Development of Modules for Fertilizer Application in The Teaching of Practical Agricultural Science in Secondary Schools in Nsukka Education Zone of Enugu State Nigeria

Edwin ChizobaIsani[1], Abraham Olawuyi Emmanuel Egunsola[2], Daniel Hassana[3]

Department of Vocational Education,
Modibbo Adama University of Technology Yola, NIGERIA.

ABSTRACT

This study was designed to develop modules for fertilizer application in the teaching of practical agricultural science in secondary schools in Nsukka education zone. In doing this one research question was raised to guide the study, descriptive survey design was adopted, the study covered the 58 secondary schools in the zone. The researcher's prepared modules on fertilizer application were used for data collection. The responses of agricultural science teachers were interpreted. It was discovered that the teachers agreed with all the items on the modules for fertilizer application. It was therefore recommended that workshop should be organized for agricultural science teachers to acquaint them with handling of these modules in teaching practical agriculture. There should be proper supervision on the part of the secondary school education managers for the implementation of the items on the module.

Keywords: Fertilizer application, agricultural science,

INTRODUCTION

Increased use of mineral fertilizer has played a critical role in many developing countries (including Nigeria) that have experienced high and sustained levels of agricultural productivity growth, policy makers in Nigeria face major challenges in deciding how to promote increased fertilizer use. This investment note is grounded in the assumption that viable private sector-led markets for fertilizer will have to be developed if fertilizer use is to increase sustainably in Nigeria. The task will not be easy on the demand side as well as supply side; fertilizer exhibits a number of characteristics that complicate the emergence of viable private sector-led markets. These include the strong seasonality in demand for fertilizer and the highly dispersed nature of that demand, the riskiness of using fertilizer, the lack of purchasing power among many potential fertilizer users, the bulkiness of many fertilizer products and the need to achieve large volumes in fertilizer procurement and distribution to capture economics of scale (Adedepu, 2013).

It is also very clear from my observation that schools may not be clearly considered during fertilizer procurement and distribution. Overcoming these challenges will require a concerted effort involving co-ordinated intervention in a number of areas. Secondary schools as already observed are not considered during fertilizer procurement and distribution. Based on this reason one of the Enugu State policy thrust which is raising young farmers with entrepreneurial skills will not be achieved and as such there is need to develop modules for fertilizer application in secondary schools in Nsukka education zone so as to catch the students young for agricultural occupation.

Nsukka education zone is located in the Enugu State north senatorial district and it is made of igbo'etiti, Nsukka and Uzo-uwani local government areas. Nsukka education zone has the following number of secondary schools.

Copyright © 2014 SAVAP International

ISSN: 2307-3721, eISSN: 2307-3713
www.erint.savap.org.pk

i. Igboetiti L.G.A – 16

ii. Nsukka L.G.A – 30 and

iii. Uzo-uwani L.G.A – 12

These schools in the zone all have school farms for practical agriculture as a result of abundance of land in the zone and as an agrarian area, there is need to develop modules for fertilizer application on crops for practical agricultural science teaching.

Skills in Fertilizer Application

It has been known that a crop's access to inorganic nutrient is one of the major factor limiting yield, the others being water availability, temperature, pests and diseases. Concentrated plant nutrient, in the form of mineral fertilizer enable farmers to control nutrients availability and achieve yield as large and produce quality as high as the other factors restricting yield and quality permit. (Davis and Jones, 2013) Rabeson, (2001) stated that the use of mineral fertilizers is based on the present and predicted global fertilizer use and that market demand for food and fertilizer varies with economic conditions and changes in line with development in the efficiency of using plant nutrients sources, crop residues, manures and fertilizer.

Large regions such as much of sub-saharan Africa make very meager use of fertilizers, so that cultivated soils slowly lose their fertility, unevenness in crops fertilization is high; for example, cash crops are often not fertilized at all, the use of fertilizers throughout the farming community varies due to availability and economic factors (Balasurbranan, 2009).Experience and information regarding requirements and optimal fertilizer efficiency. Example, frequent heavy rains or droughts, soils with low capacity for retaining nutrients (low cation exchange capacity). However, the need for increased agricultural production should gradually manifest itself in enhanced demand and higher prices for food products. This should in time increase fertilizer use notably in those nations where nutrients availability to farmers form a principal restraint on productivity.

Olsen (2008) stated that fertilizer contain important mineral nutrients need by the plant and are usually applied to the soil. The role of fertilizer especially nitrogen, phosphorous and potassium (NPK) are in the manufacturing of plant food-starch and fat, in reproduction, production of protein in the maintenance of life and growth.

Although most of the modern varieties of crops have high fertilizer response, the potential high yield can only be realized if the fertilizer, especially nitrogen is properly managed. The farmers should practice the split application of NPK to coincide with the important growth stages for active plant uptake to minimize losses from the soil.

Other methods of fertilizer application according to Miears. (2007) are as follows:

A) Broadcasting

It refers to spreading fertilizers uniformly all over the field suitable for crops with dense stand, the plant roots permeate the whole volume of the soil, large doses of fertilizer and phosphorus fertilizers such as rock phosphate are used.

Broadcasting of fertilizers is of two types.

i) *Broadcasting at sowing or planting (Basal application)*

The main objectives of broadcasting the fertilizers at sowing time are to uniformly distribute the fertilizer over the entire field

Copyright © 2014 SAVAP International

ISSN: 2307-3721, eISSN: 2307-3713

ii) ***Top dressing***

It is the broadcasting of fertilizers particularly nitrogenous fertilizers in closely sown crops like paddy and wheat, with the readily available form to growing plants.

B) Placement

It refers to the placement of fertilizers in soil at a specific place with or without reference to the position of the seed placement of fertilizers is normally recommended when the quality of fertilizers to apply is small, development low level of fertility and to apply phosphatic and potassium fertilizer.

The most common methods of placement are as follows:

i) ***Plough sole placement***

In this method, fertilizer is placed at the bottom of the plough furrow in a continuous band during the process every band is covered as the next furrow is turned. This method is suitable for areas where soil becomes quite dry upto few centimeters below the soil surface and soils having plough sole layer.

ii) ***Deep placement***

It is the placement of ammoniacal nitrogenous fertilizers in the reduction zone of soil particularly in paddy fields, where available to the crop. This method ensures better distribution of fertilizer in the root zone soil and prevents loss of nutrient.

iii) ***Localized placement***

It refers to the application of fertilizers into the soil close to the seed or plant in order to supply the nutrients in uniformly to the plants. The common methods to place fertilizers close to the seed or plant are as follows:

Drilling

In this method, the fertilizer is applied at the time of sowing by means of seed-cum-fertilizer drill. This places fertilizer and seeds at different depths. Although this method has been found suitable for the application ofphosphatic and potassic fertilizers germination of seeds and young plants may get damaged due to higher concentration of soluble salts.

Side Dressing

It refers to the spread of fertilizer in between the rows and around the plants. The common methods of side-dressing are:

Placement of nitrogenous fertilizers by hand in between the rows of crops like maize, sugarcane, cotton etc., to all the growing crops andPlacement of fertilizers around trees crops like mango, apple, grapes, papaya etc.

C) Band Placement

It refers to the placement of fertilizers in bands. Band placement is of two types

Hill Placement

It is practiced for the application of fertilizers in orchards. In this method, fertilizers are placed close to the plant in band. The length and depth of the band varies with the nature of the crop.

Copyright © 2014 SAVAP International

ISSN: 2307-3721, eISSN: 2307-3713

Row Placement

When the crops like sugarcane, potato, maize, cereals etc., are sown close together in rows, the fertilizer is applied in to the row, which is known as row placement.

D) Pellet Application

It refers to the placement of nitrogenous fertilizer in the form of pellets 2.5 to 5cm deep between the rows of the crops. The fertilizer is mixed with the soil in the ratio of 1:10 and made small pellets of convenient size to deposit in the row

Being immobile, phosphates are better utilized when placed.

E) Starter Solutions

It refers to the application of solution of N, P205 and K20 in the ratio of 1:2:1 and 1:1:2 to young plants at the time of vegetative growth.

Starter solutions helps in rapid establishment and quick growth of seedlings.The disadvantages of started solutions are extra labour is required, and the fixation of phosphate is higher

F) Foliar Application

It refers to the spraying of fertilizer solutions containing one or more nutrients on the foliage of growing plants.Several nutrient elements are readily absorbed by leaves when they are dissolved in water and sprayed on them.The concentration of the spray solution has to be controlled, otherwise serious damage may result due to sorchi. Foliar application is effective for the application of minor nutrients like iron, copper, boron, zinc and manganese applied along with fertilizers

G) Application through Irrigation Water (Fertigation)

It refers to the application of water soluble fertilizers through irrigation water.The nutrients are thus carried into the soil in solution.Generally nitrogenous fertilizers are applied through irrigation water.

H) Injection into Soil

Liquid fertilizers for injection into the soil may be of either pressure or non-pressure types.Non-pressure solutions may be applied either on the surface or in furrows without appreciable loss of plant nutrients.Anhydrous ammonia must be placed in narrow furrows at a depth of 12-15 cm and covered immediately to prevent volatilization.

I) Aerial Application.

In areas where ground application of synthetic fertilizer is not practicable, the fertilizer solutions are applied by aircraft particularly in hilly areas.

STATEMENT OF THE PROBLEM

It is widely recognized that achieving rapid agricultural productivity growth is essential to raising overall economic growth in Nigeria and meeting the millennium development goals especially those related to reducing poverty and hunger. (Adesina 2012).

Copyright © 2014 SAVAP International

ISSN: 2307-3721, eISSN: 2307-3713

There is also widespread agreement that improved fertilizer use will improve soil fertility soil fertility is needed to stimulate agricultural productivity growth in Nigeria. For the foreseeable future, the welfare of rural population throughout much of Nigeria will be tied to agriculture. Agriculture is the backbone of the rural economy in Nigeria, generating a significant share of gross domestic product and providing by far the longest sources of rural employment (Adesina 2012). All too often however, agricultural growth has been disappointing as a result of neglecting the school children in planning and implementation of our fertilizer use programme. The secondary school children who would be future farmers are left out by both the government or the school authority. Hence the need to develop modules for fertilizer application in secondary schools in Nsukka education zone.

SIGNIFICANCE OF THE STUDY

The findings and recommendations of the study would benefit the students, the school and the society at large. The result of the findings and recommendations of the study if published would acquaint the students with skills in fertilizer application which they will on graduation take to the society for practice. The school authority would gain because these skills gained will increase crop yield for the school.

RESEARCH QUESTION

One research question was raised to guide the study.What is the module for fertilizer application on crops?

PURPOSE OF THE STUDY

The purpose of the study is to develop modules for fertilizer application in secondary schools in Nsukka education zone.

METHODOLOGY

One research question based on the specific objective of the study was formulated to guide the study. The descriptive survey research design was used in conducting the research. The target population comprised the 143 agricultural science teachers in Nsukka education zone. There was no sampling for the study. This is to avoid sampling error that may occur if sampling is done (Uzoagulu, 1998).

The instrument used for data collection was a 10 item modules developed by the researcher. These cover the knowledge areas in which one must be proficient in order to enable the students acquire valuable skills in fertilizer application on crops.

A four point rating scale of strongly agree (SA), Agree (A), Disagree (D), and strongly disagree (SD) was formulated and provided to the respondents. Copies of the instrument were administered to the agricultural science teachers in the study area by the researchers themselves. The entire 143 copies of the instrument were completed and returned. Data collected were analyzed using percentage and mean.

RESULTS AND DISCUSSION

What are the modules for fertilizer application on crops.?

To answer this research question, items on modules in fertilizer application were presented to the respondents to indicate their level of agreement. The mean scores of the responses on the items are presented in the table 1.

Copyright © 2014 SAVAP International

ISSN: 2307-3721, eISSN: 2307-3713

Table. Teachers' mean scores on modules for fertilizer application N=143

S No.	*Modules*		*X*
1	Fertilizer Application Regulations	Information about who needs to become an applicator and the guide to be followed. Details of all knowledge areas that must be mastered, the records that must be kept and who and how to report data. Details of additional restrictions on fertilizer de-icing materials	3.45*
2	Safety and health requirement in fertilizer application	Information on the safe use of fertilizers and the appropriate use of personal protective clothing and equipment.	3.18*
3	Principles in turf grass nutrition	Information on the basics of fertilizer application to include information on macro and micronutrients selection of fertilizers, application, and symptoms of either nutrient deficiencies or excesses.	3.43*
4.	Fertilizer programming and fertilizer selection	Strategies for choosing the most appropriate fertilizer sources for the situation. Attention is given to the preferred timing and levels of fertility sources based on soil testing, the turfgrass being grown, the season, and specific fertilizer characteristics.	2.94*
5	Label interpretation and basic fertilizer calculations	How to interpret and utilize data presented on a fertilizer label regarding guaranteed nutrient analysis, fertilizer source, and fertilizer solubility. Examples of basic fertilizer calculations that consider both dry and liquid sources, as well as nitrogen solubility characteristics.	4.11*
6.	Soil and tissue testing	Information on the importance of soil testing, including proper procedures and timing for collection of soil samples and analysis of soil sample results.	2.65*
7	Rotary spreader calibration	Importance of proper calibration and area calculations, strengths and weaknesses of using a rotary (broadcast) spreader, and the basic steps and calculations in calibrating and applying fertilizer materials with this type of spreader.	3.12*
8	Drop spreader calibration	Importance of proper calibration, the strengths and weaknesses of using a drop (gravity-fed) spreader, and the basic steps and calculations in calibrating and applying fertilizer materials with this type of spreader.	3.16*
9	Sprayer calibration	Importance of proper calibration and their calculations, strengths and weaknesses of using a spray system for fertilizer delivery, and the basic steps and calculations in calibrating and applying fertilizer materials with three types of spray systems: a backpack sprayer, a single-nozzle spray gun, and a multi-nozzle spray.	3.05*
10	Management strategies that optimize the environmental benefit of turf grass.	Information on basic principles and benefits of environmentally safe application of fertilizers	2.75*

N = 143; *=Agree; **=Disagree; X=mean.

Copyright © 2014 SAVAP International

ISSN: 2307-3721, eISSN: 2307-3713

Table 1 above shows the data on the modules for teaching fertilizer application in secondary schools. The data indicated that agricultural science teachers in the study area agreed to all the items provided on the modules for fertilizer application.

DISCUSSION OF THE FINDINGS

The findings of this study were arranged and discussed based on the research question. Agric science teachers in the secondary schools in Nsukka education zone agreed to all the items on modules for fertilizer application for teaching of practical agriculture presented to them. These include; safety and health requirement in fertilizer application principles in turf grass nutrition, fertilizer programming and fertilizer selection; label interpretation and basic fertilizer calculations; soil and texture testing; rotary spreader calibration; drop spreader calibration; sprayer calibration and management strategies that optimize the environmental benefit of turf grass.

CONCLUSION/RECOMMENDATION

Base on the findings of the study, the following conclusion were made; secondary school agricultural science teachers in the study area agree to the items on modules for fertilizer applications. This include; safety and health requirement in fertilizer application, principles in turf grass nutrition, fertilizer interpretation and basic fertilizer calculation among others.

RECOMMENDATIONS.

1. Workshop should be organized for teacher to acquaint them with handling of these modules in teaching practical agriculture.
2. There should be proper supervision on the part of the secondary school education managers for the implementation of the items on the module.

REFERENCE

[1] Adedepua, C.A. (2012). Tissue potassium concentration and sampling, Time for evaluating potassium fertilizer needs. *Tropical Quain Bulletin* 6:49-53

[2] Adesina, A. (2012). Federal Government Agriculture Transformation Agenda in Nigeria. A seminar paper on fertilizer procurement and Distribution. Abuja: Federal ministry of Agriculture.

[3] Balasubranan, J.K. (2009). *Nutrient cycling in agro system*. Dordnech, London: Klumder Academic Publisher.

[4] Davis, L.L.,& Jones, J. W. (2013). Fertilizer Experiment with Rice in California, USDA. *Journal of Agronomy Technology*, 5:65-69

[5] Miears, R.J. (2007). *Fertilizer and culture problems in crop production Technology*. Tokyo, Japan: Yekendo Ltd.

[6] Olsen, K.I. (2008) Mineral deficiency symptoms in crops. *Arkaness Agricultural Experiment Bullein*, 4:35), 40-47.

[7] Rabeson, R. (2001). *Rice soil constrains and fertility management in the High land of Madagascar*. Manila, Philippines: International Rice Research Institution.

[8] Uzoagulu, A.E. (1998*). Practical guide to writing research project report in tertiary institutions.* Enugu, Nigeria: John Jacob

Copyright © 2014 SAVAP International

ISSN: 2307-3721, eISSN: 2307-3713