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Effect of Climate Change on Tillage Implement

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Abstract
Higher temperature and declining rainfall patterns as well as an increasing frequency of extreme climate events (such as droughts and flood) are the expected future climate in the tropics (Mitchell and Tamnner, 2006). In dry areas, moisture is a most limiting factor for crop production and it contribute to insecure household food security in these area rainfalls is less than the potential moisture looses through evaporation and transpiration. Climate is the long-term effect of the sun's radiation on the rotating earth's varied surface and atmosphere. It can be understood most easily in terms of annual or seasonal averages of temperature and precipitation. As the world becomes more aware and concerned about climate change, the agricultural implement manufacturers who wants to transform citizen into customers have become concerned as well. The general objective of this research work is to study effect of climate changes on the usage of tillage implement in Nigeria. The specific objectives of this research work include to; identify the major pattern with effect of sunshine intensity on mechanized tillage equipment and make recommendation based on the findings. The level, appropriate choice and subsequent proper use of mechanized inputs into agriculture has a direct and significant effect on achievable levels of land productivity, labor productivity, the profitability of farming, the sustainability, the environment and, on the quality of life of people engaged in agriculture. Primary data were collected through interview and questionnaire approach, while secondary data are from journals, bulletins, and internet were employed in the study, where 120 respondents were involved in this findings. In order to allow intensity of perception as expressed by respondent participation, 4-point scale was used in the questionnaire design. This aspect of the research work explores deeply the socio-economic characteristic of the respondent [independent variables] on the perception of respondents' on effect of climate change on tillage implement [dependent variable]. The relationship was tested using multiple regression analysis, further analysis were carried out with the help of chi-square to buttress our result. The end result shows that corrosion and implement damage or breakdown are major effect of climate on tillage implement as they are significant at 1.2% and 1.5% respectively . It is also concluded that information dissemination for farmers should be through radio, television, extension workers, and printed materials. Statistical result indicated that there is a great need for government intervention encouraging individual and technocrat to develop renewable energy, in order to solve the aforementioned problem caused by climate change on tillage implement, which invariably affect agricultural production and food security of the nation negatively.

Keywords: Climate, Implement, Tillage, Regression, Corrosion.

1. Introduction
As the world becomes more aware and concerned about climate change, the agricultural implement manufacturers who wants to transform citizen into customers have become concerned as well. Too much rain increase in the soil content and later results in flood and will have effect on the workability or tractor effect which reduce the working hours and income of the owner or operators. This affects production capacity of the farmers negatively.

Mechanization has brought about great improvements in farming over the years, but there is a negative side to the tractors and machinery that make farming so efficient. Each year there are injuries and fatalities among those who work with or near farm machinery. It is paramount to note that there are more accidental deaths in agriculture than any other major industries [Rijk, 1989]. It is noted that farm mechanization activities are the sources of majority of an accidents or injuries happened in farming processes, which usually result to loss of lives, money consuming and time wastage.

Tools, implements, and powered machinery are essential and major inputs to agriculture. The term mechanization is generally used as an overall description of the application of these inputs [Clarke, 2000]. The level, appropriate choice and subsequent proper use of mechanized inputs into agriculture has a direct and significant effect on achievable levels of land productivity, labor productivity, the profitability of farming, the sustainability, the environment and, on the quality of life of people engaged in agriculture.

[Pariyar, 2001] defined farm mechanization as the development and introduction of mechanized assistance of all forms and at any level of sophistication in agricultural production to improve efficiency of human time and labour. The present state of mechanization in Nigeria agriculture is still far from increasing the rate of farming earnings and productivity. This is because mechanization plan has not been formulated following a well-designed, reliable and thorough analysis [Manandhar, 2006a]. Tropical agricultural mechanization involves the use of tools, implements and machines to improve the efficiency of human time and labour. The most appropriate machinery and power source for any operation depends on the work to be done, cultural settings, affordability, availability and technical efficiency of the options. These indications were clearly evident that agricultural mechanization is not an end in itself, but a means of development that must be sustained.

Therefore a socially beneficial agricultural production is determined based on a wide range of social, economic and ecological factors. These factors determine whether a technology is practicable, beneficial, or sustainable in an area.

The agrarian structure of Nigerian agriculture has failed to make adequate contributions to the nation's economic development.

This failure of agricultural industry especially in farm settlement schemes can be attributed to the absence of an appropriate level of agricultural mechanization. [Ijadunola, 2011] observed that the application of human, animal and mechanical equipments in agriculture with reference to technical, socio-economic and cultural constraints of farm can be acknowledged in the continuing official promotion of primitive hand tool technology characterized by low production efficiency. FAO affirmed that Nigeria as a nation from the first decade of the country's independence in 1960 had experienced failure in improving the farm mechanization through various agricultural policies that were implemented.

[Manandhar, 2006b] reported that agricultural mechanization as system engineering requires not only advances in machine development and applications but also the close cooperation of many sections. In recognition of this fact, certain environmental, agricultural, social and economic conditions must be ascertained to favour investments in mechanization technologies and their sustainable use. Timeliness of tillage and planting, weeding and/or harvesting are critical factors where affordable labour is insufficient to permit timely operation. Other key factors that influence successful mechanization include Socio-economic factors, supporting infrastructure, land and other agro-ecological conditions, technical skills and service [Anazodo, 1986].

Objectives of the study

The general objective of this research work is to study effect of climate changes on the usage of tillage implement in Nigeria. The specific objectives of this research work include to; identify the major pattern with effect of sunshine intensity on mechanized tillage equipment and make recommendation based on the findings

Methodology

Overview

The issue of research methodology is central to the collection and analysis of evidence in an empirical study. This section of the paper provides an overview of the research framework adopted in analyzing the effect of climate changes on the usage of tillage implement in Nigeria.

Steps involved in conducting the case study and gathering data through questionnaire, interviews and documentation are highlighted in this section. The techniques for analyzing and interpretation were presented.

This section explains the journey undertaken in answering the research questions. For the purpose of attaining the study objectives listed in chapter one, a combination of different techniques are employed to sufficiently illustrate or evaluate the effect of climate changes on the usage of tillage implement, a case study of six local governments in Lagos State.

Description of the study area

Metropolitan Lagos is located in the south-western part of Nigeria. It lies approximately on longitude 2°42´E and 3°22´E and latitude 6°22´N and 6°52´N. It is the largest metropolitan area in Nigeria [13] . The study area include Ikorodu, Ikeja, Ijanikin, Alimosho, Ojota, and Ikoyi local government area respectively

Lagos metropolis lies generally on low lands, with about 17,500 hectares of built-up area of which residential occupy the single largest portion of 8,939 hectares (51.9%), commercial, 821 hectares (4.8%), Industrial, 1,444hectares (8.4%), Institutional and special use, 2366 hectares (13.7%), Open space, 453 (2.6%) and agriculture, 3,205 (18.6%).

Research Procedure

The data for this study was generated from two main sources; primary data and secondary data

[a] **Primary data:** Primary data was collected with the aid of an interview guide in obtaining opinion and response from the intending target audience. Data included in the interview guide are those on the socio-economic characteristics, effect of farm accident on agriculture in Nigeria, perception of respondents on causes of farm accident, and perception of respondents towards farm accident prevention in Nigeria.

[b] **Secondary data:** The secondary data collected includes data obtainable from recent Journals, Bulletins, National Office of Statistics and information's from the Internet.

Sources of Data and Research Instruments

For the purpose of this study, the primary and secondary data source was used. While the questionnaire serves as the primary source of data, Journals, Magazine, Federal Office of Statistic Bulletins as well as the internet was contacted as secondary sources of information.

The 4-point scale was used in the study for this section because it allows for the intensity of perception as expressed by respondent participation. Respondents could "strongly agree or agree or disagree or strongly disagree" Oscamp (1977) postulated that the Likert method was the initial item pool. The respondents was required to simply tick (√) on the opinion which best satisfied their response.

Also, the research questionnaire was classified into section as follows:

Section A; socioeconomic characteristics of respondent in the study

Section B; Perception of tillage implement operators on climate change.

Section C; Effect of change in climate pattern and intensity on tillage implement.

Section D; Perception of respondents towards prevention of climatic change on tillage implement.

Research Questions and Hypotheses

In view of the above stated problems, this study provided findings to the following questions:

1. What is the attitude and perception of respondents towards climate change in Nigeria?
2. How does climate change affect tillage implement in terms of productivity?
3. What type of effect does climate changes have on agricultural production process in Nigeria economy?

The following hypotheses were tested at 5% significance level

Hypothesis I

Ho 1: Socioeconomic status of the respondents has no significant effect on climate change on tillage implement.

Hypothesis II

Ho 2: Climate change has no significant effect on the attitude of respondents towards the tillage implement.

Hypothesis III

Ho 3: Perception of respondents in climate change prevention has no significance relationship with agricultural production in Nigeria

Administration of the Research Instrument

The nature of the problem necessitates combination of qualitative and quantitative methods for data collection. These include survey method for quantitative data and personal interview for qualitative data. The techniques was used in order to elicit relevant information to the study.

Reliability and Validity Assurance

The content and face validity of the instrument was ensured by showing them to experts on their comments and advice, modification and necessary adjustments towards the research work. The concern for reliability here is the extent to which the researcher can depend on the result that a test produces, or in other words the extent to which such result could be produced consistently. In order to test for accuracy, consistency and stability of a measured instrument, a reliability test using test retest method was carried out.

Section A: Socioeconomic Characteristics

This includes the respondent's age, sex, marital status, naitivity, educational status, income per month, religion, ethnic group, household size, climate awareness with sources, tillage implement availability and state of the facility.

Section B: Perception of tillage implements operators on climate change.

The questionnaire item was constructed with the assistance of expert in testing and measuring its reliability. The instrument used was subjected to four point Likert type scale containing four options which vary from Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD) and scored as follows:

Strongly Agree	1		
Agree		2	
Disagree	3		
Strongly Disagree		4	

Section C: Effect of change in climate pattern and intensity on tillage implements.

The variables related to the effects of change in climate on tillage implement was discussed here, asking how respondents felt about the change in climate, in relation to tillage implement : Very Unserious (VU), Unserious (U), Serious (S), Very Serious (VS) and scored as follows:

Very Unserious	1		
Unserious		2	
Serious	3		
Very Serious		4	

Section D: Perception of respondents towards prevention of climatic change on tillage implements.

The variables related to the solution of change in climate on tillage implement was discussed here, forming a kind of way forward model for respondents about the change in climate, in relation to tillage implement : Strongly Disagree (SD), Disagree (D), Agree (A), Strongly Agree (SA) and scored as follows

Strongly Disagree		1	
Disagree	2		
Agree		3	
Strongly agree		4	

Method of Data Presentation

The data collected through the questionnaire was coded and analyzed using the sample Mean, Frequency, Percentage and Figures on the variables descriptively. Furthermore, this aspect of the research work explores deeply the attitude of respondents towards climate changes on tillage implement in agriculture. The relationship in the hypothesis between the socio-economic variables [independent] and the effect of climate changes on tillage implement in agriculture (dependent) variable was tested using a Correlation and Chi square analysis for Hypothesis 1, 2, and 3 respectively.

The table below shows the summary of the relationship between socio-economic variables [independent] and high cost of maintenance [dependent] using the Durbin-Watson regression analysis.

The lead equation becomes

$$\mathbf{Y = C_0 + C_1X_1 + C_2 X_2 + C_3 X_3 + C_4 X_4 + C_5 X_5 + \ldots\ldots\ldots\ldots\ldots + C_n X_n + \mu}$$ **[Linear Equation]**

where the dependent variable Y is the high cost of maintenance and the independent variable $X_1 - X_7$ with $C_1 - C_7$ as their corresponding coefficient are:

C_0 = Constant
Y = high cost of maintenance
X_1 = Sex
X_2 = Age
X_3 = Marital Status
X_4 = Academic qualification
X_5 = Income (Per month)
X_6 = Household size
X_7 = Ethnic group
X_8 = Religion
μ = error term

Coefficient Of determination (R^2)

It measure the goodness of fit of the regression line, specifically the co-efficient measure the proportion of the dependent variable which is being explained by variation in the independent variables, R2 lies between 1 and 0 the closer it is to 1 the better and close to prediction of the hypothesis

$$R2 = SSR / SST$$

Where

SSR = Regression sum of square
SST = Total sum of square

T- test

The t=test express the level of significant of the difference of the co-efficient of the explanatory variable. This was also used to test the states hypothesis.

$$T = b1 - bb / Sb1$$

Where:

B1 = regression slope coefficient
bb = hypothesized slope
Sb1 = standard error of the slope

F-test

The F-test the overall test of significant of all the variable and the higher the value the better the goodness of the fit of the equation

$$F = MSR / MSE$$

Re –presentation of research question and hypothesis

Hypothesis is one of the most powerful tools that provide dependable knowledge in a research work . There are two hypotheses of this study which are tested using inferential methods of analysis – Chi-square (χ^2) test of goodness of fit. A statistical hypothesis is made up of the null hypothesis (H_o) and the alternative hypothesis (H_a). The null hypothesis is one which renders an assumption insignificant while the alternative hypothesis contradicts the null hypothesis.

The procedure for using the Chi-square (χ^2) is as follows:

a. State the null hypothesis (H_0) and alternative hypothesis (H_1).
b. Construct the contingency table for the observed frequency (O) from the questionnaire.
c. Construct the contingency table for the expected frequency (E) using the formula:

$$E = \frac{sum\ of\ observed\ frequencies}{number\ of\ observed\ frequencies}$$

d. Calculate the Chi-square (χ^2) using the formula:

$$\chi^2_{cal} = \sum \frac{(O-E)^2}{E}$$

e. Determine the table value of Chi-square (χ^2) for one-sample test, at 5% level of significance with (n – 1) degree of freedom, n is the number of rows.

Restatement of Hypothesis
Ho= Null Hypothesis
Ha = Alternative hypothesis

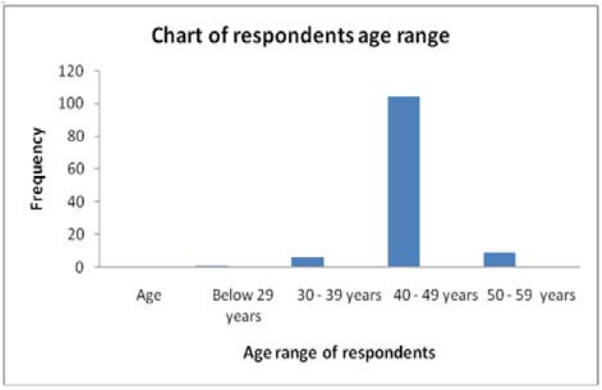
Results

The result was studied in parts, critically analyzed and discussed under various subheadings to follow the study objectives.

Personal Data of Respondents

Age Classification of Respondents

The age distribution of the respondents is described in table 1 below. The age range of respondents was observed to fall between 18 and 59 years. The largest group consist of respondents between the age of 40 – 49 years with a percentage of 86.7% while the lowest group consist of respondent with age between 18 - 29 years which were observed to be 0.8% of the study population.



Description of Respondents by Sex Classification.

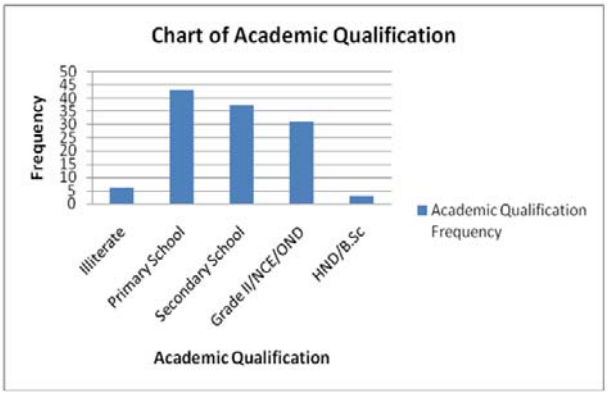
The gender representation of the respondents was categorized into the male and the female category with the male to female proportion observed as 98.3% to 1.7% respectively indicating that more male respondents were interviewed during the research survey period.

Marital Status of Respondent

The marital status of the respondents considered for this study indicated that of the entire population, 98.3% of the respondents are married while 1.7% are single. The findings which make use of 120 respondents on field showed that larger percent of the implement operator are married, which was also complement by the highest age range which is between 40 – 49 years.

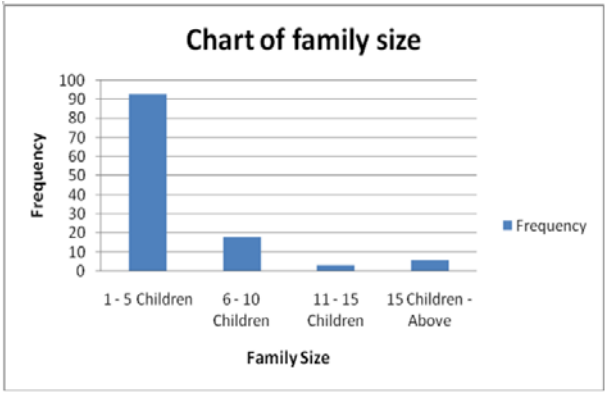
Educational Qualification of Respondents

The educational qualification of the respondents indicated that 5.0% of the study population has no formal educational training. While 35.8% of the respondents witnessed the primary formal education in the study area which is the highest frequency among the implement operator, meanwhile the percentage of respondent with secondary school certificate was observed to be 30.8%. The remaining fraction of 25.8% and 2.5% are those with Grade II/NCE/OND training and HND/B.Sc qualification respectively. This result implies that a weak or low educational status of respondents was witnessed in the study area.



Family Size Classification of Respondents

The household size of respondents in the study area indicated that 1 – 5 capacity of the family size were observed to be the highest with total percentage of 77.5%, while family with 11 – 15 capacity with 2.5% indicate to be the lowest. While the proportion of other respondent was observed to be 15.0% and 5.0% respectively.

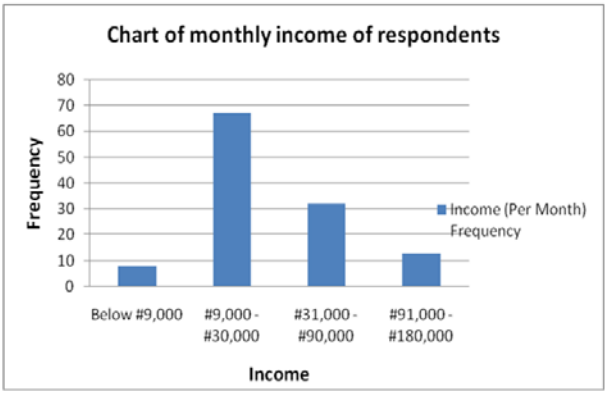


Nativity status

The findings make use of 120 respondents on field, and the table below indicates that 109 respondents which makes 90.8% of the total population and 11 respondents which is 9.2% of the population are non-indigene.

Income (Per Month)

The operator's income is low because of the low educational standard. This analysis has showed that the educational level of the respondents' negatively affect the income. It shows that the highest frequency of the respondent earn between #9,000 - #30,000 which is too low for the family size standard of living, in Lagos state, Nigeria.



Religion of the respondents

Since, the respondents are predominately indigene of Lagos state, which are typical from Yoruba ethnic, the result of the analysis shows that 85.8% are Christian, 11.7% practice Islam, while 2.5% are traditional worshippers. The believe of this type of ethnic group based on their religion in relation to climate is positive.

Climate changes awareness

According to the result of this analysis, it shows that higher percentage of respondents' are aware of the change in climate, while only little percent of the population are not aware of change in climate on tillage implement. The analysis which is based on 120 respondents, shows that 96.7% of the operator are aware of the change in climate, while 3.3% are not aware.

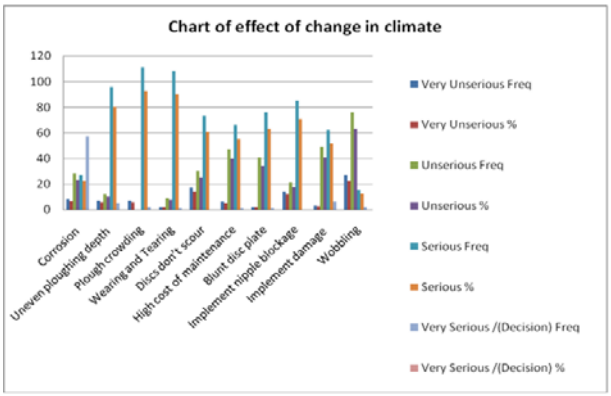
Implement availability and condition

The analysis of the result shows that the study area has almost all the tillage implement, except some of them that those not have slasher. Based on the result of the study, slasher

Effect of change in climate pattern and intensity on tillage implement

The table below describes respondent's perception effect of change in climate pattern and intensity on tillage implement. Their opinion indicate that the effect of change in climate is very significance to tillage implement, which in variably will affect agricultural production and produce. 47.5% of the respondent's showed that corrosion is a very serious problem created by change in climate on tillage implement.

Of the study population, only 63.3% of the respondent rejected the notion that change in climate leads to wobbling hub of the implement while other stated factors like uneven ploughing depth, ploughing crowding, wearing and tearing, disc don't scour, high cost of maintenance, blunt disc plate, implement nipple blockage, and implement damage or breakdown are some of the negative effect of the change in climate on tillage operations.



According to the study population which involves 120 respondents', it reveals that the informal type of education of the operator is one of the major problem caused by climate changes on tillage implement. 70.8%, 63.3%, 61.7% and 50.8% of the respondents' strongly agreed that regular seminar and training, proper maintenance schedule, checking of implement hitching, and applying rust resistance oil or grease, are some of the way of prevention of climate changes on tillage implement.

The result of this analysis also shows that 86.7%, 81.7%, 90.8% and 41.7% agreed that bush burning, spray with chemicals, grease implement through nipple, and standard insurance practices, are also among the solution to climate change on tillage implement.

Discussion

Chi-Square Analysis

The test of relationship between the effect of climate change on tillage among the respondent in the study area indicated that ($P < 0.05$) that is, there is significant effect between the effect of climate change and tillage implement. The test was tested at a 95% confidence interval level. The implication of this result is that, corrosion, wearing and tearing, disc don't scour, high cost of maintenance, blunt disc blade, nipple blockage, implement breakdown and wobbling hub are negative effect caused by change in climate on tillage implement, as they are all significant at 95% confidence interval.

The educational attainment of the respondents as well as their knowledge of change in climate is also a great problem, which affect the income of the operator in relation to their large family size. This will greatly affect the operators' performance negatively on field.

Regression Analysis Result

Because the 'best fit' model was to be considered a selection criteria, such as Model F value, R-square and the significance of the regression coefficients, the linear model has been chosen for further discussion.

The F-value was 4.853, which was significant at 5% level i.e. the socio-economic factors actually had an impact on the climate change on tillage implement in the study area.

The R-SQUARE value was 0.308 which means that the model (corrosion, uneven plough depth, plough crowding, wearing and tearing, disc don't scour, high cost of maintenance, blunt disc plate, implement nipple blockage, implement damage or breakdown, and wobbling hub) has accounted for 30.8% of the variance in the dependent variable.

Considering the impact of each predictor variable, on the criterion variable (climate change affecting land topography), the following findings were deduced.

Corrosion, and implement damage or breakdown was some of the serious effect caused by change in climate on tillage implement and was significant at 1.2%, and 1.5% level respectively. This indicates that the factors are significant to the study.

This means that null hypotheses, Ho1, Ho2, and Ho3 are rejected according to the analysis result.

This indicates that the higher the educational level of the respondent, the higher will be their corresponding safety guidelines that will be followed to manage or reduce the effect of climate change on tillage implement. This analysis shows that there will be occurrence of more climate change on farm if activities of human like bush burning are not reduced. Also in terms of the topology of the land, it has significance inference on climate change in relation to tillage operation.

a Dependent Variable: Climate change affect (land topology)

Conclusion and Recommendation

For a better performance of tillage implement and modern prevention of ozone layer depletion which greatly cause change in climate, all the aforementioned problems characterized by illiteracy level of the operator.

With the problems identified in this study, the following solutions and recommendations are being proffered to address the identified challenges and encourage better performance of implement on field in the study area.

a. **Educational intervention:** Education and training should be organized for operator involved in tractor operation, since most of them have primary school certificate. Also, graduate has to be encouraged to be employed as implement operator. This will really improve farming procedure with use of mechanized equipment.
b. **Spray implement with paints:** In order to avoid rusting of implement, they have to be sprayed with chemicals which will not allow pesticides or soil reaction on the implement.
c. **Grease implement hub:** Since, tractor and its implement have a lot of nipples. Application of lubrication to all the points are very important in order to avoid wearing and tearing, which can leads to damage or breakdown of the system.
d. **Proper maintenance schedule:** Systematic way of servicing or overhauling of the implement must be properly scheduled, in order to allow smooth running of the system. Maintenance of the implement is very important in order to as well avoid breakdown of the whole system component.
e. **Use of renewable energy:** The farmers in the study area need to be introduce to renewable energy source such as wind mill, water mill, solar power, etc for carrying out specific operation on farm. This will greatly reduce the CO_2 emission which greatly destroy the ozone layer, and caused change in climate. According to the analysis, which has been showed to have negative effect on tillage implement.
f. **Standard insurance practices:** Farmers and implement owner, should try as much as possible to have a comprehensive insurance practices on all of their implement and machinery. This will greatly help when there is crisis on any one of the implement without little or no delay in farm work.

Table 1: Age description of respondents in years

Age Category	Frequency	Percent
less than 18 - 29 years	1	0.8
between 30 - 39 years	6	5.0
between 40 - 49 years	104	86.7
between 50 - 59 years	9	7.5
Total	120	100.0

Source: Nigeria Field Survey 2011

Table 2: Sex Classification of Respondent

Sex	Frequency	Percent
Male	118	98.3
Female	2	1.7
Total	130	100.0

Source: Nigeria Field Survey 2011

Table 3: Distribution of Respondents by Marital status

Marital Status	Frequency	Percent
Married	118	98.3
Single	2	1.7
Total	120	100.0

Source: Nigeria Field Survey 2011

Table 4: Educational qualification of respondents

Educational Qualification	Frequency	Percent
Illiterate	6	5.0
Primary School	43	35.8
Secondary School	37	30.8
Grade II/NCE/OND	31	25.8
HND/B.Sc	3	2.5
Total	120	100.0

Source: Nigeria Field Survey 2011

Table 5: Family size description of respondents

Family Size	**Frequency**	**Percent**
1 – 5 Children	93	77.5
6 – 10 Children	18	15.0
11 – 15 Children	3	2.5
15 Children - Above	6	5.0
Total	120	100.0

Source: Nigeria Field Survey 2011

Table 6: Nativity status

Nativity	Frequency	Percent
Indigene	109	90.8
Non - Indigene	11	9.2
Total	120	100.0

Source: Nigeria Field Survey 2011

Table 7: Income (Per Month)

Income	Frequency	Percent
Below #9,000	8	6.7
#9,000 - #30,000	67	55.8
#31,000 - #90,000	32	26.7
#91,000 - #180,000	13	10.8
Total	120	100.0

Source: Nigeria Field Survey 2011

Table 8: Religion of the respondents

Religion	Frequency	Percent
Christianity	103	85.8
Islam	14	11.7
Traditional	3	2.5
Total	120	100.0

Source: Nigeria Field Survey 2011

Table 9: Climate change awareness

Awareness	Frequency	Percent
Yes	116	96.7
No	4	3.3
Total	120	100.0

Source: Nigeria Field Survey 2011

Table 10: Implement availability and condition

Implement	Condition	Frequency	Percent
Plough	Available & Very Good	111	92.5
	Available & Good	3	2.5
	Available But Poor	1	0.8
	Not Available	5	4.2
	Total	120	100.0
Harrow	Available & Very Good	114	95.0
	Available & Good	2	1.7
	Not Available	4	3.3
	Total	120	100.0
Ridger	Available & Very Good	114	95.0
	Available & Good	1	0.8
	Not Available	5	4.2
	Total	120	100.0
Planter	Available & Very Good	25	20.8
	Available & Good	1	0.8
	Not Available	94	78.3
	Total	120	100.0
Slasher	Available & Very Good	18	15.0
	Available & Good	1	0.8
	Available & Fair	22	18.3
	Available But Poor	2	1.7
	Not Available	77	64.2
	Total	120	100.0

Source: Nigeria Field Survey 2011

Table 11: Effect of change in climate pattern and intensity on tillage implement (n = 120)

	Very Unserious		Unserious		Serious		Very Serious /(Decision)	
	Freq	%	Freq	%	Freq	%	Freq	%
Corrosion	8	6.7	28	23.3	27	22.5	57	47.5/(VS)
Uneven ploughing depth	7	5.8	12	10.0	96	80.0	5	4.2/(S)
Plough crowding	7	5.8	-	-	111	92.5	2	1.7/(S)
Wearing and Tearing	2	1.7	9	7.5	108	90.0	1	0.8/(S)
Discs don't scour	17	14.2	30	25.0	73	60.8	-	-/(S)
High cost of maintenance	6	5.0	47	39.2	66	55.0	1	0.8/(S)
Blunt disc plate	2	1.7	41	34.2	76	63.3	1	0.8/(S)
Implement nipple blockage	14	11.7	21	17.5	85	70.8	-	-/(S)
Implement damage	3	2.5	49	40.8	62	51.7	6	5/(S)
Wobbling	27	22.5	76	63.3	15	12.5	2	1.7/(U)

Source: Nigeria Field Survey 2011

Table 12: Perception of respondents towards prevention of climatic change on tillage implement (n = 120)

	Strongly Disagree		Disagree		Agree		Strongly Agree/Decision	
	Freq	%	Freq	%	Freq	%	Freq	%
Reduction in human activities like bush burning	-	-	13	10.8	104	86.7	3	2.5/(A)
Regular seminar and training	3	2.5	5	4.2	27	22.5	85	70.8/(SA)
Spray implement with chemicals	-	-	4	3.3	109	90.8	7	5.8/(A)
Grease implement hub via nipple	-	-	6	5.0	98	81.7	16	13.3/(A)
Employing skilled operator	4	3.3	78	65.0	34	28.3	4	3.3/(D)
Proper maintenance schedule	2	1.7	3	2.5	39	32.5	76	63.3/(SA)
Check implement for proper hitching	2	1.7	5	4.2	39	32.5	74	61.7/(SA)
Apply rust resistance oil or grease	-	-	7	5.8	52	43.3	61	50.8/(SA)
Use of renewable energy on farm	13	10.8	50	41.7	40	33.3	17	14.2/(D)
Standard insurance practices	50	41.7	30	25.0	34	28.3	6	5.0/(A)

Source: Nigeria Field Survey 2011

Table 13: Chi-Square analysis

Pearson Chi-Square	Value	Df	Asymp. Sig. (2-sided)	Decision
Corrosion	40.867(a)	3	.011	S
Uneven plough depth	194.867(a)	3	.167	NS
Plough crowding	189.350(a)	2	.482	NS
Wearing and tearing	271.667(a)	3	.026	S
Disc don't scour	42.950(a)	2	.000	S
High cost of maintenance	100.067(a)	3	.000	S
Blunt disc plate	123.867(a)	3	.000	S
Nipple blockage	76.550(a)	2	.000	S
Implement breakdown	89.667(a)	3	.001	S
Wobbling hub	104.467(a)	3	.001	S

S = Significant
NS = Not Significant

Table 14: Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.555(a)	.308	.245	.50621

ANOVA (b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.435	10	1.244	4.853	.000(a)
	Residual	27.931	109	.256		
	Total	40.367	119			

Source: Nigeria Field Survey 2011

Coefficients (a)

Model		Unstandardized Coefficients		Standardize Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.676	0.603		2.778	0.006
	Corrosion	-.348	.136	-.239	-2.556	.012
	Uneven plough depth	-.258	.217	-.120	-1.189	.237
	Plough crowding	1.245	.787	.220	1.583	.116
	Wearing and tearing	.376	.468	.113	.802	.424
	Disc don't scour	.118	.216	.077	.548	.585
	High cost of maintenance	-.038	.247	-.018	-.153	.878
	Blunt disc plate	-.117	.298	-.049	-.394	.695
	Implement nipple blockage	-.606	.246	-.274	-2.470	.015
	Implement breakdown	-.606	.246	-.274	-2.470	.015
	Wobbling hub	-.208	.198	-.127	-1.048	.297

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