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Differences in Climate Change Effects and Adaptation Strategies between Male and Female Livestock Entrepreneurs in Nsukka Agricultural Zone of Enugu State, Nigeria

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Abstract

The study examined differences in climate change effects and adaptation strategies between male and female livestock entrepreneurs in Nsukka Agricultural Zone of Enugu State, Nigeria. It was conducted using 80 randomly selected livestock entrepreneurs. Data were collected using interview schedule. Descriptive statistics were used to analyze data. Fifty percent of the respondents were female. Males sourced more climate-related livestock information than females; recording 29.6% difference in feed formulation information; which is the most differed. Females were more affected by climate change than males, with the difference more on disruption of animal heat period due to high temperature (male $\bar{X}$= 2.80; female $\bar{X}$=3.50; difference in mean{dm} = -0.70). Male entrepreneurs differed from females in the adaptation strategies used in combating climate change and also on their view on effectiveness of adaptation strategies. Females were more constrained than male in adapting to climate change; with the variance more on lack of information facilities (male $\bar{X}$= 2.28; female $\bar{X}$= 2.60; dm = -0.32). Males and females differed in their effects and adaptation strategies to climate change. Hence, government and extension should step in to booster productivity by addressing climate-related bottle

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neck faced by entrepreneurs in livestock production, especially those faced by female.

Keywords: Gender, livestock, climate change, livestock entrepreneurs

Introduction

Agriculture is one of the most important sectors of the Nigeria economy that an entrepreneur can venture into. Agriculture accounts for about 42% of Nigeria's Gross Domestic Product (GDP) and two-thirds of employment which is the highest among all the sectors (Okoro, 2004). Livestock accounts for one third of Nigeria's agricultural GDP (Thornton, 2010), providing income, employment, food, farm energy, manure, fuel and transport. They are also a major source of government revenue. Livestock especially ruminants, are the most efficient users of uncultivated land and can contribute substantially to crop production.

Climate change has been a major natural challenge facing entrepreneurship in agriculture especially livestock production (Anyadike, 2009), mainly arising from its impact on grassland and productivity. Heat stress suffered by animals will reduce the rate of animal feed intake and result in poor growth performance (Rowlinson, 2008). Lack of water and increase frequency of drought in certain countries will lead to loss of resources. Consequently, as exemplified by many African countries, existing food insecurity and conflict over scarce of resources will be exacerbated (Calvosa, Delgerma and Katiuscia, 2009).

Ozor (2009) stated that livestock production systems in Nigeria would be vulnerable to climate change in respect of anticipated decrease in rainfall in the Sudan-sahelian zone and consequent reduction in the available pastureland. This is to say that further changes in rainfall and temperature will affect livestock production as well as availability of animal species. Though increase in temperature is generally seen to be destructive to the production of crops and human lives, FAO (2009) noted that livestock production could be boosted by temperature increase; mostly in polar and temperate regions. Conversely, Deressa and Hassan (2009) found increasing temperature damaging to Nigerian agriculture; a situation that is not uniformly distributed across agro-ecological zones. Issa (2009) in agreement with the findings of Deressa and Hassan (2009) reported that both commercial and subsistence livestock farmers are negatively affected by rising temperature. According to Tailor and Negada (2005), heat stress had detrimental effect on the reproduction of buffaloes, although buffaloes are well adapted morphologically and anatomically to hot humid climate. Upadhya *et al* (2009) stated that thermal stress on Indian livestock particularly cattle and buffaloes has been reported to decrease estrus expression and conception rate. This is to say that varying climate has varying effects on crops and livestock depending on the agro-ecological location.

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According to Dixon (2003), adaptation is the adjustment in practices or structures in response to projected or actual change in climate change, with the goal of maintaining the capacity to deal with current and future change. Ozor and Nnaji (2010) stated that while mitigation is necessary to reface the rate and magnitude of climate change, adaptation is essential to reduce the damages from climate change that cannot be avoided. The fact that agriculture is practiced across a broad range of climate and environmental conditions makes it necessary for the country to develop an array of adaptation options that will meet the different conditions of the different ecological location of the nation and that will be gender sensitive. Improving adaptive capacity is important in order to reduce entrepreneurs' vulnerability to climate change.

The impact of climate change will be felt by countries, communities and people differently based on the extent of their vulnerability (Ozor, 2010). Men, women, the elderly, youth and children will experience the impacts of climate change differently. Women are particularly growing to be more vulnerable not because of their sex but because of the social, cultural and economic roles they perform. They constitute majority of the poor population due to lack of access to some agricultural resources and are mostly involved in unpaid labour. Women are also primary users and mangers of natural resource.
Furthermore, women lack rights and access to resources and information vital to overcoming the challenge posed by climate change. If a gender approach is not considered in the design and development measures to climate, the differences between women, men and youth will be overlooked thereby inadvertently reinforcing gender inequality. It is therefore necessary to examine the differences in climate change effect and adaptation strategies to climate change.

Methodology

The study was conducted in Nsukka Agricultural Zone of Enugu State. The zone is one of the six agricultural zones in Enugu State. It shares common boundaries with Igbo Eze-South LGA in the north, Igbo-Etiti LGA in the south, Uzo-Uwani LGA in the west and Udenu LGA in the east, all boundaries in Enugu State. The inhabitants of this area are mostly farmers and traders. The major animals reared in the zone include sheep, goat, cattle, pig, fish, and both local and exotic birds. The farmers also grow crops such as cassava, cocoyam, okra, pepper etc. on commercial and small scales. The climate is characterized by two main seasons, the rainy and dry season.
All livestock farmers in Nsukka Agricultural Zone of Enugu State, Nigeria, comprised the population for the study. Multi-stage random sampling technique was used in selecting the respondents. In the first stage, two blocks were randomly selected from three blocks in the zone using simple random sampling techniques. In the second stage, four circles were selected from each of the selected blocks; the selected circles in the blocks were listed as follows: Obukpa, Ibagwa-ani, Edem-ani, Okpuje, Eha-alumona, Alo-uno, Nru,

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and Nguru. In the third stage, 10 farmers comprising five males and five females were selected from a list of farmers from the 8 circles using simple random sampling technique to give a total of 80 farmers for the study.

Data for the study were collected by use of interview schedule. To identify difference on livestock information sourced by farmers, respondents were provided with a list of livestock information from which they indicated either 'Yes' or 'No'. To determine difference to the effect of climate change on farmers, respondents reacted on a 4-point Likert-type scale (to a very great extent = 4, to a great extent = 3, to a little extent = 2, to no extent = 1). Variables with X ≤ 2.5 were regarded as not having effect on livestock rearing, while X ≥ 2.5 were taken as variables having effect on livestock production. To ascertain difference in adaptation strategies used by farmers to cushion climate change effects, respondents were asked to indicate the level of effectiveness of adaptation strategies on a 3-point Likert-type scale (very effective = 3, effective =2, not effective =1). Responses with X ≤ 2.0 were considered as not an effective strategy to adaptation, while X ≥ 2.0 were considered as effective adaptation strategy to climate change effect. To identify constraints to adaptation on climate change effect, a 3-point Likert-type scale (very serious constraint = 3, serious constraint =2, not a constraint = 1) was used. Responses with X ≤ 2.0 were considered as not constraints, while X ≥ 2.0 were considered as serious constraints to adaptation strategies.
Data collected were analyzed and presented using descriptive statistics.

Results and Discussion

Socio-Economic Characteristics of the Respondents

The socio-economic characteristics of respondents are presented in Table 1. The majority (60%) of the farmers were above 40 years, with mean age of 49 years. More (31.2%) of the respondents had acquired secondary education while only 16.2% had no formal education. About 60% were married, with household size of 52.5 percent being 6-10 persons. The average years of farming experience was 11.9 years. This implies that farmers should have experienced change in climate. Majority (96.2%) were members of one social organization or the other. This implies that group approach could be an effective means of reaching out to the farmers on their productive activities.

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Table 1: Socio-economic characteristics of the respondents

Socio-economic characteristics	Percentage (%)	Mean (*M*)
Sex		
Female	50	
Male	50	
Age		
Below 20	6.2	
21-25	6.2	
26-30	7.5	48.9
31-35	12.5	
36-40	7.5	
41 and above	60.0	
Educational status		
No formal education	16.2	
Primary education attempted	13.8	
Primary education completed	26.2	
Secondary education attempted	6.2	
Secondary education completed	31.2	
Tertiary education	6.2	
Marital status		
Single	15	
Married	75	
Widowed	10	
Household size		
1-5 persons	43.8	
6-10	52.5	
11 persons and above	3.7	
Farming experience (years)		
1-10	86.2	
11-20	8.8	11.9
21 and above	5.0	
Membership of social organization	96.2	

Climate-Related Livestock Information Sourced by Farmers

Table 2 shows that more male sourced climate- related livestock information than female with up to 20% difference (pd) in the following areas: feed formulation (pd = 29.6%); raising animal either for diary, beef or breeding (pd = 28.6%); access to credit (pd = 26.3%); and method of livestock vaccination (pd = 22.9%). This could be as a result of the technicality and high energy requirement for feed formulation, vaccinating large number of animals, milking and breeding. The difference in access to credit could be linked to socio-cultural and economic limitations, barring women from owning land which

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could be used as collateral for loan. Data in Table 2 also reveal that male differed insignificantly from female in the following areas of information sourced for livestock production: identification of symptoms of diseases (pd = 0.1%); artificial insemination (pd = -0.7); and available market outlet (pd = -2.9%). This implies that the average farming experience of 11.9 years might have given farmers enough opportunities on diseases symptoms identification and available market in the area. The insignificant difference in sourcing information on artificial insemination could be as a result that the practice is not common in the area as can be seen in the percentages of male and female that sourced information on that subject.

Table 2: Differences between male and female on livestock information sourced

Information sourced	%Male	%Female	%difference(pd)
Livestock housing style for heat regulation	82.9	72.7	10.2
Method of livestock vaccination	71.4	48.5	22.9
Access to credit	65.7	39.4	26.3
Diseases symptoms identification	97.1	97.0	0.1
Improved variety of livestock	42.9	27.3	15.6
Feed formulation	62.9	33.3	29.6
Available market outlet	97.1	100.0	-2.9
Preparation of hay for livestock	11.4	18.2	-6.8
Sanitation practices in livestock production	88.6	81.8	6.8
Record keeping	42.9	33.3	9.6
Crossbreeding of livestock	14.3	9.1	5.2
Raising animal either for diary, beef or breeding	28.6	0.0	28.6
Practice of artificial insemination	11.4	12.1	-0.7
Where and how to get livestock drugs	77.1	60.6	16.5

Difference Between Male and Female in Climate Change Effects on Livestock Production

Table 3 indicates that males differed from females in all the climate change effect on livestock production except on scarcity of labour due to migration and poor access road to farm due to erosion. This could be that both sex migrate in unpleasant conditions and also make use of the same farm road whether in good or bad shape. This is in line with Ozor (2009), who opined that the number of environmental migrants will substantially increase in future due to climate change impact. Female entrepreneurs were more affected than males in the following areas of livestock production: disruption of heat period due to high temperature (dm= -0.70), miscarriage as a result of high temperature (dm= -0.42), poor feed intake due to high humidity (dm = -0.22) and weight loss as a result as a result of increase in temperature (dm = -0.14). The results also reveal that females were prone to some climate change effects that males are not experiencing; such as heavy wind (*M*=2.88), flooding (*M*=2.55), and scarcity of pasture (*M*=2.55). This implies that male entrepreneurs tend to be more endowed on how to handle climate change related effects than female farmers. This could be linked to their better access to productive

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resources than female. The multifarious task of women could also affect or divide attention given to livestock.

Table 3: Difference between male and female in climate change effects on livestock production

Effects	Male Mean(*M*)	Female Mean(*M*)	Difference in mean(dm)
Miscarriage as a result of high temperature	**3.10***	**3.52***	**-0.42**
Prolonged dry season leading to water scarcity	**3.12***	**3.15***	-0.03
Heavy wind which could damage animal house	2.45	**2.88***	-0.43
Flooding of animal house due to excessive rainfall	2.32	**2.55***	-0.23
Inadequate rainfall leading to scarcity of pasture	2.32	**2.55***	-0.23
Increase in pest and disease infestation	2.35	2.48	-0.13
Scarcity of labour due to migration	**2.65***	**2.65***	0.00
Poor access road to farm due to erosion	**3.55***	**3.55***	0.00
Increase in livestock water intake	2.02	2.48	-0.46
Disruption of heat period due to high temperature	**2.80***	**3.50***	**-0.70**
Poor feed intake due to high humidity	**2.60***	**2.82***	**-0.22**
Weight loss as a result of increase in temperature	**2.58***	**2.72***	**-0.14**
Increase in labour demand	1.88	2.22	-0.34

***Climate change effects (Cut off-point = 2.5)**

Differences Between Male and Female in Adaptation Strategies to Climate Change on Livestock Production

Table 5, shows that males differed from females on the following adaptation strategies: regular cleaning and disinfection of pen (dm = -0.38), regular vaccination to reduce mortality (dm = 0.21), constant water to regulate body temperature (dm = 0.20), living close to pen house (dm = 0.14) and planting of trees near livestock house as wind break (dm = -0.04). This implies that female livestock farmers see regular cleaning and disinfection of pen as effective adaptation strategies over the male entrepreneurs. This could be connected to their role in home chores. Male livestock farmers tend to use more of regular vaccination, constant water supply and leaving close to pen house over the female. This could be linked to their innate energetic nature of being able to withstand stress over time. Planting of trees near pen house differed insignificantly between male and female farmers. This could be that both sex sees tree-planting as essential in climate change management. This corroborates with the view of Charlton and Hamilton (2008) that tree-planting can and will make a valuable contribution to the fight against global

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climate change, as well as providing a host of wider environmental and socio-economic benefits.

Table 4: Differences between male and female in adaptation strategies to climate change on livestock production

Strategies	Male Mean($\bar{X}$)	Female Mean($\bar{X}$)	Difference in mean (dm)
Regular vaccination to reduce mortality	**2.69**	**2.48**	0.21
Regular use of hay as a result of dry pastures	1.34	1.30	0.04
Keeping of disease resistant breed	1.89	1.33	0.56
Regular cleaning and disinfection of pen	**2.17**	**2.55**	-0.38
Pen reinforcement to withstand flood	1.83	**2.21**	-0.38
Constant water to regulate body temperature	**2.26**	**2.06**	0.20
Increase in space area for adequate ventilation	**2.03**	1.82	0.21
Installation of cooling equipment	1.11	1.21	-0.10
Roofing of pen with poor conductor of heat	1.83	1.85	-0.02
Constant power supply	1.31	1.27	0.04
Reduction in flock size for adequate ventilation	1.46	1.48	-0.02
Regular culling of diseased animal	1.86	1.64	0.22
Planting of trees near livestock house as wind break	**2.23**	**2.27**	-0.04
Building pen close to water source.	1.63	1.33	0.30
Quarantine practice	1.57	1.70	-0.13
Use of meteorological information	1.54	1.67	-0.13
Proper treatment of water giving to livestock	1.69	1.76	-0.07
Use of high nutrient feed	1.83	1.67	0.16
Living close to pen house	**2.69**	**2.55**	0.14

Cut-off point = 2.0

Constraints to climate change adaptation strategy

Table 6 reveals that male and female livestock farmers differed in the following constraints to climate change adaptation: lack of information facilities (dm = -0.32), lack of government policy on climate change (dm = -0.26), cultural limitations (dm = -0.16), poor income source (dm = 0.08), inadequate knowledge on climate change management (dm = -0.05), lack of access road to livestock house (dm = -0.05), and poor or no access to extension service (dm = 0.04). This implies that female livestock farmers are more under-privileged in adapting to climate change effects than their male counterparts, as can be seen on Table 5. Female farmers are well off than male only in income source. This may not be unconnected to the multifarious activities of women which most times are restricted

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by unfavorable economic, cultural, social and political conditions. This is in line with Adesina (2013) who noted that hardworking farmers, who want to make a good life, were constrained by lack of access to land, credit, technologies, extension and market access.

Table 5: Constraints to climate change adaptation strategies on livestock production

Constraints	Male mean($\bar{X}$)	Female mean($\bar{X}$)	Difference in mean(dm)
Poor income source	**2.08**	**2.00**	**0.08**
Cultural limitations	**2.62**	**2.78**	**-0.16**
Lack of access to credit facilities	1.80	1.98	-0.18
Lack of information facilities like radio, television etc.	**2.28**	**2.60**	**-0.32**
Poor access to water resources for animal intake	1.90	1.92	-0.02
Lack of government policy on climate change	**2.32**	**2.58**	**-0.26**
Lack of access to improve animal breeds	1.62	1.68	-0.06
High cost of building livestock houses	1.78	1.72	0.06
Poor or no access to extension service	**2.18**	**2.22**	**-0.04**
Inadequate knowledge on climate change management	**2.10**	**2.15**	**-0.05**
Inadequate manpower	1.80	1.75	0.05
Lack of access road by farmers to livestock house	**2.40**	**2.45**	**-0.05**
Inadequate veterinary care	1.40	1.55	-0.15

Cut-off point = 2.0

Conclusion and Recommendations

Female livestock producers lacked sufficient access to productive resources like information, fund when compared with their male counterpart, despite their vital role in agriculture. Consequently, they were in most times handicapped in surviving climate change effects on livestock. Government should redirect interventions and research efforts to this sector in order to improve farmers' adaptability to climate change. Extension needs to intensify efforts in order to provide farmers, especially women with the necessary information for livestock development.

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