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TRAINING NEEDS OF RURAL FARMERS IN ORGANIC FERTILIZER PRODUCTION FROM SOLID WASTE FOR SUSTAINABLE CROP PRODUCTION IN IMO STATE

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Abstract: *The aim of the study was to determine the training needs of rural farmers in organic fertilizer production from solid waste for sustainable crop production in Imo State of Nigeria. The study was carried out in Imo State using a census research design. Three research questions and three null hypotheses guided the study. The population for the study comprised of 57 extension agents and 1386 rural farmers in the three agricultural zones of Imo State. Random sampling was used to reduce the number of farmers to 462 making the entire population to be 519. The instrument used for data collection was 37 item structured questionnaire developed by the research. The instrument was structured using a four point rating scale for data collection and was face validated by three experts. Cronbach Alpha statistics was used to determine the internal consistency of the instrument and a grand coefficient of 0.70 was obtained. Mean with standard deviation were used to answer the research questions and t-test was used to test the hypotheses at 0.05 level of significance at 198 degree of freedom. The findings of the study revealed that rural farmers need training in planning, production process, health and safety measures in organic fertilizer production from solid waste for sustainable crop production in Imo State. The null hypotheses tested showed no significant difference in the mean responses of rural farmers and extension agents. Based on the findings, rural farmers need training in organic fertilizer production. Some recommendations were therefore made that extension workers should develop a skill module for effective training of the need areas to the rural farmers, extension agents should create awareness to rural farmers on the need to use mostly organic fertilizer because of its benefits over other soil nutrient replenishing substances for sustainable crop production.*

Keywords: *Organic, fertilizers, solid wastes, training, planning, production, health and safety measures, rural farmers and extension agents.*

Introduction

The historical concept of fertilizer is as old as mankind. Fertilizer is a substance which when added to the soil supplies essential elements for the growth and yield of crops (Brady, 2002). Traditionally, man has depended on the recycling functions performed by the soil ecosystem through biochemical activities to maintain the fertility of the soil and ensure continual production of food. But as the population increased, scientist started exploring ways to maintain soil fertility. Many communities started relying heavily on the use of fertilizers for the production of crops (Njoku, 2010). www.fertilizer.machine.net types of fertilizer (2022) Classified fertilizers into two namely: inorganic.

According to Iwena (2002), inorganic fertilizers are chemical substances in form of powder, granules, pellets or crystal made form inorganic rock minerals which when added to the soil increase its fertility while organic fertilizers is made from the remains of plants and animals. Both forms of fertilizers are used by

farmers in Imo State for crop production with greater dependence on inorganic fertilizers. Inorganic fertilizers give immediate stimulation to crops and contribute substantially to high yields (Njoku, 2010). But in many cases, the costs of these inorganic fertilizers are beyond the reach of many farmers and their availability is not always guaranteed.

On the other hand, organic fertilizer (manure) is a valuable renewable resource which improves the biological, chemical and physical properties of the soil (Alam, 2002). Organic fertilizers (manure) are the decayed plant and animal products which have been carefully prepared to supply nutrients to crops/plants (Iwena, 2012). This implies that organic fertilizer can be produced from locally available biodegradable solid wastes. Osinen (2005) opined that solid wastes are rubbish, refuse or garbage resulting from industrial, commercial, agricultural, domestic and community rabbit goat, swine, cattle, poultry manures among others as well as cassava peels and various kinds of vegetable materials and industrial wastes. These soiled wastes can be used in the production of fertilizer.

Production is the process of making or manufacturing goods as well as the process of providing service. According to Olaitan, Nwahcukwu, Igbo, Onyemaechi and Ekong (1999) and Iwena (2012), production is the process that transforms resources into useful goods and services using human capital, land, building and other utility services to effect a change. This indicates that production refers to all economic activities which result in the creation of goods and service. With reference to this study production involves activities performed in collecting materials and producing a fertilizer using decomposable organic solid wastes. This organic fertilizer produced can be bagged, stored and utilized when needed or applied directly to the soil as soon as it matures. The success of organic fertilizer production in the rural areas depends on farmer's possession of the requisite skills.

Rural farmers are those people that live in the rural communities doing all sorts of farming activities to earn their living. Evans (2015) saw rural farmers as those involved in farming and carrying out other related farming activities in the villages. These farmers also engage in agricultural activities by producing food for their own consumption and little for sale (Food and Agricultural Organisation FAO), 2011). Moreso, these farmers cultivate food crops, monocrops, rear livestock, engage in fishing and hunting among others but they depend on seasonal and natural conditions to carry on their farming activities (Ugwu, 2019). This implies that rural farmers produce the majority of food grown especially in subsistence farming. In the context of this study, these rural farmers need to be trained in the techniques of organic fertilizer production from solid waste especially in Imo State which is the study area. This is because organic fertilizer is a cheap source of plant food for improved crop production.

Training is the process of learning the skills that one needs to do a job. Flippo (2008) defined training as the act of increasing the knowledge and skills of an employees in doing a particular job. Flippo emphasized that training is given to individuals to improve their abilities to do their vocation more effectively and efficiently. FAO (2015) added that training equips individuals or recipients with skills to pursue new liveliho`ods and adopt technology to their needs. Training needs according to Dervon (2008) is a system gathering of data to find out where there are gaps in the existing skills, knowledge and attitude of employee. Rural farmers need to be trained to adopt modern and effective technology in organic fertilizer production from solid waste. These training can be given to these farmers through extension agents.

Extension agent is usually a technically trained person with excellent skill. Extension agents are those trained in the dissemination of improved farming methods and techniques which improves production efficiency and enhance income generation (Ekele, 2015). This implies that their roles re to disseminate new ideas, innovations and knowledge to farmers. With reference to this study, it is these extension agents that

will train the rural farmers on the planning, production process, health and safety measures in organic fertilizer production from solid waste.

Planning is the arrangement for doing or using something worked out in advance. Igbinosi (2002) observed that planning is concerned with deliberately achieving some objectives and it proceeds by assembling actions into some orderly sequence. Obhakhan (2005), is of the view that planning is essentially an aspect of decision making process which help to define what is to be done, how to do it, at what cost and when to do it. It means deciding what one need to do in future. This implies that in organic fertilizer production, the farmer sets objectives and plans on how to achieve the stated objectives such as setting goal prior to cropping season, locating sources of suitable organic solid waste, identifying personnel to be involved in waste collection, providing required tools and facilities ready for production among others. This shows that after planning, the next stage is the production process of the organic fertilizer.

The production of organic fertilizer starts with the collection of suitable organic solid waste. FAO in Osinem (2005) views waste as rubbish, refuse, or garbage resulting from industrial, commercial, domestic and community activities. Osinem in Njoku (2010) classified wastes into solid, liquid (effluent) and gaseous materials. These solid wastes consists of organic biodegradable (compostable) and inorganic non-biodegradable (non-compostable) materials. With reference to this study, these solid wastes that are compostable include various agricultural by-products such as straw, husks of wheat, rice, Maize, sorghum, millet, sugar industry residues, cane bagasse, sugar beets among others; beverage industry residues, cocoa husks and pulp, tea processing, animal dungs and by-products such as bone and blood meals, sewage sludge, municipal wastes; fruits and vegetable residues, brewery products among others. The use of oil palm bunch refuse either around the oil palm base or in the form of bunch ash is also source of organic fertilizer. Production process also according to Irubor (2006) involves sorting the trash, converting some of the trash to those useful products, composting and convertion. In the production process, the health of the farmers and the family must be considered.

The success of agricultural production depends largely on the health and safety of the farmers. Hornby (2005) define health as the state of being physically and mentally healthy while safety is the state of being safe and protected from danger or harm. Hence, the farmer needs extension service not only in plant nutrition but also in human nutrition and disease prevention. This is because disease undermines the agricultural system and affects nutritional situation and food science of the rural families. In the context of this study, the extension agents are useful in assisting the rural farmers learn and take advantage of improved agricultural technologies and innovations so as to enhance agricultural development and family wellbeing. The extension agent according to Njoku (2010) will teach the farmers the steps involved in the production of organic fertilizer and the method of application of the product to the soil using health and safety measures such as wearing protective clothing, hand gloves, curing the fertilizer before application, applying fertilizer without allowing it to touch the plant, washing hands properly after application, using improved health facilities to ensure personal health such as hospitals and clinics, going for regular medical check-ups to maintain personal health among others. Homby (2015) defines measure as an official action that is done in order to achieve a particular aim. This implies that there is need for rural farmers to be trained on health and safety measures in organic fertilizer production from solid waste because when adults fall sick and die, families face declining productivity as well as loss of knowledge about indigenous farming methods and assets (FAO, 2001) which will equally affect sustainable food production.

Sustainable crop production takes into account environmental, health, social and economic concerns. Sustainable according to Ugwu (2019) means involving the use of natural products and energy in a way that does not harm the environment and long lasting. www.britannica.com>crop – agriculture (2022) defines a

crop in agriculture as a plant, or plant product that can be grown and harvested extensively for profit or subsistence. While crop production is the process of growing crops for domestic and commercial purposes to meet the demand for food and fibre.

This implies that a sustainable crop production is a collaborate network that integrates several components in order to enhance a community's environmental, economic and social well-being. Therefore, sustainable crop production in this study involves the continuous planning for organic fertilizer production from solid waste, its production process, and health and safety measures needed by rural farmers in order to produce enough organic fertilizer for sufficient supply of plant nutrition and made available for rural farmers use.

An organic fertilizer is a valuable renewable resource which improves the biological, chemical and physical properties of the soil. Organic fertilizer can be produced from local available biodegradable solid wastes which is cost effective and does not entail complex biotechnological techniques required for bio-fertilizers. But it has been observed that many rural farmers especially in Imo State rely heavily on the use of inorganic fertilizers for the production of crops despite the high costs of these fertilizers which are beyond the reach of many of these rural farmers and their availability is not always guaranteed. FAO (2011) reported that the resulted widespread inorganic fertilizer shortages and their high costs make their use un-economical for some crops.

Sustainable crop production in Imo State requires effective participation of rural farmers in organic fertilizer production from solid waste. It is mostly likely that rural farmers do not possess adequate theoretical and practical skills needed for planning, production process and health and safety skills needed in organic fertilizer production from solid wastes. Some of these rural farmers are illiterates while others are semi-illiterates (Ugwu, 2019). Some of the skills they possess are often applied wrongly leading to low crop production. Hence, the study sought to determine the training needs of rural farmers in organic fertilizer production from solid waste for sustainable crop production in Imo State.

Purpose of the Study

The main purpose of this study was to determine the training needs of rural farmers in organic fertilizer production from solid waste for sustainable crop production in Imo State. Specifically the study sought to determine:

1. the training needs of rural farmers in planning for organic fertilizer production from solid waste for sustainable crop production in Imo State
2. the production process of organic fertilizer from solid waste for sustainable crop production in Imo State
3. the health and safety measures for organic fertilizer production from solid waste for sustainable crop production in Imo State.

Research Questions

1. What are the training needs of rural farmers in planning for organic fertilizer production from solid waste for sustainable crop production in Imo State?
2. What are the training needs of farmers in production process of organic fertilizer from solid waste for sustainable crop production in Imo State?
3. What are the training needs of rural farmers in health and safety measures for organic fertilizer from solid waste for sustainable crop production in Imo State?

Hypotheses

The following null hypothesis tested at 0.05 level of significance guided the study:

Ho_1: There is no significant difference in the mean ratings of farmers and extension agents on the training needs of rural farmers in planning for organic fertilizer production from solid waste for sustainable crop production in Imo State

Ho_2: There is no significant difference in the mean ratings of farmers and extension agents on the training needs of rural farmers in production process of organic fertilizer from solid waste for sustainable crop production in Imo State

Ho_3: A significant difference do not exist in the mean ratings of farmers and extension agents on the training needs of rural farmers in health and safety measures for organic fertilizer from solid waste for sustainable crop production in Imo State.

Research Method

The study adopted a census research design. A censor research according to Kottani (2004) in Ideh (2020), is a complete enumeration of all items in the population. This design was used because the entire population for the study was manageable and the results of the study would be generalized on the entire population.

The study was conducted in Imo State. Imo State is one of the States in South-East geopolitical zone with three agricultural zones namely Okigwe, Orlu and Owerri. All the agricultural zones produce crops like maize, yam, cocoyam, rice, cassava, oil palm, vegetables and plantain in abundance and have extensive fertile farmlands. It is bordered by Abia State on the East, River Niger and Delta State to the West, Anambra State to the North and Rivers State to the South. The State lies within latitudes $4^{o}45^{o}$N and $7^{o}15^{o}$N, and longitude $6^{o}50^{o}$E and $7^{o}25^{o}$E with an area of around 5,100sqkm.

The population for the study was 1386 farmers and 57 extension agents in the three agricultural zones of Imo State (Imo State Agricultural Development Programme, 2022). Random sampling was done to reduce the population of the farmers to 462 making the entire population to be 519. It was this 519 respondents that was used for the study. A self-structured questionnaire was used as instrument for data collection. The questionnaire contained a total of 36 structured items on the training needs of rural farmers on organic fertilizer production from solid wastes for sustainable crop production in Imo State. Each training need item had a four point response scale of Highly Needed (HN), Needed (N), Moderately Needed (MN) and Not Needed (NN) with nominal values of 4, 3, 2, 1 and assigned to them respectively.

The instrument was subjected to face validation by two experts from the Department of Crop Science, Faculty of Agriculture and one from Measurement and Evaluation from Department of Mathematics and Computer Science Education from Faculty of Education all in Enugu State University of Science and Technology, Enugu. They validated the instrument to ensure the appropriateness of the measuring instrument and that the instrument was structured to address the purpose of the study (Uzoagulu, 2011). The comments of the experts were used to modify the final instrument used for data collection.

The reliability of the instrument was determined by using Croubach Alpha reliability method to determine the internal consistency of the instrument. The clusters yield a coefficient reliability of 0.72, 0.68 and 0.70 respectively and a grand coefficient index of 0.70 indicating that the instrument was reliable and suitable for data collection for the study.

A total of 519 copies of the questionnaire was distributed to the respondents with the help of three guided research assistants. These assistants were briefed by the researcher on how to administer the instrument to the respondents. All the 519 copies of the questionnaire were properly filled and returned, giving a return rate of 100%. It was these properly filled questionnaire that was used for analysis.

The data collected was analysed using weighted mean with standard deviation to answer the research questions. The t-test was used for testing the null hypothesis at 0.05 level of significance. The decision was based on the principles of real limits of the mean, thus:

Highly Needed (HN)	-	3.50 – 4.00
Needed (N)	-	2.50 – 3.49
Moderately Needed (MN)	-	1.50 – 2.49
Not Needed (NN)	-	1.00 – 1.49

The null hypothesis were significant where the probability value was less than the 0.05 at appropriate degree of freedom, otherwise the null hypothesis was not significant.

RESULT

The result obtained from the data analysed were presented in table below according to the research questions and hypotheses that guided the study.

Research Question 1

What are the training needs of rural farmers in planning for organic fertilizer production from solid waste for sustainable crop production in Imo State?

Table 1

Mean ratings and standard deviation of respondents on training needs of rural farmers in planning for organic fertilizer production from solid waste for sustainable crop production in Imo State

S/N	Rural farmers need training in planning for organic fertilizer production from social waste in the following areas:	Respondent N = 519 X	SD	Decision
1.	Setting goals prior to corping season	3.66	.41	HN
2	Locating source of suitable organic solid waste	3.60	.48	HN
3	Identifying suitable organic solid waste for fertilizer production	3.71	.43	HN
4	Identifying personnel to be involved	3.48	.55	N
5	Providing required tools and facilities	3.65	.45	HN
6	Adopting efficient waste collection system	3.40	.52	N
7	Setting time frame for waste collection	3.62	.50	HN
8	Arranging for conveyance of waste	3.52	.50	HN
9	Choosing a suitable site for composting	3.71	.44	HN
10	Conveying waste to composting centre	3.60	.48	HN
	Grand Cluster Mean/Value	**3.59**	**.47**	**HN**

NOTE: x – mean, SD – standard Deviation, HN – Highly Needed, N – Needed

The data presented in **Table 1** above revealed that eight (8) items were highly needed in planning for organic fertilizer production from solid waste. The means of the items ranged from 3.52 to 3.71. However, two items were needed in planning for organic fertilizer production form solid waste. The means of these items were 3.48 and 3.40. With a grand mean of 3.59 and standard deviation of 0.47. It shows that rural farmers highly need to be trained in planning for organic fertilizer production solid waste for sustainable crop production in Imo State.

Table 2

Summary of t-test analysis of mean ratings of farmers and extension agents on the training needs of rural farmers in planning organic fertilizer production from solid waste for sustainable crop production in Imo State.

Variables	N	T	df	Sig. (2tailed)	Mean difference	Std. error difference	Decision
Extension Agents Farmers	57 462	0.848	517	0.396	0.26502	0.31232	NS

Table 2 shows that t-value at 0.05 level of significance and 517 degree of freedom for the 10 items is 0.848 with a significant value of 0.396. Since the significance value of 0.396 is more than the 0.05 level of significance, the null hypothesis is not significant. This means that there is no significant difference with regards to the 10 items on the mean rating of extension agents and farmers on the training needs of rural farmers in planning for organic fertilizer production from solid waste for sustainable crop production in Imo state. The null hypothesis was upheld.

Research Question 2

What are the training needs of farmers in production process of organic fertilizer from solid waste for sustainable crop production in Imo State?

Table 3

Mean ratings and standard deviation of respondents on training needs of rural farmers from solid waste for organic fertilizer production from solid waste for sustainable crop production in Imo State

S/N	Rural farmers need training in production process of organic fertilizer in the following areas:	Respondent N = 519 X	SD	Decision
1.	Sorting compostable materials prior to composting	3.78	0.40	HN
2.	Chopping material to reduce the size to enhance decomposition	3.45	0.58	N
3.	Stacking cut materials to height of 100-150cm	3.39	0.56	N
4	Converging compost with a black material to increase temperature.	3.60	0.50	HN
5	Moistening the pile to maintain 60% moisture	3.65	0.47	HN
6	Monitoring temperature of compost weekly	3.65	0.52	N
7	Testing temperature of pile using a stick	3.49	0.53	N
8	Turning compost pile thoroughly for decomposition	3.52	0.46	HN
9	Incubating materials for up to 30-60 days with biochem	3.69	0.46	HN
10	Determining mature compost (no heat & smell)	3.71	0.44	HN
11	Harvesting composted material and dry on a concrete floor	3.74	0.43	HN
12	Mixing materials in suitable combinations	2.19	1.12	HN
13	Sieving composted material with 2cm wire mesh	1.80	0.91	HN
14	Analysing composted product for presence of O.M.N.P&K	3.54	0.56	N
15	Fortifying product to enhance shelf-life	3.56	0.55	N
16	Bagging product using polyethylene plastic bag	3.70	0.50	HN
17	Storing product under shelter away from rain and sun	3.20	0.52	N
	Grand Cluster Mean/Value			**HN**

NOTE: x – mean, SD – standard Deviation, HN – Highly Needed, N – Needed

The data presented in **Table 3** revealed that rural farmers need training in 11 items out of the 17 items listed. The means of these items range from 3.52 to 3.78. Only two items showed that rural farmers need training on item as production process. These items are sieve composted material with 2cm more mesh with mean of 2.19 and analyse composted product for OM, N, P & K with a mean of 1.89 that farmers need training in the production process of organic fertilizer from solid waste for sustainable crop production in Imo State.

Table 4

Summary of t-test analysis of mean ratings of farmers and extension agents on the training needs of rural farmers in production process organic fertilizer production from solid waste for sustainable crop production in Imo State.

Variables	N	T	df	Sig. (2tailed)	Mean difference	Std. error difference	Decision
Extension Agents Farmers	57 462	0.862	517	0.103	0.26673	0.3871	NS

The result of t-test analysis presented in **Table 4** shows that the t-value at 0.05 level of significance and 517 degree of freedom for 17 items is 0.862 with a significant value of 0.103. Since the significant value of 0.103 is more than the 0.05 level of significance, the null hypothesis is not significant. The implication is that there is no significant difference with regards to the 17 items on the mean ratings of extension agents and farmers on the training needs of rural farmers in production process of organic fertilizer production from solid waste for sustainable crop production in Imo State.

Research Question 3

What are the training needs of rural farmers in health and safety measures for organic fertilizer from solid waste for sustainable crop production in Imo State?

Table 5

Mean ratings and standard deviation of respondents on training needs of rural farmers in health and safety measures for organic fertilizer production from solid waste for sustainable crop production in Imo State

S/N	Rural farmers need training in health and safety measures in the following areas	Respondent N = 519 X	SD	Decision
1	Wearing protective clothing/hand gloves	3.80	0.41	HN
2	Curing the organic fertilizer before application	3.60	0.52	HN
3	Applying organic fertilizer when soil is sufficient, wet	3.73	0.48	HN
4	Applying organic fertilizer without allowing it to touch the plant	3.59	0.52	HN
5	Washing hands properly after application	3.66	0.52	HN
6	Testing soil to know deficient nutrients	3.55	0.53	HN
7	Using improved health facilities to ensure	3.71	0.46	HN
8	Personal health facilities to ensure	3.64	0.50	HN
9	Maintaining better personal nutrition for personal health	3.52	0.69	HN
10	Going for regular medical check-ups to maintain health wearing face masks	3.64	0.51	HN
	Grand Cluster Mean/Value	**3.64**	**0.51**	**HN**

NOTE: x – mean, SD – standard Deviation, HN – Highly Needed, N – Needed

The data presented in Table 5 revealed 10 health and safety measures rural farmers highly need to be trained for organic fertilizer production from solid waste for sustainable crop production in Imo State. The means of

these items ranged from 3.52 to 3.80 and standard deviation of 0.41 to 0.69. With a grand cluster mean of 3.64 and standard deviation of 0.51, it shows that all the respondents indicated that rural farmers highly need training in these items. With 0.51 as the grand cluster values indicates that the respondents did not differ much in their responses and not far from the mean.

Table 6

Summary of t-test analysis of mean ratings of farmer and extension agents on the training needs of rural farmers in health and safety measures for organic fertilizer production from solid waste for sustainable crop production in Imo State.

Variables	N	T	df	Sig. (2tailed)	Mean difference	Std. error difference	Decision
Farmers Extension Agents	642 57	0.305	517	0.439	1.74275	0.40482	NS

Table 4 shows that the t-value at 0.05 level of significant and 517 degree of freedom for the 10 items is 0.305 with significant value of 0.439. Since the significant value of 0.439 is more than the 0.05 level of 0.439 is more than the 0.05 level of significant, the null hypothesis is not significant. This means that there is no significant difference between the mean ratings of farmers and extension agents on the training needs of rural farmers in health and safety measures for organic fertilizer production from solid waste for sustainable crop production in Imo State. Hence the null hypothesis is therefore not significant.

Findings

The following findings were made based on the result of the data anlayzed.

1. The respondents agreed that all the items were needed by rural farmers in planning for organic fertilizer production from solid waste for sustainable crop production in Imo State. the items included setting goals prior to cropping season, locating source of suitable organic solid waste, identifying suitable organic solid waste for fertilizer production, providing required tools and facilities, adopting efficient waste collection system, choosing a suitable site for composing among others.

   The hypothesis showed that there was no significant difference with regards to the 10 items on the mean ratings of extension agents and farmers on the training needs of rural farmers in planning for organic fertilizer production from solid waste for sustainable crop production in Imo State.

2. The training needs of rural farmers in the production process of organic fertilizer from Imo State include sorting compostable material prior to composting, chopping to reduce the size to enhance decomposition; stacking cut materials to a height of 100-150cm, covering compost with moistening the pile to maintain 60% moisture among others. These are in agreement with the respondent's opinion as they all strongly agreed to these. The hypothesis showed that there was no significant difference with regards to the 17 items on the mean ratings of extension agents and farmers on the training needs of rural in production process of organic fertilizer production from solid waste for sustainable crop production in Imo State.
3. The respondents showed that rural farmers highly need training in health and safety measures for organic fertilizer production from solid waste for sustainable crop production in Imo State. These items include wearing protective clothing/hand gloves, wearing face masks, curing the fertilizer before application, applying organic fertilizer when soil is sufficiently wet, applying organic fertilizer without allowing it to touch the plant among others. The null hypothesis tested showed no significant difference between the mean ratings of extension agents and rural farmers on health and

safety measures for organic fertilizer production from solid waste for sustainable crop production in Imo State.

Discussion

The result of the study on research question one showed that rural farmers highly need training in planning for organic fertilizer production from solid waste for sustainable crop production in Imo State. The items listed had a grand mean of 3.59 and standard deviation of 0.47. The items included setting goals prior to cropping season, locating source of suitable organic solid waste, identifying suitable organic solid waste for fertilizer production, identifying personnel to be involved, providing required tools and facilities, adopting efficient waste collection system, setting time frame for waste collection, arranging for conveyance of waste, choosing a suitable site centre. These findings are in line with Igbinosa (2002) who observed that planning is concerned with deliberate achievement of some objectives which proceeds by assembling actions into some ordering sequence. Obhakhan (2005) added that planning is essentially an aspect of decision making process which help to define what is to be done, how to do it, at what cost and when to do it. This implies that rural farmers should be trained on how to set objectives and plan on how to achieve the stated objectives towards production of organic fertilizer from solid waste for sustainable crop production.

The null hypothesis tested on planning for organic fertilizer production from solid waste for sustainable crop production showed no significant difference between the mean ratings of extension agents and farmers. The non-significant difference showed that the respondents were not influenced with respect to the responses to these items.

The findings in research question 2 showed that the respondents agreed that the rural farmers need training in production process of organic fertilizer from solid waste for sustainable crop production in Imo State. All the itemized production processes had a grand mean of 3.20 and a standard deviation of 0.52 showing needed. The items included sorting compostable materials prior to compositing, chopping materials to reduce the size to enhance decomposition, stacking cut materials to a height of 100-150cm, covering compost with a black material to increase temperature among others. These findings are in line with FAO in Osinem (2005) hat opined that solid wastes consist of compostable (biodegradable) and non-compostable (non-biodegradable materials). Drubor (2006) added that these solid wastes should be sorted as a production process. These means that production of fertilizer from organic waste to take place, the farmers must start from sorting compostable materials from non-compostable materials.

The null hypothesis tested on the training needs of rural farmers in production process of organic fertilizer from solid waste for sustainable agriculture showed no significant difference between the mean ratings of farmers and extension agents. The non-significant difference showed that the respondents agreed that there is need to train farmers on production of organic fertilizer from solid waste for sustainable crop production in Imo State.

The result on research question three showed that all the itemized health and safety measures were agreed to by the respondents that rural farmer's highly need to be trained in these areas for organic fertilizer production from solid waste. These items had a grand mean of 3.64 and standard deviation of 0.51. These items are wearing protective clothing/hand gloves, curing the organic fertilizer before application, applying organic fertilizer when soil is sufficiently wet, applying organic fertilizer without allowing it to touch the plants, washing hands properly after application among others. This is in line with Njoku (2010) that health and safety measures in organic fertilizer production from solid waste include wearing protective clothing/hand gloves, curing the fertilizer before application, applying fertilizer without allowing it to touch the plant, washing hands properly after application among others. Rural farmers highly need to be trained on

how to use these measures because the success of agricultural production depends largely on the health and safety of the farmers.

The null hypothesis tested on training needs of rural farmers in health and safety measures for organic fertilizer production from solid waste for sustainable crop production showed no significant difference. The non-significant difference showed that the respondents agreed that health and safety are necessary for the farmers to be trained in the production of fertilizer from organic waste. The non-significant difference may be due to the fact that the respondents agreed that when adults fall sick and die, families face declining productivity as well as loss of knowledge about indigenous farming methods and assets which will in turn affect sustainable food production (FAO, 2001).

Conclusion

The concept of fertilizer is as old as mankind. Fertilizer is a substance which when added to the soil supplies essential element for the growth and yield of crops. There are two types of fertilizer viz organic and inorganic fertilizer. Inorganic fertilizer is made from inorganic rock minerals while organic fertilizer is made from the remains of plants and animals. Both forms of fertilizers are used for crop production with greater dependence on inorganic fertilizer because it is readily available. But in many cases the costs of these inorganic fertilizers are beyond the reach of many farmers. On the other hand, organic fertilizer are valuable renewable resource which improves the biological, chemical and physical properties of the soil. They are made from decayed plants and animal products which have been carefully prepared to supply nutrients to crops. This implies that organic fertilizer can be produced from locally available biodegradable solid wastes such as rubbish, refuse or garbage resulting from industrial, commercial agricultures, livestock wastes, domestic and community activities.

Therefore, rural farmers need to be trained to make use of these available valuable local solid waste in organic fertilizer production for sustainable crop production instead of depending on inorganic fertilizer which is in limited quantity as well as costly. Rural farmers to be able to produce organic fertilizer for sustainable crop production should be trained in such areas and planning for organic fertilizer production from solid waste, production process of organic fertilizer from solid waste and health and safety measures for organic fertilizer production from solid waste. This is because sustainable agriculture requires effective participation of rural farmers in organic fertilizer production from solid waste as it will reduce the cost of crop production.

Recommendations

Based on the findings of the study, the following recommendations were made.

1. Extension agents should develop a skill module that would be used for effective training of these needs areas to the rural farmers.
2. Extension agents should create awareness to rural farmers on the need to use mostly organic fertilizers because of its benefits over other soil nutrient replenishing substances.
3. Government should make available health facilities available to rural farmers at subsidized prices.

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