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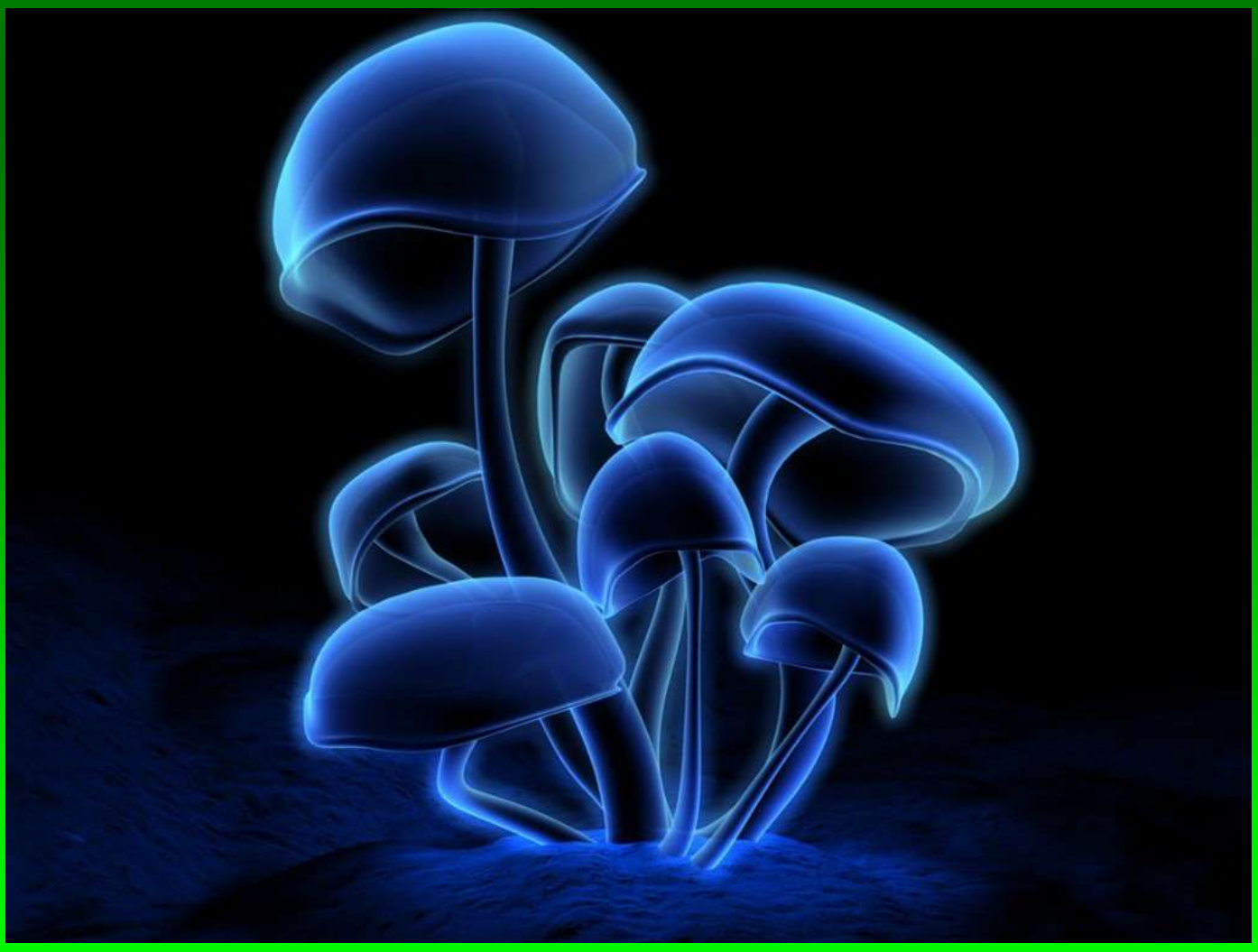

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Effects of Water Melon (*Citrullus lanatus*) on Growth Performance of *Oreochromis niloticus* Fingerlings as a Replacement for Soybean Meal

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Abstract: *This study was designed to evaluate the growth performance of O. niloticus fingerlings fed watermelon seed meal as substitute for soybean meal. Four iso-nitrogenous diets (35% crude protein) were formulated with watermelon seed meal replacing soybeans at 0%, (T1), 50% (T2), 75% (T3), 100% (T4). The 0% diet served as control diet,. Ten fingerlings were randomly allocated treatment and their replicates and fed the experimental diets at 5% body weigh daily for 56days. The mean weight gain and specific growth rate differed significantly between the control diets and test diets. The highest weight gain (15.62g) was recorded in T3 (3.39g and the lowest values were recorded in T4 (12.79g) respectively. Other parameters such as feed intake, condition factor, survival rate were not significantly (P>0.05) different but increased level of WSM in the feed. Nutrient utilization indices with regard to FCR and PER though not significant (>0.05) these parameters showed decreasing trend to level of WSM in the diets. This scenario has been attributed to higher fibre and antinutrient contents of WSM which might have interfered with digestibility of nutrients. No effect was recorded on water quality parameters such as Temperature, Dissolved oxygen and pH. WSM can be included up to 75% in O. niloticus diets so as to reduce high cost of soyabean in fish feed production.*

Keywords*: O. niloticus, Water melon seed, Growth, Soy bean meal*

INTRODUCTION

Tilapia (*O. niloticus*) belongs to the family Cichlidea, it is one of the commonly cultured fish species in this part of Nigeria, second to the African catfish (*C. gariepinus*). Its popularity makes it a common name given to anybody involved in Fish Farming around the study area. One of the major factors for the increased popularity is the dwindling catch from the wild and or capture fisheries with each passing day (Gabriel *et al*., 2007). However, increased cost of feed has continued to be a major setback to this important aspect of Agriculture. Jamiu and Ayinla (2003) stated that feed management determines the viability of aquaculture as it accounts for at least 60 percent of the cost of fish production. Therefore, the establishment of economically

viable fish culture ventures requires the incorporation of agricultural wastes or by-products as feed ingredients or direct feed (Shang and Costa-Pierce 1983) to replace conventional feed stuffs whose dwindling supply has resulted into arbitrary hike in prices. Conventional ingredients used in fish feed are in high demand for human consumption and their yield are currently being affected by climate change, hence out of concern for and the implications for food security as well as water and land use, there is urgent need to get local materials especially agricultural by-products of lower price to replace these costly feed materials (Tiamiyu *et al.,* 2014). Agricultural by-products in the tropics are as abundant as there are wide arrays of plants and fruits. Today, more emphasis is been placed on substitution possibility of some of these byproducts whose nutritive values have been ascertained. By-products of banana (Ogunsipe *et al*., 2010; Ekwe *et al*., 2011); cashew (Omosulis *et al*., 2011); Neem seed cake (Hassan *et al*., 2015) and Cassava leaf meal (Hassan *et al*., 2017) had already been successfully tested in animal husbandry and fish culture. Cocoa pod husk meal has been shown to replace maize in the diet of cichlid, *O. niloticus* and catfish *Clarias isheriensis* (Fagbenro, 1992). Likewise, plantain peel meal has been shown to replace up to 25% of maize in the diet of *C. gariepinus* without adversely affecting the growth (Falaye and Oloruntuyi, 1998). These are locally available and are not consumed by man in most cases (Ibiyo and Olowosegun, 2004).

Watermelon (*Citrullus lanatus*) seed meal is one of such agricultural by-product whose nutritive potential has not been effectively taped in animal nutrition. Water melon a creeping annual cash crop which belongs to the family Curcurbitaceae. It grows successfully in the tropics and sub tropics (Mohr, 1989). Watermelon seed is rich in minerals, protein, vitamins, carbohydrate and fibre (khaled, 2001). Watermelon seeds are rich in oil and protein (Mustafa *et al*., 1972 and Alkhalifa, 1996). Watermelon seed oil proved to be good source of high quality edible oil characterized by low free fatty acid content (Mustafa *et al*., 1972). The experience with watermelon seed cake or meal in rations for animals showed that it is a good source of digestible protein comparable to other oil seed cakes like cottonseed, linseed (Tiamiyu *et al.,* 2014). In this part of Nigeria water melon production is very popular and produced both in rainy and dry season. After, consumption the seeds are usually dumped as waste material. In view of the increasing demand for fish and high cost of conventional feed ingredients and availability of these of the test seed in the study, this experimented was conducted.

MATERIALS AND METHODS

Study area

The study was conducted at the research and Teaching Farm of the Department of Fisheries University of Maiduguri, Borno State, Nigerira.

Experimental fish

The fingerlings of *O. niloticus* for this study were obtained from the Fish hatchery complex of the Fisheries Department, University of Maiduguri. The experiment fish were sorted carefully to obtain homogenous set of fingerlings with a view to reduce experimental errors associated with variation in initial weight of fish before commencement of any growth trial.

Experimental design

The experiment which lasted for 56 days was carried out in plastic bowls measuring 52 x 33.5 x 21 cm (25L). The fingerlings were randomly distributed at a stocking density of 10fish/Tank and each group of fish and their replications were assigned to a particular diet for 56 days. Experimental diets were formulated to contain water melon seed meals as a replacement of Soybean at 0% (T1), 50% (T2), 75% (T3), and 100% (T4) respectively. The o% diet served as control.

Experimental procedure

After 14 days of acclimatization, the fish were introduced to the experimental diets and by hand at 5% of the cumulative body weight of each container. Daily ration was divided into two feedings per day (08:00 and 16:00) and the fingerlings were weight fortnightly so as to adjust the feed by virtue of weight gained. An electronic digital scale was used to measure weights of fingerlings

Collection of Feed Ingredients and Formulation of Experimental Diets;

The feed ingredients used in the feed formulation includes Fish meal, Soybean meal, Maize meal, Vitamin and Mineral premixes were purchased from the Maiduguri Monday market, they were then processed and ground into meal for storage. Water melon seeds were procured from an open market in Maiduguri. The feed ingredients were processed and milled according to method described by Tiamiyu *et al*. (2014). Pearson Square method of feed formulation was adopted to obtain 35% crude protein diet. After the formulation the processed meals were thoroughly mixed with addition of water (500ml/kg) until a dough-like consistency was formed. The dough was immediately pelletized using a hand operated pelleting machine. The pellets were sun dried and kept in an air-tight polythene bags and properly labeled.

Growth Parameters Determination

The following indices of growth and nutrient utilization were determined from the data obtained:

- **Specific growth rate (SGR)** were calculated using the formula

$$SGR\% = \left(\frac{lnWf - lnWi}{T}\right) \times 100$$

- **Feed Conversion Ratio (FCR)**
  The Feed Conversion Ratio (FCR) is the amount of food required to produce a unit of fish, or is the grams of feed consumed per gram of body weight gain. FCR was calculated using the formula;
  Feed conversion ratio (FCR) = total feed intake (g)/total wet weight gain (g).
- **The feed conversion efficiency (FCE %)** is the grams of weight gained per gram of feed consumed. It was calculated using the formula
  Feed conversion efficiency (FCE %) = (weight gain by fish (g)**/** diet fed (g)) X 100
- **Protein Efficiency Ratio (PER)** is the grams of weight gained per gram of protein consumed. Calculated with the formula below
  Protein Efficiency Ratio (PER) = wet weight gain (g)/total protein fed.

Where protein fed = [(% protein in diet x total diet consumed) / 100]

- **Relative growth rate (RGR %);**

$$RGR\% = \left(\frac{Wf - Wi}{Wi}\right) \times 100$$

- **Weight gain (WG)** is the final weight of the fish minus the initial weight of the fish, calculated as follows

$$WG = Wf - Wi$$

Where *Wf* refers to the mean final weight,
Wi is the mean initial weight of fish and
T is the feeding trial period in days.

Condition factor (Fulton) (*K*) for all individuals of the fish was calculated using the following formula:

$$K = (W/TL^3) \times 100$$

Where**:**
K – Condition factor (Fulton),
W **–** Body weight in grams,
TL **–** Total length in centimetres.

- **Survival Rate (%)**

$$S\% = (\frac{Ni}{No}) \times 100$$

Where;
No – Total number of fish stocked at the beginning of the experiment

Ni – Total number of fingerlings alive at the end of the experiment

Proximate Analysis

Proximate compositions of water melon seed meal, other dietary ingredients, formulated diets, initial and final carcass of fish were determined according to standard methods of AOAC (2000).

Data Analysis

The data obtained were analyzed using one way analysis of variance (ANOVA). Duncan's Multiple Range Test was used to rank the mean differences. All analysis was computed using SPSS package version 20.

Table 1: Gross and proximate composition of experimental diets

	T1(100:0)	T2(50:50)	T3(25:75)	T4(0:100)
Fish meal	10.00	10.00	10.00	10.00
Soybean meal	65.10	32.55	16.28	0
Watermelon seed	0	32.55	48.83	65.10
Maize	11.70	11.70	11.70	11.70
Rice bran	11.70	11.70	11.70	11.70
Min/Vit premix	1.00	1.00	1.00	1.00
Salt	0.50	0.50	0.50	0.50
	Proximate composition of diet			
Moisture	8.52 ± 0.01^{b}	8.37 ± 0.00^{c}	8.69 ± 0.01^{a}	8.39 ± 0.02^{c}
Protein	35.37 ± 0.00	35.75± 0.01	34.69 ± 0.01	34.73 ± 0.01
Lipid	7.15 ± 0.00^{c}	8.62 ± 0.02^{a}	8.64 ± 0.01^{a}	8.39 ± 0.02^{b}
Ash	8.19 ± 0.02^{b}	7.52 ± 0.01^{d}	7.92 ± 0.01^{c}	8.28 ± 0.01^{a}
Fibre	4.19 ± 0.01^{c}	5.26 ± 0.01^{a}	5.20 ± 0.01^{b}	5.10 ± 0.01^{c}
NFE	36.17 ± 0.03^{c}	34.48 ± 0.03^{b}	34.86 ± 0.00^{e}	35.11 ± 0.02^{d}

Mean in the same row with different superscripts differ significantly (P< 0.05)

KEYS:

T1 – 100% soybean meal: 0% water melon seed T2 – 75% soybean meal: 25% water melon seed
T3 – 50% soybean meal: 50% water melon seed T4 – 25% soybean meal: 75% water melon seed

RESULTS AND DISCUSSION

Growth performance and nutrient utilization parameters are presented in Table2. The initial weight of the *O. niloticus* ranged from 2.67-2.78g which did not significantly (P>0.05) differ between experimental treatments and the control. Mean weight gain differed significantly (P<0.05) between treatments and the control diets. The control diet recorded the lowest value (12.79 ± 0.24g) and the highest weight gain (18.48 ± 0.01)was obtained by fish fed 75% Water melon seed meal (wsm) based diet but decreased to 14.± 0.15 at 100% WSM based diet. These

may be due to the ability of *O. niloticus* to survive and thrive well in low protein diet probably because it is herbivorous specie. Similar trend was observed for Specific growth rate, Relative growth rate (RGR), Total feed intake (2.59g-2.96g) and SGR which ranged from 2.23 in the control to 2.87 in T3 showed significant ($p<0.05$) performance of the test diets compared to the control. Survival rate had ranged from 93.33-100% and condition factor (0.56-0.67) followed similar trend with SGR and Feed intake, But the former were not significantly ($P>0.05$) different between the control and the test diets.

Table 2: Mean (± SE) Growth Performance and Nutrient of *O. niloticus* fed with varying replacement level of Soyabean meal with water melon Seed

Parameters	**Replacement Values of water melon seed meal (%)**			
	0	**50**	**75**	**100**
Initial Weight (g)	2.78 ± 0.13^{a}	2.67 ± 0.10^{a}	2.77 ± 0.05^{a}	2.75 ± 0.07^{a}
Final Weight (g)	15.57 ± 0.13^{b}	15.54 ± 0.34^{b}	18.48 ± 0.01^{a}	17.31 ± 0.22^{ab}
Weight gain (g)	12.79 ± 0.24^{b}	12.87 ± 0.29^{b}	15.62 ± 0.06^{a}	$14. \pm 0.15^{ab}$
Initial length (cm)	3.00 ± 0.05^{a}	3.00 ± 0.17^{a}	3.60 ± 0.10^{a}	3.06 ± 0.33^{a}
Final length (cm)	5.83 ± 0.49^{a}	6.50 ± 0.05^{a}	6.90 ± 0.23^{a}	5.76 ± 0.24^{a}
Length gain (cm)	2.83 ± 0.43^{a}	2.50 ± 0.20^{a}	3.30 ± 0.32^{a}	2.70 ± 0.25^{a}
Specific Growth Rate (%)	2.23 ± 0.23^{b}	2.32 ± 0.18^{b}	2.85 ± 0.07^{a}	2.65 ± 0.04^{ab}
Feed Conversion Ratio	1.14 ± 0.18^{a}	1.92 ± 0.03^{a}	1.87 ± 0.03^{a}	1.92 ± 0.04^{a}
FCE(%)	92.26 ± 14.99^{a}	108.66 ± 4.38^{a}	114.60 ± 4.61^{a}	109.80 ± 5.15^{a}
Protein Efficiency Ratio	2.10 ± 0.43^{a}	2.09 ± 0.47^{a}	1.27 ± 0.01^{a}	1.24 ± 0.01^{a}
ANPU	0.47 ± 0.00^{b}	0.32 ± 0.00^{c}	0.28 ± 0.00^{d}	0.17 ± 0.00^{e}
Condition Factor (K)	0.56 ± 0.09^{a}	0.60 ± 0.04^{a}	0.64 ± 0.04^{a}	0.67 ± 0.09^{a}
Survival Rate (%)	93.33 ± 3.33^{a}	93.33 ± 3.33^{a}	100.00 ± 0.00^{a}	93.33 ± 3.33^{a}

* Values in each row allocated common superscripts or without superscripts are not significantly different from each other ($P > 0.05$).

However, FCR, PER and NPU decreased with increasing level of WSM in the diets. But no significant differences were computed in these parameters as presented in Table1 above. Since there was no significant differences in the protein content of the diet, differences in performance of experimental fish may be linked to superiority of protein quality of watermelon

which increased as level of replacement increases up to 75% and decreased thereafter at 100% level of replacement. The Characteristic feed utilization efficiencies and consequent growth rates has earlier been reported and attributed to dietary protein quality by Cai *et al.* (2004), Sotolu & Faturoti, (2008), Anti-nutritional factors in watermelon seed may also be implicated as possible cause of reduction in growth in 100% replacement diet.. Olubamiwa *et al*. (2000) had earlier stated that watermelon seeds possess chemical compounds such as alkaloids, lectins and phenolic compounds such as lactones, tannins and flavonoids which probably function in the protection of seeds from microbial degradation until conditions are favourable for germination (Cai *et al*., 2004; Komutarin *et al*., 2004). These compounds might have led to prevention of digestion in the gut of the fish at level of replacement. Previous authors (Tuleun *et al.* 2009) stated that the wide use of legume as feedstuff alternatives have been largely limited by the presence of antinutritional factor like trypsin inhibitors tannins and cyanide. Fakunle *et al* (2013) also reported that that toxic component or anti-nutritional factors in most agricultural by-products may cause irritation of digestive tract which is capable of decreasing feed intake and growth. Hence inclusion beyond the tolerable level of the fish leads to adverse growth consequences. Many other authors have similarly reported varied replacement level of about 50% (Babatunde *et al*. 2001, Falaye *et al.* 1999), 60% (Olubamiwa *et al*. 2000) and 100% (Tiamiyu *et al*., 2014) of waste and by-products with conventional once, with commendable successes. It can be correctly inferred then that replacement of convention feeds by alternate sources of plant and animal origin, depends on the nature and composition of the unconventional feedstuffs, inclusion levels, anti-nutritional factor of feed ingredients, method of processing and the tolerance levels of the experimental fish species.

Another possible reason for the reduced growth, feed intake, protein efficiency ratio and increased feed conversion ratio may be due high fibre content of WSM which could affects digestibility of nutrient in the elementary system. This in line with the views of Falaye *et al*. (1999) who reported a lower digestibility coefficient with increased cocoa husk in the diets and linked observations to elevated crude fibre resulting from the complex polysaccharides of the husk. Similarly, Fagbenro (1992) associated the digestibility in *C. Isheriensis* fed cocoa husk rations with cellulose activity in the fish gut. Gatlin (2010) indicated that cellulose and other fibrous carbohydrate are found in the structural component of plant and are indigestible to monogastric animals including fish. Oladunjoye *et al.* (2005) furthermore stated that high fibre content could be responsible for growth depression. However the result of the present study show that *Clarias gariepinus* cannot tolerate inclusion levels beyond 75% and fiber content beyond 5% as negate the recommendations of Sawaya *et al*. (1986) who stated that watermelon seed should not be included at levels higher than 20%, because these levels brings up the fiber content of the ration over 10%, which reduce feed intake.

Despite the significant effect observed in growth, the survival rate of the fish fed the different diet were not affected, Basavarajah and Anthony (1997) had reported a survival rate of 98% for common carp fry fed conventional feed and 100% for fry fed supplementary feed for a 35 days feeding trial. Similarly Singh and Goswami (1996) pointed out that 100% survival rate of carp can be achieved under very minimal stress and well fed condition, survival likely depend strongly on tolerance level of different fish species to the nature and level of anti-nutritional

factor in the feedstuff. Carcass composition of the fish fed the experimental diets were higher in values than the those recorded in the start of the study, protein retention was higher for the control and T2 suggesting that the protein to energy ratio used in the feed was at the right level and as a result, there was no sparing of protein for energy. The lipid content increase in this study is likely due to the fact that both soybeans and watermelon seeds are oil seeds (Mustafa *et al*., 1972), Abbas (2007) and Manjappa *et al,* (2011) opined that better nutrients utilization in fish carcass fed high lipids diets is related to both the dietary protein level and availability of non-protein energy sources.

CONCLUSION

The superiority of protein in soybean as well as anti-nutritional factor present in the raw watermelon seed meal and high fiber contents of diet are envisaged as reasons for better performance of diet with no or lesser water melon meal inclusion. Lesser water melon inclusion is sufficient for effective growth and nutrient utilization under the experimental condition carried out in this study. It is therefore, means that there is further room for fish farming to become even more productive without compromising the environmental or welfare standards.

RECOMMENDATION

Based on results of this study, there is need to investigate the decreasing trend recorded at 100% level of replacement. This is to establish optimum replacement levels of WSM FOR SBM at levels above 70% levels of replacement. Different processing methods and their effect on nutrient composition and growth performance of *O. niloticus* should be carried out.

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Climate Change Adaptation Needs/Priorities of Rural Women Farmers in Flood Plain Areas of Owerri Agricultural Zone of Imo State, Nigeria

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Abstract: *Adaptation is key to surviving the menace of climate change. This paper investigates adaptation needs/priorities of rural women farmers in Imo State, Nigeria. The specific objectives were to ascertain rural women farmers awareness of climate change, identify perceived effects of climate change on rural women farmers, examine adaptation needs of these women and determine adaptation strategies used by rural women. Data were collected with structured questionnaire from 180 rural women farmers randomly selected from a list of 1800 registered women farmers with the Owerri ADP office. Results showed that the rural women were very much aware of climate change as indicated by high mean responses to certain signs such as increase in temperature. M = 2.31), unpredictable heavy rainfall (M = 2.51), unpredictable heavy winds (M = 2.45) among others. Climate change affects rural women by increasing their work load, reducing their food portions, loss of farm assets, increase rate of diseases/illness. In adapting to climate change, the rural women farmers need as a matter of urgency to find alternative livelihood options (M = 2.68), safer areas to relocate (M = 3.31), access to credits/market (M = 3.34) among others. To adapt, they employ strategies such as crop rotation, planting early maturing crops, engage in off-farm activities, cooperative farming.*

Keywords*: climate change, temperature, adaptation, women, farmers*

Introduction

Climate change is perhaps the biggest challenge facing agriculture today. We are already seeing changes, both in long-term temperature and rainfall averages, and in the frequency and magnitude of droughts and floods (Adegoke *et al.,* 2014). According to the Intergovernmental Panel on Climate Change, Africa is the continent most vulnerable to climate change. One

estimate predicts that by 2050, without radical change, food availability in sub-Saharan Africa will drop by 500 calories per person – a decline of 21%.

Nigeria, Africa's most populous country and largest economy, is especially vulnerable because more than 70% of the population (100 million people) rely on agriculture for their livelihoods. Agriculture also accounts for almost 24% of the gross domestic product (GDP). Recent increases in droughts, floods, erosion, land degradation and other threats to agriculture – many of them linked to climate change – are predicted to accelerate in the coming decades. Without adequate preparation, the impacts will be huge. GDP over all sectors could shrink by up to 11% by 2020, and by 30% by 2050 (Adegoke *et al.,*2014). The cost of these estimated losses has been put at between 15 and 69 trillion Naira (US$100–460 billion). Because so many people depend on agriculture, and because food security is linked with national security, it is of paramount importance to do everything we can to prepare for climate change.

The impacts of a changing climate on the lives and livelihoods of the global poor become clearer with each passing year. Among agrarian populations, these impacts are particularly pronounced, as they contend with ever-more uncertain conditions in which to raise food and earn a living. While the impacts of climate change have effects, large and small, on all who rely on agriculture for their livelihoods, these effects are not uniformly felt. The contemporary literature on adaptation widely acknowledges that the patterns of vulnerability to climate change impacts we see today are largely, if not principally, shaped by roles, responsibilities, and entitlements associated with various markers of social status and expectation, including gender, class, and caste (Adger, 2006; Paavola and Adger, 2006; Pelling and High, 2005; Reid and Vogel, 2006).

The rural poor , mostly women in developing countries, many of whom are already food insecure, are likely to experience the most severe effects (IPCC, 2007) and are in greatest need of adaptation strategies and development assistance to cope with changing weather patterns (Keane *et al.,*2009).Yet, it is these poor, vulnerable, and marginalized women within these countries who have the least capacity or opportunity to prepare for the impacts of a changing climate given their limited resources (Nelson *et al*.,2010). Assets are important for the poor women because they can help them cope better with shocks, including climate shocks and the longer term impacts of climate extremes. But sadly women farmers do not have the assets needed to adapt to climate change menace. We do not also know what the rural women need in order to adapt, this thus makes this work inevitable. The specific objectives were to a). ascertain respondents awareness of climate change; b). Identify perceived effects of climate change on rural women farmers; c) examine perceived adaptation needs/priorities of respondents; d). determine adaptation strategies of respondents to climate change.

Methodology

The study was carried out in Owerri Agricultural Zone of Imo State, Nigeria. The zone is located between Latitudes 4°45´ and 7°25´ north of the equator and Longitudes 6°5´ and 7°25´ east of the Meridian (IMSG,2000). Owerri Agricultural Zone is one of the three Agricultural Zones in Imo State. The zone was chosen because it has areas that are close in terms of distance to water bodies i.e. streams, rivers, lakes which are most vulnerable to flooding as a result of

influences emanating from the water bodies. Again it has areas with high land use intensity, with low relief areas and nearest to streams which are prone to high flooding. Areas that fit these description are Ohaji/Egbema, Oguta, Owerri North, Ikeduru and Ahiazu-Mbaise. It comprises eleven local Government Areas, namely: Aboh Mbaise, Ahiazu Mbaise, Ezinihitte Mbaise, Ikeduru, Mbaitoli, Ngor-okpuala, Ohaji/Egbema, Oguta, Owerri Municipal, Owerri North and Owerri West. It has a population of 1,763,361 in 2016 projected from 2006 national census figure (NPC, 2006). There are two main seasons in the zone dry and rainy seasons. The annual rainfall is between 1900mm and 2200mm while the mean annual temperature is between 200C with a relative humidity of about 75% annually (IMSG, 2000). The zone is richly endowed with fertile land suitable for growth of arable crops. Multi stage random sampling technique was used to sample the respondents. In the first stage, purposive sampling technique was used to select 5 of the LGAs which are areas with the most severe flood menace (Oguta, Ohaji/Egbema, Ikeduru, Ahiazu Mbaies and Owerri North). At the 2nd stage, 10 most affected communities were selected namely Opuoma, Obiakpu, Mmahu, Abacheke (Ohaji/Egbema), Orsu-Obodo, Ezi-Orsu, Nnebukwu (Oguta), Akabo (Ikeduru), Amuzi (Ahiazu Mbaise) and Egbu (Owerri North). The third stage involved the proportionate random selection of 180 women farmers from a list 1800 rural women affected by the flood from the Imo State office of National Emergency Management Agency (NEMA). The primary data were collected from field investigation or survey using structured questionnaires. Secondary data sources were utilized to provide background information and other necessary to achieve some objectives of the study.

Descriptive statistical tools such as mean and standard deviation were used to achieve the objectives of the study**.** Mean was computed on a 3-point Likert type rating scale of very much aware assigned values of 3,2,1 to capture women farmers awareness of climate change **(objective 1)**. The values were added and divided by 3 to get the discriminating mean value of 2.0. Any mean value equal to or above 2.0 was regarded as very much aware, while values less than 2.0 were regarded as not aware. Mean was computed on a 4-point Likert type rating scale of strongly agree, agree, disagree and strongly disagree assigned weight of 4,3,2,1 to capture the perceived effects of climate change on the respondents**(objective 2)**. The values were added and divided by 4 to get the discriminating mean value of 2.5. Any mean value equal to or above 2.5 was regarded as an effect on women, while values less than 2.5 were not regarded as an effect. Mean was also computed on a 13 statement 4-point Likert type rating scale of strongly agree, agree, disagree and strongly disagree assigned weight of 4,3,2,1 to capture the perceived climate change adaptation needs/priorities of the respondents**(objective 3)**. The values were added and divided by 4 to get the discriminating mean value of 2.5. Any mean value equal to or above 2.5 was regarded as an adaptation needs by the women, while values less than 2.5 were not regarded as adaptation needs. Mean was also computed on a 12 statement 4-point Likert type rating scale of very important strategy, important strategy,. Less important strategy and not important strategy assigned weight of 4,3,2,1 to capture the perceived climate change adaptation strategies of the respondents**(objective 4)**. The values were added and divided by 4 to get the discriminating mean value of 2.5. Any mean value equal to or above 2.5 was regarded as an adaptation strategy used by the women, while values less than 2.5 were not regarded as a strategy.

Results and Discussion

Awareness of climate change

Table 1 showed that the respondents were very much aware of climate change as shown by their high mean responses. They were aware of the changes in temperature (M = 2.31), unpredictable heavy rainfall (M=2.51), increased drought/dryness (M=2.07), delayed rainfall (M= 2.47), heavy flooding/soil erosion (M=2.37). Other changes seen in the climate by the respondents included soil degradation (M= 2.25), reduced crop yield (M= 2.35), unexpected death of crops in field (M= 2.45), loss of harvest (M= 2.44), increased diseases/pests outbreak (M= 2.51) and unpredictable heavy winds (M= 2.45).

Studies predict a probable increase of 3ºC/4ºC in the average temperature during all seasons in 2080–99 compared with 1980–99 for most of Africa. These figures are 1.5 times higher than the predicted global increases (IPCC, 2007). Burkina Faso, and the Sudanese zone in particular, will experience higher temperatures. This temperature increase will prompt a rise in the level of potential evapo-transpiration and an increase in the amount of water lost from seas and reservoirs. As a result, there will be less water available for human and animal consumption and irrigation. Economies that depend primarily on natural resources will be the hardest hit. **Reduced rain levels** have also been observed in the Sahel, where annual rainfall during the last 30 years fell by 20–40 per cent compared with rainfall for the period 1931 to 1969 (Hulmes et al., 2001). However, an increase in rainfall has also been observed since the end of the 1980s, and the 1996–2006 period showed an upward trend in the North-Sudanese and Sahelian zones of Burkina Faso and a downward trend in part of the South-Sudanese zone, particularly in the south west of the country (DANIDA,2008). According to a number of studies (IPCC, 2007) changes in the rain cycle affect soil humidity, aquifer regeneration and agricultural soil quality, but also cause extreme phenomena such as droughts and floods, the frequency and intensity of which are expected to increase (IPCC, 2007).

Table 1: Women farmer's awareness of climate change

Climate change signs	Mean	SD
Increase in temperature	2.31	0.672
Unpredictable heavy rainfall	2.51	0.523
Increased drought/dryness	2.07	0.710
Delayed rainfall	2.47	0.567
Heavy flooding/soil erosion	2.37	0.567
Soil degradation	2.25	0.684
Reduced crop yields	2.35	0.574

Unexpected death of crops in field	2.45	0.744
Loss of harvest	2.44	0.732
Increased diseases/pests outbreak	2.51	1.564
Unpredictable heavy winds	2.45	0.560

Field survey data, 2016 Mean of 2.0 and above signifies awareness

Effects of climate change on women farmers

Women farmers are unfortunate victims of climate changes menace in the study area. Table 2 showed that the negative effects of climate change on the respondents were numerous. Climate change increased the workload of women farmers with mean response of 2.61, reduces food portions of women farmers (M= 3.52), and leads to loss of farm assets/bad harvests (M= 2.69). Climate change slows down girl child/women education opportunities (M=2.98) and leads to destruction of productive resources of women (M= 2.94). Other negative effects included higher rates of malnutrition due to food shortages (M= 2.78), increase heat related mortality/morbidity (M=3.35), increased rate of respiratory-related diseases (M=3.44), increased rate of water borne infections (M= 3. 07), exposure to sexual harassment/assaults (M= 3.20), exposure of women to attacks by dangerous animals (M= 3.50) and loss of women gainful employment opportunities (M=2.97).

The main impact of climate change on women is the increase in their workload. Droughts, floods and a lack of rain, damage cereal harvests, meaning that many families will not have sufficient quantities of cereals to feed themselves. As a result, women have to redouble their efforts to find alternative activities and obtain income with which to buy the food they need, since they are responsible for providing food. In addition to this, women must invest more time and effort in finding water and wood, because these have become scarcer as a result of desertification and over-exploitation (Campbell *et al*., 2009).

In the case of extreme phenomena such as floods, women work together with men to rebuild their homes and recover their livelihood. They combine their usual tasks within the home with productive activities in order to raise enough money to buy food and replace dead animals. Moreover, if a member of the family falls ill (elderly people and children are worst affected by high temperatures), it is up to the women to look after them (Romero-Gonzalez *et al.,* 2011). If there is a lack of food caused due to bad harvests as a result of climate change, it is the women who reduce their food portions, despite the physical work they do, which increases malnutrition. Insufficient food, an excessive workload and breastfeeding mean that malnutrition is more prevalent among mothers and young children. The increased workload leaves women with very little time to dedicate to income generating activities or take part in the life of the community.

One of the primary reasons that women are more vulnerable to the effects of climate change is that they are disproportionately dependent on threatened natural resources. A recent report by the UN Intergovernmental Panel on Climate Change (IPCC, 2007), 'Impacts,

adaptation and vulnerability', predicts that yields from rain-fed agriculture in sub-Saharan Africa could be reduced by as much as 50% by 2020. Such a strain on food production will certainly translate into increased hardship for women, who often carry out the majority of farming activities. In fact, women are responsible for approximately 75% of household food production in sub-Saharan Africa, 65% in Asia, and 45% in Latin America (Stoparic, 2007). As crop yields decline and resources become scarcer, women's workloads will expand, jeopardizing their chances to work outside the home or attend school. In times of drought, they will also have to spend more time performing another typical female responsibility — carrying, purifying and supplying the family's water (COP 10, 2004).

As water- and heat-related diseases increase because of climate change, women will bear the extra burden of increased care giving and increased threats to their own health. The World Health Organisation (2007) states that, "Changes in climate are likely to lengthen the transmission seasons of important vector-borne diseases, and to alter their geographic range, potentially bringing them to regions that lack population immunity and/or a strong public health infrastructure. Malaria is one example a vector-borne disease that will likely increase due to climate change, particularly as a result of increased temperatures and rainfall. Pregnant women are particularly vulnerable because they attract malaria-carrying mosquitoes at twice the rate of non-pregnant women. Moreover, pregnancy reduces a woman's immunity to malaria, making her more susceptible to infection and increasing her risk of illness, severe anaemia and death. Maternal malaria increases the risk of spontaneous abortion, premature delivery, stillbirth and low birth weight – a leading cause of child mortality.

Table 2: **Effects of Climate Changes on Women farmers**

Effects on Rural Women	**Mean**	**SD**
Increase workload of women farmers	2.61	0.83
Reduces food portions of women farmers	3.52	0.87
Destruction of productive resources of women	2.94	1.02
Loss of farm assets/bad harvest	2.69	0.74
Slows down girl child education opportunity	2.98	0.96
Higher rate of malnutrition due to food shortage	2.78	0.76
Increase in heat-related mortality/morbidity	3.35	0.71
Increase rate of respiratory-related illnesses	3.44	0.66
Increase rate of water-borne diseases/infections	3.57	0.78
Exposure to sexual harassment/assaults	3.20	1.57

Loss of women's gainful employment opportunity	2.97	0.560
Exposure to attacks by dangerous animals	3.50	1.25

Field survey data, 2016 Mean values 2.50 shows strong effect

Climate Changer Adaptation Needs/Priorities

Table 3 showed clearly what the respondents wanted in order to adapt to climate change menace. Therefore, in order to adapt, the respondents need to relocate communities to safer areas (M=3.04), improved transport facilities during flood seasons (M=3.04), improved access to credit and markets (M=3.34), develop skills for alternative livelihoods (M=3.15), access to short term crop varieties (M= 3.30). Other adaptation needs of rural women were finding alternative livelihood options (M=2.68), solid shelters for themselves (M= 2.76), provision of permanent medical/veterinary services (M=2.64), preserve and reviving of marginal lands (M=2.75), land for practice of multiple/intercropping (M=2.88), best practices to reduce farm risk (M=2.33), training and education (M=2.96), sharpen knowledge on best farming skills (M=2.87).

Safety is a major concern for all, but especially for women in their role as carers. In Bangladesh, women living in one of the villages that had recently formed a char (where erosion along the river caused the village to become cut off as an island in the river) felt that they were not safe as long as they lived there. For them, the first adaptation priority was to relocate the community to an area within the embankment where they could live safely and cultivate land. Other groups prioritized adaptation *in situ*, through the construction of solid houses with higher plinth levels (Mitchel, *et al.,* 2007). Several women also mentioned the need to build flood shelters – a place within the community where poor people could go, but also a place that would be safe for their animals and that they could use to store seeds, animal fodder and food. Access to doctors, pharmacists, vets and agricultural extension services appear as an important aspect of women's wellbeing and livelihoods. During times of flood, roads are often inundated and communities are deprived of these services. In a scenario of increased flooding, women felt that it was vital to improve their access to the services and markets on which their livelihoods depend during the flood season.

Table 3: Climate Changer Adaptation Needs/Priorities

Adaptation Needs/Priorities	Mean	SD
Finding alternative livelihood options	2.68	1.370
Relocate communities to safer areas	3.31	0.92
Build solid community shelters for themselves	2.76	1.12
Provide permanent medical/veterinary service	2.64	1.09

Improper transport facilities during flood seasons	3.04	0.98
Improper access to credits and markets	3.34	0.89
Preserve and revive marginal land to hold water	2.75	1.16
Develop skills for alternative livelihoods	3.15	1.08
Practice multiple cropping/intercropping	2.88	0.84
Best practice to reduce farm risk	2.93	0.77
Access to improve short term crops	3.30	0.94
Sharpen knowledge on best farming skills	2.87	1.27
Training and education	2.96	1.08

Field survey data, 2016 Mean values 2.50 signifies adaptation needs

Climate Change Adaptation Strategies

Table 4 showed that the respondents survived the menace of climate change by employing the following adaptation Strategies:- practice of crop rotation (M= 2.98), planting early maturing crop varieties (M= 2.73), changing of planting dates (M=2.78), engaging in off-farm activities (M= 2.57), mixed cropping/farming (M= 3.30), use of diseases-resistant crop varieties (M= 3.41), sales of crops produced before damage (M= 2.65), practice of cooperative farming (M= 2.87), delayed late land preparation (M= 2.68), use of local knowledge to diversity crops (M= 2.96), and use of indigenous knowledge to prevent diseases/pest attack (M= 3.38). The above findings agrees with the situation of women in Bangladesh. According to Mitchell *et al.,*2007) when the water level in Bangladesh rises, some women move to the nearest high location and make temporary shelters to ensure their safety and that of their families. Others find refuge in the houses of relatives or friends on higher ground. Those who have the necessary resources increase the plinth level of their houses or their homestead, allowing them to protect some of their belongings. To protect their assets and livelihoods, women try to store seeds in high places within the house before the floods come. Livestock is sometimes taken to higher ground, but safe places to keep cattle are often hard to get to. To cope with the resulting lack of food and assets, women borrow money or sell their livestock or other goods. To reduce losses resulting from crops rotting in inundated fields, some people have switched to cultivating crops that can be harvested before the flood season, or varieties of rice that will grow high enough to remain above water when the floods come

Table 4: Climate Change Adaptation Strategies

Adaptation Strategies	Mean	SD
Practice of crop rotation	2.98	0.94
Planting early maturing crop varieties	2.73	1.09
Changing of planting dates	2.78	0.96
Engaging in off-farm activities	2.57	0.81
Mixed cropping/farming	3.30	0.92
Use of diseases-resistant crop varieties	3.41	0.78
Sales of crops produces before damage	2.65	1.10
Practice of cooperative farming	2.87	1.28
Delayed late land preparation	2.68	0.78
Use of local knowledge to diversity crops	2.96	1.05
Use of indigenous knowledge to prevent diseases	3.38	0.91

Field survey data, 2016 Mean 2.50 shows accepted strategies

Conclusion

Climate change is a global problem known to all as people see signs of its occurrence on a daily basis. Such signs as increase temperature, heavy rainfall, heavy winds and others. These have adverse effects on women who work both in farm and at home as their work load is increased leading to several health challenges. However, women need certain conditions to adapt. These include alternative livelihood, good shelter, safer transportation/movement and credit/loans among others. They practice crop rotation**.**

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Socio-economic Concerns and Crisis Management of Agribusiness Companies

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Abstract: *The aim of this study was to access the socio-economic concerns of host communities and crisis management of agribusiness companies in Benue State. Two hundred and fourteen respondents were chosen for the study via sample size determination. The regression model consisting of, standard social interaction, socio-economic wellbeing, improving knowledge and education, improving livelihood and empowerment of tribes and cooperatives played very important roles in crisis management of agribusiness companies operating in Benue State. The safety and health of the employees and domain consensus are necessary for setting effective work environment policies, accident safeguard, food and medical facilities. The study concludes that, there is significant effect of socio-economic concerns on host communities and crisis management of agribusiness companies in Benue State. Provision of schools, hospitals, bore holes, etc, should be one of the CSR activities of the companies so as to enable the host communities feel the impact of the companies first hand. Socio-economic concerns require that management take pro-active measure so as to prevent social unrest in the host community. Agribusiness companies should try and carry out free medical outreach and entrepreneurial trainings for community members.*

Keywords: *agribusiness companies, host communities and crisis management, socio-economic concerns*

1. Introduction

Socio-economic concerns warrant the agribusiness company to engage in corporate philanthropy; contributing to community development activities and involving social projects (Ezeigwe, 2010; Ogidi, 2015). The safety and health of the employees and domain consensus are necessary for setting effective work environment policies, accident safeguard, food and medical facilities. As per the United Nations, "poverty is fundamentally a denial of choices and opportunities, and a violation of human dignity. It means lack of basic capacity to participate effectively in society. It means not having enough to feed and clothe a family, not having a school or clinic to go to, not having the land on which to grow one's food or a job to earn one's living, not having access to credit. It means insecurity, powerlessness and exclusion of

individuals, households and communities. It means susceptibility to violence, and it often implies living on marginal or fragile environments, without access to clean water or sanitation". (UN Statement, June 1998 –signed by the heads of all UN agencies). Poverty is a socio-economic issue . Socio-economic issues are factors that have negative influence on an individuals' economic activity including: lack of education, cultural and religious discrimination, overpopulation, unemployment and corruption (Ogidi, Olotu and Olopete, 2013). Poverty is also a variable that determines one's socio-economic status - meaning, an individual's or group's position within a hierarchical social structure which depends on a combination of variables, including occupation, education, income, wealth, and place of residence.

1.1. Objective of the Study

The aim of this study was to access the socio-economic concerns of host communities and crisis management of agribusiness companies in Benue State.

1.2. Research Question

What are the socio-economic concerns of host communities and crisis management of agribusiness companies in Benue State?

1.3. Statement of Hypothesis

H0: There is no significant effect of socio-economic concerns on host communities and crisis management of agribusiness companies firms in Benue State

2. Methodology

2.1. Research Design

The study employed correlational survey research design. A survey research design seeks to obtain information that describes existing phenomenon by asking individuals about their perceptions, attitudes and values.

2.2. Population of the Study

The population consists of staff from private companies operating in Benue State, such as Ashi Rice, Miva Rice, Tito Randiaries and Gushen Water. The total population was made up of one hundred and sixty (460) staff who have worked for more than 5 years in the above mentioned private firms.

2.3. Sample Size and Sampling Determination

Two hundred and fourteen (214) respondents were chosen for the study through the use of Yaro-Yamene (1967) sample size determination technique.

2.4. Method of Data Collection

Primary data was used in this study. This was made possible by the administration of research questionnaires. Secondary data from literature was used to complement primary data results.

2.5. Data Analysis Techniques

The data for the study was analyzed using computer-based Statistical Package for Social Sciences (SPSS version 21 for Microsoft Windows). Statistics from multiple regression analysis

was formally used to test the hypothesis for this study; the t-statistical tests were used to test the individual independent variable influence on the dependent variable.

3. Results and Discussion

3.1. Survey Response

A total of 214 questionnaires were sent-out and 177 were retrieved; after careful scrutiny, 13 were rejected, because they were defaced or improperly filled. A successful response rate of 82.7% was achieved as 164 of the questionnaires were considered acceptable.

3.2. Test of Hypothesis

The t calculated values are significant because they are greater than the t tabulated value (1.98). The F calculated value of 35.315 is greater than the F tabulated value and shows significant relationship between the output and input variables. The null hypothesis should be rejected and the alternative hypothesis (**H1**) accepted, which states that, *"there is significant effect of socio-economic concerns on host communities and crisis management of agribusiness companies in Benue State".*

Table 1: Socio-Economic Concerns and Crisis Management (n=164)

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	**Std. Error**	**Beta**		
(Constant)	0.336	0.258		1.306	0.195
SSI	0.201	0.071	0.246	2.854*	0.005
SEW	0.178	0.079	0.198	2.251*	0.027
IKE	0.126	0.052	0.156	2.122*	0.000
IL	0.960	0.082	0.919	9.919**	0.000
ETC	0.499	0.144	0.358	3.475**	0.001

Note: Dependent Variable: **Crisis Management**, *, ** Correlation is significant at the 0.05 level & 0.01 level (2-tailed), F Calculated value = 35.315 at 0.05, R = 0.794, R^2 = 0.630, SSI=standard social interaction, SEW=socio-economic wellbeing, IKE=improving knowledge and education, IL=improving livelihood, ETC=empowerment of tribes and cooperatives
Source: SPSS Version 21 for Windows

3.3. Discussion of the Findings

The regression model consisting of, standard social interaction, socio-economic wellbeing,

improving knowledge and education, improving livelihood, and empowerment of tribes and cooperatives played very important roles in crisis management of agribusiness companies operating in Benue State. This is in tandem with the United Nations (2010) study that absence of socio-economic assistance means susceptibility to violence, and it often implies living on marginal or fragile environments, without access to clean water or sanitation" (UN Statement, June 1998 –signed by the heads of all UN agencies). Socio-economic concerns warrants the firm to engage in corporate philanthropy; contributing to community development activities and involving social projects (Ezeigwe, 2010; Ogidi, 2014a). The safety and health of the employees and domain consensus are necessary for setting effective work environment policies, accident safeguard, food and medical facilities (Ogidi, 2014b). As per the United Nations, "poverty is fundamentally a denial of choices and opportunities, and a violation of human dignity. It means lack of basic capacity to participate effectively in society. It means not having enough to feed and clothe a family, not having a school or clinic to go to, not having the land on which to grow one's food or a job to earn one's living, not having access to credit. It means insecurity, powerlessness and exclusion of individuals, households and communities. Poverty is a socio-economic issue. Socio-economic issues are factors that have negative influence on an individuals' economic activity including: lack of education, cultural and religious discrimination, overpopulation, unemployment and corruption. Poverty is also a variable that determines one's socio-economic status - meaning, an individual's or group's position within a hierarchical social structure which depends on a combination of variables, including occupation, education, income, wealth, and place of residence.

4. Conclusion

The study's findings indicate that regression coefficients or slopes of socio-economic concerns variables have significant impacts on crisis management variables. These findings further support the alternate hypotheses that these regression coefficients or slopes are significantly different from zeros and have predictive powers in estimating crisis management of agribusiness companies operating in Benue State. The study concludes that, there is significant effect of socio-economic concerns on host communities and crisis management of agribusiness companies in Benue State.

5. Recommendations

i. provision of schools, hospitals, bore holes, etc, should be one of the CSR activities of the companies so as to enable the host communities feel the impact of the companies first hand;
ii. socio-economic concerns requires that management take pro-active measure so as to prevent social unrest in the host community; and
iii. agribusiness companies should try and carry out free medical outreach and entrepreneurial trainings for community members

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Effect of Environmental Concerns on Crisis Management of Agribusiness Companies in Benue State

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Abstract: *The main aim of the study is to examine the extent to which environmental concerns of agribusiness companies affect crisis management in Benue State. Two hundred and fourteen respondents were chosen for the study via sample size determination. For the regression model, the study found out that limit pollution, national and international standards, best practices, health of staff and inhabitants, and policy on green energy are essential for crisis management in agribusiness companies operating in Benue State. Over the last few decades, the exploitation of our planet and degradation of our environment have gone up at an alarming rate. The study thus, concludes that, environmental concern has significant effect on crisis management by agribusiness companies in Benue State. Environmental concerns of firms should be budgeted for by agribusiness companies in order to minimize the affect of crisis on the host communities in Benue State. Land and soil pollution can be reduced to minimum if agribusiness companies help to curb their level of carbon and solid wastes should be recycles or properly disposed at waste land sites. Water pollution should be reduced by collecting effluents from the agribusiness companies are properly sealed and disposed.*

Key words: *agribusiness companies, crisis management, environmental concerns*

1. Introduction

Society is defined in broader sense and many levels which include all stakeholders and groups that keep interest in supplier, Government, local communities and even the environment (Ogidi, Olotu and Olapede, 2013; Iqbal, Ahmad, Hamad, Bashir and Sattar, 2014). Corporate social responsibility (CSR) disclosure has attracted much attention over the past three decades (Uwuigbe, 2011). It could be through provision of electricity, pipe borne water, building of good roads and ensuring security in the society in the environment where the firm operates. Environmental activities should be embarked by the firm to enhance pollution control projects, adherence to federal standards and evaluation procedures of new packages to ensure ease of disposal or possible recycling (Ezeigwe, 2010; Ogidi, 2014a). The environment must be controlled so as to reduce adverse effect on the host communities.

Our Mother Earth is currently facing lot of environmental concerns. The environmental

problems like global warming, acid rain, air pollution, urban sprawl, waste disposal, ozone layer depletion, water pollution, climate change and many more affect every human, animal and nation on this planet. Over the last few decades, the exploitation of our planet and degradation of our environment have gone up at an alarming rate (Ogidi, 2014c). As our actions have been not in favor of protecting this planet, we have seen natural disasters striking us more often in the form of flash floods, tsunamis and cyclones. Different environmental groups around the world play their role in educating people as to how their small actions when combined together can play a big role in protecting this planet (Ogidi, Olutu and Olapede, 2013). If you look at the environment around us, you can see that there are a number of issues that come to our attention.

Pollution of air, water and soil take a huge number of years to recover. Industry and engine vehicle fumes are the most obvious toxins. Substantial metals, nitrates and plastic are poisons in charge of pollution. While water contamination is brought about by oil slicks, acid rain, and urban sprawl; air contamination is created by different gasses and poisons discharged by businesses and manufacturing plants and burning of fossil fills; soil contamination is majorly created by mechanical waste that takes supplements out of the soil. Clean drinking water is turning into an uncommon thing. Water is turning into a monetary and political concern as the human populace battles for this need. Waste from industrial and agricultural activities pollute the water that is used by humans, animals and plants. Land pollution simply means degradation of earth's surface as a result of human activities like mining, littering, deforestation, industrial, construction and agricultural activities. Land pollution can have huge environmental impact in the form of air pollution and soil pollution which in turn can have adverse effect on human health (Ogidi, 2015). Climate change is yet another environmental concern that has surfaced in last couple of decades. Environmental change has different destructive impacts that include, but are not limited to, the melting of polar ice, change in seasons, new sicknesses, and change in general climate situation. Environmental asset abuse is also an important environmental concern. Fossil fuel utilization brings about discharge of greenhouse gasses, which causes environmental change. However, individuals are taking endeavors to move to renewable energy sources. Our woodlands create new oxygen and additionally help in managing temperature and precipitation. At present, timberlands cover 30% of the area, but wooded areas are being lost on a regular basis because people are looking for homes, food, and materials. Deforestation is a huge problem and will just continue to get worse. Temperature increases, like climate change, are the consequence of human practices, including the use of greenhouse gasses. When the atmosphere changes and the heat increases, it can cause a number of problems and start to destroy the world we live in.

The amount of carbon in the water and the atmosphere is continuing to be a problem in the world around us. The primary effect is on shellfish and microscopic fish, and it has similar effects to osteoporosis in humans. The current environmental concerns represent a considerable measure of danger to well-being of people, and creatures. Dirty water is the greatest well-being danger of the world and poses a risk to the health and lifespan of people and animals. The ozone layer is an undetectable layer of protection around the planet that secures us from the sun's unsafe beams. Depletion of the critical Ozone layer of the air is

credited to contamination brought about by Bromide and Chlorine found in Chlorofloro carbons (CFC's). When these poisonous gasses each the upper parts of the atmosphere, they cause a gap in the ozone layer, the greatest of which is over the Antarctic (Ogidi, 2014c). Non-renewable resources are limited and will get expired one day. Consumption of fossil fuels at an alarming rate can lead to global warming which can further result in melting of polar ice caps and increase in sea levels. Modern day agriculture practices make use of chemical products like pesticides and fertilizers to deal with local pests. Some of the chemicals when sprayed do not disappear and infact seeps into the ground and thereby harms plants and crops. Also, contaminated water is used for irrigation by farmers due to disposal of industrial and agricultural waste in local water bodies. Noise pollution is another common form of pollution that causes temporary disruption when there is excessive amount of unpleasant noise. Construction activities, industrialization, increase in vehicular traffic, lack of urban planning are few of the causes of noise pollution. Littering simply means disposal of piece of garbage or debris improperly or at wrong location usually on the ground instead of disposing them at trash container or recycling bin. Littering can cause huge environmental and economic impact in the form of spending millions of dollars to clean the garbage of road that pollute the clean air.

1.1. Objective of the Study

The main aim of the study is to examine the extent to which environmental concerns of agribusiness companies affect crisis management in Benue State

1.2. Research Question

To what extent does environmental concern affect crisis management by agribusiness companies in Benue State?

1.3. Statement of Hypothesis

H0: There is no significant relationship between environmental concern and crisis management by firms in Benue State

2. Methodology

2.1. Research Design

The study employed correlational survey research design. A survey research design seeks to obtain information that describes existing phenomenon by asking individuals about their perceptions, attitudes and values.

2.2. Population of the Study

The population consists of staff from private companies operating in Benue State, such as Ashi Rice, Miva Rice, Tito Randiaries and Gushen Water. The total population was made up of one hundred and sixty (460) staff who have worked for more than 5 years in the above mentioned private firms.

2.3. Sample Size and Sampling Determination

Two hundred and fourteen (214) respondents were chosen for the study through the use of Yaro-Yamene (1967) sample size determination technique.

2.4. Method of Data Collection

Primary data was used in this study. This was made possible by the administration of research questionnaires. Secondary data from literature was used to complement primary data results.

2.5. Data Analysis Techniques

The data for the study was analyzed using computer-based Statistical Package for Social Sciences (SPSS version 21 for Microsoft Windows). Statistics from multiple regression analysis was formally used to test the hypothesis for this study; the t-statistical tests were used to test the individual independent variable influence on the dependent variable.

3. Results and Discussion

3.1. Survey Response

A total of 214 questionnaires were sent-out and 177 were retrieved; after careful scrutiny, 13 were rejected, because they were defaced or improperly filled. A successful response rate of 82.7% was achieved as 164 of the questionnaires were considered acceptable.

3.2. Results of Hypothesis Testing

The t calculated values all showed significant values, because they are greater than the t-tabulated value (1.98). The F calculated value is 46.382, which is greater than the F tabulated value indicating significant relationship between variables of the hypothesis. The null hypothesis is rejected while the alternative hypothesis (**H1**) is accepted, which states that, *"there is significant relationship between environmental concern and crisis management by agribusiness companies in Benue State".*

Table 1: Environmental Concern and Crisis Management (n=164)

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	**Std. Error**	**Beta**		
(Constant)	0.129	0.246		0.522	0.603
LP	0.239	0.067	0.278	3.541**	0.000
NIS	0.195	0.076	0.207	2.715*	0.012
BP	0.252	0.083	0.294	4.182**	0.000
HIS	0.604	0.120	0.442	5.041**	0.000
PGE	0.499	0.144	0.358	3.475**	0.001

Note: Dependent Variable: **Crisis Management**, *, ** Correlation is significant at the 0.05 level & 0.01 level (2-tailed), F Calculated value = 46.382, R = 0.831, R^2 = 0.691, LP=limit pollution, NIS=national and international standards, BP=best practices, HIS=health of staff and inhabitants, PGE=policy on green energy

Source: SPSS Version 21 for Windows

3.3. Discussion of the Findings

For the regression model, the study found out that limit pollution, national and international standards, best practices, health of staff and inhabitants, and policy on green energy are essential for crisis management in agribusiness companies operating in Benue State. This is in reality with Exeigwe (2010; Ogidi, 2014b) who emphasized that environmental activities should be embarked by the firm to enhance pollution control projects, adherence to federal standards and evaluation procedures of new packages to ensure ease of disposal or possible recycling. The environment is controlled so as to reduce adverse effect on the host communities. This study is in tandem with Olawale (2014), who emphasized that the extent to which an organization is able to forge ahead in spite of this unavoidable constraint will depend much on the human resource managers on whom rests the arduous task of resolving crisis within the environment. Our Mother Earth is currently facing lot of environmental concerns. The environmental problems like global warming, acid rain, air pollution, urban sprawl, waste disposal, ozone layer depletion, water pollution, climate change and many more affect every human, animal and nation on this planet. Over the last few decades, the exploitation of our planet and degradation of our environment have gone up at an alarming rate. As our actions have been not in favor of protecting this planet, we have seen natural disasters striking us more often in the form of flash floods, tsunamis and cyclones.

4. Conclusion

The study's findings indicate that regression coefficients or slopes of environmental concern variables have significant impacts on crisis management variables. These findings further support the alternate hypotheses that these regression coefficients or slopes are significantly different from zeros and have predictive powers in estimating crisis management of companies operating in Benue State. The study thus, concludes that, environmental concern has significant effect on crisis management by agribusiness companies in Benue State

5. Recommendations

i. environmental concerns of firms should be budgeted for by agribusiness companies in order to minimize the affect of crisis on the host communities in Benue State;
ii. land and soil pollution can be reduced to minimum if agribusiness companies help to curb their level of carbon and solid wastes should be recycles or properly disposed at waste land sites; and
iii. water pollution should be reduced by collecting effluents from the agribusiness companies are properly sealed and disposed

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Role of Infrastructure and Crisis Management by Agribusiness Companies in Benue State

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Abstract: *The study objective was to determine the extent to which infrastructure affects crisis management by agribusiness companies in Benue State. The study employed correlational survey research design. The population consists of staff from private companies operating in Benue State, such as Ashi Rice, Miva Rice, Tito Randiaries and Gushen Water. The total population was made up of 460 staff who had worked for more than 5 years in the above mentioned agribusiness companies. Two hundred and fourteen (214) respondents were arrived at through sampling determination. Primary data was used in this study. This was made possible by the administration of research questionnaires. Secondary data from literature was used to complement primary data results. The data for the study was analyzed using computer-based Statistical Package for Social Sciences (SPSS version 21 for Microsoft Windows). Infrastructure aided host communities to develop and maintain a calm status towards the firm operating in its domain. Infrastructure is central to sustainable development and economic competitiveness of any nation. The study concludes that, there is significant relationship between infrastructure and crisis management of companies operating in Benue State, Nigeria. Agribusiness companies should enact at least one single laudable infrastructure to serve as an icon to the host communities in Benue State. Involving important elements in the infrastructural planning and development by the agribusiness companies will go a long way in reducing the tension between the host communities and agribusiness companies.*

Key words: *agribusiness companies, crisis management, infrastructure, Benue State*

1. INTRODUCTION

Infrastructure is a basic component of Corporate Social Responsibility (CSR). CSR is the relationship between firms and society in which they operate and interact. The ability of firms to care for its immediate community is what we refer to as social responsibility it could be through monetary or non monetary donations to the community (Onwe, 2014; Ogidi, 2014a). Society is defined in broader sense and many levels which include all stakeholders and groups that keep interest in supplier, Government, local communities and even the environment (Ogidi, Olotu & Olapede, 2013; Iqbal, Ahmad, Hamad, Bashir & Sattar, 2014). Corporate social responsibility (CSR) disclosure has attracted much attention over the past three decades

(Uwuigbe, 2011). It reduces the information gap between the firm and stakeholders and thus lowers the firm's cost of capital (Dhaliwal, Li, Tsang & Yang, 2009; Cormier, Ledoux & Magnan, 2009; Ogidi, 2014b) and enhances firm value (Orlitzky, Schmidt & Rynes, 2003; Margolis & Walsh, 2003). Corporate social responsibility (CSR) can simply be defined as the act of taking care of one immediate community (Onwe, 2014). One basic component of CSR is "infrastructure" which could be through provision of electricity, pipe borne water, building of good roads and ensuring security in the society in the environment where the firm operates (Ogidi, 2014c). One of the major causes of conflicts is host communities' distrust for firms operating in their domains. Consequent on the poor relationship between the two parties, host communities believe that companies exploit them by destroying their natural habitat. The companies however, fail to adequately compensate them by putting in place basic infrastructure to meet the needs of the community.

1.1. Objective of the Study

To determine the extent to which infrastructure affects crisis management by agribusiness companies in Benue State

1.2. Research Question

To what extent does infrastructure affects crisis management by agribusiness companies in Benue State?

1.3. Statement of Hypothesis

H0: There is no significant effect of infrastructure on crisis management by agribusiness companies in Benue State

2. LITERATURE REVIEW

2.1. Theoretical Framework

Conflict Theory: Of the classical founders of social science, conflict theory is most commonly associated with Karl Marx (1818–1883) (Marx and Engels, 1998). Based on a dialectical materialist account of history, Marxism posited that capitalism, like previous socioeconomic systems, would inevitably produce internal tensions leading to its own destruction. Marx ushered in radical change, advocating proletarian revolution and freedom from the ruling classes. At the same time, Karl Marx was aware that most of the people living in capitalist societies did not see how the system shaped the entire operation of society. Two early conflict theorists were the Polish-Austrian sociologist and political theorist Ludwig Gumplowicz (1838–1909) and the American sociologist and paleontologist Lester F. Ward (1841–1913). Although Ward and Gumplowicz developed their theories independently they had much in common and approached conflict from a comprehensive anthropological and evolutionary point-of-view as opposed to Marx's rather exclusive focus on economic factors. Gumplowicz, in *Grundriss der Soziologie* (*Outlines of Sociology*, 1884), describes how civilization has been shaped by conflict between cultures and ethnic groups. Gumplowicz theorized that large complex human societies evolved from the war and conquest. The winner of a war would enslave the losers; eventually a complex caste system develops (Irving, 2007). Horowitz says that Gumplowicz understood

conflict in all its forms: "class conflict, race conflict and ethnic conflict", and calls him one of the fathers of Conflict Theory (Horowitz, 1986).

Conflict theory posits that in a society or an organization, each individual participant and/or group struggles to maximize certain benefits and this inevitably contributes to social change. This change may include political struggles and revolution. The theory focuses on the idea that personal or group's ability has a role to play in exercising influence and control over others in producing social order. Hence, conflict theorists believe that there is a continual struggle between all different elements of a particular society. According to Wallace & Wolf (2006), conflict theory evolved as a major alternative to the functionalist approach to analyzing a society's general structure. Ritzer (2003) also observes that apart from the theory's origination in reaction to structural functionalism, it also has other roots that include Marxian theory and works of Georg Simmel on social conflict. Conflict theory provided an alternative to the functionalist approach in the 1950s and 1960s. Although it was superseded by a variety of neo-Marxian theories after the 60s (Ritzer & Goodman, 2004), it has become increasingly popular and relevant in modern sociology (Wallace and Wolf, 2006). Functionalists consider societies and social institutions as systems in which equilibrium is created through the interdependence of all the parts. They do not deny the existence of conflict; however, they believe that the society evolves means of controlling it. This forms the basis of functionalist analysis. Conflict theorists, on the other hand, perceive the society in a different light. Contrary to functionalists' view of the existence of interdependence and unity in the society, conflict theorists view the society as an arena where groups contend for power. For conflict to be controlled, one group must be able to, at least temporarily, suppress its rivals. Conflict theory focuses on the shifting balance of power among competitors in the society, rather than the creation of equilibrium through interdependence and cooperation (Wallace & Wolf, 2006). This Marxist perspective has been specifically applied to international organizations/multinational corporations, which are the focus of this study. According to Pease (2003), Marxists argue that international organizations are products of hegemony. However, traditional Marxists and Gramscian Marxists have two separate notions of hegemony, thereby leading them to different conclusions on the nature of international organizations. While traditional Marxists tend to equate hegemony with military and both class and national boundaries without compromising the dominant class' position.

2.2. Conceptual Framework

a) Concept of Infrastructure: Infrastructure is necessary for host communities to develop and maintain a calm status towards the firm operating in its domain. Businesses are recognizing that adopting an effective infrastructure approach to CSR can reduce the risk of business disruptions, open up new opportunities, drive innovation, enhance brand and company reputation and even improve efficiency (Ezeigwe, 2010).

Human (national) development is about meeting and satisfying basic human needs and aspirations, protecting their freedoms and rights, minimising risks to their survival, enhancing human security, and empowering them to tap and maximise their potential (Jega, 2010). Infrastructure is central to sustainable development and economic competitiveness of any nation. A nation without infrastructure is like a body without anatomy. Today, inadequate

infrastructure is holding back Africa's economic growth per capita by two per cent each year, and reducing firms' productivity by as much as 40 per cent (ICA,2010). Sub-Saharan Africa is also lagging behind the rest of the world in its level of infrastructure development, thereby blocking the quick movement of goods and people on the continent and increased transport costs to as much as twice that in any typical Asian country (ICA, 2005).

The largest deficit in infrastructure can be found in the power sector where only one in four Africans have access to electricity with about 30 African countries estimated to be experiencing regular blackouts due to power shortages. Even though firms struggle to cope by installing their own back-up generators, this costs three to four times as much as the cost of grid electricity. The 48 sub-Saharan African countries including Nigeria, with some 800 million people, produce collectively only about as much power as Spain, which has only 1/18th of the population (USAID, 2009).The lack of affordable and reliable power is cited by investors as the number one constraint to doing business in most African countries, Nigeria inclusive.

Despite Africa's great potential which includes clean energy resources such as hydropower, solar, wind, and geothermal, these problems continue to persist because investments in new facilities and maintenance of existing infrastructure have been woefully inadequate, leaving many African countries with degraded and inefficient electricity services; poor quality roads, railways, and ports; and an inadequate ICT backbone (USAID, 2009).

Nigeria by its size and population of about 170 million bears at least 20 per cent of this burden, and the citizens are generally disillusioned with the level of development and distrusting of government because not much has been done in the provision of physical infrastructure 55 years after independence.

It is a recurring decimal of pains that the country faces with poor road, water and sanitation conditions, inadequate electricity, gas, and fuel oil supply, leading to high use of solid fuels (fuel woods) especially for domestic chores. As reported by the World Health Organisation, Nigeria has the highest rate of deaths attributable to solid fuel use, at 79,000 annually and four per cent national burden of disease.

The first power station in Nigeria was established by the Public Works Department in Lagos in 1896, with a capacity of 60MW, while the first private electricity company, Nigerian Electricity Supply Company was set up in 1929, with a capacity of 19MW. The scheme, a hydro-electricity plant on Kura Falls was originally meant to supply electricity to the Tin mines in Jos, but later extended its services to Bukuru, Jos Townships and Kafachan. In subsequent years, other exploitable hydro power sites with cumulative potential of over 12,000MW were identified. With 120 years of public sector experience, and 87 years of private sector, what is our story?

The National Integrated Power Project scheme was designed as a fast-track Federal Government initiative to resolve the power supply problem in Nigeria, by expanding Generation, Transmission and Distribution capacities. The scheme was conceived in the late 2004 and implementation commenced in 2006 under the administration of President Olusegun Obasanjo, but ran into a hitch shortly after the new administration of President Umaru Yar'Adua came on board in May 2007. The initial contentious issue was the legality of the funding process. The Revenue Mobilisation Allocation and Fiscal Commission had instituted a

legal action against the mode of utilisation of the proceeds of the excess crude account for the project. As the argument raged on, another controversy arose as to the actual expenditure on the project up to the time. Various amounts were bandied by officials of both the old and the new administration and the media was awash with all manner of sensational news and commentaries. The matter however came to a head when via a motion moved by the Minority Leader, the House of Representatives resolved to have its Committee on Power probe the entire project. President Yar'Adua, in deference to the House, ordered a stop to further fund disbursements to the project until the outcome of the probe. This decision created apprehension among the contractors, and work stopped for a long while until the resumption of payment to contractors and grant of a 70 per cent waiver on charges incurred on all longstanding containers belonging to the NIPP that were lying at the terminal for about three years.

The NIPP is an amalgam of generation, transmission and distribution projects packaged as Engineering Procurement Construction contracts managed by the Niger Delta Power Holding Company incorporated by government for the purpose. The project at the outset, according to the Forum of NIPP Consultants and Contractors, engaged the services of a total of 108 consulting and contracting firms, including 34 consulting and 53 contracting Nigerian firms, with about 5000 Nigerian employees as of August 2007. Now, with this array of experts, how did it happen that feedstock, route reconnaissance and delineation issues were not addressed? How did it happen that the construction of Mambilla Dam with an assured 2,600MW, was not commenced immediately since it had a longer completion timeline, and the NIPP didn't have all the time in the world? Today, we have quite some turbines that have not been cranked years after installation with attendant repercussions.

Could all these and more be due to inadequate planning, negligence and poor management? Could it be due to the fact that the Niger Delta Power Holding Company is managed by a non-engineer? Are the consulting firms, multi-disciplinary partnerships or single family or sole businesses? Are they ACEN firm members? Are these questions even relevant? If not, what are the relevant questions? I engaged a number of important stakeholders and they had so much to say in hush voices. Certainly, engineering, not political questions, as happened in the House of Representatives, need to be asked now as to what really happened that we are where we are at.

The bottom line however is that so much resources have been committed, but of what benefit to the generality of the people? This is the perception among a large segment of the society, and one cannot in good conscience discountenance their opinion. I believe that a technical audit of this project, spearheaded by ACEN is necessary to put paid to the controversies around the projects, learn lessons and develop more sustainable templates for future projects. There are about 200,000km of roads in Nigeria, and 36,000km belong to the Federal government. Of the latter, only about 30 per cent that are in good condition. The shares of the states and local governments are in terribly worse conditions. The issues here revolve around poor institutional arrangements. The Ministry of Works is combining policy formulation with implementation and this is proving Herculean. It is common knowledge that the ministry is the only one without fully enabled parastatals for implementation. The road

sector bills have been on the table since 2008. They were eventually sent to the Seventh National Assembly but there isn't enough interest in them yet.

b) Concept of Crisis Management: Authors of crisis management did suggest various strategies for effective management of crises. Various approaches depend on the situation in question. Important steps to crises management comprise an early identification of the cause, mitigation and management of crises (Warner and Pelfreyman, 2003; Elimeleh, 2007; Brian, 2007; Murawski *et al.,* 2011). The authors confirmed that the end of a crisis does not put a stop to the management activities. Instead, it should be the time that the organization not only enjoys the accomplished success but sits back to reevaluate actions taken so as to prepare a better delivery in subsequent situations.

3. METHODOLOGY

3.1. Research Design

The study employed correlational survey research design. A survey research design seeks to obtain information that describes existing phenomenon by asking individuals about their perceptions, attitudes and values.

3.2. Population of the Study

The population consists of staff from private companies operating in Benue State, such as Ashi Rice, Miva Rice, Tito Randiaries and Gushen Water. The total population was made up of one hundred and sixty (460) staff who have worked for more than 5 years in the above mentioned private firms.

3.3. Sample Size and Sampling Determination

Two hundred and fourteen (214) respondents were chosen for the study through the use of Yaro-Yamene (1967) sample size determination technique.

3.4. Method of Data Collection

Primary data was used in this study. This was made possible by the administration of research questionnaires. Secondary data from literature was used to complement primary data results.

3.5. Data Analysis Techniques

The data for the study was analyzed using computer-based Statistical Package for Social Sciences (SPSS version 21 for Microsoft Windows). Statistics from multiple regression analysis was formally used to test the hypothesis for this study; the t-statistical tests were used to test the individual independent variable influence on the dependent variable.

4. RESULTS AND DISCUSSION

4.1. Survey Response

A total of 214 questionnaires were sent-out and 177 were retrieved; after careful scrutiny, 13 were rejected, because they were defaced or improperly filled. A successful response rate of 82.7% was achieved as 164 of the questionnaires were considered acceptable.

4.2. Test of Hypothesis

Four of the t test values showed significant values, because they are greater than the t-tabulated value of 1.98. The F calculated value is 48.258, which is greater than the F tabulated

value indicating significant relationship between the dependent and independent variables and of hypotheses three. The null hypothesis is rejected while the alternative hypothesis (**H1**) is accepted, which states that, *"there is significant effect of infrastructure on crisis management by agribusiness companies in Benue State".*

Table 9: Infrastructure on Crisis Management (n=164)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.539	0.331		7.674**	0.000
CID	0.604	0.120	0.442	5.041**	0.00
SDP	0.499	0.144	0.358	3.475**	0.001
CIL	0.219	0.056	0.295	3.894**	0.000
EPD	0.047	0.228	0.036	0.206	0.294
CU	0.148	0.045	0.183	3.289**	0.000

Note: Dependent Variable: **Crisis Management**, **Correlation is significant at the 0.01 level (2-tailed), F Calculated value = 48.258 at 0.05, R = 0.790, R^2 = 0.624, CID=contribution to infrastructure development, SDP=sustains developmental projects, CIL=contributes to ICT and learning, EPD=evaluation of developmental programs, CU=crisis are unlikely

Source: SPSS Version 21 for Windows

4.3. Infrastructure and sustainable development and crisis management

Our study is in tandem with Blažević, Tubić and Brdar (2012) which determined crisis management as key to sustainable development of tourist destination**.** The aim of the study is to point out that the responsible management and crisis management in the recessionary economic environment is requirement for the competitiveness of tourist destinations and potential opening of blue ocean to Croatian tourism. The study was conducted on 25 town's tourist associations in Croatia. Economic development in Republic of Croatia requires frenetic changes within the economic system. Therefore, crisis management is aimed at identifying problems and finding effective solutions to promote infrastructure and sustainable economic development during the recession. The current global economic crisis, as well as the perennial Croatia's economic crisis, Sets a number of challenges for the creation of adequate tourism policy. Incentive impulse of economic policy leaders is slow to reflect on the tourism aggregate, so a valid question is: is it not to late for the blue ocean strategy. The concept of socially

responsible business forms latest trends in tourism development that should be considered in the context of the development of tourism and the latest economic and socio-cultural trends.

4.4. Discussion of the Findings

For the model, contribution to infrastructure development, sustains developmental projects, contributes to ICT and learning, evaluation of developmental programs, and crisis are unlikely were very significant in crisis management of companies operating in Benue State. This study is in line with Jega (2010) who emphasized that human (national) development is about meeting and satisfying basic human needs and aspirations, protecting their freedoms and rights, minimising risks to their survival, enhancing human security, and empowering them to tap and maximise their potential (Jega, 2010). Infrastructure are necessary for host communities to develop and maintain a calm status towards the firm operating in its doman . Businesses are recognizing that adopting an effective infrastructure approach to CSR can reduce the risk of business disruptions, open up new opportunities, drive innovation, enhance brand and company reputation and even improve efficiency (Ezeigwe, 2010). Infrastructure is central to sustainable development and economic competitiveness of any nation. A nation without infrastructure is like a body without anatomy. Today, inadequate infrastructure is holding back Africa's economic growth per capita by two per cent each year, and reducing firms' productivity by as much as 40 per cent (ICA, 2010). Sub-Saharan Africa is also lagging behind the rest of the world in its level of infrastructure development, thereby blocking the quick movement of goods and people on the continent and increased transport costs to as much as twice that in any typical Asian country (ICA, 2005).

5. Conclusion

The study's findings indicate that regression coefficients or slopes of infrastructure variables have significant effect on crisis management variables. These findings further support the alternate hypothesis that these regression coefficients or slopes are significantly different from zeros and have predictive powers in estimating crisis management of companies operating in Benue State. The study concludes that, there is significant relationship between infrastructure and crisis management of agribusiness companies operating in Benue State, Nigeria.

6. Recommendations

i. Enacting at least one single laudable infrastructure to serve as an icon by the agribusiness companies to the host communities in Benue State;
ii. Involving important elements in the infrastructural planning and development by the agribusiness companies will go a long way in reducing the tension between the host communities and agribusiness companies; and
iii. Employment of host communities to manage infrastructure put in place by the agribusiness companies will manage crisis in the study area.

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Effect of Promotional Mix Elements on Market Shares of Milk Marketers in Abia State, Nigeria

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Abstract: *The effect of promotional mix elements on the market shares of milk marketers in Abia state, Nigeria was studied. A sample size of 82 was randomly selected from the two major towns in Abia State being Umuahia and Aba. Descriptive statistics and regression analysis were used to determine factors that affect promotional mix on market shares of marketers of milk drink products. Promotional budget provision, product life cycle, competition and government regulations were factors that affect the number of promotional activities embark upon by the marketers of milk drink products while advertising, sales promotion, personal selling, direct marketing were promotional tools that affect market shares of marketers of milk drink products. It was observed that personal selling is the promotional activity mostly practiced among the marketers of milk products. It was recommended that marketers of the products in the study areas see allocation of funds to promotional activities as an investment and not a cost and more so do well to get approval from the right government agency to enable them harness the promotional opportunities.*

Key words: *Promotional mix, Diary products, milk marketers, market shares.*

INTRODUCTION

Our bodies need protein to work properly and to grow or repair tissues within the system. Calcium helps to keep our bones and teeth strong. The calcium in dairy foods is particularly good for us because our bodies absorb it easily (Chinenye, 2009).The total fat content of milk drink products can vary a lot. Fat in milk provides calories for children, but for adults, much fat intake is tantamount to excess energy intake which can cause overweight, cholesterol in the blood, and increased risk of heart attack (Sonny, 2012). Thus, several milk producers and marketers have come up with a variety of milk drink that is befitting for both adult and youth. However, adjustment to suit any class of person(s) that may wish to take the milk product cannot on its own lead to either increased sales or viable market share, but intimating the customers about the change, is the ultimate. Promotion is among the basic variables which the marketing manager uses to reach and influence the decisions of their target audience. Promotion is an exercise in information, persuasion and influence. So, the purpose of

promotion is to reach the targeted consumers and persuade them to buy (Anyanwu, 2010). Promotion has its variables which are known as promotional mix. The promotional mix describes a blend of promotional variables chosen by marketers to help a firm reach its goals. Activities identified as elements of the promotional mix vary, but typically include the following: advertising, personal selling, sales promotion, Public or publicity, direct marketing, corporate image, sponsorship, guerilla marketing, product placement etc. These are variables that when used effectively can make a customer look toward a product (Kotler, 2003). The milk drink producers and marketers have to convey the message about their offerings to the customers by adopting one or more of the promotional mix tools. In selecting appropriate promotional mix, the milk producers and marketers must consider the target audience, the stage of the products' life cycle, characteristics of the products, and decision stages of the products and the channel of distribution (Kotler, 2000). This study therefore seeks to evaluate the effects of promotional mix elements on market shares of milk marketers in Abia State.

Statement of Problem

Most producers use price and product quality as tools for sales, these may apply only if the target population are aware of the existence of these products. The existence, uniqueness and potential benefits of the products must be communicated to customers. This calls for the study of promotional elements that influence and create awareness among the prospective buyers. Several producers of milk drink industries do not assess the stage of the product in the market before selecting the promotional tool. Lack of knowledge on how to encode the massage to enable the decoder assimilate the information is another problem many firm encounter. Knowledge of the nature of the product, nature of the market (customers) will play a part both in choosing the promo mix and massage content but several firms and marketers neglect these variables. The need to harness the promotional mix by the producers and marketers of milk product is part of the worries of this paper as improper use of promotional tool may affect the level of patronage of milk products.

Objectives of the Study

The main objective of the study is to determine the effect of promotional mix tools on market shares of marketers of milk products in Abia State, Nigeria.

The specific objectives are to:

i identify the type of promotional tools mostly applied by the marketers of milk products.

ii determine factors affecting the number of promotional tools used by marketers of milk drink products in the study area

iii evaluate the effect of promotional mix elements on market shares of milk products.

LITERATURE REVIEW

Milk Drink Products

Milk product is organic product with varieties of protein and benefits, with a lot of economic importance in Nigeria and Africa at large (Mark, 2011). Milk consumption pertain are changing as income levels, demography, and tastes have driven the market place. Nigerian has increasingly shown interest in milk products in recent years. Different brands of milk products have sprang up competing with the known brands. Milk product before now was assumed to be mostly for children or students but research carried out by Aneke (2011) show that adults consume reasonable quantity of dairy products.

Samuel (2011) in his research on the consumption patterns of Nigerians on the milk product concluded that current development in the milk industry in Nigeria recorded a number of changes in the last decade (1999-2009), which are determined mainly by the milk as the basic raw material of the dairy industry lost its local character and is distributed beyond the region and country borders. Classic selection of dairy products has changed and extended, the dairy products are offered together with so called 'analog products'which are, for example the alternative to cheese, but are not produced on the basis of milk but vegetable oil, wheat starch, natural cheese flavor and color, production of dairy ingredients has branched out, the use of milk is also moved to catering and fast food. Adedeye (2011) said that consumption of food in Nigeria is mainly affected by some emphasis laid by either religious leaders or culture in the country. He concluded that ability of the firm that produces food products to create good massages that will fit in any classes of people, culture and religious sentiment of their product will help to clear the doubt or sentiment created against their product. Milk Product such as yoghurts and yoghurt milk, acidophilus milk, soured milk, etc faced with such challenges in Nigeria Samuel (2011) concluded.

Emeji (2012) said that lack of adequate information about a product will make prospective consumers not to look toward the product, mostly when the product has substitute. Promotion is exercise in information, persuasion and influence. Since the purpose of promotion is to reach the targeted consumers and pervade them to buy, producers of milk drink product should let their customers know more about their product if not everything. Though milk drink is rich, there is other service added values milk products may give and these values need to be communicated.

Elements of Promotional Mix

Every product needs to be drawn to the attention of the target market, and its benefit identified. The principal methods are; Advertising, Personal Selling, Sales promotion ,Publicity ,Public relation etc

The aim of an organization's promotional strategy is to bring existing or potential customers from a state of relative unawareness of the organization's product to a state of actively adopting the firm's products.

Advertising

Anyanwu (2010) defines Advertising as a process of communication, persuasive information about a product to the markets by means of the written and spoken word. There are five principal media of advertising as follows; the press, commercial television, direct mail, commercial radio and outdoor. Objective of Advertising is to introduce a new product or service; here advertisement attempts to present to the prospective buyers a new product or

service and this usually near a costly and dramatic launching of a new product or service. To expand the market to new buyers; advertisement is done to introduce a product to new buyers who might find interest or usefulness of it, announce modification; a product that is already in the market might want to be given a new face, and then there is need for advertisement to highlight to the consumers that modifications had been done, announce a price change.

Personal Selling

Armstrong (2000) defines it as the process by which the seller sells to the consumer face to face. The personal selling consists of a selling process which is the most expensive form of promotion. Company that use more of personal selling are said to be adopting push strategy while that of advertising are using pull strategy.

Sales Promotion

Sales promotion activities are a form of indirect advertisement, designed to stimulate sales mainly by the use of incentives; Free sample, Twin-pack bargain, Temporary price reduction, Special discount bonus.

Publicity

Publicity differs from other promotional mix in that it is costless most of the time. Publicity according to Cole (1996) is "news about the organization or its products reported in the press". Publicity is a very necessary tool because it creates the good will of an organization. Use of Publicity when properly managed by the Public Relation Officer of an organization can serve the following purposes: it can be used to attract public attention; it can also be used to maintain public visibility and used for the provision of information to the public. Publicity often takes the form of news released or press conferences.

Public Relation

Public relation is another form of promotion. It is the means by which the organization related or communicates with the environment. Public relation is aimed at better customer relations and immediate feedback.

Promotional Mix Strategy

Marketing managers may choose between two alternative strategies to use when promoting their product, which are; Push strategy and Pull strategy.

Push strategy:

When a market uses the push promotion, it means that the product involves "pushing" through distribution channel till it gets to the final consumers. The strategy involves the producer directing his marketing activities towards channels members to induce them to bring the product or promote the product to the final consumers. One major promotional mix use in this strategy is advertising and sales promotion.

Pull strategy

In this strategy, the producer focuses on the final consumers to induce them to buy the product. If the strategy is effective, the consumers demand the product from channel members (middlemen). This is the mostly used strategy. In this strategy, consumer's demand pulls the product through the channel. The two strategies can be applied simultaneously. However the B2C (business to consumer) use more of pull Strategy while the B2B (business to business) use more of the push strategy.

Factors That Influence Selection of Promotional Mix

A marketing manager from one company might decide to focus on social media, whereas a marketing manager from another company might decide to focus her company's efforts on television commercials. Nnoli (2011) opined that budget available, *Stage in the product life cycle of a product, Type of product and type of purchase decision, Target market characteristics and consumers' readiness to purchase, Consumers' preferences for various media, Regulations, competitors, and environmental factors, Availability of media are factors that affect promotional mix.*

RESEARCH METHOD

This study was carried out in Abia State. Abia is one of the five states that make up the South East geopolitical zone of Nigeria and it is located between longitude 04^0 45^1 and 06^0 17^1 North and latitude 07^1 00^1 and 08^0 10^1 East. The population stood about 2,883,99 persons with a relatively high density of 580 persons per square Kilometer (NPC, 2007).

Abia has seventeen (17) local governments with two notable towns which are Aba and Umuahia and there are few industries and big supermarkets that deal on milk drink products on the above mentioned local governments. Major occupations of the people of Abia State are farming and trading as it is pre-dominated by Igbo speaking tribe. The population for this study consists of milk drink marketers in Abia State. A multi-stage- sampling techniques was used to select marketers of milk drink product. These comprised of those selling loya milk, soya milk, nunu milk, peak milk, cowbell etc in Aba and Umuahia Metropolis. Fifty (50) sellers/marketers of milk drink were randomly selected from each of the town given total number of a hundred (100) respondents.

Both descriptive statistics and econometrics tools were used in the analysis. objective (i) was analyzed using descriptive statistics such as mean, frequency tables and percentage while objective (ii) and (iii) were analyzed using multiple regression model.

Model Specification

The model used in determining factors that affect promotional mix of milk products enterprises is thus given:

$$Y = b_0 + bX_1 + bX_2 + bX_3 + bX_4 + bX_5 + Ui \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad 3.1$$

Y = Promotional mix (promotional activities 1, otherwise ,0)

b_0 = the slope of the regression

b_1-b_5 = the coefficient of the X's(independent variables)

X_1 = budget available (Yes =1, No= 0)

X_2 = product life circle (New product=1, otherwise =0)

X_3 = Types of product (Yes=1, No=0)

X_4 = competition (number of rivalry around the marketers)

X_5 = regulations (Yet approved products =1, otherwise 0)

Ui = error term

The model used in determining the effect of promotional mix on market shares of milk drink products is explicitly written:

$MS = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7)$ ……. 2

MS = Market Shares (Number of customers)

X_1 = advertising (₦)

X_2 = sales promotion(₦)

X_3 = personal selling(₦)

X_4 = public relation(₦)

X_5 = Direct Marketing(₦)

X_6 = Experience(number of years in the business)

X_7 = Education

RESULTS AND DISCUSSIONS The results of the analysis done on data obtained for this study are presented and discussed below.

Objective 1: *Types of Promotional tools mostly applied by the producers and marketers of milk products.*

Table1: types of business and mostly applied Promotional strategy

Items	Frequency	Percentages
Personal Selling	35	43
Advertising	16	19.5
Sales Promotion	9	10.5
Direct Marketing	22	27
Total	**82**	**100**
Types of business		
Distribute milk product	21	26
Own retail store	61	74
Total	**82**	**100**

Source: Survey Data, 2017.

Result shows that Promotional strategy mostly applied by the respondents is personal selling 35(58%) followed by direct marketing 22(27%), advertising 16(19.5%) and sales promotion 9(10.5) respectively. The type of business of the respondents were exclusive distributors of milk products and own retail store of milk products. Exclusive distributors of milk products have respondents of 21(26%) while own retail stores of milk products were 61(74%).

Objective 2: *Factors affecting the number of promotional tools used by producers and marketers of milk drink products in the study area*

Table 2: Analysis of factors that affects the number of promotional mix marketers of milk products use.

	Linear	**Exponential**	**Semi-log**	**Exponential**
Constant	**101.008**	**020.234**	**009.321**	**231.22**
	(4.012)* **	**(1.654)***	**(1.543)***	**(2.098)** **
Budget available	054.765	81.098	012.013	22.091
X_1	(6.341)***	(1.612)*	(0.908)	1.453)
Product life cycle	067.876	23.004	143.111	11.921
X_2	(1.845)*	(1.22)	(2.130)**	(1.81)*
Types of product	020.876	12.134	671.43	123.21
X_3	(0.941)	(1.211)	(0.091)	(1.012)
Competition X_4	17.981	009.002	123.03	021.213
	(1.723)*	(1.087)	(0.987)	(1.89)*
Regulation X_5	-091.22	22.120	0.654	12.043
	(1.907)*	(4.213)***	(1.456)	(2.341)**
R^2	0.617	0.439	0.301	0.410
F – ratio	13.932***	1.908*	5.823***	1.870*

Source: Survey Data, 2017.

Values in parenthesis are t- values*Statistical significant at 10%,**Statistical significant at 5%

*** Statistical Significant at 1%.

Linear functional form was chosen as the lead equation. This is base on the number of variables that where significant, the correspondence of the a priori expectation in the model, the high level of R^2 and the goodness of fit of the model (f- ratio).

Budget available was positively related to promotional mix and statistical significant at 1% level. This means that an increase in the budget of the marketers concerning promotion will lead to additional promotional mix to be adopted by the marketers. Product life circle was significant at 10% level and positively related. This indicates that a newly introduced product will increase the number of promotional strategies adopted by the marketers of milk products.

Competition was positively related and statistical significant at 10% level showing that the number of rivalries in the marketing of milk product will also increase the number of promotional strategies adopted by the marketers. Regulations was statistical significant but negatively related to promotional mix at 5% level, indicating that unapproved milk drink products will be less promoted to avoid the government attraction since such products may not have been approved.

Coefficient of determination (R^2), which determines the variations in the dependent variable accounted for by the independent variables included in the model, was 0.617(61%). The F – ratio (13.932), which indicates the goodness of fit of the model was statistical significant at 1% level

Objective 3: *Determining the effect of promotional mix on market shares of marketers milk products*

Table 3: Analysis of effect of promotional mix on marketers' market shares

	Exponential	**Linear**	**Double- Log**	**Semi log**
Constant	342.092	023.124	12.345	032.109
	(4.341)***	**(**3.213)***	(2.123)**	(2.098)**
Advertising X_1	231.009	102.132	009.198	62.012
	(3.094)***	(1.978)*	(2.212)**	(0.123)
Sales PromotionX_2	089.231	1.342	098.23	12.311
	(4.28)***	(1.760)*	(1.431)	(2.981)***
Personal selling X_3	14.091	007.20	031.21	132.01
	(2.121)**	(1.909)*	(2.110)**	(1.232)
Public Relation X_4	087,99	120.8765	187.121	853.101
	(1.448)	(1902)*	(1.870)*	2.876)**
Direct Marketing X_5	092.009	987.001	007.32	143.109
	(1.897)*	(0.009)	(1.409)	(1.980)*
Experience X_6	033.090	21.1231	27.021	110.089
	(1.558)*	(1.092)	(1.00)	(0.002)
Education X_7	912.323	092.992	162.32	0.028
	(0.020)	2.123)**	(1.110)	(0.002)
R^2	0.775	0.612	0.413	0.512
F – ratio	39.574	11.102	10.24	5.810

Source: Survey Data, 2017.

Values in parenthesis are t- values

* Statistical significant at 10% , ** Statistical significant at 5%, *** Statistical Significant at 1%

Based on the number of variables that where significant, the correspondence of the a priori expectation in the model, the high level of R^2 and the goodness of fit of the model (f- ratio)

Exponential functional form was chosen as the lead equation.

The variables significant in the model were Advertising, sales promotion, personal selling, direct marketing and experience. These variables were positively related to market shares indicating that an increase cost in any of the significant variables will lead to an increase in the market shares of marketers of milk product in the studied area. The variables were statistical significant at 1% (Advertising), 1% (sales promotion), 5% (personal selling), 10% (direct marketing) and 10% (experience).

CONCLUSION AND RECOMMENDATIONS

The impact of promotional mix elements on the market shares of milk drink products in Abia state, Nigeria showed that cost of advertising, cost of sales promotion, cost of personal selling, cost of direct marketing and experience were found to have significant impact on the market shares of the milk product marketers. Factors that affect number of promo tools used by the marketers of milk drink products were budget availability, product life circle, and competition and government regulations. Government regulations was negative related to promotional mix indicating that Government policy and activities affect the choice and number of promotional activities a marketer/producers of milk drink product might embark on. If a marketer made availability budget for its promotional activities that will increase the choice of more promotional tools as new product will require increased number of promotional activities to facilitate patronage from customers. Personal selling strategy is the most applied by these marketers in there promotional activities. The business remains profitable and competitive as several brands are there in the market.

Based on the outcome of this study, the researchers recommend thus:

i. Marketers of milk product should see allocation of funds (budgeting) to promotional activities as an investment and not a cost. Better budgetary provision for promotion will bolster the awareness and acceptance of milk products which can culminate in increased market share.
ii. Marketers of milk products should come to terms with the fact that every product has a life cycle, and therefore assess the stage at which their products are in the cycle to enable them adopt the appropriate promotional activity for each stage.
iii. Salesmen should be trained and adequately armed with sufficient knowledge of the products, market conditions, and other information so as to net-in the expected results.
iv. Marketers of milk product should ensure that their products get the required approval from regulatory agencies to avail themselves of the opportunities of using any suitable promotional tool to reach their potential customers.

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Use of Garlic (*Allium Sativum*) as Feed Additive on Growth Performance of African Catfish (*Clarias gariepinus* Burchell, 1822) Reared under Indoor Condition

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Abstract: *Stunted growth in pond and high costs of feed has been reported to be major factors affecting aquaculture growth in Africa including Nigeria. The effects of garlic powder Allium sativum as feed additive on growth performance and Nutrient utilization of Clarias gareipinus fingerlings were investigated. Four iso-nitrogenous diets (40% CP) containing garlic at varying levels of 0%,5%,10%,15% inclusion were formulated and allocated to triplicate groups of Clarias gareipinus at 10 fish per 50litre plastic basin for 56 days. The inclusion levels were based on previous studies on other species of fish. The result shows that although no significant differences were established among the experimental treatments and the control in terms of mean final weight, mean weight gain, specific growth rate, protein efficiency ratio and mean feed intake, these parameters showed increasing trend to level of garlic in the diet, weight gain increased from 10g to 18.31g in the control and the 15% garlic based diets respectively. However, feed conversion ratio decreased with increasing level of garlic in the experimental diets. The study indicates that garlic inclusion at these levels tends to enhance better growth and nutrient utilization by Clarias gareipinus. We recommend that higher levels of inclusions than the one used in this experiment can be tried to further investigate the increasing trends indicated by the present study.*

Keywords: *feed additive, growth promoter, inclusion levels*

INTRODUCTION

To economically produce a healthy high quality fish, good nutrition is an essential factor of consideration. In fish farming nutrition is critical because feed represents 40 – 60% of the production costs. Fish nutrition has advanced dramatically in recent years with the development of new balanced commercial diets that promote optimal fish growth and health (Sahu *et al.,* (2007). The development of new species-specific diet formulations supports the agriculture (fish farming) industry as it expands to satisfy increasing demand for affordable safe and high quality fish and sea food products (Craig and Helfrich, 2002). The success of any fish farming depends largely on the provision of suitable and economical fish feed through which optimum growth can be obtained (Eyo, 1994). The supply of qualitative animal protein in

sufficient quality and at affordable cost has continued to remain a dream yet to be realized. It is a perennial problem and a major challenge to the livestock industry in most developing countries (Sahu*et al*., 2007) High cost of feed due to shortage and availability of conventional feed stuff for compounding livestock rations has been the major cause of rising cost of animal products (Sakiyay, 2010).

Efforts aimed at increasing animal protein supply must necessarily address the competition between man and livestock for feed sources which has often resulted into shortage of such conventional feed stuffs like maize, soya beans, and groundnut cake for compounding livestock feeds (Omage *et al.*, 2008). This limitation imposed by scarcity of the conventional feed stuffs and has made it necessary to source for alternative and cheaper feed materials to relatively unavailable conventional feedstuffs and this will directly reduce production cost and improve profitability. It has been studied and reported that in intensive culture of fish breeding in which the fish are fed artificial feeds, the major recurring cost is the cost of feed which is about 60 – 75% of the operating cost for every cycle (Eyo, 2002).

Recently the use of antibiotics as a growth promoter in diets of fish has been restricted by the government because of the harmful effects on human health (Botsoglu and Fletouris, 2001; Williams 2001 and McCartney, 2002). In view of this shortcoming research interest is now focused on alternatives to antibiotics that may keep fish healthy such as probiotics and plant based immune stimulants (Sahu*et al.,* 2007). In addition, the global demand for safe food has promoted the search for natural alternative growth promoters to be used in aquatic feeds. In concerning evolved of phytobiotic in aquaculture is a relatively new area of research showing promoting results (Cristea *et al.,* 2012).

Garlic is one of such ingredients showing potentials for use as growth promoter. It's a rich source of calcium, phosphorus and vitamin B_1 it has a high content of carbohydrates and as a consequence a high nutritive value. Garlic also contains iodine salts which have a positive effect on the circulatory system and rheumatism, silicate which has positive effects on the skeletal and circulatory system. Garlic also contains vitamin complex B. vitamin A, C and F (Dragan, 2008). Although it has been used as immuno-stimulants, its use as growth promoter in Clarias gariepinus feed has been understudied.

MATERIALS AND METHOD

Study Area

The study was carried out at Fish Nutrition Laboratory of the Department of Fisheries University of Maiduguri.

Source of Experimental fish and Acclimatization procedure

One hundred and twenty (120) *Clarias gariepinus* fingerlings were purchased from Mshelia fish farm in Maiduguri. The fingerlings were brought to the Laboratory in a fifty (50) litre Jerry can at about 5:00pm in the evening so as to avoid afternoon temperature peaks. As soon as we arrived the Laboratory the fingerlings were carefully transferred in to a $1m^2$ concrete pond and allowed to acclimatized for two weeks (14days), during which they were fed the control diets twice daily at 5% of their biomass.

Source and Preparation of Experimental Feed Ingredients

Feed ingredients such as Fish meal, soya bean meal, Corn, premix, table salt, Lysine and methionine, and dried Garlic powder were purchased at Maiduguri Monday market. Each of these ingredients was separately sorted to remove extraneous materials before been milled to obtain the meals following the methods of Hassan et al. (2015) respectively.

Formulation of Experimental Diets.

Each of the ingredients was measured according to the formulation (Table1). The different levels of garlic powder (0%, 5%, 10% and 15%) were then incorporated and thoroughly mixed to obtain a homogenous product. This was followed by addition of water and continues stirring until it formed dough-like consistency which was immediately pelleted using a hand operated pelleting machine. Thereafter, the pelleted feeds were sun dried and packaged in polythene bags in well ventilated room under ambient temperature.

Table 1 Ingredient Composition of Experimental diets

Ingredients	D1(control)	D2 (5%)	D3 (10%)	D4 (15%)
Maize	21.34	20.22	19.20	18.15
Fish meal	32.00	30.40	28.8	27.2
Soya Bean Meal	32.00	30.40	28.8	27.2
Methionine	0.50	0.50	0.50	0.50
Lysine	1.50	1.50	1.50	1.50
Salt	0.50	0.50	0.50	0.50
Binder	1.50	1.50	1.50	1.50
Premix	2.00	2.00	2.00	2.00
Garlic	-	5.00	10.00	15.00

Experimental design and procedure

The experiment was designed to have four (4) treatment replicated three times each. The experimental treatments were labelled as T_1 (0%), T_2 (5%), T_3 (10%) and T_4 (15%) based on the levels of Garlic inclusion. The treatment containing 0% garlic served as control. One hundred and twenty (120) *Clarias gariepinus* fingerlings of mean initial weight (3.2g) were randomly stocked in these treatments at 10fish/container after which they were starved for 24hrs prior to the commencement of the feeding trial. The feeding trial was carried out in plastic containers (50 liters). Fish were fed at 5% of their body mass twice daily and adjusted based on their new weight after every two weeks, during which fish behaviour and mortality were monitored daily and recorded respectively.

Measurement of growth parameters

The following parameters were determined to express fish growth performance and nutrient utilization:

Weight gain =Final weight – initial weight

$$\text{Feed intake} = \frac{\text{mean feed intake}}{\text{Number of days}} \times \text{Number of fish}$$

$$PER = \frac{\text{weight gain}}{\text{protienfed}}$$

$$FCR = \frac{\text{Feed Intake}}{\text{Weight gain}}$$

$$SGR = \frac{\log \text{finalweight} - \log \text{initialweight}}{\text{Time (days)}} \times 100$$

$$\text{Condition factor (K)} = \frac{W}{L^3} \times 100$$

RESULTS AND DISCUSION

The result of the growth performance of the experimental fish in this experiment are presented in Table2.The mean initial weight of the experimental fish which ranged from 3.04g(T_3) to 3.45g(T_4) did not differ significantly ($p<0.05$) between the experimental treatments and the control. This ensured homogeneity of size at commencement of feeding trial. Other growth parameters such as Mean weight gain, specific growth rate, condition factor, survival rate and nutrient utilization parameters such as feed intake, feed conversion ratio, protein efficiency ratio although showed increasing trend to increasing levels of Garlic in the diets did not show significant difference ($p<0.05$) with the control diet. The mean weight gain of the experimental fish ranged from 10.0g(T_1) to 18.3g(T_4), Specific growth rate ranged from 1.05gT_1 to 1.42g(T_4), mean total feed intake ranged from 14.47g(T_1) to 19.97g (T_4), protein efficiency ratio of the experimental fish ranged from 1.80T_1 to 2.78T_2, food conversion ratio ranged from 1.54(T_1) to 1.17(T_4). Although no significant difference was in the result on growth performance, there was generally increase in growth with increasing level of garlic in the experimental diets compared with the control. This result is in line with report of Diab (2002) and Metwally (2009). It therefore shows that garlic as feed additive enhances nutrient utilization which is reflected in improved Protein efficiency ratio (PER). Protein efficiency ratio has been used as an indicative good utilization dietary protein. Protein efficiency ratio (PER) is known to be regulated by the non-protein energy input of the diet and is a good measure of the protein-sparing effect of lipid and carbohydrate (Tibbets *et al.,* 2005). Protein efficiency ratio and feed efficiency are utilized as quality indicator for fish diet and its amino acid balance. Therefore, these factors are used to evaluate protein utilization and turnover (Shalaby et al., 2006). The present results are in agreement with those obtained Sahu et al. (2007) reported that SGR and FCR in fish (Labeo rohita) fed with 0.5, 1% garlic powder/kg diet was not significantly different as compared with those of the control. Another reason for the current may due to reduced palatability as suggested by Horton et al., 1991; Freitas et al., 2001; Bampidis et al., 2005) who reported that garlic did not affect growth performance in livestock fed diet containing garlic because of the pungent smell which may lead to lower diet palatability. The condition factor which ranged between (0.90 and 1.65) is an indication of the general wellbeing of the fish fed graded level of garlic (Table 2).

Table 2. Mean (±SE) Growth Performance and Nutrient Utilization of Clarias gariepinus fed experimental diets

Parameters	**Garlic (*Allium sativum*)inclusion level (%)**

	T_1(0%)	T_2(5%)	T_3(10%)	T_4(15%)
Initial length	6.83±0.32^{ab}	7.27±0.19^{ab}	6.30±0.24^{ab}	6.94±0.78^{ab}
Final length	12.83±0.73^{a}	13.73±2.00^{a}	12.73±0.59^{a}	12.38±1.10^{a}
Initial weight	3.38±027^{a}	3.11±0.64^{a}	3.04±0.30^{a}	3.45±0.40^{a}
Final weight	13.39±2.80^{a}	20.41±13.74^{a}	15.47±1,86^{a}	21.58±4.97^{a}
Weight gain	10.00±2.83^{a}	17.10±13.77^{a}	12.58±1.44^{a}	18.31±4.79^{a}
Specific growth rate	1.05±0.18^{a}	1.35±0.48^{a}	1.30±0.10^{a}	1.42±0.20^{a}
Food conversion ratio	1.54±0.56^{a}	1.33±0.93^{a}	1.28±0.19^{a}	1.17±0.55^{a}
Protein efficiency ratio	1.80±0.82^{a}	2.78±2.18^{a}	1.96±0.32^{a}	2.46±0.98^{a}
Feed intake	14.47±2.24^{a}	15.06±0.58^{a}	16.06±0.73^{a}	19.97±5.06^{a}
Condition factor	1.65±2.10^{a}	0.90±2.89^{a}	1.15±1.60^{a}	0.97±3.59^{a}

Means (±SE) with the same superscripts along the same row are not significantly different ($p<0.05$).

The result of this study is in agreement with the findings of Lagler (1956) who reported a range of values (0.5 to 1.0.) for healthy fish. The general welfare of fish recorded in this study may be due to the protective effect of garlic associated with its antioxidant properties as suggested by Pedraza-Chaverri*et al.* (2000) and Rahman (2003).

Carcass composition is information that relates to nutrient retention and or deposit by fish fed experimental diets. This parameter have been used to assessed nutrient digestibility and availability in experimental animals as it entails to what extent the feed consumed by the animal is retained in its tissues. In this study there was general increase in carcass crude protein of experimental fish fed garlic based diets compared to the fish fed the control diet. The highest value of 62.2% (Table3) was recorded in fish fed highest levels of garlic (T2) and lowest value of 54.32% was obtained in T4. In a related experiment Kamruzzaman, et al. (2011) reported that nitrogen (N) retention is considered as an important index of protein status in ruminants and N digestibility, N absorption and N retention were numerically higher in GS-diet with garlic stem and leaf silage than hay-diet, although N intake was similar. Probably, due to nature of the plants and plenty of bioactive components present in garlic, these parameters might have a positive impact on N balance by influencing microbial proteolytic activities of rumen fluid in sheep and fed with GS-diet. Oi et al. (2001) reported that protein anabolism occurs in rats fed the high protein diet supplemented with garlic. In the present study although there was no significant difference it is in agreement with these findings since carcass protein and protein efficiency showed increasing trend to garlic supplementation in the diet.

Table 3 Carcass Composition of C. gariepinus before and after feeding with Experimental diets

Parameters	Dry Matter	Crude Protein	Lipid	Ash	NFE
T_O	98.68±0.43^{a}	50.00±0.23^{a}	17.0±0.33^{a}	2.0±0.44^{a}	2.0±0.19^{a}
T_1	96.20±0.23^{a}	57.85±0.33^{a}	11.0±0.32^{a}	3.0±0.23^{a}	2.1±0.20^{a}
T_2	95.30±0.22^{a}	62.20±0.30^{a}	9.00±0.43^{a}	1.0±0.22^{a}	1.2±0.23^{a}
T_3	96.90±0.26^{a}	55.14±0.43^{a}	18.0±0.26^{a}	2.0±0.28^{a}	2.2±0.18^{a}
T_4	96.76±0.24^{a}	54.32±0.33^{a}	15.0±0.43^{a}	2.0±0.26^{a}	1.9±0.18^{a}

Means± SE. values having the same super script along a column are not significantly different ($p>0.05$)

T_0= Initial Carcass Analysis; T_1= Treatment 1(0%);T_2= Treatment 2 (5%);T_3= Treatment 3 (10%);T_4= Treatment 4 (15%).

Dietary lipids are important nutrients affecting energy production in most fish and essential for growth and development. But, fish are known to utilize protein preferentially to lipid or carbohydrate as an energy source (Chang sixRa et al. 2012). In present study, lipid in whole body composition of the experimental fish was greatly increased from 11.0% in the control and 18.0% in fish fed 10% garlic based diets. Dietary garlic extract might result in excessive lipid aggregation in whole body because increase in protein utilization for fish fed GE diet could reduce role of lipid as an energy source for growth, so deposition of lipid was higher in garlic based diets group than in control similar to suggestion made by Chang sixRa et al., (2012).The mean temperature ranged between 27.17±0.33 to 28.98±0.77, The mean dissolved oxygen ranged between 6.17±0.03 to 6.30±0.20 and The pH ranged between 7.15±0.06 to 7.28±0.20 respectively. These values are within the ranges recommended for most tropical fish species.

CONCLUSIONS

From the results of this experiment garlic can be effectively used to enhance fish growth and nutrient utilization there by reducing the dependant on synthetic materials of residual consequences as growth promoter.

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Determinants of Market Participation among Women Soybean Farmers in Hawul Local Government Area of Borno State, Nigeria

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Abstract: *This study was conducted to analyse the determinants of market participation among women soybean farmers in Hawul Local Government Area of Borno State. Multistage sampling procedure was used to draw data from 182 respondents with the aid of structured questionnaire. The analytical techniques used included descriptive statistics and Probit regression model. The resultrevealed that the mean age of farmers was 39 years, 67% of farmers were literate with an average household size of 8 persons per household. The mean years of Soybean farming experience was 4 years with farmers having an average of 1.9 hectares of land. Probit model results showed that educational level, nonfarm income, soybean price, credit access, farming experience, cooperative membership and extension visits significantly influenced the likelihood of participation in soybean markets at ($p<0.01$) while farm size and household size significantly influenced market participation at($p<0.05$).Distance to the markets negatively influenced market participation at ($p<0.05$).The study recommends that women farmers should be provided easy access to markets, market information and productive resources in order to achieve maximum market participation.*

Keywords: *Market participation, Women, Soybean, Probit model, Hawul*

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INTRODUCTION

Market is any setting that allows buyers and sellers to exchange any type of goods and services. It provides a link between the local and global economy, thereby facilitates efficiency in the exchange of goods and services (Heyne *et al*., 2014). Through access to different markets, farmers are enabled to access inputs and credit, market their produce and access other consumption goods (FAO, 2009).

Agricultural markets are prerequisites for enhancing agriculture-based economic growth and increasing rural incomes in the medium term particularly for the rural poor households (Makhura, 2001). Market-oriented production systems are essential for improving rural

incomes. Therefore, promoting market-orientation among farmer, especially small farmers in developing countries is pivotal for overall economic development and supply of adequate food. This will involve improving the production and marketing processes as well as capacity for income generation among resource-poor farmers (Omiti *et al.,* 2009). This entails the intensification of agricultural production systems and increased commercialization and specialization in higher-value crops which must be built upon the establishment of efficient and well-functioning markets and trading systems (FAO, 2001).

Market participation is important amongst smallholder farmers andcan be an effective route in increasing incomes and widen opportunities for employment (Dorward *et al.,* 2003; Machethe, 2004). It is essential for small farmers to transform from low production subsistence farming to high level commercial production to leap from poverty (Siziba *et al*. 2011).

In the developing countries, women farmer's participation in agricultural output markets is not equal to that of their male counterparts. Women farmers are disadvantaged because of unequal distribution of resources as well as cultural barriers. Women farmers are more likely to be autarkic than to be net sellers or net buyers (Bellemare and Barret, 2004). This hinders their participation in markets and reduces the earnings from their production activities (Tiruneh *et al.,* 2001). To this end, increased integration of these women smallholder farmers into markets at local, regional and national levels becomes an issue of paramount importance.

Many policy makers and development economists have emphasized the significance of marketing in agricultural and economic development. Market participation is important to smallholder farmers as it offers them benefit such as improve income and create opportunities for rural employment (Dorward, 2003; Machethe, 2004). Therefore, it is important to identify the factors influencing women farmer's market participation in order to propose appropriate policies that could increase farmer incomes and improve the economy. It was against this background that this study was conducted with the view to identifying the main determinants of women farmer's market participation in Soybean markets inorder to recommend appropriate policies that could promote their participation in output markets.

METHODOLOGY

The Study Area

This study wasconducted in HawulLocal government area of Borno State. The area is located in the Southern Guinea Savanna agro-ecological zone and lies between latitudes 10^{o} 15'N – 10^{o} 41'N and longitudes 12^{0} 05' E – 12^{0} 34'E. It has a total land area of about 2,098 square kilometres and total population of 120,314 persons of which 60,319 were women (NPC, 2006). The projected population for the area in 2016 was estimated at 158,814 based on an annual growth rate of 3.2 per cent.The area is bordered to the north by Biu LGA, Shani LGA to the south, Kwaya Kusar to the south west and Askira Uba LGA to the south east.

The climate of the area is characterized by moderate temperature ranging between 20 ^{o}C to 39^{o}C with mean annual rainfall of 1500mm.The climatic condition of the area is favourable for soybean production. Soybean performs well in the savannah zones where rainfall is more than 700mm (Dugje *et al*., 2009). Farming is the most important economic activity in the study

area. The major crops grown and traded in the area include maize, cowpea, sorghum, groundnut, soybean, rice and vegetables such as tomato and pepper (Samuel, 2014).

Sampling Procedure and Data collection

Multistage sampling procedure was used to select respondents for this study. In the first stage, five wards were purposively selected out of the twelve wards in the study area notable for intensive soybean production. These are Kwajaffa Harrang, Marama kidan, Grim danchuba, Shaffa Hizshi and Pama Hutambaya. In the second stage, two communities each were randomly selected from the five wards. In the third stage, proportionate sampling was done to select 25 per cent of women soybean farmers in the earlier selected communities from the sampling frame. A total of 182 respondents were used for the study.The list of soybean women farmers was obtained from the ADP office in the area.

Data were obtained from primary source through the use of structured questionnaire using the interview schedule. Data collectedincluded those on socioeconomic characteristics of the respondents,output levels and prices of soybean.

Analytical Techniques

Descriptive statistics and probit regression model were used to analyse the data collected. The probit model was used to examine analyze those factors influencing market participation of women soybean farmers. The decision to participate in the market is discrete and it takes a value of 1 or 0. In this study, farmers whose proportion of soybean sales was more than 60% were considered as market participants (considering that the respondents were women and the crop was newly introduced as a cash crop). Thus y = 1 if farmers sales exceed threshold level of y (60%) and y = 0 otherwise (Von Braun and Immink, 1994; Goletti, 2005); Ohen *et al*. 2013). The explicit form of the probit model is expressed as:

$$y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \beta 7X7 + \beta 8X8 + \beta 9X9 + \beta 10X10 + \varepsilon i \quad \text{.....equa 1}$$

Where:

y = Binary response (defined a 1 if a farmer participates and 0 otherwise)

β_0= Intercept

β_1- β_{10} = Estimated parameters

X_1 = Level of Education (years)

X_2 = Household size (Number of persons in family)

X_3 = Non- farm income (Naira)

X_4 = Access to credits (yes =1, 0, otherwise)

X_5 = Farming experience (years)

X_6= Cooperative membership (yes = 1, 0, otherwise)

X_7 = Extension visits (yes =1, 0, otherwise)

X_8= Distance to market (km)

X_9 = Price of soybean (Naira)

X_{10} = Farm size (hectares)

ε = Error term

RESULTS AND DISCUSSION

Socio-economic Characteristics of Women Soybean Farmers

The results of the socioeconomic characteristics of the respondents is shown in Table 1.The result revealed that the mean age of therespondents was 39 years,implying that they are in their active age. They could be able to withstand the rigours of marketing. Themajority (68.1%) of the respondents were married. This shows that married farmers have more economic and social responsibilities to meet, hence they could participate more in markets.The mean household size was 8 members. Household size is an indicator of amount of family labour that is available for agricultural activities. This implied the availability of family labour on the farm which could boost production. This also shows that there are many mouths to be fed so demand for food and other consumables is high therefore participation in markets is inevitable where the household would sell to generate income to cater for the needs of its family members.

The result further revealed that 67% of the women farmers were literate having some formal education ranging from primary to tertiary level implying that farmers with formal education tend to be more market oriented, have better access to market information and therefore produce to take advantage of the market environment. Themajority (58.8%) of the respondents had from 1 to 5 years of soybean farming experience. The average number of years of farming experience was 4 years. This could be attributed to the fact that prior to the year 2004, the crop was not grown on a commercial level. An intervention project named PROSAB (Promoting Sustainable Agriculture in Borno State) came in 2004 and introduced the crop as a high valued commercial crop. Theresult showed that the mean farm size was 1.9 hectares. This showed that women farmersin the study area are small scale farmers. This further shows that they could manage their farmlands using household labour for farming activities.

Table 1: Socioeconomic characteristics of women soybean farmers (n = 182)

Variables		Frequency	Percentage	Mean
Age of the respondent (years)				
15-20		18	9.9	39
21-30		40	22.0	
31-40		58	31.9	
41-50		41	22.5	
above 50		25	13.7	
Marital status				
Married		124	68.1	
Single		23	12.6	
Divorced		20	11.0	
Widowed		15	8.2	
Educational qualification (level)				
Non formal education		60	33.0	
Primary		70	38.5	
Secondary		47	25.8	
Tertiary		5	2.7	
Household size				
≤ 5		60	33.0	8
6-10		80	44.0	
11-15		30	16.5	
16 and above		12	6.6	
Yield (kg)				
<300		8	4.4	656.4
301-500		32	17.6	
501-700		65	35.7	
701-900		41	22.5	
901-1100		20	11.8	
Above 1100		16	8.8	
Soybean Farming experience				
<5		107	58.8	4
5-10		68	37.4	
11-15		6	3.3	
Above 15		1	.5	
Farm size (hectares)				
<1	1-2	26	14.3	
2- 4		76	41.8	1.9
4.1-6		66	36.3	
above 6		14	7.7	

Source: Field survey, (2016)

Déterminants of Soybean Market Participation

The result of the probit model is presented in Table 4.2. The ratio statistics indicated by chi-square statistics are highly significant (p< 0.000)suggesting that the model has a strong explanatory power. The pseudo R^2 is 0.7175 indicating the specification fits the data well.The coefficient of level of education (0.359) was positive and significant (P<0.01). This means that as the level of education increases, probability of market participation increases. This could be attributed to the fact that educated farmers are more enlightened, they try to makeinformed decisions that could reduce risks. This is in line with the findings of Makhura (2001) who reported a positive and significant relationship between education and maize producer's market participation.

The coefficient of household size (0.629) was positive and significant (P< 0.05) implying that the larger the household size, the higher the probability of participation in markets. This suggests the availability of family labour for farming and marketing activities. Family members could also be a source obtaining information on an also best practices and market information on current prices of soybean in markets form neighbours and friends. This conforms to the findings of Akunbile (1999)that local farmers keep large family sizes for agricultural purposes.

The coefficient of non-farm income (0.004) was positive and significant (P< 0.01) influencing the likelihood of market participation.This implied that a unit increase in non-farm income will increase the probability of participation by 0.4 units. This suggests that farmers could use money obtained from other sources such as businesses, salaries, employment into purchase of inputs like seeds, fertilizers and chemicals which are critical for increased market share of produce which will require sales thereby improving market participation.

Table 2: Probit analysis fordeterminants of market participation

Variables	Coefficients	Std. Err.	Z-value
Constant	2.11	0.557	3.79***
Level of education	0.359	0.049	7.31***
Household size	0.629	0.327	1.92**
Non-farm income	0.004	0.001	3.81***
Access to credit	1.153	0.202	5.72***
Soybean price	0.663	0.091	7.31***
Farming experience	0.363	0.089	4.09***
Farm size	1.509	0.742	2.03**
Cooperative membership	0.615	0.21	2.92***

Distance to market	-0.513	0.219	-2.34**
Extension contact	0.671	0.09	3.79***
Number of observation	182		
Log likelihood=	-22.08		
LR Chi^2 (10) =	112.12		
Prob > chi^2=	0.0000		
Pseudo R^2=	0.7175		

Source: Field survey, 2016, Note: ***, **, are significant at 1% and 5% respectively

The coefficient of access to credit (1.153) was positive and significant (P< 0.01) indicating that as the farmers access to credits increase, probability to participate in markets will also increase. The farmers who have access to credits are more likely to participate in the markets. This could be attributed to the fact that with access to credit enables farmers to acquire and adopt efficiency and productivity enhancing technologies. Hence more output for marketing.

The coefficient of distance to the market (-0.513) was negative and significantly related to probability market participation (P< 0.05). This means that as distance to market increase, likelihood of participation in markets decreases. Nearness to markets could encourage and increase the likelihood of participation. Farmers living closer to markets could easily convey their produce to markets due to the nearness in distance and can also save on transportation costs by conveying their produce by carts.

The coefficient of soybean price (0.663) was positive and significant (P< 0.01) with market participation. This implied that participation in the market increased with an increase in price of soybean. This is plausible as farmers respond to higher prices which increased their marketing margins. This result conforms to the findings of Jaleta *et al*. (2009) that favourable prices influence participation in markets.

The coefficient of farm size (1.509) was positive and significant (p< 0.05), implying that as farm size increase, the probability of market participation also increases. This could be due to the role of farm size in boosting total production level and thus surplus produce. Farmers with large farm sizes could allocate certain portion of their land for food and for cash crop production giving them better position to participate in output markets. This is in line with the findings of Martey *et al.* (2012) that farm size increases likelihood of participation in markets.

The coefficient of farming experience (0.363) was positive and significant (P< 0.01), meaning that the more the farming experiences of the farmer, the more likely the probability of participation in markets. This could be attributed to the fact that

experienced farmers have accumulated knowledge over the years and are able to forecast prices.The coefficient of extension visits (0.671) was positive and significant ((P< 0.01), implying that probability of participation in markets increased with increased contacts with extension agents. The likely explanation is that agricultural extension workers are the bridge between research programme and farmers and these interactionsprovides farmers with the necessary marketing information on issues such as prices, products demand and availability thus encouraging them to participate he in the market. This finding is consistent with the findings of (Alene *et al.,*2008).

The coefficient of cooperative membership (0.615) was positive and significant (P< 0.01), indicating that the probability of market participation increases when a farmer is in cooperative associations. Cooperatives help their members in marketing their product at reduced cost by pooling their resources together. The female farmer doesn't need to participate in all aspects of the marketing process.

CONCLUSION AND RECOMMENDATIONS

The study concluded that market participation was positively influenced by the socio-economic variables of the farmers. The farmers are likely to shift from non-participation to market participation with an increase in the level of any one of those variables. However to further increase the level of their participation, the study recommends that Government should provide skills acquisition programmes to enhance women farmer'sincome especially during off farm season. This income from non-farm source could be channelled into soybean enterprise improving market participation.Since distance to markets was negatively associated with market participation, there is need to invest in roads, rails and other transport networks in order to achieve increased market participation. This could be done by improvement of rural roads to enhance easy access to markets and lower transportation costs.Government should help in facilitation of agricultural services which are institutional such asincreasing the ratio of farmer to extension worker, development of financial institutions like microfinance banks that would provide soft loans to farmers and also encourage savings for future use.

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