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Strategic Management of Climate Change Challenges to Crop and Livestock Productions in Southern Nigeria

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Abstract
The study investigated strategic management of climate change challenges to crop and livestock production in Southern Nigeria which is currently being threatened by climate change effects/challenges. Crop and livestock production in this area include economic farm products that are currently facing serious climate change threats /challenges. Climate change and agricultural production literature show that the havoc caused by climate change in Nigeria suggests more frightening future threats on agriculture in Africa. This makes it imperative to evolve sustainable strategic management techniques for managing climate change challenges to crop and livestock productions that constitute major farm products in Southern Nigeria. The study adopted a descriptive survey research design. A total of 610 respondents comprising of 266 registered crop farmers, 266 livestock farmers and 78 agricultural extension agents were used as study sample. A questionnaire and focus group discussion guide were the instruments used for data collection. Data were analyzed using the means, standard deviation and t-test statistics. The study revealed the Weaknesses & Threats; Strengths & Opportunities (SWOT analysis) of climate change challenges to crop and livestock productions. It was found among others that: death and low yield of crops and livestock due to drought; heat stress are Weaknesses and Threats while the Strengths and Opportunities include, adoption of species or varieties of crops and breeds of animals that are resistant to drought and heat stress as well as government intervention. It was recommended among others that agricultural scientists and researchers should focus more on developing crops and livestock species that are climate change tolerant.
Key Words: Strategic Management, SWOT Analysis, Climate Change, Crop & Livestock production.

1. Introduction:

Eradication of extreme poverty and hunger, a components and one aim of the millennium development goals, will be unrealializable if the challenges of climate change on earth are not properly addressed. Climate change is the widespread variation in climate which is attributed to human activities especially the burning of fossil fuels, industrial and agricultural activities (Diamas 2006, European Union (EU), 2007). The above human activities release greenhouse gases (GHGs)
such as carbon dioxide, methane, nitrous oxide, water vapour among others, which prevent the reflection of the radiated heat from the heated earth surface back to the atmosphere. This
phenomenon brings about increased global temperature, change in frequency of precipitation,
floods, drought, storms, melting of polar ice cap with its attendant rise in sea level, and the general changes in weather patterns.
Climate change virtually affects every sector of the economy such as health, transportation, manufacturing industries, and agriculture among others. In agricultural sector, crops, livestock and farmers bear the brunt of the impact or challenges of climate change. According to Mugan (2010), a farmer is a person engaged in agriculture. In other words, he/she is one who raises living organisms (livestock and crops) for food or raw materials, has ownership interests in crops or livestock, and provides land and management in their production. In Nigeria, particularly in Southern part, crop produce include tuberous, legumes, carbohydrate, vegetables, tree crops, spices, and fruits among others while livestock products include white Fulani cattle, Zebu cattle, Ndama Cattle, sheep, goats, Pigs, poultry and fishes (Oladipo, 2007).
The impact of climate change on crops and livestock is enormous. Environmental Protection Agency [EPA] (2012) noted that climate change alters animal and crop life cycles, which causes some plants' flowers bloom earlier in spring. Adefalolu in Umeghalu and Okonkwo (2012) reported that temperature rise increases heat stress that cause poultry epidemic in Western Nigeria. Sungno and Mendelsohn (2006) observed that for African farmers, the net income across all farm animals falls as temperature rises, especially for beef cattle. They further predicted average loss of 22% ($8 to $23 billion loss) in expected income from livestock in 2020; 31% ($9 to

$25 billion) by 2060, and 54% ($25 to $ 40 billion) by 2100. This shows a high rate of loss in agricultural products. In support of the above, International Food Policy Research Institute [IFPRI] (2009), noted that agriculture is extremely vulnerable to climate change. The IFPRI also reported that higher temperature reduces yield while higher humidity induces weed and pest proliferation. The institute emphasized that the effects of climate change on agriculture results in short-run crop failure and long- run production decline. Although, there may be gains in crops in some regions of the world, the overall impact of climate change on agriculture is negative. This ugly phenomenon threatens global food security. Therefore it becomes doubtful if the millennium development goal of eradicating poverty and hunger will ever be achieved how much less by 2015 in Nigeria especially in the south.

Devising ways of coping with the impact of climate change on agriculture is therefore essential, if farmers are to meet up with the global food security issues. Such tasks require adoption of serious strategic management techniques for managing climate change challenges to agricultural productions by the farmers. Strategy in the view of Lugman (2011) means plans and innovative ideas that are geared towards achieving a particular purpose. Farmers need to adopt sustainable and effective strategies that will address climate change challenges to agriculture. Such strategies should address the mitigation and adaptation aspects of the challenges. Climate change mitigation is the reduction of greenhouse gas emission, and/or the removal of the already emitted gases from the atmosphere through carbon sinks, e.g. photosynthesis by plants (European Union [E.U.], 2007). Climate change adaptation on the other hand, is about taking deliberate and considered actions to avoid, manage or reduce the consequences of a hotter, drier and more extreme climate, and taking advantage of the opportunities such as extended growing season or more moderate temperature in some colder areas, which such changes may generate (Keenan, 2011). Apparently, climate change phenomenon has come to stay, with its challenges facing all spheres of life especially crop and livestock productions in Southern Nigeria. This study therefore attempted to investigate the extent to which climate change challenges can be strategically managed by SWOT analysis in Southern Nigeria.

1.1. Statement of Problem:

Farmers in Southern Nigeria where the havoc of climate change is severe need effective agricultural extension services to facilitate the adoption of sustainable strategies that will overcome the serious threats posed by climate change on their agricultural products. Expressing high hopes on farmers' agricultural potentials, Koffi Ananan, the chairman of the Alliance for a Green Revolution in African (AGRA), noted that with the 60% of the word's uncultivated arable land in Africa, unleashing the potentials of Africa's agricultural sector is paramount to global food security that is under acute and rising pressure (Arusha and Domfeh, 2012). The above scenario therefore necessitates the need to find out some sustainable strategies for coping with climate change challenges that threaten farmers and their agricultural products in Southern Nigeria. Consequently, the researchers sought for strategic management techniques of managing climate change challenges facing crop and livestock production in Southern Nigeria.

1.2 Purpose of Study:

The purpose of this study is to investigate the Strategic Management of climate change challenges to crop and livestock productions by farmers in Southern Nigeria. Specifically the study will.

i. Identify the Weaknesses & Threats of climate change challenges to crop **production;**
ii. Find out the Weaknesses & Threats of climate change challenges to livestock production;
iii. Determine the Strengths & Opportunities of climate change challenges to crop production
iv. Ascertain the Strengths & Opportunities of climate change challenges to livestock production.

1.3 Research Questions:

To guide the study, the following research questions were posed:

1. What are the Weaknesses & Threats of climate change challenges to crop production?
2. What are the Weaknesses & Threats of climate change challenges to livestock production?
3. What are the Strengths & Opportunities of climate change challenges to crop production?
4. What are the Strengths & Opportunities of climate change challenges to livestock production?

1.4 Hypotheses:

Four null hypotheses were formulated at 0.05 level of significance to guide the study as follows:

Ho_1: There is no significant difference between the mean ratings of the registered crop farmers and the Agricultural extension agents on the Weaknesses & Threats of climate change challenges to crop production.

Ho_2: The difference between the mean ratings of the registered livestock farmers and the extension agents on Weaknesses & Threats of climate change challenges to livestock production is not significant.

Ho_3: There is no significant difference between the mean ratings of the registered crop farmers and the agricultural extension agents on the Strengths & Opportunities of climate change challenges to crop production.

Ho_4: There is no significant difference between the mean ratings of the registered crop farmers and the agricultural extension agents on the Strengths & Opportunities of climate change challenges to crop production.

Ho_5: The difference between the mean ratings of the registered livestock farmers and the extension agents on Strengths & Opportunities of climate change challenges to livestock production is not significant.

2.0 Review of Literature:

Bates, Kundzewicz, Wu and Palutikof in Ludi (2009) emphasized that climate change adaptations in agricultural production include: Adoption of varieties and species of crops with increase resistance to heat stress; shock and drought; Modification of irrigation techniques, including amount, timing , or technology; Adoption of water-efficient technologies to 'harvest' water, conserve soil moisture; and reduce siltation and salt water intrusion; Improved water management to prevent water logging, erosion and nutrient leaching; Modification of crops calendars; and Implementation of seasonal climate forecasting. In his own view, Lotter (2003) stated that adoption of organic agriculture is the answer to climate change impact on crop production. This is because organic farms withstand severe weather conditions better than conventional farms, sometime yielding 70-90% more than conventional farms during droughts.

The implication of the above is that organic farmers use a wide range of integrated pest management practices such as use of beneficial organisms, selection of pest-resistant crops and animals, and use of green pesticides, which are naturally occurring pesticides to prevent pests and diseases. In Nigeria, especially in the south, farmers need the services of the Extension Agents to be encouraged to face the challenge of climate change. Extension Agents are trained agricultural experts who provide agricultural extension services to farmers and are regarded as farmers in this study. Agricultural extension is a service or system that assists farm people, through educational procedures, to improve their farming methods and techniques, increase production efficiency and income, better their levels of living, and lift the social and educational standards of rural life. The extension agents provide agricultural extension services to the farmers, conduct training for farmers to enable them acquire skills on improved methods of crop and livestock production; collect and collate basic information relating to rural programmes; act as link between the farmers and the research institutes; and help to supervise the utilization of agricultural loans (Iwena 2011).

Strategy is a tactic used in serious incidents such as wars. Climate change challenges to agricultural products are considered serious enough by stakeholders (farmers, the government, the entire Nigerians and the world at large, including the researchers) to deserve a strategic attack which this study employed. Strategic Management is severally conceptualized as; a critical analysis of objectives and how to tackle them (Mulcaster (2009;). It involves identifying mission, vision and objectives and assigning resources to achieve them (Nag, Hambrick and Chen 2007). It also involves two approaches which the study is interested in, Prescriptive Approach, that is, – what should 'be done', the best practice or bench approach marks, which identifies the best approach to be followed or adopted and the Descriptive Approach– that is, 'what is' this implies identifying how the strategy can be implemented for best results. Achieve best results (Mintberg in en Wikipedia. org/wiki/Strategic Management 2013). This study is also interested in the view (of www.managementguide.com 2013), which stressed that strategic management must involve SWOT analysis.

SWOT Analysis is an acronym for; S- Strength, which helps in the maximum utilization of resources, involves those qualities needed to achieve mission. It includes an analysis of the expertise, traits and qualities of employees, benefits, capabilities, human competence, resources, and processes, products and services of the organization as well as customers' goodwill, brand, loyalty, indebtedness and committed employees.

W- Weaknesses involve minimization of performances and profits. This includes preventing the organization or entity from achieving full potentials, depreciation materials, insufficient research and development, narrow product range, huge debts, high employee turnover, complex decisions-making processes and large wastage.

O-Opportunities imply making use of available abilities and capabilities presented by the environment when the benefits are taken and utilized for profit. According to the website cited, organizations should recognized opportunities and grab them as a result of market, competition industry, government, technology increased demand, illiteracy and lack of information or knowledge management.

T-Threats involve plans for predictable and unfeasible circumstances that arise when conditions in external environment jeopardize reliability and profitability. According to the website, threats are uncontrollable and keep stability and survival at stake. It involves staff unrest or strike, ever changing technology, increase in complexities and prices, wars, and reduced profit. For the purpose of this study, strengths and opportunities will be combined while weaknesses and threats of the challenges facing climate change will go together.

Many authors such as, (Marilyn & Nixon 2008; Burgus,Schwab & Shelly 2012; Wang, BAI, ZHANG 2010-05) agree that SWOT analysis provides the foundation for realization of desired goals and can be leveraged to realize new opportunities. Literature also indicates that SWOT analysis is an efficient tool for strategic management purposes as its methodology is pervasive due to its simplicity. Marilyn & Nixon (2008) in their study explored the use of SWOT analysis as a tool and how its methodology has been used and changes that can be made. Their findings led to a balanced view of the technique. Also, Wang, BAI, & ZHANG (2010-05)

applied SWOT analysis in their study in the application of strategy selection of agricultural mechanization and found that it is very suitable for realization of maximum strengths of agricultural equipments. Further studies show that in developing countries' livestock systems are characterized by changes driven by population growth and increase in demand with climate change adds considerably to the changes. Thornton, Herreto, Freeman, Mwai, Rege. Jones and McDermott (2007) in their study, "Vulnerability, climate change and livestock- the research opportunities and challenges for poverty alleviation," recommended that more extensive adaptation strategies that are currently occurring are needed to reduce vulnerability in future for livestock production. Based on this recommendation this study was centered on strategic management SWOT analysis as an adaptation strategy of managing climate change effects on crop and livestock production.

Summarily the literatures reviewed indicate the need for improved crop and livestock production in the face of climate change challenges in Nigeria especially in the south. Studies show that with some adaptations these effects can be managed. Strategic management literature show that with SWOT analysis is a simple an effective tool IN strategic management and so the authors deem it fit to use it in this study.

3. Methodology

3.1 Research Design;

A survey research design was used for this study. The study area is Southern Nigeria, consisting of Anambra, Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Ebonyi, Edo, Enugu, Imo, Ogun, Ondo, Osun, Oyo, Lagos and Rivers states of Nigeria. This design is used as it involves collection of data and systematically analyzing and presenting them without any manipulations instead they are studied as they are.

3.2. Population, Sample and Sampling Technique:

The population for the study involves all the extension agents, the registered crop and livestock farmers in the study area affected by 2012 flood disaster and other climate change challenges in Southern Nigeria. Using a purposive stratified sampling technique, a total of 78 that is (266 crop and 266 livestock registered farmers in that category) were selected for the study. In all, 610 respondents were used.

3.3. Instrument for Data Collection:

The instruments for data collection were the SWOT Analysis Climate Change Challenges on Crop and Livestock Production Management Questionnaire (SWOTACLPMQ) and Focus Group Discussion Guide. The SWOTACLPMQ was structured on a four-point rating scale of it Strongly Agree, Agree, Disagree and Strongly Disagree, weighted 4, 3, 2,1point(s) respectively.

It has four clusters**,** and Weaknesses &Threats and Opportunities & Strengths of climate change challenges to crop production with ten and eight items respectively, as well as Weaknesses &Threats and Opportunities & Strengths of climate change challenges to livestock production with
ten and eight items respectively.

3.3.1. Validation and Reliability of the Instrument:

Face validation of the instruments was done by three experts, one in crop science, one expert in Animal Science, both from the Faculty of Agriculture and the other in administration and planning of the department of Educational Foundations, and all from the University of Nigeria, Nsukka. For the trial testing 12 Agricultural Extension Agents and 32 Commercial Agriculture Development Project (CADP) beneficiaries (farmers) from Northern Nigeria that participated in the pilot phase of the project were used. Cronbach Alpha Reliability Co-efficient method was used to determine the reliability of the instrument, which yielded a co-efficient value of 0.87.

3.4. Method of Data Collection:

Data was collected by visiting the extension agents in their offices and giving them the questionnaire to respond to, as well as administer to the registered farmers under them with the help of four research assistants. A total of 610 copies properly completed questionnaires were returned.

3.5 Method of data Analysis:

Data collected were analyzed using means for the research questions and the t-test statistics to test the null hypothesis. To arrive at appropriate decisions, a criterion mean of 2.50 was employed. This implies that any mean score below 2.50 was rejected as a Strength, Weakness, and Opportunity and or Threat of climate change challenge to crop or livestock production and any mean 2.50 and above was accepted for the same reason. In the same vein, if the t-cal value was higher than the t-critical (t-tab) value, the hypothesis was rejected; otherwise it was not rejected. The focus group discussion guide was used to collect qualitative data used to support the quantitative data collected.

4.0 Results:

The results are presented in the tables below in line with the research questions and null hypothesis.

Table 1:Mean responses and t-test analysis of the registered crop farmers and the Agricultural Extension Agents on the Weaknesses and Threats of climate change challenges to crop production. (N_1 = 226, N_2 = 78)

S/N	Item Statements	$\overline{X}_1$	S_1	$\overline{X}_2$	S_2	t-Cal	t-tab	Decision
	A: Weaknesses & Threats of climate change challenges to Crop production							
1	Wilting or withering of crops	4.00	0.00	4.00	0.00	0.00	1.96	N.S.
2	Low yields of crops	3.52	0.50	3.44	0.50	0.89	1.96	N.S.
3	Death of crops due to drought and heat	3.35	0.42	3.12	0.34	-5.30	1.96	N.S
4	Increased incidence of diseases, vectors and pests.	3.64	0.49	3.00	0.00	1.49	1.96	N.S
5	Increased nutrient leaching due to increased precipitation and flooding	3.49	0.50	3.42	0.50	0.08	1.96	N.S
6	Premature dropping of fruits due to high temperature and drought.	3.49	0.50	3.42	0.50	0.08	1.96	N.S.
7	Reduced water availability for crop production due to drought and high temperature.	3.48	0.50	3.56	0.50	-0.89	1.96	N.S.
8	Increased cost of production arising from pest, weed, disease control and increased irrigation requirement	3.33	0.48	3.37	0.47	-0.29	1.96	N.S
9	Extended growing period or season	3.00	0.83	3.37	0.47	-2.18	1.96	N.S.
10	Proliferation of weeds as more species-rich weed flora result from extended growing season that prolonged time for their reproductive phase.	2.84	0.33	2.88	0.30	-0.57	1.96	N.S.
	Overall Table Summary of Result:	**3.41**	**0.45**	**3.36**	**0.36**	**0.59**	**1.96**	**N.S.**

N.B: $\overline{X}_1$ = Mean of Registered Crop Farmers.
$\overline{X}_2$ = Mean of Agricultural Extension Agents
N_1 = 266, N_2 = 78, df = 342
N.S = Not significant.

Table 1 shows that all the respondents from the registered crop farmers and the Agricultural Extension Agents agreed that all the items constitute the Weaknesses & Threats of climate change challenges to crop production as all their mean scores are above the criterion mean of 2.50. The table also shows that there is no significant difference in the mean ratings of the registered crop farmers and the Agricultural Extension Agents on the Weaknesses & Threats of of climate change challenges to crop production. The overall t-cal 0.59 is lower than the t-tab 1.96. The hypothesis that the difference in the mean ratings between the registered crop farmers and the extension agents on weaknesses & threats of climat.e change challenges to crop production is not significant was therefore not rejected.

The focus group discussion guide supported the view that climate change reduced crop yield, increased cost of crop production, and may lead to food insecurity in Nigeria.

Table 2: t-test analysis of the mean responses of the Livestock farmers and the Agricultural Extension Agents on the Weaknesses & Threats of Climate Change challenges to Livestock Production. (N_1 = 226, N_2 = 78.

S/N	Item Statements	$\overline{X}_1$	S_1	$\overline{X}_2$	S_2	t-Cal	t-tab	Remark
	B: Weaknesses & Threats of Climate Change challenges to Livestock Production							
1	Death of livestock due to heat stress, diseases and pests.	3.80	1.10	3.70	0.52	0.96	1.96	N.S.
2	Shortage of water for livestock due to drying up of streams, ponds etc. especially in nomadism	3.25	1.11	3.12	0.40	1.35	1.96	N.S.
3	Shortage of pasture in range land due to drought.	3.60	0.98	3.54	0.50	0.60	1.96	N.S.
4	Increased incidence of livestock diseases.	2.78	0.28	2.70	0.47	0.94	1.96	N.S.
5	Increased incidence of livestock pests especially tse-tse fly due to humidity.	2.70	0.26	2.59	0.45	1.34	1.96	N.S.
6	Reduction in yield especially milk output and weight gain of the farm animals.	3.40	1.12	3.28	0.38	1.26	1.96	N.S.
7	Fall in relative revenue per animal specie	3.58	0.96	3.52	0.49	0.06	1.96	N.S.
8	Shortage of oxygen for marine and estuarine fishes due to high emission of carbon dioxide and high temperature.	2.48	0.94	2.24	0.49	2.43	1.96	S
	Overall Table Summary of Result:	**3.20**	**0.84**	**3.09**	**0.46**	**1.12**	**1.96**	**N.S.**

The table shows that all items (1-7) are accepted as the Weaknesses & Threats of climate change challenges to livestock production. The table also shows that there is no significant difference between the mean ratings of the two groups of the respondents with regards to the weaknesses & threats of climate change challenges to livestock production. The overall t-call of 1.12 is less than the t-cal of 1.96 at 0.05 level of significance. The null hypothesis that there is no significant difference in the opinions of the two groups was therefore not rejected.

The focus group discussion guide showed that climate change affected negatively the livestock production, as livestock products are reduced as well as shortage of pastures.

Table 3
t-test analysis of the mean responses of the registered crop farmers and the Agricultural Extension Agents on the climate change strategies for crop farmers. (N_1 = 226, N_2 = 78

S/N	Item Statements	$\bar{X}_1$	S_1	$\bar{X}_2$	S_2	t-Cal	t-tab	Remark
	C: Strengths &Opportunities of climate change challenges to crop production.							
1	Modification of crop calendars i.e. timing or location of cropping activities	2.94	0.24	3.00	0.00	-2.00	1.96	N.S.
2	Implementation of seasonal climate forecasting	2.88	1.17	2.89	0.44	-0.10	1.96	N.S.
3	Adoption of organic farming system	3.49	0..50	3.18	0.39	3.78	1.96	S
4	Adoption of varieties and species of crops with increased resistance to heat stress, drought etc.	3.56	0.50	3.64	0.48	-1.01	1.96	N.S
5	Adoption of zero tillage practices.	3.61	0.49	3.31	0.34	6.00	1.96	S.
6	Government promotion and adoption of crop insurance policy by the farmers.	2.86	0.34	2.89	0.31	-0.42	1.96	N.S.
7	Development of small-scale irrigation and water harvesting schemes in dry sub-humid semi-arid and arid areas.	2.92	0.27	2.71	0.46	2.53	1.96	S.
8	Promotion of on farm and homestead forestry and agro-forestry practices in dry sub-humid, semi-arid and arid areas.	3.67	0.48	3.37	0.47	2.31	1.96	N.S.
9	Information exchange and diologue between the crop farmers and government (Agric Ministries and Extension Agents) on climate change.	3.65	0.48	3.00	0.00	1.55	1.96	N.S.
10	Capacity building or skill development of crop farmers by the government through training to help the farmers deal with climate change challenges	3.67	0.48	4.00	0.00	-3.30	1.96	N.S.
	Overall/ Table Summary of Result:	**3.33**	**0.50**	**3.18**	**0.29**	**0.93**	**1.96**	**N.S.**

The above table shows the strengths & opportunities of climate change challenges to crop production. The table showed that all the ten items were accepted as strengths & opportunities of climate change challenges to crop production. The overall summary shows that the t-cal of 0.93 is less than the t-tab of 1.96 at 0.05 level of significance. The null hypothesis that there is no significant difference in the opinion of the two groups was upheld.

Focus group discussion guide showed that modification of agricultural calendar and farmers' training on climate change can make them manage the situation.

Table 4: t-test analysis of the mean responses of the registered crop farmers and the Agricultural Extension Agents on Strengths & Opportunities of climate change challenges to Livestock Production. ($N_1 = 226$, $N_2 = 78$

S/N	Item Statements	$\overline{X}_1$	S_1	$\overline{X}_2$	S_2	t-Cal	t-tab	Remark
	D: Strengths & opportunities of climate change challenges to Livestock Production							
1	Improving quality of pastures and grazing land	2.66	1.15	2.55	0.43	1.01	1.96	N.S.
2	Integration of crop and livestock production with efficient crop and forage rotation	3.12	0.34	3.46	0.46	-3.3	1.96	N.S.
3	Use of dietary additives in ruminant farm animals to enhance efficient digestion and reduce methane emission through enteric fermentation	2.90	1.16	2.80	0.45	1.00	1.96	N.S.
4	Improved manure management through cooling and using solid covers for solid tanks, composting of the manure, etc to reduce green house gas emission (GHGs).	3.33	0.50	3.18	0.29	2.00	1.96	.S.
5	Government promotion and adoption of livestock insurance policy by the farmers.	2.96	1.16	3.20	0.45	-2.38	1.96	N.S.
6	Adoption of livestock species and breeds that tolerate environmental stress and changes by farmers.	3.38	1.25	3.33	0.40	0.51	1.96	N.S.
7	Adoption of organic farming practices and Zero Tillage in Pasture production and management.	3.10	1.17	2.89	0.44	2.10	1.96	S.
8	Participation in workshop, seminar Use of training manuals etc geared towards capacity building of livestock farmer in dealing with climate change related new challenges such as new diseased, pests, weather problems.	3.35	1.25	3.30	0.40	0.51	1.96	N.S.
	Overall Table Summary of Result:	**3.10**	**1.00**	**3.09**	**0.42**	**0.18**	**1.96**	**N.S.**

The above table also shows that all the eight items constitute strengths & opportunities of climate change challenges to livestock production. The table also shows that the overall t-cal of 0.18 is less than the t-tab of 1.96 at 0.05 level of significance. The null hypothesis of no significant difference in the opinion of the two groups on the issue was upheld. Focus group discussion guide showed that improving the qualities of pastures and grazing land as well as the use of dietary addictives in ruminant farm animals enhance digestion and reduce methane emission.

5.0. Discussions and Findings:

It was found that the Weaknesses & Threats of climate change challenges to crop production in Southern Nigeria are:

- Wilting or withering of crop
- Low yields of crops
- Death of crops due to drought and heat
- Increased incidence of diseases, vectors and pests.
- Increased nutrient leaching due to increased precipitation and flooding
- Premature dropping of fruits due to high temperature and drought.
- Reduced water availability for crop production due to drought and high temperature.
- Increased cost of production arising from pest, weed, disease control and increased irrigation requirement
- Extended growing period or season
- Proliferation of weeds as more species-rich weed flora result from extended growing season that prolonged time for their reproductive phase and that
- There was no significant difference between the mean ratings of the registered crop farmers and the Agricultural extension agents on the Weaknesses & Threats of climate change challenges to crop production.

This finding agrees with Adefalolu in Umeghalu and Okonkwo (2012), who reported that temperature rise increase heat stress in poultry which lead to heat stress poultry epidemic in Western Nigeria. Sungno and Mendelsohn (2006) also gave credence to the fall in relative revenue per animal species in a report that predicted 22% ($9 to $ 24 billion) loss in expected income of African livestock farmers in 2020, 31% ($9 to 24 billion) by 2060 and 54% ($25 to $ 40 billion) by 2100. The focus group discussion guide data showed that low yield of livestock products, future food insecurity, and poor quality pastures were some challenges of climate change to livestock production.

It also agrees with IFPRI (2009) report that high humidity induces pest proliferation and that climate change generally increases short-run crop failure which threatens global food security. The result of focus group discussion guide showed that climate change resulted in low crop yield and increase in cost of production.

It was also found that the Weaknesses and Threats of climate change challenges to livestock production are:

- Death of livestock due to heat stress, diseases and pests.
- Shortage of water for livestock due to drying up of streams, ponds etc. especially in nomadism
- Shortage of pasture in range land due to drought.
- Increased incidence of livestock diseases.
- Increased incidence of livestock pests especially tsetse fly due to humidity.
- Reduction in yield especially milk output and weight gain of the farm animals.
- Fall in relative revenue per animal species.
- Shortage of oxygen for marine and estuarine fishes due to high emission of carbon dioxide and high temperature and that
- The difference between the mean ratings of the registered livestock farmers and the extension agents on Weaknesses & Threats of climate change challenges to livestock production was not significant.

This finding agrees with Adefalolu in Umeghalu and Okonkwo (2012), who reported that temperature rise increase heat stress in poultry which lead to heat stress poultry epidemic in Western Nigeria. Sungno and Mendelsohn (2006) also gave credence to the fall in relative revenue per animal species in a report that predicted 22% ($9 to $ 24 billion) loss in expected income of African livestock farmers in 2020, 31% ($9 to 24 billion) by 2060 and 54% ($25 to $ 40 billion) by 2100. The focus group discussion guide data showed that low yield of livestock products, future food insecurity, and poor quality pastures were some challenges of climate change to livestock production.

According to the study, the Strengths and Opportunities of climate change challenges to crop production are:

- Modification of crop calendars i.e. timing or location of cropping activities.
- Implementation of seasonal climate forecasting.
- Adoption of organic farming system.
- Adoption of varieties and species of crops with increased resistance to heat stress, drought etc.
- Adoption of zero tillage practices.
- Government promotion and adoption of crop insurance policy by the farmers.
- Development of small-scale irrigation and water harvesting schemes in dry sub-humid semi-arid and arid areas.
- Promotion of on farm and homestead forestry and agro-forestry practices in dry sub-humid, semi-arid and arid d areas.
- Information exchange and dialogue between the crop farmers and government (Agric Ministries and Extension Agents) on climate change.
- Capacity building or skill development of crop farmers by the government through training to help the farmers deal with climate change challenges and that,
- There was no significant difference between the mean ratings of the registered crop farmers and the agricultural extension agents on the Strengths & Opportunities of climate change challenges to crop production and that;

5. The study also found that the Strengths and Opportunities of climate change challenges to livestock production in Southern Nigeria are:

- Improving quality of pastures and grazing land.
- Integration of crop and livestock production with efficient crop and forage rotation.
- Use of dietary additives in ruminant farm animals to enhance efficient digestion and reduce methane emission through enteric fermentation.
- Improved manure management through cooling and using solid covers for solid tanks, composting of the manure, etc to reduce green house gas emission (GHGs).
- Government promotion and adoption of livestock insurance policy by the farmers.

- Adoption of livestock species and breeds that tolerate environmental stress and changes by farmers.
- Adoption of organic farming practices and Zero Tillage in Pasture production and management.
- Participation in workshop, seminar.
- Use of training manuals etc geared towards capacity building of the livestock farmer in dealing with climate change related new challenges such as new diseased, pests, weather problems and that;
- The difference between the mean ratings of the registered livestock farmers and the extension agents on Strengths & Opportunities of climate change challenges to livestock production was not significant.

It is interesting to note that all the ten items constitute the Strengths and Opportunities of climate change challenges to crop production in this study. This is in line with Ludi (2009), who noted that adopting crops with increased resistance to heat stress, shocks and drought such as drought- tolerant African Maize (see www.aatf-africa.org), modification of crops calendars, are effective climate change adaptations in agricultural production. Lotter (2003) equally affirmed adoption of organic farming system as a good coping strategy in crop production, when the author reported that organic farms withstand severe weather conditions better than conventional farms, sometimes yielding 70 – 90% more than conventional farms during droughts.

Finally the above findings agree with Ludi (2009), who stated that promoting crop and livestock insurance by the government and subsequent utilization by the farmers; and adoption of livestock species and breeds that tolerate environmental stress and changes, are climate change adoptions in agricultural production. Iwena (2011), equally affirmed capacity building of livestock farmers in dealing with climate change challenges through training, when he stated that conducting training for farmers to enable them acquire skills on improved methods of livestock production is one of the key roles of agricultural extension agents. The core message from the focus group discussion was that for Southern Nigeria to combat triumphantly the challenges of climate change, all hands must be on deck, and enough money should be voted for, early enough to face the Weaknesses & Threats while utilizing the Strengths as they are waiting strategically to grab available opportunities.

5.1 Conclusion

The vulnerability of agriculture to climate change is such a crucial issue that eradication of extreme poverty and hunger in the world, as contained in the millennium development goal is a difficult task, unless the challenges of climate change on agriculture is properly addressed. The situation is even more disheartening when one considers the fact that the 60% of the world's cultivatable land is in Africa, and much hope is vested in the continent for the global food security. This is a continent predicted to lose 22% ($ 8 to $23 billion) by 2020, 31% ($9 to $ 24 billion) by 2060, 54% ($25 to $40 billion) by 2100, from its livestock sector. Nigeria, which is the most populous country in the continent, is already experiencing heat-stress- Poultry epidemic, flooding and other severe challenges of climate change in its agricultural system. There is no better way than employing the use of Strategic Management in solving this problem the finding of this with study indicate with SWOT analysis climate change challenges to crop and livestock production can
be managed successfully.

5.2 Recommendations

In the midst of the above scenario, it is recommended as follows:

i. Agricultural scientists/researchers in universities and agricultural research institutes should make their researches more relevant by developing species/varieties of crops and species/breeds of livestock that tolerate and produce high yields under environment stress imposed by climate change.
ii. Government should embark on effective capacity building of farmers on how to manage the challenges of climate change on their agricultural productions, through seminars & workshops on Strategic Management and use of training manuals most importantly, via the agricultural extension agents.
iii. Government should make agricultural insurance more effective to protect the farmers from great losses that confront them in their agricultural enterprise, as a result of climate change.
iv. That government and non-governmental organizations should invest more on irrigation facilities to enable farmers cope with the problems of drought and shortage of water.

Promotion of an efficient information flow on climate change and Strategic Management issues among the farmers, agricultural extension agents, meteorologists and other stakeholders, on agriculture and climate change should be dynamic.

References

Arusha, T. & Domtch, K.A. (2012). African green revolution catalyst to *global food security .http:/ /african/ global/ foodsecurity/ climate.php.htem.*

asked questions. *http://epa.gov/ climatechange/faq.html.*

Burgus S. Schwals.C & Shelly, M (2012). Assessing rural coalition that addresses safety & health issues. *Journal of Extension*. 50(2) April. www.joe.org

Diamas, S. (2006). Change: Turn down. Switch off. Recycle. Walk. Make a pledge!

http://www.climatechange.eu.com.
Environmental Protection Agency (EPA), (2012). Climate change questions: Frequently
European Union, [E.U.), (2007). About climate change adaptation. *http://www.clim-atic.org/publications and documents.htm.*
Ezeji, S.C.O.A. (2004). *Basic principles of research in education*. Enugu: Cheston Agency
International Food Policy Research Institute, (IFPRI) (2009). Climate change: Impact on Agriculture and costs of Adaptation. *http://climatechge. impact/ agriculture/ cost/adapt html*.
Iwena, O.A. (2011). *Essential agricultural science for senior secondary schools*. Ogun State, Nigeria: Tonad Publishers Ltd.
Keenan, R. (2011). What is 'climate change adaptation' Victorian centre for climate change adaptation research.*http://climate/change/ adapt/veccar.htm*
Lotter, D.W. (2003). Organic agriculture. *Journal of Sustainable Agriculture* 21 (4).
Ltd.
Ludi, E. (2009). Climate change, water and food security. *http://www.odi.org.uk.*
Lugman, S. (2011). What is strategy? *http:/www.strategy.com.*
Marilyn M. Helms, Judy Nixon, (2010) "Exploring SWOT analysis – where are we now?: A review of academic research from the last decade", *Journal of Strategy and Management*, Vol. 3 Iss: 3, pp.215 – 251.
Mintzberg, S (2003) Strategic Management. en.wikipedia.org/wiki/strategicmanagement. Retreved on May 07, 2013. Muderivation of a discussion of a conversation definition in the field. *Strategic Management Journal* 28(9) 935-9551
Mulcaster, W. R.,(2009). Three strategic framework. *Business Series. 10 (1), 68-75.*
Mugan, P. (2010). Farmer definition *http://en.wikipedia.org/ wiki/agriculture.*
Nag, R., Hambrick, D. E. and Chen, M, J., (2007). *What is strategic management really? Indeli*
Sungno, N. & Mendelsohn, R. (2006). The impact of climate change on livestock management in Africa: A structural Ricardian Analysis. school of forestry and environmental studies, Yale University. *http://climate /mgt /anal.htm*
Thornton, P.,Herrero. M., Freeman,A,Okoyo,M,.Rege,E,Jones,P.,& McDermott, J.,(2007). Vulnerability, climate change and Livestock Research Opportunities and Challenges for Poverty Alleviation, *Open Access Journal 4(1) 1-23.*
Umeghalu, I.C.E. & Okonkwo, J.C. (2012). Mitigating the effect of climate change on Nigerian agricultural production. *Scientific Journal of Agriculture*. *http://www. sjournals.com*.
Wang Zhi-gin, BIA Ren-Pu Zanga Ling-X ian (2010-05). Application of SWOT + HAP method in strategy selection of Agricultural mechanization development in Henan Province China: China Agricultural University Beijing 100083. *en.cnki.com.cm/Article_.en*

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