is likely to fall on the shoulders of women (CIDA, 2002).

Women are the main producers of the world's staple crops, providing up to 90 % of food for the rural dwellers and producing 60-80 % of the food in most developing countries. At present, women are in struggle to cope with year to year variability of maize, sorghum, millet and groundnut yield associated with the Nino southern

oscillation (Aguilar, 2007). This is the situation in South America and in Africa. The scenario in Nigeria is not different. As a result of women vulnerability to climate change, and the implication for sustainable livelihood, it will be of great importance to study the adaptive measures of women farmers in Delta State against climate change and the challenges they face in applying these strategies. The specific objectives of the study were therefore to:

- ascertain the socio economic characteristics of women farmers in Delta State.
- identify the adaptive measures used by women farmers to mitigate the effect of climate change.
- examine the challenges to adaptation to climate change.
- determine the socio-economic characteristics of the women farmers that influence their choice of adaptation strategies, and establish their implications for extension services.

METHODOLOGY

This study was carried out in Delta State. The State is demarcated into Delta North, Delta Central and Delta South Agricultural Zones by the Delta State Agricultural Development Programme (DTADP). The State is located approximately between longitudes 5^0 and 6^0 East of the Greenwich meridian and latitude 5^0 and 6^0 North of the Equator. It shares boundaries with Edo State to the North, Bayelsa State and the Atlantic Ocean to the South, Anambra State to the east and Ondo State to the West. It lies in the rain forest belt and arable crops are predominantly grown by farmers. About 75 % of the farming population is mostly small-holder farmers, who are mostly women. It has an estimated population of 3 million people.

Sampling Procedure and Sample Size

Proportional sampling method was used to select respondents from the 3 agricultural zones. From a population of 2,150 registered women farmers 10 % was selected resulting in a sample of 215 respondents. Table 1 gives a breakdown of the population in each zone and the number of respondents selected.

Table 1: Population and sample size

Agricultural Zones	Population of Registered Women Farmers	Sample 10%
South	650	65
Central	709	71
North	791	79
Total	2150	215

The data collected were analyzed using descriptive statistics such as frequency counts, percentages, mean and regression. The socio-economic characteristics of the women farmers, choice of adaptation strategies and implications were analyzed using frequencies and percentages, while challenges to adaptation were studied using frequencies, percentages and mean scores as well as regression model. Three function forms namely linear, semi-log and double log were tried and the best of fit was chosen based on value of coefficient of determinant (R^2) and the number of significant parameters.

RESULTS AND DISCUSSION

Demographic characteristics of respondents

Demographic characteristics of respondents were presented in Table 2. The results indicate that most of the respondents (74.9 %) were between the age ranges of 21 to 50 years. This agrees with a study on women farmers in Anambra state by Uzokwe (2000) where 92 % were within that age range. Majority (80.84 %) were married with a mean household size of 6. About 75 % of the respondents had different levels of formal education, mainly secondary education (33.95 %) Most of the respondents (62.79 %) had not been visited by extension agents. This shows weak extension farmer linkage. It therefore means that even if extension agents are knowledgeable in adaptation strategies most of the women were not privileged to the information they had since they were not being visited. It implies that most of them used indigenous method or other knowledge sources.

Table 2: Demographic characteristics of respondents

Variables	Frequency	Percentage (%)
Age (years)		
< 20	41	19.07
21 – 30	56	26.08
31 – 40	69	32.09
41 – 50	36	16.74
>50	13	06.05
Marital Status		
Married	191	80.84
Single	3	1.40
Divorced	10	4.65
Widowed	11	5.12
Level of education		
No formal education	52	24.19
Primary education	66	30.70
Secondary education	73	33.95
Tertiary education	24	11.6
Household size (no of persons)		
1 – 2	15	6.98
3 – 4	55	25.55
5 – 6	69	32.09
7 – 8	42	19.53
9 – 10	15	6.98
>10	19	8.83
Farming experience (years)		
<5	21	9.77
5-10	33	15.35
11 – 15	47	21.86
16 – 20	59	27.44
21 – 25	30	13.95
26 – 30	18	8.37
>30	7	3.26
Frequency of Extension contact (no of times monthly)		
0	135	62.79
1	41	19.07
2	28	13.03
3	11	5.11
4	0	0

Adaptation strategies used by women farmers

Table 3 revealed that most of the adaptation strategies were used by the farmers to mitigate the effects of climate change on their agricultural production. Deressa *et al.* (2009) opined that technical measures such as drought resistant seeds and better coastal protection is effective in mitigating the effects of climate change while Bradshan

Table 3: Adaptation Strategies of Women Farmers

Agricultural Practices of Women Farmer	Frequency	Percentage	Score	Mean	Rank	Decision
Change of planting date	197	91.62	788	3.67	1	S
Mulching	195	90.75	781	3.63	2	S
Shifting cultivation	193	89.75	771	3.59	3	S
Reduced use of chemical fertilizer	191	89.00	765	3.56	4	S
Use of organic fertilizer	190	88.25	760	3.53	5	S
Adoption of heat tolerant breeds of animal	190	88.25	760	3.53	5	S
Change of tillage practices	185	86.04	740	3.44	7	S
Use of integrated pest management	183	85.00	730	3.40	8	S
Planting of trees	183	85.00	730	3.40	8	S
Cooling of pens	165	76.75	661	3.07	10	S
Change of crop varieties	163	75.75	651	3.03	11	S
Crop rotation	162	75.50	650	3.02	12	S
Irrigation	153	71.00	610	2.84	13	S

et al. (2004), Kurukulasurya and Mehdelson (2006) and Nhemachema and Hassan (2007) discovered that the use of new crop varieties and livestock species that are more suited to drier conditions, irrigation, crop diversification, mixed farming and change in planting dates, help in mitigating the effect of climate change. All these assertions agree with the findings in the study.

The planting date is change by the farmers because of delayed onset of rainy season. Rainy season is the farming season, especially in Delta State where agriculture is rain fed. Mulching is carried out in order to reduce evaporation of moisture from the soil. This result shows that many women farmers are using adaptation strategies in spite of poor extension farmer linkage in the area of study. It is most likely that they have other information sources. This is an improvement on the findings of Oruru (2009) where she discovered that many farmers were still using their old farming method in the face of climatic changes that were actively affecting their agricultural production and had not adopted any measure.

Challenges to adaptation strategies used

Table 4 shows that the greatest challenge faced by farmers in adaptation of strategies used to mitigate climate change is lack of information (79.08 %). This mirrors the poor extension farmer linkage reported in this study. The implication is that the respondents rely mainly on indigenous knowledge and other information sources. Insufficient money (49.52 %) and inadequate labour (48.43 %) were also identified as key factors.

Table 4: Challenges to adaptation strategies used

Challenges to adoption to climate change	Percentage %
Insufficient money	49.52
Lack of information	79.08
Inadequate land	27.70
Inadequate labour	48.43
Poor irrigation potential	6.84

Table 5 showed that Age (X_1) was found to have negative effect on the adaption of strategies against climate change at 5 % level of significance. This means that the older the female farmers are, the lesser their willingness to accept innovations. This agrees with Maduakor (2010), and Lamchi *et al.* (2003) who stated that as one gets older, the more risk averse the person becomes. Marital status (X_2) also had negative effect with the choice of adaptation methods. This means that marriage influences the choice of adaptation measures. The implication is that unmarried female farmers do not use adaptation measures or strategies. Level of formal education (X_3) had positive relationship with the choice of adaptation strategies to climate change. The implication is that the more educated women farmers are, the more they are willing to use more climate change adaptation strategies. This agrees with the findings of Okoye (1971) and Lemchi *et al*. (2003) who noted that technological change is achieved through formal education.

Table 5: Summary of linear function showing the influence of socio-economic variables on the choice of adaptation measures

Variables	Co-efficient	Std error	T–value
Constant	0.997	0.320	3.115*
Age (X_1)	$-1.559E^{-02}$	0.006	-2.60*
Marital status (X_2)	$-2.386E^{-02}$	0.015	-1.60
Level of education (X_3)	$6.542E^{-02}$	0.014	4.66*
Household size (X_4)	$9.047E^{-07}$	0.000025	3.648*
Farming experience (X_5)	0.427	0.070	6.10*
Extension contact (X_6)	0.157	0.017	9.176*

$R^2 = 0.708$; F = 98.287; Significant at 5% level

Household size (X_4) relates positively with the choice of adaptation measures against climate change. This shows that the larger the household size, the more the women farmers are willing to use various adaptation strategies against climate change. This could be because there is greater pressure on them to increase their agricultural production to meet the food security demands of their large households. Farming experience (X_5) is positively related to the choice of adaptation strategies and statistically significant at 5% level of significance. This indicates that the more experienced farmers are; the better choices of adaptation strategies against climate change they are able to make.

Frequency of extension visits (X6) is positively related with choice of adaptation to climate change and significant at 5 % level of significance. This is because, the more extension agents visit farmers, the more they are taught about adaptation strategies and the better they understand and use the strategies. This agrees with Asiabaka (1996) and Onyeweaka (1988) who reported independently that frequency of extension contact influences adoption behaviour of farmers.

Conclusion

This study shows that many adaptive measures are being used by the women farmers in Delta state, in spite

of poor extension farmer linkage. This clearly shows that the farmers have other information sources which include mass media, farmer to farmer contact and indigenous knowledge. There could also have been rapid diffusion from the few farmers that are visited by extension agents that is if the extension agents have adequate knowledge of the strategies themselves.

For women farmers' to meet the food security needs of their families, they need to constantly increase their food production. To ensure sustainability in food production, improved methods of farming need to be used by the farmers. Though there are various ways through which farmers get agricultural information, extension has however been institutionalized to bridge the gap between research and extension. This study however showed weak extension-farmer linkage. Since the women farmers are already using many known adaptation strategies, their constraints include lack of money, lack of information, inadequate labour, inadequate land and poor irrigation potentials and need to be serious address to enable them effectively use them to ensure maximum productivity.

Implication for extension Service

Extension should be proactive in finding solution to farmers' problems through liaising with research institutions. Extension is therefore supposed to train extension agents in different strategies of mitigating climate change to ensure not only sustained food production but increased food production. In spite of the fact that indigenous knowledge systems exist, extension is supposed to build on it and use it as a platform to introduce scientifically proven methods of mitigating the effects of climate. Where extension is not effective, like in the study, the farmers' are left with no other option than to depend on information from other sources like Non Governmental Organizations (NGOs), publications in print media (for literate farmers'), workshops and farmer to farmer contact. This will ensure that the information related to climate change reaches most of the female farmers. Extension services need to prop up promotion of adaptation to climate change in ways that will motivate women farmers to adopt appropriate adaptation technologies.

Extension services in this part of the country are faced with the problem of inadequate personal, lack of political will and poor funding. It is not enough for stakeholders to sit back while extension services are rendered irrelevant to farmers. Extension has to be properly positioned to take its place as the main institution established to diffuse information from research to farmers at this critical period of climate change to ensure food security. Where the government pays lip service to agricultural development, the extension services should be privatized and commercialized.

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