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EDITORIAL

This edition of the Journal of Researches in Agricultural Sciences is a reflection of two major changes that have taken place, since the last edition. First, three erstwhile universities in the state (University of Ado-Ekiti, University of Education, Ikere-Ekiti and University of Science and Technology, Ifaki-Ekiti) which had agriculture in their programmes were merged into one –Ekiti State University, Ado-Ekiti. Second, the Board of Editors of the Journal published by the Faculty of Agricultural Sciences was re-constituted with the mandate to revive the Journal and ensure the regular publication of pre-determined volumes per year. Thus, the Journal had been re-packaged to accommodate the ever-expanding curriculum in agriculture and the activities of researchers in meeting the current challenges encountered in the drive for food and nutrition security.

The articles in this edition have been blind peer-reviewed in line with the time-honoured tenets of international research journalism. It has become obvious that the desire to re-register the presence of the Journal in the academic community through online publication in response to the expansion in readership/referencing, subscription and submission of articles. The website being designed will offer the interested researchers the opportunity to visit the Journal online for needed information. This development would guarantee the regular publication of the Journal.

The Editorial Board appreciates the concern of the Dean and Board of the Faculty of Agricultural Sciences on the need to revive the Journal. The efforts of all contributors who promptly attended to comments made during the review process and the reviewers who took the time to add value to the quality of the papers submitted for publication are appreciated. It is our desire to get better with each edition.

Thank you.

Professor O. J. Ayodele
Editor-in-Chief.

AIMS AND SCOPE

The Journal of Researches in Agricultural Sciences publishes original articles and reviews in agriculture and related interdisciplinary studies that explore and exploit the production of food for mankind. It also publishes scientific works related to strategic and applied studies in all aspects of agricultural science.

The Journal publishes regular issues as well as special issues including symposia, conferences etc.

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Please note that these Instructions include guidelines that are specific to the Journal of Researches in Agricultural Sciences.

Author representations

Submission of a manuscript implies: that the work described has not been published before; that it is not under consideration for publication anywhere else; that its publication has been approved by all co-authors, if any, as well as by the responsible authorities at the institution where the work has been carried out.

Online submission

Authors must submit their manuscripts online via the Journal of Researches in Agricultural Sciences Editorial Manager at jras.foas@gmail.com, or foas.jras@eksu.edu.ng

Regular articles

Regular articles report original research on, or techniques for studying, the fundamental relationships between natural resources utilization and agricultural productivity.

Articles in special issues

Special issues are collections of themed articles, sometimes arising from conferences, symposia or other notable events. Only full papers of the same standard as regular articles will be considered for publication in special issues. Articles submitted to the Journal for inclusion in special issues are subjected to the same editorial processes as regular articles.

Reviews

Review articles are intended to be comprehensive summaries of topical issues in particular aspects of agricultural science. Prospective authors of reviews should contact the Editor-in-Chief before preparing such articles.

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Cover letter

All submissions must include a cover letter that includes:

- i. A confirmation of author representations that the work described has not been published before; it is not under consideration for publication anywhere else, and publication has been approved by all co-authors.
- ii. A statement of the novelty and significance of the work and the relevance to the mission of the Journal of Researches in Agricultural Sciences.
- iii. Names, affiliations and E-mail addresses of at least three suitable referees, together with a brief statement of why they are qualified to evaluate the manuscript. Referees should be selected from institutions other than those of the author(s).
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Title page

The title page should include:

- The name(s) of the author(s), with symbols to link each name with that author's institutional affiliation and an asterisk to denote the corresponding author
- A concise and informative title
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Abstract

The abstract should be 150 to 250 words. The content should state the main purposes and research questions of the study, the methods used, the main results, and the key conclusions.

Keywords

Authors should provide 4 to 6 keywords, which can be used for indexing purposes.

Main body

Manuscripts describing original research will typically include the following sections: *Introduction*: a concise, up-to-date description of the background to provide a general reader of the Journal with enough context to understand the research being presented and its significance, as well as providing a clear statement of the research question and any hypotheses being explored. *Materials and methods*: techniques, materials, and equipment described in sufficient detail for another trained researcher to be able to reproduce the experimental work reported. Methods that are identical to published procedures should be summarized and include a citation to the original work.

Data Analysis: in submissions that have a significant theoretical or mathematical component, a description of the analytical procedures may be required.

Results: a description of the analyses and measurements related to answering the central research questions.

Discussion: the interpretation of the results, considering their significance, and putting them into a wider context through comparison with previously published research. The use of a combined “Results and Discussion” section is preferred as the format for the journal.

Conclusions: a concise statement of the main conclusions drawn from the research reported in the manuscript.

Acknowledgments: a list of people who contributed to the work in the manuscript but who are not named in the author list, and a list of funding sources that supported the research presented.

Text

Text formatting

Manuscripts should be submitted in Microsoft Word.

Use a normal, plain font (e.g., 12-point Times New Roman) for text.

Use italics for scientific names.

Use the automatic page numbering function to number the pages.

Do not use field functions.

Use tab stops or other commands for indents, not the space bar.

Use the table function, not spreadsheets, to make tables.

Use the equation editor or Math-Type for equations.

Save your file in docx format (Word 2007 or higher) or doc format (older Word versions).

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No more than three levels of displayed headings should be used.

Abbreviations

Abbreviations should be defined at the point of first use and be used consistently thereafter.

Abbreviations defined in the abstract should be redefined in the main body of the submission.

Scientific style

Internationally-accepted signs and symbols for units (SI units) should be used throughout. Negative exponents should be used instead of a slash, e.g., m s^{-2} rather than m/s^2 .

Nomenclature: In so far as possible, authors should use systematic names similar to those used by Chemical Abstracts Service or IUPAC.

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The list of references should only include works that are cited in the text and that have been published or accepted for publication. Personal communications and unpublished works should only be mentioned in the text.

Reference should be arranged in alphabetical order (APA format) of authors' names at the end of the paper. Each should be given in the following form: authors' names, year of publication, the title of paper, the title of the journal in full and italicized, volume number, first and last page e.g.

Braimah, A. K. (2000). Land evaluation for sorghum. *Nigerian Journal of Soil Science* 12:4-11.

Kilmer V. J. (1990). *Handbook of Soils and Climate in Agriculture*. CRC Press, Boca Ratio. In the text, reference should be given by the name of the author, followed by the year of publication in brackets. The letters, a, b, etc. should be used to distinguish between papers published by the same author in a single year.

Assessment of Knowledge, Attitude, Practices of Community-Integrated Management of Childhood Illness Practices among Rural Nursing Mothers in Ogun State, Nigeria

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Abstract: Community Integrated Management of Childhood Illness (C-IMCI) practice combines improved case management of childhood illness with aspects of nutrition, disease prevention, appropriate home care, normal growth, and development of children less than five years old. This study assessed the socio-economic characteristics, attitude, knowledge, and practices of C-IMCI practices among rural nursing mothers in Ogun State. Convenience sampling technique was used to select 210 nursing mothers from Odeda and Obafemi-Owode Local Government Areas of Ogun State during the monthly immunization programme schedule at the Primary Health Centres. Data were collected with the aid of interview guide and analyzed using frequency counts and percentages. The mean age of the respondents was 28.0 years, 77.5% had some form of education, 71.1% practiced Christian religion and the monthly income was ₦16,294. 00 while the household size was 5. Also, most of the nursing mothers were highly knowledgeable on C-IMCI practice (90.5%), had a favourable attitude toward patronage of hospitals for post-natal services (57.5%) and were favourably disposed to breastfeeding their child within an hour of birth (72.0%). The study, therefore, concluded that the nursing mothers were highly knowledgeable, favourably disposed to C-IMCI practices and utilized the C-IMCI practices. It is recommended that efforts should be directed towards improving the knowledge of C-IMCI practices among nursing mothers, especially in the rural areas of the state.

Keywords: Community Integrated Management of Childhood Illness, knowledge, nursing mothers.

Introduction Children under five years of age bear a disproportionate share of the global burden of disease. Although major gains have been made in reducing childhood mortality during previous decades, stagnation or even reversals of the trends has been observed recently in many countries. Of the nearly 10.5 million annual deaths among children aged five years and below, over 70% can be attributed to five primary causes: pneumonia, diarrhoea, malaria, measles, and malnutrition. One of the interventions has been to create vertical disease-specific programmes directed at each of these causes at both global and national levels. Some of the successes of these vertical programmes are the widespread acceptance and use of oral hydration therapy (ORT) and increased immunization coverage in many countries.

However, the presence of multiple disease-specific programmes has contributed to a number of administrative, political and technical difficulties in delivery of health services. In response to these concerns, the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) have developed a new strategy known as Integrated Management of Childhood Illness (IMCI) which provides a holistic approach to managing sick children. IMCI is a broad strategy designed to reduce childhood mortality, morbidity and disability in developing countries, and to contribute to

improved growth and development of children less than five years of age.

The IMCI strategy sets priorities to address the problems that have the greatest impact on child survival, growth and development. These problems include: malnutrition, micronutrient deficiency, HIV/AIDS which are underlying causes of mortality in up to 30% of cases, acute respiratory infections which cause over 2 million child deaths per year, diarrhoea which causes 1.2 million child deaths per year, vaccine-preventable diseases such as measles, malaria which account for more than 600,000 child deaths per year (UNICEF, 1999). The integrated management of childhood illness includes interventions meant to promote growth and development, prevent illness and respond to it appropriately when it does occur. These interventions may take place in the health facility centre or in the home and are supported by the three components of the strategy:

Component 1: Improving case management skills of health providers through training, using locally adapted guidelines.

Component 2: Improving the health system by strengthening district health planning and management, making available essential drugs and supplies required for effective case management, providing quality support and supervision at health facilities, improving referral

and health information systems and organizing work efficiently at the health facility.

Component 3: Improving family and community practices by promoting those practices with the greatest potential for improving child survival, growth and development (henceforth referred to as Community IMCI or C-IMCI).

Below are **16 Key Family Practices** meant to decrease mortality and morbidity in children under five and enable them to grow and develop (WHO, 2004).

For Physical Growth and Mental Development

1. Breastfeed infants exclusively for at least six months. (HIV-positive mothers need special counseling on infant feeding to understand and practice the safest options.)
2. Starting at about six months of age, feed children freshly prepared energy and nutrient-rich complementary foods, while continuing to breastfeed up to two years or longer.
3. Ensure that children receive adequate amounts of micronutrients (vitamin A and iron, in particular), either in their diets or through supplementation.
4. Promote mental and social development by responding to a child's needs for care through talking, playing, and providing a stimulating environment.

For Disease Prevention

5. Take children as scheduled to complete the full course of immunizations (BCG, DPT, OPV, and measles) before their first birthdays.
6. Dispose faeces (including children's faeces) safely; wash hands after defecation, before preparing meals, and before feeding children.
7. Protect children in malaria-endemic areas by ensuring that they sleep under treated mosquito nets.
8. Adopt and sustain appropriate behavior regarding prevention and care for HIV/AIDS affected people, including orphans.

For Appropriate Home Care

9. Continue to feed and offer more fluids, including breast milk, to children when they are sick.
10. Give sick children appropriate home treatment for infections.
11. Take appropriate actions to prevent and manage child injuries and accidents.
12. Prevent child abuse and neglect and take appropriate action when it has occurred.
13. Ensure that men actively participate in

providing childcare and are involved in the reproductive health of the family.

Care seeking

14. Recognize when sick children need treatment outside the home and seek care from appropriate health care providers.
15. Follow the health worker's advice about treatment, follow-up and referral.
16. Ensure that every pregnant woman has adequate antenatal care. This includes having at least four antenatal visits with an appropriate health care provider and receiving the recommended doses of the tetanus toxoid vaccination. The mother also needs support from her family and community in seeking care at the time of delivery and during the postpartum and lactation period.

The attitude and knowledge that people have concerning and towards health care system may affect their usage of the available services. For instance, practices of C-IMCI practices may be heavily influenced by the nursing mothers' knowledge and attitude. Nursing mothers with a higher level of knowledge about the usefulness of C-IMCI practices will tend to utilize them compared to those with low knowledge of its importance. Research has shown that residents of rural communities experience poor health outcomes and exhibit higher health needs than residents in the urban communities. Therefore, there is a need to focus adequate attention on the health needs of rural people especially the children.

Knowledge requires awareness, experience, and observation. Awareness is not the same as knowledge which relates to the degree or level of information the nursing mothers have received and internalized on the C-IMCI practices. It should, therefore, be noted that knowledge of C-IMCI practices is expected to be determined by the level of its awareness and training provided to the people. These are, in turn, influenced by the level of education, religion, marital status, age and other socio-economic characteristics. For instance, the knowledge that people have concerning and towards health care system may affect their usage of the available services. Therefore, to achieve the overall objective, this study specifically described the socio-economic characteristics of nursing mothers; and determined the knowledge and attitude of C-IMCI practices among the respondents.

Methodology

The study was conducted in Ogun State in south-western Nigeria. Odeda and Obafemi-Owode Local Government Areas were purposively selected for the study because of the availability and functional C-IMCI practices in their Primary Health Centres (PHC's). Four (4) wards in Odeda Local Government Area (namely: Alabata, Olodo, Osiele, Orile-Ilugun) and three (3) wards in Obafemi-Owode Local Government Area (namely: Ajebo, Obafemi, Ofada) were purposively selected. The existing PHC per ward was selected thus yielding seven Primary Health Centres for the study. Convenience sampling technique was used to select thirty (30) nursing mothers from each of the PHC's during the monthly immunization programmes. A total of two hundred and ten (210) nursing mothers were thus used for study.

The scale used for measurement of knowledge was at anominal level on two point rating as true and false. The score ranged from zero (0) to 23. The maximum obtainable score was 23 while the minimum obtainable score was zero (0). The minimum score (0) and the maximum obtainable score (23) were added to get a resultant score of 23 which was then divided into 2 units of categorization as low knowledge and high knowledge. The total knowledge scores were categorized as follows:

High knowledge 11-23
Low knowledge 0-11

The scale used for measurement of attitude was at interval level on five-point rating as: Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (SD) for positive statements and reverse for the negative statements of 19 items. The scores ranged from 19-95. The maximum obtainable score by any respondent was 95 while the minimum obtainable score was 19. The minimum score (19) and the maximum score (95) were summed to get a resultant score of 114 which was divided into 2. Based on the total attitude score, the respondents were categorized as having positive and negative attitude and categorized as follows:

Positive attitude 58-95
Negative attitude 19-57

Results and Discussion

Socio-economic characteristics of the respondents

Table 1 shows the socio-economic characteristics of the nursing mothers in Odeda and Obafemi-Owode LGAs. The educational status shows the following: 22.0, 27.0 and 9.0% had tertiary, secondary and primary education respectively;10.0 and 8.5% did not complete secondary and primary education while 23.0% did not attend school. This literacy level at 77% is expected to enhance the woman's knowledge of modern health-care facilities, improve her ability to communicate with modern health-care providers thereby increasing the value she places on good health and which would result in higher demand for modern health-care services. Caldwell and Caldwell (1990) had posited that educated mothers are more likely than uneducated women to take advantage of modern medicine and comply with recommended treatments because education changes the mother's knowledge and perception of the importance of modern medicine. C-IMCI strategy identifies the importance of the education of the child's mother and care giver as it empowers them to know and understand how to give prescribed drugs, how to measure and prepare the Oral Rehydration Treatment (ORT) solution or prepare a cough mixture. In an earlier report, WHO, (2006) had observed that populations whose health is compromised by socio-economic factors such as income, cost, insurance, education may face many problems that make their lives and that of their children miserable.

The mean monthly income of respondents was ₦16,294.00 which is below the Nigeria recommended minimum wage of ₦18,000. This is an indication of low purchasing power of the nursing mothers in the study area. Since income has a positive impact on the use of health care services it could be inferred that these respondents may not be able to afford the finances related to this heath service utilization. Wagstaff (2002) had observed that people with high economic status have the greater tendency to make use of orthodox health services compared to those in the rural areas with low economic status.

Table 1: Respondents according to their socio-economic characteristics (n=200)

Socio-economic characteristics	F (%)	Mean	S.D
Age (years)			
=20	30 (15.0)	28 years	6 years
21-30	116 (58.0)		
31-40	48 (24.0)		
41 & above	6 (3.0)		
Educational status			
Non-formal	46 (23.0)		
Islamic education	1 (0.5)		
Incomplete primary education	17 (8.5)		
Complete primary education	18 (9.0)		
In-complete secondary education	20 (10.0)		
Complete secondary education	54 (27.0)		
Tertiary education	44 (22.0)		
Estimated annual income (₦)			
< 250,000	108 (54.0)		
250,000-499,000	82 (41.0)		
500,000-749,000	3 (1.5)		
750,000-959,000	5 (2.5)		
1 million and above	2 (1.0)		
Place of delivery			
Home	28 (14.1)		
Traditional birth attendance	1 (1.0)		
Private hospital	80 (40.0)		
Religious centre	8 (4.0)		

Source: Field Survey 2014

Respondents Knowledge on C-IMCI Practices

The result in Table 2 shows that majority of the nursing mothers were highly knowledgeable of breastfeeding the child within one hour after birth (72.0%), breastfeeding the child for two years (62.5%) and that colostrum served as immunization for the baby (82.5%).

Knowledge requires awareness, experience, and observation. Awareness is not the same as knowledge. The knowledge that nursing mothers have of C-IMCI practices may affect the utilization and would relate to the degree or level of information they have received and internalized. Majority of the nursing mothers were highly knowledgeable on C-IMCI practices and may have the tendency towards the utilization and uptake. This agrees with the findings by Knustsen (1994), Padgett *et al.* (1994), Bellon *et al.* (1995) that knowledge and understanding of an

individual on a particular illness may influence the utilization of the health services provided for ameliorating it.

Categorization of Respondents' Knowledge of C-IMCI Practices

Table 3 shows that majority (90.5%) of the respondents were highly knowledgeable of C-IMCI practices. According to the Health Belief Model (HBM), individuals act to avoid a health treat if they have knowledge on the illness and believe it is serious and that the perceived benefits of actions are enormous. The desire to avoid illness, or conversely get well if already ill and the belief that a specific health action will prevent, or cure the illness depends on the individual's knowledge and awareness of the causes and cure of the illness. Most of the nursing mothers were highly knowledgeable of the causes of childhood illnesses. Since they are already knowledgeable of C-IMCI practices, these would be utilized for their children than those who had low knowledge of the practices.

S/N	Knowledge on C-IMCI Practices	True (%)	False (%)
1.	It is good to put the baby on the breast within one hour after birth.	*144 (72.0)	56 (28.0)
2.	In order to have enough milk a mother needs to breastfeed every 4 hours (at least six times a day).	90 (45.0)	*110 (55.0)
3.	Colostrum or first milk serves as the first immunization for the baby.	*165 (82.5)	35 (17.5)
4.	In the first six months, the infant needs water and/or other drinks in addition to breast milk.	128 (64.0)	*72 (36.0)
5.	When breastfeeding, the baby's chin needs to touch the mother's breast.	*172 (86.0)	28 (14.0)
6.	A malnourished infant and young child has more episodes of diarrhoea.	*175 (87.5)	25 (12.5)
7.	Vitamin A supplementation is necessary only for children under 2 years.	156 (78.0)	*44 (22.0)
8.	Breastfeeding benefits the baby, but not the mother.	115 (57.5)	*85 (42.5)
9.	When a mother is HIV-positive, there are ways to decrease HIV transmission to the baby.	*165 (82.5)	35 (17.5)
10.	Even if a mother believes she does not have enough breast milk, she can still be able to adequately breastfeed her baby.	*185 (92.5)	15(7.5)
11.	A mother can prevent sore and cracked nipples by correctly positioning and attaching her baby at the breast.	*192 (96.0)	8 (4.0)
12.	The most important thing a mother can do to produce sufficient breast milk is to breastfeed her baby frequently, both day and night.	*197 (98.5)	3 (1.5)
13.	Infant formula contains antibodies that protect against diseases, especially against diarrhoea, respiratory and ear infections.	177 (85.9)	*23(11.2)
14.	Mixed feeding (meaning breastfeeding and giving other foods and drinks) before six months can cause diarrhoea, respiratory and ear infections.	*119 (59.5)	81 (40.5)
15.	Pregnant women can continue breastfeeding.	*24 (12.0)	176 (88.0)
16.	Expressed breast milk can be stored in room temperature up to 1 day.	*120 (60.0)	80(40.0)
17.	An HIV/AIDS infection increases energy and nutrients needs	*147 (73.5)	53(26.5)
18.	A woman that is malnourished can still adequately breastfeed her baby	123 (61.5)	*77(38.5)
19.	Do not feed leftover food that might be contaminated	*182 (91.0)	18 (9.0)
20.	Antenatal care is needed for pregnant women	*192 (96.0)	8 (4.0)
21.	Young children should be breastfed for 2 years	*125 (62.5)	75 (37.5)
22.	Children 9-24 months old should eat 3-4 times in a day and have 1-2 snacks	*182 (91.0)	18 (9.0)
23.	Mothers do not need support from the family or the community in order to feed their children	*141 (70.5)	59 (29.5)

Source: Field Survey, 2014

Table 3: Distribution of categorization of respondents’ knowledge on C-IMCI Practices (n=200)

Knowledge	Score	Frequency	Percentage
High	35-46	195	90.5
Low	23-34	5	9.5

Source: Field Survey, 2014

Attitude of the Nursing Mothers towards Utilization of C-IMCI Practices

The attitude of nursing mothers to the utilization of C-IMCI practices are shown in Table 4. Most of the nursing mothers took their children to the hospital for vaccination (79.5%), visited the hospital when the children had diarrhoea (71.0%), followed health workers' advice and attended antenatal care services (68.0%). Although most agreed that they had time to exclusively breastfeed their babies (77.5%) only 44.0% practiced exclusive breastfeeding for six months. Some of the reasons given for this failure in exclusive breastfeeding related to the belief that it is impossible for the baby to live or survive without taking water for the first six months of life, that breast milk alone cannot sustain the child and needs additional or complementary food to keep him whole and healthy during the period. This might be due to the lack of knowledge and understanding of the importance of exclusive breastfeeding by the nursing mothers. The eventual uptake and use of C-MCI practices by the nursing mothers will be affected.

According to the Theory of Reasoned Action (TRA), the best predictor of behaviour is intention. Intention is the cognitive representation of a person's readiness for a given behaviour, and it is considered to be the immediate antecedent of behaviour. Most of the nursing mothers had a positive attitude towards C-IMCI practices and so would utilize the practices compared to the nursing mothers that had a negative attitude. These findings agree with the result of research conducted in Iraq that most of the women believed that breast milk was not enough to feed their infants (Abdul Ameer *et al.*, 2008). Also, Kuzma (2013); Agha *et al.* (2007) had reported that exclusive breastfeeding up to six months of baby's life was not clearly understood and not in common practice by the nursing mothers.

Categorization of Respondents' Attitude towards C-IMCI Practices

The result in Table 5 shows that almost all (99.0%) of the respondents had a positive attitude towards

C-IMCI practices. According to Health Belief Model (HBM), an individual's access to and use of health services is a function of the attitude and determines health service utilization. The positive attitude towards C-IMCI practices would enhance the uptake and utilization of C-IMCI practices by the nursing mothers. This finding agrees with Andersen (1995) who posited that an individual who has positive attitude would utilize health service than an individual who has a negative attitude.

Conclusion and Recommendations

This study has made significant contributions on the attitude and knowledge to practices of C-IMCI practices among rural nursing mothers in Ogun State. The findings of the study show that the nursing mothers were highly knowledgeable and were favourably disposed to C-IMCI practices. The following recommendations are made towards ensuring better uptake and utilization of C-IMCI practices. Efforts should be directed towards improving the knowledge of C-IMCI practices among nursing mothers, parents, and guardians in rural areas of the state. Training programmes on the recommended C-IMCI practices directed at individuals, corporate organizations and health institutions should be organized by government agencies, Ministry of Health, Ministry of Agriculture and NGOs.

Copies of the C-IMCI practices should be made available in the different local languages to the residents of Ogun State at such training programmes. Also, extension agents should also be trained on the content of the C-IMCI practices and be made to see the potentials of C-IMCI practices on child development and growth, disease prevention, agricultural production and rural development. This will have multiplier effects on increased awareness and knowledge of C-IMCI practices among rural nursing mothers' residents of Ogun State. Empowerment programmes that have the potentials of reducing poverty among rural resident should be incorporated into C-IMCI training programmes.

Table 4: Distribution of respondents according to their attitude towards C-IMCI Practices (n=200)

S/N	Attitude on C-IMCI practices	SA (%)	A (%)	U (%)	D (%)	SD (%)	MEAN	S.D
1	I ensure I will take my child to hospital to receive vaccination	159(79.5)	34(17.0)	1(0.5)	7(3.5)	-	4.73	0.64
2	I do not follow health workers advice about treatment	18(9.0)	13(6.5)	1(0.5)	98(49.0)	70(35.0)	3.95	1.20
3	The child should not be taken to hospital when severe headache occurs	1 (7.5)	9(4.5)	1(0.5)	101(50.5)	74(37.0)	4.05	1.11
4	I breastfeed my child exclusively for six months	71(35.5)	17(8.5)	1(0.5)	56(28.0)	55 (27.5)	2.97	1.70
5	The child should be taken to hospital when there is high fever	133(66.5)	59(29.5)	-	5(2.5)	3 (1.5)	4.57	0.76
6	I do not have time to exclusively breastfeed my baby	27(13.5)	17(8.5)	1(0.5)	99(49.5)	56 (28.0)	3.70	1.33
7	The child should be taken to hospital when stooling	142(71.0)	48(24.0)	1(0.5)	5(2.5)	4 (2.0)	4.60	0.80
8	I do not go for antenatal care service	14(7.0)	7(3.5)	1(0.5)	96(48.0)	82 (41.0)	4.13	1.08
9	The child should be taken to hospital for regular check ups	120(60.0)	63(31.5)	2(1.0)	10(5.0)	5 (2.5)	4.41	0.93
10	The child should not be taken to hospital to receive vaccination	13(6.5)	10(5.0)	2(1.0)	89(44.5)	86(43.0)	4.13	1.10
11	The child should not be taken to hospital when sudden weight occurs	12(6.0)	9(4.5)	3(1.5)	97(48.5)	79(39.5)	4.11	1.06
12	The child should not be taken to hospital when unable to eat well	10(5.0)	5(2.5)	2(1.0)	101(50.5)	82(41.0)	4.20	0.97
13	I take my child to hospital when severe headache occurs	93(46.5)	50(24.3)	1(0.5)	27(13.5)	29(14.5)	3.76	1.51
14	The child should be taken to hospital for postnatal care services	115(57.5)	73(36.5)	1(0.5)	3(1.5)	8(4.0)	4.42	0.91
15	The child should be taken to hospital when unable to eat well	119(59.5)	68(34.0)	1(0.5)	4(2.0)	8(4.0)	4.43	0.93
16	The child should not be taken to hospital for postnatal services	24(12.0)	10(5.0)	3(1.5)	92(46.0)	71(35.5)	3.88	1.28
17	The child should be taken to hospital when there is severe cough	124(62.0)	67(33.5)	1(0.5)	5(2.5)	3(1.5)	4.52	0.77
18	Nursing mothers should follow health worker's advice about treatment	136(68.0)	64(32.0)	-	-	-	4.68	0.47
19	I go for adequate antenatal care services	136(68.0)	58(29.0)	-	3(1.5)	3(1.5)	4.60	0.72

Source: Field Survey, 2014

Table 5: Distribution of categorization of respondents' attitude towards C-IMCI Practices (n=200)

Attitude	Categorized Score range	Frequency	Percentage
Positive	58-95	198	99.0
Negative	19-57	2	1.0

Source: Field Survey, 2014

References

Agha, A., White, F., Younus, M., Kadir, M. M., Ali, S., and Fatmi, Z. 2007. Eight key household practices of integrated management of childhood illness (IMCI) amongst 6 to 59 months in Gambat, Sindh, Pakistan *JPMA*, 57:288.

Andersen, R. M. 1995. Revisiting the behavioural model and access to medical care: does it matter? *Journal of Health and Social Behaviour* 36: 1-10.

Bellon, J. A., Delgado, A., Luna del, D., and Lardell, P. 1995. Influence of age and sex on various types of utilization of the primary health care. *Gac Sanit* :343-53.

Caldwell, J. C. and Caldwell, P. 1990. High fertility in sub-Saharan Africa. *Scientific American* 118-225

Knutsen, S. F 1994. Life-style and the use of health services. *American Journal of Clinical Nutrition* 59 (5): 1171-1175.

Kuzma, J. 2013. Knowledge, attitude and practice

related to infants' feeding among women in rural Papua New Guinea: A descriptive mixed method study. *International Breastfeeding Journal* 8(16).

Padgett, D. K., Patrick, C., Burns, B. J., and Schlesinger H. J. 1994. Ethnicity and the use of outpatient mental health services in a national insured population. *American Journal of Public Health* 84: 222-226.

United Nations Children's Fund. 1999. The household and Community Component of IMCI: A Resource Manual on Strategies and Implementation Steps.

Wagstaff, A. 2002. Poverty and health sector inequalities. *Bulletin of the World Health Organization* 80: 97-105.

WHO. 2004. Implementation Resolutions (Program Reports). The Fifty-Seventh Assembly. World Health Organization, Geneva.

WHO. 2006. World Health Report 2006: Working for Health. World Health Organization. Geneva.

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the impacts of dietary supplementation with *Costus afer*, *Tridax procumbens* and *Eleusine indica* (sole or mixtures) on the growth and carcass characteristics of broilers.

Materials and Methods

Fresh samples of *Costus afer*, *Eleusine indica* and *Tridax procumbens* plants were collected from the Teaching and Research Farm, University of Calabar, Calabar. Sub-samples were oven-dried and analyzed for the chemical composition using standard methods described in AOAC (2005). Commercial starter and finisher diets (Table 1) purchased from reputable marketers served as the basal diets (Control- Treatment 1); 600g of sole forage (*Costus afer*, *Eleusine indica* and *Tridax procumbens*), 1:1 mixture of *Costus afer*-*Eleusine indica*, *Costus afer*-*Tridax procumbens*, *Eleusine indica*-*Tridax procumbens* and 1:1:1 mixture of *Costus afer*-*Eleusine indica*-*Tridax procumbens* were supplemented into the basal diet to constitute Treatments 2, 3, 4, 5, 6, 7 and 8, respectively as follows:
Treatment 1 - Control- Basal diet
Treatment 2- Basal diet + 600g of *Costus afer*(Ca)
Treatment 3- Basal diet + 600g of *Eleusine indica* (Ei)

Table 1: Gross composition of basal diets*

Composition (%)	Broiler starter	Broiler finisher
Crude protein	21.00	18.00
Fat and oil	6.00	6.00
Crude fibre	5.00	5.00
Calcium	1.00	1.00
Available phosphorus	0.45	0.40
Lysine	1.00	0.85
Methionine	0.50	0.34
Salt	0.30	0.30
Metabolisable energy (Kcal/kg)	2800	2900
Net weight /kg bag	25.00	25.00

*Composition from bag labels, Top feed PLC

Results and Discussion

Table 2 shows the chemical composition of the forages. The chemical composition differed significantly (P<0.05) among the forages. *Costus afer* had the highest crude protein (16.69%) and moisture (9.86%) with moderate amounts of crude fat (2.52%), anti-nutrients, minerals and vitamins and the least crude fibre (19.88%), fibre fractions and ash (7.88%). *Eleusine indica* had the least crude protein (8.33%), crude fat (2.29%) and vitamins, moderate ash (9.94%), moisture

Treatment 4- Basal diet + 600g of *Tridax procumbens*(Tp)
Treatment 5- Basal diet + 300g Ca + 300g Ei
Treatment 6- Basal diet + 300g Ca + 300g Tp
Treatment 7- Basal diet + 300g Ei + 300g Tp
Treatment 8- Basal diet + 200g Ca + 200g Ei + 200g Tp

A total of one hundred and sixty-eight (168) day-old Hybro strain chicks was used for the 56-day experiment in deep litter system. Each treatment had 21 birds divided into seven (7) birds in three replicates. The standard management practices were adhered to except vaccination or medication so as to assess the effects of the treatments on the health status of the birds. Data were collected on the behaviour of the birds (forage preference) and weekly growth performance (mortality, body weight, weight gain, feed intake and feed conversion ratio). On day 56, three birds were picked per treatment for the measurement of carcass characteristics (carcass yield, organ weights and gastro-intestinal morphometry). Data were analysed in a one-way analysis of variance in a completely randomized design and treatment means separated using Duncan's Multiple Range Test of GenStat Release 8.1 (GENSTAT, 2011) software package.

(8.70%) and minerals but the highest crude fibre (28.57%) and anti-nutrients. *Tridax procumbens* was the richest in crude fat (3.92%), ash/minerals (16.90%) and vitamins; moderate in crude protein (16.12%) and crude fibre (24.77%) but least in moisture (6.74%) and anti-nutrients. These forages are good sources of nutrients and low in anti-nutrients indicating that they have low toxicity. The nutrient contents are within the ranges previously described for tropical forages (Igboh, 2009; Sun *et al.*, 2012a; Idrus *et al.*, 2014)

while the phytochemical constituents are lower than the toxic range (Iji *et al.*, 2004) and so would be safe as feed for poultry.

The phytochemical screening for active components of the forages is shown in Table 3. Cardenolides and chalcones were absent in all three forages. *Costus afer* contained appreciable amounts of alkaloids, saponins and phenols, moderate amounts of tannins, glycoside and trace amounts of phlobatannin while flavonoid, anthraquinone, steroids were not detected.

Eleusine indica contained appreciable alkaloids, tannins, phenols and phlobatannins, moderate saponins, flavonoids, glycosides and steroids and trace amounts of anthraquinones and terpenes. *Tridax procumbens* contained appreciable alkaloids and phenols, moderate saponins, tannins, flavonoids and phlobatannins while anthraquinones, steroids and terpenes were completely absent. The presence of these phytochemicals could also explain some of the medicinal activities ascribed to these forages (Anyasor *et al.*, 2010; Sun *et al.*, 2012b).

Table 2: Proximate compositions of selected forages

Composition (%)	Ca	Ei	Tp	SEM
Crude protein	16.69 ^a	8.33 ^b	16.12 ^a	0.09
Crude fat	2.52 ^{bc}	2.29 ^c	3.92 ^a	0.03
Crude fibre	19.88 ^c	28.57 ^a	24.77 ^b	0.02
Ash	7.88 ^c	9.94 ^b	16.90 ^a	0.02
Moisture	9.86 ^a	8.70 ^b	6.74 ^c	0.02
Nitrogen free extract	43.17 ^a	42.17 ^b	31.55 ^c	0.05
Neutral detergent fibre	42.81 ^c	61.38 ^a	45.64 ^b	0.02
Acid detergent fibre	29.86 ^c	43.84 ^a	31.78 ^b	0.01
Acid detergent lignin	10.99 ^c	19.64 ^a	12.29 ^b	0.02
<i>Anti-nutrients</i>				
Phytate	0.16 ^b	0.17 ^a	0.14 ^c	0.02
Oxalate	0.12 ^a	0.13 ^a	0.11 ^b	0.01
Tannin	0.03	0.03	0.02	0.00
Saponin	0.35 ^b	0.39 ^a	0.25 ^c	0.02
<i>Minerals</i>				
Sodium	0.22 ^c	0.24 ^b	0.36 ^a	0.02
Potassium	0.66 ^c	0.70 ^b	1.27 ^a	0.03
Calcium	0.41 ^b	0.22 ^c	0.50 ^a	0.02
Phosphorus	0.32 ^c	0.32 ^b	0.37 ^a	0.02
Magnesium	0.25 ^c	0.27 ^b	0.29 ^a	0.02
Iron (mg/kg)	172.5 ^b	178.45 ^b	234.70 ^a	0.12
Copper (mg/kg)	3.75 ^b	4.35 ^b	6.65 ^a	0.15
Zinc (mg/kg)	23.60 ^c	26.50 ^b	52.45 ^b	0.22
<i>Vitamins</i>				
Vitamin A(mg/kg)	2658.35 ^a	262.5 ^b	2865.50 ^a	0.89
Vitamin B ₁ (mg/kg)	0.92 ^a	0.47 ^c	2.41 ^a	0.02
Vitamin B ₂ (mg/100g)	0.12 ^b	0.08 ^b	0.17 ^a	0.01
Vitamin C (mg/kg)	5.31 ^c	3.74 ^c	12.63 ^a	0.02

% NFE = 100 – (%M +% CP + % CFA + % CFI + % Ash)

Ca-*Costus afer*; Ei- *Eleusine indica* Tp - *Tridax procumbens*

Table 3:Phytochemical screening of the three forages

Constituent	Ca	Ei	Tp
	Observation	Observation	Observation
Alkaloids	+++	+++	+++
Saponins	+++	++	++
Tannins	++	+++	++
Phenols	+++	+++	+++
Flavonoids	—	++	++
Phlobatanins	+	+++	++
Glycosides	++	++	+++
Anthraquinines	—	+	—
Steroids	—	++	—
Terpenes	—	+	—
Cardenoloides	—	—	—
Chalcones	—	—	—
+++	- AA	- Appreciable Amount	++
+	- TA	- Trace Amount	—
		MA	- Moderate Amount
		CA	- Completely Absent

Table 4 shows the scale of preference of selected forages by broiler birds as determined by their respective intake. Total forage consumed ranged from 414.00-2036.00g and was significantly ($P<0.05$) different among the treatments. Broilers fed the diet supplemented with the mixture of three forages had the highest intake followed by mixtures of two forages- *Costus afer* and *Tridax procumbens*, *Eleusine indica* and *Tridax procumbens* and *Costus afer* and *Eleusine indica* in that order and sole *Tridax procumbens* and *Costus afer* while the least intake was in birds fed

Eleusine indica. This observation supports the practice of serving a variety of forages to poultry so that the bird can choose the forage that would provide adequate nutrients needed for its physiological activities (Spencer, 2013). The preference for *Tridax procumbens* and *Costus afer* could be due to their higher nutritive contents, especially protein, such that birds fed *Tridax procumbens* and *Costus afer* and their mixtures will be expected to perform better than those on *Eleusine indica* which was least consumed.

Table 4: Forage intake by birds on different dietary treatments

Parameter	C	Ca	Ei	Tp	CE	CT	ET	CET	SEM
Total forage intake (g)	-	949.00 ^c	414.00 ^f	1013.00 ^d	1617.00 ^c	1715.00 ^b	1670.00 ^{bc}	2036.00 ^a	39.70
Weekly forage intake (g/wk)	-	118.50 ^d	51.70 ^e	126.60 ^d	202.10 ^c	214.30 ^b	208.80 ^{bc}	254.50 ^a	4.97
Daily forage intake (g/day)	-	16.94 ^d	7.39 ^e	18.09 ^d	28.86 ^c	30.62 ^b	29.83 ^{bc}	36.36 ^a	0.71

Means followed by different superscript across rows are significantly ($P<0.05$) different

C- Control Ca- *Costus afer*, Ei - *Eleusine indica*, Tp - *Tridax procumbens*

CE -1:1 mixture of *Costus afer* and *Eleusine indica*, CT - 1:1 mixture of *Costus afer* and *Tridax procumbens*, ET - 1:1 mixture of *Eleusine indica* and *Tridax procumbens*

CET - 1:1:1 mixture of *Costus afer*, *Eleusine indica* and *Tridax procumbens*

There were significant ($P<0.05$) differences in all growth parameters (except for weekly feed intake and daily feed intake) between dietary treatments (Table 5). Final body weight was highest in the control treatment but did not differ from birds on diets supplemented with CET, ET, Ca, CE and CT forages. The weight gain (2827.00-3272.78g), weekly weight gain (353.40-409.10g/week) and daily weight gain (50.48-58.44g/day) followed the same trend observed in body weight. This suggests that forage supplementations depressed the body weight of birds probably due to the presence of the anti-nutrients. Forage supplementation enhanced feed intake but slightly reduced feed conversion ratio especially in the treatments involving sole *Eleusine indica* or *Tridax procumbens* forages. Birds on mixed forages and sole *Costus afer* had feed conversion ratio (2.36-2.45) which did not differ from the control (2.20). Birds on sole *Costus afer* consumed more feed probably due to its more succulent nature and high crude protein content thus enhancing the digestion of the concentrate. Birds on sole *Tridax procumbens* had the least feed intake implying that the appreciable amount of tannins and saponins in the plant could exert some negative impact on its palatability.

Percentage mortality was significantly ($P<0.05$) highest in the control group (9.52%); the birds on

sole *Tridax procumbens*, *Costus afer*-*Tridax procumbens* and *Eleusine indica*-*Tridax procumbens* mixtures had zero mortality while 4.76% mortality was recorded in other treatments. This result is comparable to the findings of Fasuyi *et al.* (2005) and confirms that forage supplementations could improve the health and immune status of broilers since no vaccination was given throughout the experiment. Three treatments: *Eleusine indica*-*Tridax procumbens*, *Costus afer*-*Eleusine indica*-*Tridax procumbens* and *Costus afer* slightly improved the carcass yield of broilers compared to the control (Table 6). The slight improvement in the carcass yield of broilers fed these forages agrees with previous reports (Silverman, 2001, Saroeun, 2010). The drum stick and wing weight as % of live weights were significantly ($P<0.05$) affected by dietary treatments whereas the other prime cuts showed no differences. Out of the organs, only the relative weights of the lungs, oesophagus, and pancreas were significantly ($P>0.05$) affected by the dietary treatments.

The relative weights of intestinal segments were ($P<0.05$) influenced by dietary treatments. Forage supplementation tended to increase the relative weights of the duodenum, ileum and caecum but led to significant reduction in the weight of the jejunum. Total intestinal, duodenal and jejunal

lengths were not ($P>0.05$) affected by forage supplementation. The values obtained for intestinal segment lengths, in this study, are higher than those reported by Mabelebele *et al.* (2014).

Conclusion and Recommendations

The three forages studied *Costus afer*, *Eleusine indica* and *Tridax procumbens* are rich sources of nutrients and can play significant roles in sustainable poultry production.

- Forage supplementation had positive impacts on the immune and growth status of broilers.
- Forage mixtures improved the carcass yield compared to the control or where only one of the forages was used in feed supplementation.
- *Costus afer* produced a better overall performance compared to the *Tridax*

procumbens while the least performance was recorded in *Eleusine indica*.

- For the forage mixtures, *Eleusine indica*-*Tridax procumbens* and *Costus afer*-*Eleusine indica* -*Tridax procumbens* gave a better performance than other combinations.

It is, therefore, recommended that forage supplements should be given to broilers under intensified management to boost their immune status, enhance growth, behaviour and carcass yield. For sole forage feeding, *Costus afer* should be the choice while the *Eleusine indica*-*Tridax procumbens* and *Costus afer*-*Eleusine indica*-*Tridax procumbens* mixtures should be given to broilers for improved performance.

Table 5: Growth performance of broilers as influenced by dietary forage supplementations

Parameter	C	Ca	Ei	Tp	CE	CT	ET	CET	SEM
Initial weight, g	38.33	38.33	38.33	39.67	39.67	39.33	38.67	39.33	1.65
Final weight, g	3311.11 ^a	3133.33 ^{ab}	2877.76 ^b	2866.67 ^b	3100.00 ^{ab}	3077.78 ^{ab}	3211.11 ^{ab}	3155.56 ^{ab}	172.00
Total weight gain, g	3272.78 ^a	3095.00 ^{ab}	2839.44 ^b	2827.00 ^b	3060.33 ^{ab}	3038.44 ^{ab}	3172.45 ^{ab}	3116.23 ^{ab}	172.30
Weekly weight gain, g/week	409.10 ^a	386.90 ^{ab}	354.90 ^b	353.40 ^b	382.50 ^{ab}	379.80 ^{ab}	379.80 ^{ab}	389.50 ^{ab}	21.54
Daily weight gain, g/day	58.44 ^a	55.27 ^{ab}	50.71 ^b	50.48 ^b	54.65 ^{ab}	54.26 ^{ab}	56.65 ^{ab}	55.65 ^{ab}	3.08
Total feed intake, g	6911.29 ^b	7455.05 ^a	7343.87 ^{ab}	7256.81 ^{ab}	7494.38 ^a	7445.95 ^{ab}	7417.14 ^{ab}	7506.52 ^a	237.90
Weekly feed intake, g/week	876.41	931.88	918.00	907.10	936.80	930.75	927.14	938.31	32.33
Daily feed intake, g/day	125.20	133.13	131.14	129.58	133.83	132.96	132.45	134.05	4.62
Feed conversion ratio	2.20 ^a	2.41 ^{ab}	2.58 ^b	2.57 ^b	2.45 ^{ab}	2.45 ^{ab}	2.36 ^{ab}	2.44 ^{ab}	0.14
Mortality, %	9.52 ^a	4.76 ^b	4.76 ^b	0.00 ^c	4.78 ^b	0.00 ^c	0.00 ^c	4.76 ^b	6.30

Means with different superscript across rows indicate significant ($P<0.05$) differences

C- Control,

Ca - *Costus afer*, Ei - *Eleusine indica*, Tp - *Tridax procumbens*,

CE - mixture of *Costus afer*-*Eleusine indica*, CT - mixture of *Costus afer*-*Tridax procumbens*, ET - mixture of *Eleusine indica*-*Tridax procumbens*,</

Table 6. Carcass characteristics of broiler chicken fed Dietary forage supplements

Parameter	C	Ca	Ei	Tp	CE	CT	ET	CET	SEM
Live weight	3311.11 ^a	3133.33 ^{ab}	2877.76 ^b	2866.67 ^b	3100.00 ^{ab}	3077.78 ^{ab}	3211.11 ^{ab}	3155.56 ^{ab}	172.00
Dressed weight	2558.83	2443.99	2016.67	2121.77	2263.00	2346.50	2512.69	2463.86	209.30
Dressing %	77.28	78.00	77.10	73.73	73.00	76.24	78.25	78.08	2.64
<i>Prime cuts, % Live weight</i>									
Back weight	15.72	15.43	15.97	15.26	14.40	16.02	15.74	16.45	1.09
Breast weight	24.58	26.34	25.39	23.87	23.13	24.31	25.19	23.26	1.69
Drum stick weight	9.55 ^c	11.36 ^{ab}	11.30 ^{ab}	9.96 ^b	10.32 ^{ab}	11.19 ^{ab}	11.26 ^{ab}	12.34 ^a	0.98
Head weight	1.99	1.77	1.92	2.32	1.87	1.66	1.72	2.06	0.30
Neck weight	4.66	4.44	5.63	4.76	4.36	4.15	4.49	4.11	0.69
Shank weight	3.43	3.25	3.34	3.56	3.17	4.14	3.44	4.11	0.82
Thigh weight	12.70	14.14	12.77	11.72	11.28	12.83	13.07	13.71	1.28
Wing weight	8.76 ^{ab}	8.16 ^{ab}	8.16 ^{ab}	7.63 ^b	8.06 ^b	8.25 ^{ab}	8.40 ^{ab}	8.89 ^a	0.49
<i>Organ weight, % Live weight</i>									
Crop weight	0.29	0.32	0.27	0.28	0.24	0.22	0.31	0.31	0.05
Empty Gizzard	1.51	1.27	1.51	1.53	1.27	1.46	1.44	1.48	0.18
Full gizzard	2.05	1.69	1.92	1.93	1.75	1.88	1.73	1.88	0.22
Gall bladder	0.11	0.12	0.12	0.15	0.14	0.12	0.11	0.12	0.03
Heart	0.41	0.41	0.38	0.37	0.41	0.36	0.35	0.41	0.05
Liver	1.71	1.55	1.66	1.62	1.55	1.55	1.55	1.66	0.15
Lungs	0.32 ^b	0.39 ^{ab}	0.40 ^{ab}	0.37 ^{ab}	0.31 ^b	0.37 ^{ab}	0.33 ^b	0.48 ^a	0.06
Oesophagus	0.15 ^a	0.12 ^{bc}	0.11 ^c	0.10 ^c	0.09 ^c	0.12 ^{abc}	0.11 ^c	0.15 ^{ab}	0.02
Pancreas	0.21	0.18 ^{ab}	0.08 ^b	0.14 ^{ab}	0.13 ^{ab}	0.13 ^{ab}	0.14 ^{ab}	0.24 ^a	0.06
Proventriculus	0.41	0.36	0.33	0.46	0.36	0.36	0.38	0.36	0.07
Spleen	0.21 ^a	0.16	0.13	0.17	0.20	0.20	0.16	0.15	0.05

References

- Adedeji, O. S. (2013). Effect of different organic feed ingredients on growth performance, haematological characteristics and serum parameters of broiler chickens. *World Journal of Agricultural Sciences* 9 (2): 137-142.
- Agiang, E. A., Oko, O. O. K. and Essien, G. E. (2011). Quails response to aqueous extract of bush marigold (*Aspilia africana*) leaf. *American Journal of Animal and Veterinary Sciences* 6(3): 130-134.
- Anyasor, G. N., Ogunwenmo, K. O., Olatunji, A.O. and Blessing, E. A. (2010). Phytochemical constituents antioxidant activities of aqueous and methanol stem extracts of *Costus afer*. Ker Gawl. (Costaceae). *African Journal of Biotechnology* 9(31): 4880-4882.
- Bloxham, D. and Lilburn, M. (2013). The effect of source of forage and level on feed intake and diet digestibility in redbros. Undergraduate Research Thesis, Department of Animal Sciences, the Ohio State University. <http://hdl.handle.net/1811/54565> Accessed January 15, 2016, 15.30hr Nigerian time.
- Fasuyi, A. O., Fajemilehin, K. S. O. and Aro, S. O. (2005). Nutritional potentials of Siam weed (*Chromolaena odorata*) leaf meal (SWLM) on laying hens: biochemical and haematological implications. *Pakistan Journal of Nutrition* 4(5): 336-341.
- GenStat (2011). GenStat Release 8.1 software package. Lawes Agricultural Trust.
- Idrus, Z., Mohammad, R. G., Mohammad, B., Mansour, M., Jamal, F., Reza, F. and Saleh, T. (2014). Effects of purslane extract on performance, immunity responses and cecal microbial population of broiler chickens. *Spanish Journal of Agricultural Research* 12 (14): 1094-1095.
- Igboh, M. N., Ikequchi C. C. and Ikewuchi J. C. (2009). Chemical profile of *Tridax procumbens*. *Pakistan Journal of Nutrition* 8 (5): 548-550.
- Iji, P. A., Khonalok, S. S. and Govs, R. M. (2004). Intestinal function and body growth of broiler chicken on major based diets supplemented with *Mimosa tannus* and microbial enzyme. *Journal Science of Food and Agriculture* 84(12): 1451-1458.
- Mabelebele, M., Alabi, O. J., Ngambi, J. W., Noris, D and Ginindza, M. M. (2014). Comparison of gastro intestinal tracts and pH values of digestive organs of Ross 308 broiler and indigenous venda chickens fed the same diet. *Asian Journal of Animal and Veterinary Advances* 9: 71-76.
- Mansour, M., Jamal, F., Reza, F., Mohammad, B., Idrus, Z., Mohammad, R. and Selah, T. (2014). Effects of purslane extract on performance, immunity responses and caecal Microbial population of broiler chickens. *Spanish Journal Agricultural Research* 12(4): 1094-1098.
- Melesse, A., Tiruneh, W. and Negesse, T. (2011). Effects of feeding *Moringa stenopetala* leaf meal on nutrient intake and growth performance of Rhode Island Red chicks under tropical climate. *Tropical and Subtropical Agroecosystems* 14(2): 485-492.
- Oko, O. O. K. and Agiang, E. A. (2011). *Aspilia africana* leaf meal as an egg booster and yolk colourant in quails. *International Journal of Agriculture* 3(1): 103-108.
- Ponte, P. I. P., Rosado, C. M. C., Crespo, J. P., Crespo, D. G., Mourao, J. L. and Chaveiro-Soares, M. A. (2008). Pasture intake improves the performance and meat sensory attributes of free-range broilers. *Poultry Science* 87: 71-79.
- Wiehoff, D. (2013). How the Chicken of Tomorrow becomes the Chicken of the World Institute for Agriculture and Trade policy, Retrieved 31 December, 2015, 12. 50 pm, Nigerian time.
- Saroeun, K. (2010). Feed selection and growth performance of local chickens offered different carbohydrate sources in fresh and dried form supplemented with protein-rich forages. M. Sc. Thesis, Department of Animal Nutrition and Management, Swedish University of Agricultural Sciences. ISBN 978-91-86197-96-4.
- Silverman, A. (2001). The 'Pasture' in Pasture Poultry, Continued. APPPA GRIT! *American Pastured Poultry Producers Association* 18: 14-15.
- Spencer, T. (2013). Pastured Poultry Nutrition and Forages. A project of the National Center for Appropriate Technology. NCAT Agricultural specialist. www.attra.ncat.org. retrieved December 12, 2015, 17.00hr Nigerian time.
- Sun, T., Liu, Z., Qin, L. and Long, R. (2012a). Aspects of lipid oxidation of meat from free-range broilers consuming a diet containing grasshoppers on alpine steppe of the Tibetan Plateau. *Poultry Science* 91: 224-231.
- Sun, T., Liu, Z., Qin, L. & Long, R. (2012b). Meat fatty acid and cholesterol level of free-range broilers fed on grasshoppers on alpine rangeland in the Tibetan Plateau. *Journal of the Science of Food and Agriculture* 92: 2239-2243.

Phosphorus Fertilizer Effects on Maize Dry Matter Yield and Nutrient Uptake and Properties of Ultisols Developed on Coastal Plain Sands in Southern Nigeria

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Abstract: One feature of acid soil infertility is poor crop growth caused by phosphorus (P) deficiency resulting from fixation of native and applied P by Al, Fe, and Mn that can attain high levels. Application of P to satisfy the fixation capacity is a management option to improve crop yields in acid soils. Maize grown in pots was used to assess the potentials of P fertilizer in improving the productivity of four Ultisols developed on Coastal Plain Sands in Southern Nigeria. Direct P application increased maize dry matter and P uptake during the first cropping of three P-deficient soils while the soil with moderate available P had a low response. Soil available P, exchangeable Ca and Mg, and plant tissue P and Ca increased whereas soil and plant Fe and Mn decreased. Residual effects of applied P were low on maize dry matter yield and P uptake but showed in increased available P, exchangeable Ca and Mg. Successive cropping decreased available P, exchangeable Ca and Mg in the soils thereby causing low performance of plants high in Mn and Fe contents.

Keywords: Ultisols, acid soils, phosphorus, response, nutrient content

Introduction

Ultisols account for 46.5% of the soil resources in Nigeria and belong to the low and very low productivity classes (Agboola *et al.*, 1997). The Ultisols formed on acid sands or Coastal Plain Sands occupy a substantial portion of the agricultural lands in Southern Nigeria. The soils are highly-weathered and intensively-leached with the constraints to productivity being chemical rather than physical and so give low yields of arable crops. The main features are poor nutrient reserves, low basic cation content and extreme to high soil acidity such that crop performance is affected by aluminum (Al) and manganese (Mn) toxicity, deficiencies or imbalances among the basic cations (Abruna *et al.*, 1975).

Two approaches used in the management of acid soils are to plant acid-tolerant crops and apply appropriate liming materials to neutralize soil acidity. Crops would grow well in acid soils if tolerant of high soil solution concentrations of Al and Mn, and efficient at absorbing native soil nutrients. Fruit trees, root and tuber crops and some food grain legumes used by farmers for subsistence and commercial production for centuries are adapted, even as no tropical plant of agricultural significance is immune to acid soil

infertility. This offers no viable alternative to liming given the low yield potentials of such crops that are adapted to the poor native soil fertility levels. The presumed tolerance can be due to the shifting cultivation (or bush fallow) and slash-and-burn practices which provide adequate nutrients for the predominant low-input and low-output traditional cropping systems (Araki, 1993). Thus, application of lime, even at modest rates, is the first requirement for effective utilization of acid soils because of the ability to decrease the detrimental effects of soil acidity. It eases the effort to build up nutrient fertility status especially that of phosphorus (P) whose widespread deficiency is due to conversion of native and applied P to insoluble forms through fixation processes by clay, Fe and Al ions and oxides.

Plays vital roles in physiological functions and forms an integral component of several biochemical compounds in the plant such that reduction in its availability and uptake reflects in low crop productivity. The use of fertilizer to increase the supply of available P in soils is the conventional recommendation to enhance uptake by crops, especially during the early stage of growth, and increase yields. Crop responses to applied P are attributed to enhanced P supply by the soil and an improvement in the ability of the

plant to absorb the nutrient after the elimination of Al toxicity (Pandey *et al.*, 1994). The main P fertilizer sources are superphosphates (calcium phosphate compounds derived from the primary mineral apatite) usually added in large amounts. The beneficial action relates to the effects of soluble Ca on soil acidity and P in reducing the toxicity of Al and Fe through their precipitation as phosphates in the soil solution (Brady and Weil, 2002).

The little research attention on the management of acid soil infertility in Nigeria relates to the use of lime and manures but which farmers have not been advised to apply before the application of fertilizers. The ensuing poor growth and yields of arable crops, especially maize, are some of the reasons for the poor adoption of fertilizers by smallholder farmers. Furthermore, the influence

of applied P fertilizer on soil factors responsible for the problem of widespread P deficiency is not fully understood. Therefore, this study aims to assess the effects of P application on the growth of maize in acid soils and evaluate the residual effects on the crop and some soil chemical properties.

Materials and Methods

Surface (0-15 cm) samples were randomly collected from farms in four locations (Oko and Ugbogiobo in Edo State; Oleh and Agbarho in Delta State of Nigeria) to represent the upland and lowland areas of soils developed on unconsolidated sands and sandstones (acid sands or Coastal Plain Sands) respectively (Ojanuga *et al.*, 1981). The features of the farms and general physiographic characteristics of the locations are shown in Table 1.

Table 1: Physiographic features of the locations where soil samples were collected

	Agbarho	Oleh	Oko	Ugbogiobo
Location	5°30'N, 5°52'E	5°32'N, 5°42'E	6°25'N, 5°30'E	6°33'N, 5°37'E
Land Use	ADP Farm used for cultivation of arable crops with regular fertilizer use; water table within 1 m of the soil surface.	Citrus farm mixed with pineapples. No fertilizer use history and water table was about 1 m to soil surface	ADP On-Station Research Farm for the cultivation of arable crops; the previous crop was maize with regular use of fertilizer.	Oil palm nursery site cleared from >7-year fallow; no fertilizers used on the site before.
Vegetation	Seasonal swamp forest	Seasonal swamp forest	Moist lowland forest	Moist lowland forest
Rainfall	2384 mm	2866 mm	2257 mm	2242 mm
Landform	Sombreiro-Warri deltaic plains	Sombreiro-Warri deltaic plains	Undulating coastal plain terraces dissected by deep gullies and long slopes	Undulating coastal plain terraces dissected by deep gullies and long slopes
Soil group	Yellowish brown soils of Calabar fasc	Yellowish brown soils of Calabar fasc	Reddish brown soils of Benin fasc	Reddish brown soils of Benin fasc
Soil unit	Freshwater and mangrove swamp	Freshwater and mangrove swamp	Nearly level plains on Coastal Plain Sands	Nearly level plains on Coastal Plain Sands
Soil type	Typic Tropaquent/ Aquic Kandiodult	Typic Tropaquent/ Aquic Kandiodult	Arenic Kandiodult	Oxic Kandiodult

Sources : Vine (1970), Ojanuga *et al.* (1981), FDALR (1990)

Pot Studies

Three (3) kilograms (kg) of air-dried and sieved (<2 mm) soil samples were measured into 5-litre plastic perforated buckets. The treatments were 0, 20 and 40 kg P.ha⁻¹ supplied with single super phosphate (18% P₂O₅) and each received basal N, K, and Mg at 90, 60 and 25 kg.ha⁻¹ from urea (46% N), muriate of potash (MOP, 60% K₂O) and magnesium sulphate (20% MgO) respectively. The treatments were replicated four times and arranged as a 4×3 factorial in a split-plot design with locations as the main plots and P levels used as sub-plots. The fertilizers were thoroughly mixed with the soils and water added to near field capacity. Four seeds of maize (*Zea mays*, SUWAN 1-SR-Y variety) were sowed in each bucket and seedlings thinned to two after emergence. The maize plants were watered daily and grown for six weeks. Maize top-growth was harvested by cutting the plants at the soil surface, put in paper bags, oven-dried at 60°C for 48 hours and weighed. The soils were left to dry for about two weeks, sampled and grown to maize for the second cycle of six weeks, to assess the residual effects of the P fertilizer added.

Analysis of Soil and Plant Samples

The initial soil samples were analyzed for particle size distribution, pH in distilled water at 1: 2 soil-solution ratio, organic carbon, total N, exchangeable cations (Ca, Mg, K and Na), total exchangeable acidity, cation exchange capacity (CEC), available P, Mn, Al and Fe using the procedures described in IITA (1979) Laboratory Manual. The soil samples taken after the first and second cropping were analyzed for pH, exchangeable cations, available P, Fe and Mn. Dried plant samples were ground finely in a Wiley mill and digested with a ternary mixture of concentrated nitric, perchloric and sulphuric acids

(25-5-5 v/v). Total P in the digests was determined using the vanado-molybdate yellow method, total K by flame photometry and total Mn and Fe with atomic absorption spectrophotometer. Total N was determined with the micro-Kjeldahl method. Dry matter yield data from direct and residual effects of applied P were subjected to analysis of variance (ANOVA) and treatment means separated using the Duncan Multiple Range Test (DMRT) as described in Steel *et al.* (1997). The changes in soil properties caused by the addition of P after the first and second cropping were determined by subtraction of the pre-cropping values.

Results

Table 2 shows that the soils were extremely acidic (pH 4.0-4.6) loamy sands with low exchangeable cation content and organic matter that varied between 1.2 and 1.8%. Available P was less than 5.0 mg.kg⁻¹ in three locations and 17.5 mg.kg⁻¹ in Ugbogiobo soil while total N varied between 0.07 and 0.12%.

Table 3 shows the dry weight of maize top-growth as influenced by direct P application in the first cropping and the residual effects during the second cropping. Yield increased in all soils and was highest at 40 kg P.ha⁻¹ but which did not differ significantly from the 20 kg P.ha⁻¹ rate. The responses, expressed as % yield increase and relative yield, show that Ugbogiobo which produced the highest dry matter yield had the least responses to P while the response was medium at Agbarho and Oleh but greatest at Oko (Table 4). Agbarho had the highest dry matter yield in the second cropping but yield responses to residual applied P were either negative as in the soils from Oko and Ugbogiobo or slight at Agbarho (2.4%) and Oleh (17%).

Table 2: Properties of soils developed on Coastal Plain Sands used for the study

Properties	Agbarho	Oleh	Oko	Ugbogiobo
Sand, %	90.4	90.0	83.4	85.4
Silt, %	6.0	4.0	2.0	3.0
Clay, %	3.6	6.0	14.6	11.6
Textural class	S	LS	SL	SL
pH (water)	4.3	4.1	4.0	4.6
Organic matter, %	1.61	1.80	1.20	1.86
Total N, %	0.09	0.10	0.07	0.12
Available P, mg.kg ⁻¹	5.3	2.1	3.6	17.5
Exchangeable cations, cmol.kg ⁻¹				
K	0.10	0.08	0.06	0.29
Ca	0.60	0.15	0.20	0.90
Mg	0.30	0.35	0.20	0.80
Na	0.02	1.31	0.34	0.53
Acidity	3.98	3.41	3.88	2.70
CEC	5.00	5.32	4.68	5.42
Base saturation, %	20.40	35.53	17.10	46.50
Al, mg.kg ⁻¹	12.2	24.3	23.0	7.3
Fe, mg.kg ⁻¹	1.4	1.7	1.1	2.5
Mn, mg.kg ⁻¹	22.0	14.0	21.9	28.0

S = Sand; SL = Sandy loam; LS = Loamy sand
CEC = Cation exchange capacity

Table 3: Direct and residual effects of applied P on dry matter yield of maize

Soils	0	20	40	Mean
		Direct		
Agbarho	6.13e	8.10d	9.15cd	7.79y
Oleh	1.38g	2.10g	3.28f	2.25z
Oko	0.90g	3.28f	3.30f	2.49z
Ugbogiobo	10.53bc	11.98a	10.68ab	11.06x
Mean	4.73k	6.36j	6.60j	-
Soils	0	20	40	Mean
		Residual		
Agbarho	4.01a	2.97b	4.13a	3.70w
Oleh	1.15ef	1.37e	0.87f	1.13z
Oko	1.17ef	1.69de	1.21ef	1.36y
Ugbogiobo	2.59c	2.35c	1.83d	2.26x
Mean	2.23j	2.09jk	2.01k	-

SE= 0.48
SE= 0.13
Mean values for direct and residual cropping and values across soils and P rates followed by same alphabets do not differ significantly (P= 0.05).

- Radford, P.J. (1967). Growth analysis formulae-their use and abuse. *Crop Science*, 7: 171-175.
- SAS Institute (2012). SAS User's guide: Statistics, SAS Institute Amazon.com.
- Sokoto, M.B., Abubakar, I.U. and Dikko, A.U. (2012). Correlation analysis of some growth, yield, yield components and grain quality of wheat (*Triticum aestivum*). *Nigerian Journal of Basic and Applied Science* 20 (4): 349-356.
- Richards, R.A. (2000). Selectable traits to increase crop photosynthesis and yield of grain crops. *Journal of Experimental Botany* 51(1): 447-458
- Sun, Y.F., Liang, J.M., Ye, J. and Zhu, W.Y. (1999). Cultivation of super high yielding rice plants. *China Rice* 5: 38-39.
- Tollenaar, M. and Lee, E.A. (2002). Yield potential, yield stability and stress tolerance in maize. *Field Crops Research*, 75: 161-169.
- Watson, D.J. (1952). The physiological basis of variation in yield. *Advances in Agronomy*, 4:101-145.

The Avifauna Distribution and Diversity in the Northern Region of Cross River State, Nigeria.

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Abstract: The diversity and abundance of bird species inhabiting the northern region of Cross River State were investigated from January to December 2012. Three vegetation types within the region: tropical high forest, derived guinea savanna, and montane/grassland vegetation types were evaluated for analysis of the association of the bird species. Transect count method was used to collect data on bird species composition and abundance in 30 plots randomly and equally distributed and established in the three vegetation types. Fifty-seven (57) bird species belonging to fifteen (15) orders and nineteen (19) families were identified. The highest species richness was recorded in the tropical high forest with 47 compared to 42 in the derived guinea savanna and 30 in the montane/grassland vegetation type. The Order Passeriformes constituted the predominant group representing 36.84% of families (n=7) and 18.75% of species (n=9). Most of the bird species were resident (87.72%) and based on relative abundance value, fall into rare and uncommon bird species. Species abundance and diversity varied between the three vegetation types. The tropical high forest vegetation had the highest species abundance and species richness compared to derived guinea savanna and montane/grassland. Shannon diversity index indicated that the derived savanna vegetation had species diversity (H=3.18) than the other two vegetation types.

Introduction

Cross River State in Nigeria is one of the remaining most forested states endowed with high biodiversity. Keay (1959) classified the vegetation of the state as forest eco-climate consisting of mangrove forest freshwater swamp, lowland rain forest, derived guinea savanna and montane/grassland vegetation. The avifauna content of the vegetation has a great potential for tourism and recreation, serves as a good indicator for monitoring environmental changes and can be used for environmental impact assessment studies because of the sensitivity to changes in the environment.

Despite the considerable interest shown in the conservation of Nigerian ecosystems in recent years, little attention has been focused on the associated bird life, its inventory monitoring, distribution, and abundance. Although, bird life resources continue to sustain the rural dwellers in Cross River State, the danger in it is the decimation of these valuable resources almost at the point of extinction. Elgood (1982) asserted that the ecosystems in Nigeria support a larger diversity of biomass of birds which is traditionally exploited and largely unmanaged except when some species are set aside as sacred.

Under proper management, birdlife is an important resource to mankind's existence through the roles it plays in the balance of ecosystems, as a preferred material for research

and a major base for the recreation and tourism industry. This paper reports an evaluation of the species abundance and diversity of bird resources inhabiting the vegetation zones of the northern region of Cross River State, Nigeria.

Materials and Methods

The study was conducted in the northern part of Cross River State, Nigeria. Cross River State lies within the tropics and is located between latitude 4° 24', and 6° 53' North and longitude 7° 50' and 9° 28' East. The climate of the state is tropical with an average temperature of 26°C all the year round and high relative humidity. The rainy season has an average of 180 days in the northern part of the state. The mean annual rainfall varies from about 2,500 mm to 4,000 mm with a dry season between November and March. The vegetation of the study area is diverse and has been described by Keay (1959) to fall into the forest eco-climate vegetation, where the forest is a mixture of pure forest stands (55%), grassland and secondary forest. The dominant tree species include fruits and seeds producers such as Oil palm (*Elaeis guineensis*), African pear (*Dacryodes edulis*), African oil bean (*Pentaclethra macrophylla*), African star apple (*Chrysophyllum albidum*), African mahogany (*Azelaia africana*), African walnut (*Cola edulis*) and African pearwood (*Baillonella toxisperma*).

Table 1: Socio-economic characteristics of cocoa farmers in Ekiti State

Characteristics	Frequency	Percentage (%)
Age (Years)		
21 – 30	02	1.6
31 – 40	06	5.0
41 – 50	38	31.67
> 50	74	61.67
Sex		
Males	93	77.5
Females	27	22.5
Marital Status		
Single	32	26.67
Married	88	73.33
Education background		
No formal education	23	19.16
Primary	53	44.17
Secondary	29	24.17
Tertiary	15	12.50
Household size		
1 – 5	48	40.00
6 – 10	70	58.33
> 10	2	1.7
Membership of Social Organization		
Village Community Development	37	30.8
Religious Group	18	15.0
Farmers’ Group Union	20	16.7
Cooperative Societies	25	20.8
Social Groups	20	16.7
Characteristics	Frequency	Percentage (%)
External Orientation		
Within the village	20	16.7
Outside the village	14	11.7
Outside the LGAs	35	29.2
Outside the State	50	41.7
Outside the Country	1	0.8
Farm Size (Hectares)		
< 1	0	0.0
1.1 – 2.0	21	17.5
2.1 – 4.0	44	36.7
4.1 – 5.0	24	20.0
5.1 – 6.0	21	17.5
6.1 – 7.0	07	5.8
7.1 – 10.0	03	2.5
Farming Experience (Years)		
< 10	09	7.5
11 – 20	46	38.3
> 20	65	54.2

Source: Field Survey, 2014

Table 2 shows the different sources of through which respondents received information about the different agrochemicals: Extension agents (45.8%), fellow farmers (16.7%), friends and relatives (11.7%) while 15.0% got information from electronic media (radio and television).

Table 2: The relative distribution of the respondents' sources of information on agrochemicals

Sources of Information	Frequency	Percentage (%)
Ministry of Agriculture	08	6.7
Colleagues (Farmers)	20	16.7
Extension Agents	55	45.8
Radio	10	8.3
Television	08	6.7
Neighbours	05	4.2
Friends/Relatives	14	11.6
Total	120	100.0

Source: Field Survey, 2014

Table 3 shows the level of awareness of respondents about farm chemicals. The level of awareness was very high for fertilizers, herbicides and pesticides at 100, 99.2 and 95.8% respectively. Out of the pesticides, the awareness was highest for insecticides and fungicides at 65.8 and 54.2% respectively. Only small proportions of the respondents were aware of rodenticides and molluscides.

Table 3: Distribution of respondents' awareness of agrochemicals

Agrochemicals	Aware		Unaware	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Fertilizers	120	100.0	00	0.0
Pesticides	115	95.8	05	4.2
Herbicides	119	99.2	01	0.8
Rodenticides	32	26.7	88	73.3
Insecticides	79	65.8	41	34.2
Fungicides	65	54.2	55	45.8
Molluscides	14	11.7	106	88.3

Source: Field Survey, 2014

Table 4 shows the levels of the respondents' use of the agrochemicals. Herbicides, fertilizers and pesticides were mostly used by 99.2, 98.3 and 91.7% of the respondents respectively. The high

level of use related to the farmers' desires to improve farm work efficiency and obtain high yields for a steady supply of farm produce. Kughur (2012) had observed that the use of agrochemicals would not only contribute to the healthy growth of crops and animals but also improve farm work efficiency and ensure stable supply of tasty agricultural produce. The relatively lower use of insecticides (62.5%) and fungicides (64.2%) by the respondents might be due to the relatively poor financial status of cocoa farmers in the study area.

Table 4: Distribution of respondents' use of agrochemicals

Agrochemicals	Applied		Not Applied	
	Freq.	Percentage (%)	Freq.	Percentage (%)
Fertilizers	118	98.3	02	1.7
Pesticides	110	91.7	10	8.3
Herbicides	119	99.2	01	0.8
Rodenticides	04	3.3	116	96.7
Insecticides	45	37.5	75	62.5
Fungicides	43	35.8	77	64.2
Molluscides	02	1.7	118	98.3

Source: Field Survey, 2014

Table 5 shows the constraints identified by respondents in the use of agrochemicals. Poor extension contact was the major constraint encountered by 40.8% of the respondents, 22.5% identified the lack of awareness while others identified the unaffordable costs of different agrochemicals (18.3%) and lack technical know-how on the use of different agrochemicals (15.0%). Most of these problems cocoa farmers were associated with characterize the rural farmers who are predominantly poor and do not benefit substantially from many government policies and services meant for their socio-economic wellbeing (Youtl Oweri, 1987).

Table 5: Constraints encountered by respondents in the use of agro-chemicals

Constraints	Frequency	Percentage (%)
Lack of technical know-how	18	15.0
Cost of agro-chemicals	22	18.3
Lack of awareness	27	22.5
Poor extension contact	49	40.8
Conservativeness	04	3.3
Total	120	100.0

Source: Field Survey, 2014

Table 6 shows that significant relationships exist between farming experience ($r = 0.24$, $p < 0.05$), farm size ($r = 0.119$, $p < 0.05$), external orientation ($r = 0.36$, $p < 0.05$) and the extent of agrochemicals use. This implies that farming experience was a function of the extent to which agro-chemicals are used. Also, the larger the farm size of individual cocoa farmers, the larger is the quantity of agro-chemicals used. Furthermore, respondents' exposure in terms of external orientation would influence the awareness and utilization of these agro-chemicals. Age, education, and membership of social organization were not significant.

Table 6: Correlation coefficients of the relationships between socio-economic characteristics of cocoa farmers and the use of agro-chemicals

Socio-Economic Variables	Coefficient	P-value	Decision
Age	0.145	0.167	Non-significant
Education	0.143	0.184	Non-significant
Farming experience	0.244	0.008	Significant
Farm size	0.119	0.002	Significant
External orientation	0.359	0.035	Significant
Membership of social organization	0.150	0.163	Non-significant

Source: Field Survey, 2014

Conclusion and Recommendation

The contribution of cocoa production to the national economy cannot be over-emphasized but the output had declined since the oil boom era. The institutional supports to tackle the various challenges militating against high yields would emphasize the massive awareness of different types of agro-chemicals by cocoa farmers through regular with extension services, farmers' groups, research institutes and NGOs. The agro-chemicals should be subsidized by the government to make them affordable. The resultant increase in accessibility to the different agrochemicals will improve the adoption decision and use by the farmers so as to improve the production of cocoa. Also, the farmers should be trained on the technical know-how of application and safety strategies of these agro-chemicals.

References

Anaman K.A. (1988), African Farm Management. Ghana University Press, Accra.

- Bamire, A.S., Fabiyi, Y.L. and Manyong, V.M. (2002) Adoption pattern of fertilizer technologies amongst farmers in the ecological zones of South Western Nigeria: A Tobit analysis. *Australian Journal of Agricultural Research* 53:901-910.
- FAO (2003) Food and Agriculture Organization FAO STAT <<http://faosata.fao.org/default.htm>.
- Kughur, J. V. (2012) Interrelations of vegetative and reproductive growth with special reference to indeterminate plants. *Botanical Review*, 28: 324-325
- Matteson, P.C., Altieri, M. A. and Gagne, W.C. (1984) Modification of small farm practices for better pest management *Annals Hev. Entomol* 29: 383-102
- Miller, G.T. (2002) Living in the Environment. 12th Edition. Praeger Publisher, London.
- Opara, U.N. (2010), Personal and socio-economic determinants of agricultural information use by farmers in the Agricultural Development Programme (ADP) Zones of Imo State. *Nigeria Library Philosophy and Practice Journal*. <http://unllib.unl.edu/LPP/IPP2010.htm>
- World Bank (2003) World Development Indicators Mimeo, Washington, D.C. CD-ROM.
- Youtl-Oweri, G.D. (1987). Impact of weed science and agricultural chemicals on farm productivity in the 1980s. *Weed Sci.* 30: 426-429.