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Impact of Agricultural Waste on Sustainable Environment and Health of Rural Women

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Abstract
The study worked on the impact of agricultural waste on sustainable environment and health of rural women. Three specific objectives were formulated for the study and included to identify the constituents of agricultural waste, to determine the environmental and health impact of agricultural waste and to determine the effective management techniques of agricultural wastes. Three research questions and three null hypotheses were also formulated in line with the specific objectives. Survey research design was adopted for the study. Population for the study was 3970 representing 450 registered livestock farmers, 3270 rural women and 250 environmental health workers in Anambra State. Proportionate random sampling technique was used to draw a sample of 350 respondents representing 40 registered livestock farmers, 286 rural women and 24 environmental health workers. Questionnaire developed by the researchers was used to collect data. The instrument was face validated by three experts and reliability was tested using cronbach alpha method which yielded a coefficient of 0.86. Data were collected with the help of fifteen research assistants and 325 instruments were retrieved representing 81% return rate. Mean and Standard Deviation were used to answer the research questions while ANOVA was used to test the null hypotheses at 0.05 level of significance and at the appropriate degrees of freedom. Any null hypothesis whose p-value was greater than 0.05 level of significance at the appropriate degrees of freedom was upheld while a null hypothesis was rejected when the p-value was less than 0.05 level of significance at the appropriate degrees of freedom. The findings of the study indicated that animal faeces, urine, used litter, beddings, animal carcass, dairy parlor washings, waste milk, wasted feed, feedlot run-off, paunch waste, abattoir waste water, animal viscera, horns, feather, bones, blood, fur, placenta, birth tissues, fetal membranes, aborted fetus among others are the materials that constitute agricultural waste. It was also found that that air pollution from burning of agricultural wastes, air pollution from cesspools, dioxins from burning agricultural wastes, dirty environment from heaps of agricultural wastes, stench/odour from decaying agricultural waste, defacing of the environment, eutrophication of water bodies, aquatic life destruction, spontaneous abortion, blue-baby syndrome, prolonged mensuration and early menopause, among others are the environmental and health impact of agricultural waste on rural women. It was recommended among others that Extension workers should properly educate farmers on the dangers of agricultural wastes and sensitize them on proper disposal methods.
Keywords: agricultural waste, environment, health, rural women, pollution.

1. INTRODUCTION

Agricultural wastes are residual materials in liquid and solid forms generated from production, processing and marketing of crops and animals. According to Ashworth and Azedero (2009), agricultural waste are organic and inorganic waste materials produced in a farm through various farming activities such as dairy farming, horticulture, seed sowing, livestock breeding, harvesting, processing and so on. Defra (2007) gave a legal definition of agricultural waste as waste from premises for agriculture with the meaning of Agriculture Act 1947. The Agriculture Act 1947 defines agriculture as including horticulture, growing fruit, seed growing, dairy farming, livestock breeding and keeping, use of land for grazing, market gardens, nursery ground and use of land for woodland. As agricultural activities are intensified to increase food production to meet the dietary needs of the ever increasing world population, so would there be increase in agricultural waste generation. Such waste generated from agriculture adversely affect and retard environmental sustainability efforts globally.

Sustainability is far becoming a global concept. Sustainability as defined by the United States Environmental Protection agency (USEPA) (2007) is the creation and maintenance of conditions under which humans and nature can exist in productive harmony thus fulfilling the social, economic, health and other requirements of present and future generations. Sustainability is a process that improves the quality of human life while living within the carrying capacity of supporting ecosystems. Sustainability effort is geared towards ensuring that we have and will continue to have the water, materials and resources to protect human health and our environment. It is sad to note that human health and environment are continuously being jeopardized by agricultural waste generated during production, processing and marketing of agricultural products.

Scottish Environmental Protection Agency (SEPA) (2005), identified wastes generated from agriculture to include animal feaces, urine, litter, beddings, animal carcass, dairy parlor washings, waste milk, wasted feed, run-off from feed lots and holding area, paunch waste, abattoir waste water, animal viscera, horns, feather, bones,

blood, fur, placenta, birth tissue, fetal membranes, aborted fetus, groundnut shells, cereal husks, palm kernel shells, sugar cane bagasse, waste wood, spoilt packaging products like boxes, bags and plastics, worn-out machinery and equipment components such as tyres and batteries. All these waste materials emanating from premises for agriculture pose serious environmental and health hazards especially to farm workers who are mainly rural women and people living or working near such premises. The National Agriculture Workers Survey (NAWS) (1995) showed that women are mostly employed as farm workers engaged in menial aspects of farm work such as clearing and packing of debris from the farm. In addition, the United States Department of Agriculture (USDA) (2013) reported that between 1982 and 2007, the number of women-operated farms grew from 121,600 to 306,200 while the number of men-operated farms within the same period declined by 220,800. The same report showed that 45% of women-operated farms are specialized in raising beef cattle, horses, sheep and goat. This report is a strong indicator that women are active players in agriculture and therefore are visible targets to threats of agricultural waste.

Robin (2001) noted that a single hog produces three times the amount of waste as a human produces while a dairy cow produces 20 times the amount of waste of a human. According to the author, farm animals generate about 220 billion gallons of waste each year in North Carolina, USA from their feaces and urine. This waste is stored in lagoons or "cesspools". Cesspools are open air pits filled with urine and feaces. As the rain falls and adds to the volume of the cesspool, there may be a run-off of the feacal slurry into adjourning lands and water, polluting the water and messing the environmental aesthetics. Such diffused flow of animal waste is referred to as non-point source (NPS) pollution (National Resources Defense Council (NRDC), 2013). NPS pollution remains the greatest water quality problem in the United States (John and Stephen in Fafioye and John-Dewole, 2012). The authors noted that when the lagoons leaks or overflows, they send dangerous microbes, nitrates and drug-resistant bacteria into public water supplies. NRDC (2013) observed that people who live near or work at factory farms breathe in hundreds of gases which are formed as manure decomposes together with the terrible stench emanating from the cesspools. The authors further identified dangerous gases from cesspools to include ammonia, hydrogen sulphide and carbon dioxide. Hydrogen Sulphide which is posited by the authors as the most dangerous even at low levels have tremendous health effects which include sore throat, headache, shortness of breath, wheezing, excessive coughing, depression, tension, fatigue, runny nose, burning eyes, nausea, diarrhea, asthma and bronchitis on humans. NRDC further noted that nitrates seeping from lagoons and spray fields into ground water can increase the risk of blue-baby syndrome leading to death in infants and has been linked to spontaneous abortions in females. Burkholder, Libra, Weyer and Heathcote (2007) observed that long-term exposure to nitrate levels between 11-16 mg/L in drinking water can cause hyperthyroidism and nitrate levels of 19-26Mg/L in drinking water can trigger spontaneous abortions in females.

A drone spy on factory farms by Devries (2012) revealed that these farms are primarily located near minority and low income communities made up of mainly women and children who are left with no protection and little means to fight large agricultural corporations that are generating waste from their agricultural activities. Devries also observed that when the lagoons of waste are filled, they are sprayed like mist into the atmosphere and residue of such sprays find their ways into surrounding communities of helpless people. The author tagged this 'environmental racism' where the affluent subdue the poor to loathsome conditions because of the economic power the rich possess.

Exposure to the birthing fluids, after-birth materials, aborted fetus which are parts of animal waste can threaten a pregnant woman's health and that of her unborn baby as reported by Department for Environmental, Food and Rural Affairs USA (2012). The report indicated that pregnant women should avoid contact with aborted lambs, after births, birthing fluids or bedding materials as they may be contaminated and subsequently trigger a zoonotic condition characterized by influenza-like and fever symptoms.

Apart from threat to human health, animal waste also constitutes a tremendous threat to environmental aesthetics and health. World Bank Group (1998) observed that waste from abattoirs present huge ugly heaps made of bones, horns, paunch waste, viscera and so on which pollute the environment. Farm Sanctuary (2014) noted that a ruptured lagoon can empty its content in water bodies causing massive aquatic deaths especially fishes. The author also revealed that phosphorus and nitrogen which are two major nutrients in animal waste often cause eutrophication when they seep into the water bodies. Eutrophication is defined by Lawrence and Jackson (1998) as a process by which a body of water acquires a high concentration of nutrients especially phosphates and nitrates which promote excessive growth of algae leading to depletion of available oxygen and subsequent death of aquatic organisms.

Crop wastes, which most times, are residues left after harvesting or processing of crop products are also part of the waste generated in agriculture. This crop residue include cereals husks, legume haulms, sugarcane bagasse, lawn clippings, vegetables and fruit peels, palm kernel shells, root and tuber peels and so on are always heaped and burnt. Such burning activity according to USEPA (2014) produces toxic compounds to the environment such as nitrous oxides, carbon monoxide, volatile organic compounds and particle pollution which adversely affect human health. A further highlight on the dangers of burning agricultural waste by Commission for Environment

Co-operation (CEC) (2014) showed that burning biomass such as wood, leaves, stalks, straws, husks, grasses and so on produces 40% of carbon dioxide, 32% of carbon monoxide, 20% of particulate matter and 50% of polycyclic aromatic hydrocarbons released into the environment around the globe. Biomass burning is considered to be a significant source of dioxins which are produced under combustion conditions, chlorine content and presence of pesticides absorbed into leaves and stalks of agricultural waste. CEC reported that in Taiwan for example, during the week of the most intense agricultural burning, the concentration of dioxins in the atmosphere is up to 17 times higher than in the weeks when such burning is not done and in China, larger amounts of dioxins are emitted in the provinces with more agricultural production, constituting about 10 and 20% of total emissions of dioxins than in provinces with less agricultural production. This report indicates that dioxins can be released during combustion process due to the presence of chlorinated pesticides such as Pentachlorophenol (PCP), fungicide and the herbicide known as 2;4-dichlorophenoxyacetic acid (2;4-1) which are common agro-chemicals used for pest and weed control.

It is proven that even in very small amounts, dioxins constitute health and environmental problems since they are persistent and remain in the earth for long period of time before degradation into other chemical forms, accumulate and are stored in the fatty tissues of animals and humans and are able to be transported long distances in the atmosphere and are thus sometimes generated in one area but ultimately can be found in another region far away. Exposures to dioxins have variety of harmful effects on human health especially in women such as: neurological effect in the fetus due to exposure during pregnancy, reproductive problems in women such as prolonged menstruation and early menopause, changes in thyroid hormone levels, various types of cancer in humans, chloracne which is an acne-like eruption of blackheads, cysts and pustules found on the cheeks, behind the ears, in the armpits and groin regions (CEC 2014).

Large amount of agro waste are generated from the market yard. Such wastes include organic wastes from cereals, pulses, fruits, vegetables and so on. The farmers bring produce to the market from farms without grading and cleaning. Arati (2006) observed that Kawangware Open Air market in Kenya generates about 10 metric tons of organic wastes per day as a result of farm produce sold at the market. This organic waste is left uncollected, piling up and polluting the environment.

Agricultural waste generated during production, processing and marketing of agricultural products can be turned into useful resources or recycled into products that can benefit man in several ways. Highlighting the benefits of agricultural waste management, Hiwassee River Watershed Coalition Inc. (HRWC) (2004) stated that site specific waste management strategies should be developed and adhered to in order to maximize cost-efficiency and adequately protect local environmental resources. The strategies recommended by HRWC for effective site specific waste management include storing farm waste as solid in building structures or as liquid in holding ponds, apply manure to the crops that can benefit from the nutrients, avoid applying waste to fields when heavy rain is expected to avoid run-off, avoid overflow and spillage of holding ponds

Findings from Gagelonia (2013), showed that alternative, renewable, diversified energy sources from rice and non-rice wastes can be used to fuel varieties of sizes of internal combustion engines that will power stationary and mobile farm machines for land preparation, irrigation, harvesting, threshing, drying, transport and milling thus empowering farmers to produce their own fuel and even sell some to improve their livelihood. In addition, Essiet (2014), reported that Wems Agro Ltd, Akotogbo, Ondo State, Nigeria has acquired a 5400ha of land for rice production with an added strategy to use rice husk to power its production using a steam-driven turbine and being a pilot project in this part of the world, many rice mill owners will key into rice husk recycling to minimize the problems of rice husk hills common in rice mill areas.

Using appropriate conversion technology, animal and crop waste can be a ‘gold mine’ from which much income can be generated. Sabiti (2011) opined that animal and crop residues can be re-cycled into useful resources such as biogas, animal feed, compost, bio-fertilizer and soil amendment which can be sold to generate income or used on the same farm. Sabiti noted that briquettes made from saw dust, groundnut shell, rice husk and cotton stalks are cheaper than coal, has lower ash content of 1-3% compared to coal which has 20-25%, no fly-ash is produced when burning briquettes and briquettes have high burning efficiency because of its low moisture content.

Most countries are yet to intensify recycling or re-use of agricultural waste and environmental regulations bordering on handling and management of agricultural waste are not strictly enforced in such countries. This has resulted in environmental pollution and subsequent health hazards which affect rural women more because of their presence in factory farms as farm workers and habitation near these farms. As agricultural premises are expanding and increasing in number, more agricultural waste will be generated. It therefore becomes imperative to examine the impact of agricultural wastes on sustainable environment and health of rural women in Anambra State of Nigeria.

2. Statement of the Problem

There is tremendous increase in agricultural activities to produce food to feed the increasing population. This

results to the diversification in crop and livestock production such as rice, maize, poultry, cattle, pigs, cassava among others, as well as the processing of these products into flour, garri, chicken, sausages, pork, beef, cheese, butter, among others. Agricultural activities of these kinds generate waste in the form of dung, urine, blood, manure, slurry, straw, shells and other products that make the environment filthy. These agricultural waste products emit a number of gases such as methane, carbon dioxide, nitrous oxide, ammonia, hydrogen sulphide among others. Agricultural wastes such as sludge deface the environment and make it unstable. A lot of health challenges are linked to environmental pollution which include diarrhea, cholera, dysentery, catarrh, headache, malaria, among others.

However, rural women are more vulnerable to the challenges due to their active involvement in agricultural production activities. This was supported by the United States Department of Agriculture (USDA) (2013) who reported that between 1982 and 2007, the number of women-operated farms grew from 121,600 to 306,200 while the number of men-operated farms within the same period declined by 220,800. National Resources Defense Council further noted that nitrates seeping from lagoons and spray fields into ground water can increase the risk of blue-baby syndrome leading to death in infants and has been linked to spontaneous abortions in females. These necessitate the need to investigate the impact of agricultural waste on sustainable environment and health of rural women in Anambra State of Nigeria.

3. Purpose of the Study

The major purpose of this study was to investigate the impact of agricultural waste on sustainable environment and health of rural women. Specifically, the study aimed to::

1. identify the constituents of agricultural waste
2. determine the environmental and health impact of agricultural waste.
3. determine the effective management techniques of agricultural wastes.

4. Research Questions

The following research questions guided the study:

1. What are the materials that constitute agricultural wastes?
2. What are the environmental and health impacts of agricultural wastes?
3. What are the effective management techniques for agricultural wastes?

5. Research Hypotheses

HO_1: There is no significant difference in the mean responses of livestock farmers, rural women and environmental health workers on the materials that constitute agricultural wastes.

HO_2: There is no significant difference in the mean responses of livestock farmers, rural women and environmental health workers on the environmental and health impacts of agricultural wastes.

HO_3: There is no significant difference in the mean responses of livestock farmers, rural women and environmental health workers on the effective management techniques of agricultural wastes.

6. Methodology

This study adopted a survey research design. A survey research design according to Nworgu (2006) is the one in which a group of people or items is studied by collecting and analyzing data from only a few people or items considered to be representative of the entire group. This design was deemed appropriate since part of livestock farmers, rural women and environmental health workers were sampled to represent the entire population.

Population for the study was 3970 representing 450 registered livestock farmers, 3270 rural women and 250 environmental health workers in Anambra State. A sample size of 350 respondents representing 40 registered livestock farmers, 286 rural women and 24 environmental health workers were drawn through proportionate random sampling technique where 10% rural women from each of the 21 Local Government Areas in the state were selected. Data were collected using questionnaire developed by the researchers. The instrument was face validated by three experts one from the Department of Vocational Teacher Education, one from the Department of Animal Science, all from University of Nigeria, Nsukka and one from the Ministry of Environment, Enugu State. Cronbach alpha statistical method was used to determine the internal consistency of the instrument which yielded a reliability coefficient of 0.86.

Administration and collection of the instrument were done with the help of 15 research assistants who were trained on the administration of questionnaire. Data collected were analyzed using Mean and standard deviation to answer the research questions. Real limit of numbers based on Grand Mean was used for interpretation. Any item whose grand mean value ranges from 4.50 to 5.00 was regarded as Strongly Agree, 3.50 to 4.49 was regarded as Agree, 2.50 to 3.49 was regarded as Undecided, 1.50 to 2.49 was regarded as Disagree while 0.50 to 1.49 was regarded as Strongly Disagree. Similarly, Analysis of Variance (ANOVA) was used to test the null hypotheses at 0.05 level of significance and at the appropriate degrees of freedom using Statistical Package for

Social Sciences (SPSS) software. Any null hypothesis whose probability value was greater than 0.05 level of significance was regarded as not significant and therefore upheld while any null hypothesis whose probability value was less that 0.05 level of significance was regarded ad significant and therefore rejected.

7. Result.

7.1 Table 1: Mean Score and ANOVA Analysis of Livestock Farmers, Rural Women and Environmental Health Workers on the Materials that Constitute Agricultural Waste

S/N		$\overline{X}_G$	SD	DEC	F	Sig (P-Value)	Rem
1	Animal faeces	4.51	0.78	SA	0.38	0.77	NS
2	Urine	4.56	0.77	SA	1.53	0.21	NS
3	Used litter	4.53	0.76	SA	0.30	0.83	NS
4	Beddings	4.47	0.76	A	0.20	0.90	NS
5	Dairy parlor washings	4.46	0.77	A	1.15	0.33	NS
6	Waste milk	4.47	0.76	A	0.54	0.66	NS
7	Waste feed	4.46	0.76	A	0.72	0.54	NS
8	Paunch waste	4.41	0.77	A	0.25	0.87	NS
9	Abattoir waste water	4.42	0.78	A	1.06	0.37	NS
10	Animal viscera	4.45	0.78	A	0.43	0.73	NS
11	Horns	4.40	0.79	A	0.94	0.42	NS
12	Feathers	4.43	0.79	A	0.39	0.76	NS
13	Bones	4.46	0.83	A	0.66	0.58	NS
14	Blood	4.39	0.86	A	0.24	0.87	NS
15	Fur	4.36	0.84	A	1.03	0.38	NS
16	Placenta	4.41	0.84	A	0.37	0.77	NS
17	Birth tissues	4.43	0.83	A	0.57	0.63	NS
18	Fetal membrane	4.38	0.80	A	0.42	0.74	NS
19	Aborted fetus	4.42	0.78	A	0.81	0.49	NS
20	Groundnut shells	4.41	0.81	A	0.31	0.82	NS
21	Cereal husks	4.41	0.77	A	1.52	0.20	NS
22	Palm kernel shells	4.40	0.77	A	0.58	0.63	NS
23	Coconut shell	4.42	0.78	A	1.10	0.35	NS
24	Sugar cane bagasse	4.42	0.80	A	0.32	0.81	NS
25	Feedlot run-off	4.46	0.80	A	1.16	0.33	NS
26	Animal carcass	4.38	0.83	A	0.82	0.77	NS
27	Waste wood	4.45	0.82	A	2.46	0.06	NS
28	Saw dust	4.44	0.79	A	1.18	0.32	NS
29	Used packing materials	4.43	0.78	A	3.03	0.30	NS
30	Worn-out machinery and equipment components	4.40	0.78	A	0.62	0.60	NS
31	Legume haulms	4.44	0.81	A	1.39	0.25	NS
32	Vegetable and fruit peels	4.45	0.78	A	0.79	0.50	NS

The result presented in Table 1 showed that items 1, 2 and 3 had their grand mean values at 4.51, 4.56 and 4.53 respectively which are within the range of 4.50 to 5.00. This signifies that the respondents strongly agree that those items are materials that constitute agricultural wastes. Table 1 also showed that items 4 to 32 had their grand means ranging from 4.36 to 4.47 which are within the range of 3,50 to 4.49. This as well signifies that the respondents agree that those items are the materials that constitute agricultural waste. Data presented in the same table indicated that the standard deviation of the items ranges from 0.76 to 0.86 with a range difference of 0.1 which indicated that the opinions of the respondents did not vary so much

Furthermore, table 1 showed that the p-values of the items range from 0.06 to 0.90 which are greater than 0.05 level of significance at the appropriate degrees of freedom. This shows that there is no significant difference in the mean responses of the respondents on those items as the materials that constitute agricultural wastes. Therefore, the hypothesis of no significant difference is upheld.

7.2 Table 2: Mean Score and ANOVA Analysis of Livestock Farmers, Rural Women and Environmental Health Workers on the Environmental and Health Impacts of Agricultural Wastes.

S/N		$\overline{X}$ G	SD	Dec	F	Sig (P-Value)	Rem
33	Destruction of aquatic life	4.60	0.77	SA	0.25	0.87	NS
34	Air pollution by stench from cesspools	4.43	0.71	A	0.43	0.65	NS
35	Air pollution from burning of agricultural wastes	4.61	0.65	SA	2.69	0.06	NS
36	Release of dioxins into the atmosphere from burning of crop residue	4.37	0.70	A	0.03	0.74	NS
37	Dirty environment from piles of agricultural waste	4.61	0.60	SA	2.22	0.11	NS
38	Toxic compounds like Nitrous Oxide and carbon monoxide released during the burning of agricultural wastes	4.39	0.70	A	0.30	0.74	NS
39	Poor Visibility from smoke of burning agricultural waste	4.47	0.69	A	0.82	0.44	NS
40	Water pollution as a result of nitrates seepage from wastes	4.39	0.71	A	0.20	0.82	NS
41	Stench/odour from decaying agricultural wastes	4.51	0.74	SA	2.95	0.05	NS
42	Defacing the environment by waste hills	4.38	0.73	A	0.21	0.82	NS
43	Eutrophication of water bodies	4.53	0.74	SA	1.51	0.22	NS
44	Release of carbondioxide, nitrous oxide, methane from agricultural wastes contribute to climate change	4.37	0.80	A	0.16	0.85	NS
45	Spontaneous Abortions in females	4.50	0.78	SA	0.15	0.86	NS
46	Blue-baby syndrome from Nitrate poison	4.32	0.84	A	0.21	0.81	NS
47	Prolonged mensuration and early menopause from dioxin poisoning	4.45	0.78	A	0.43	0.73	NS
48	Chloracne from dioxin poisoning	4.38	0.80	A	0.42	0.74	NS
49	Zoonotic conditions due to contact with contaminated or aborted fetus and fetal tissues	4.53	0.76	SA	0.30	0.83	NS
50	Sore throat, headache, wheezing runny nose, coughing, burning eyes, asthma and bronchitis from hydrogen sulphide emissions	4.44	0.81	A	1.39	0.25	NS

Data presented in Table 2 indicated that items 33, 35, 37, 41, 43, 45 and 49 had their grand means within the range of 4.50 to 5.00. This shows that those items were strongly agreed by the respondents as the impacts of agricultural waste on environment and health of rural women. The table also indicated that items 34, 36, 38, 39, 40, 42, 44, 46, 47, 48 and 50 had their grand means within the range of 3.50 to 4.49. This also revealed that the respondent agreed that those items are the impacts of agricultural wastes on environment and health of rural women. The standard deviation as indicated in table 1 ranges from 0.60 to 0.84 with a range difference of 0.24, which shows that the responses of the respondents are close together.

Similarly, data in table 1 revealed that the p-values of the items are less that 0.05 level of significance at the appropriate degrees of freedom. This shows that there is no significant difference in the mean responses of the respondents on the impacts of agricultural wastes on the environment and health of rural women. Therefore, the null hypothesis 2 is accepted.

7.3 Table 3: Mean Score and ANOVA Analysis of Livestock Farmers, Rural Women and Environmental Health Workers on the Effective Techniques for Agricultural Waste Management.

S/N		$\overline{X}$ G	SD	Dec	F	Sig (P-Value	Rem
51	Store farm waste as dry solids in building structures	4.64	0.69	SA	2.53	0.08	NS
52	Timely drying of poultry manure inside the barn	4.54	0.69	SA	2.98	0.05	NS
53	Convert wastes to biogas	4.56	0.68	SA	1.78	0.17	NS
54	Convert agricultural waste to ethanol	4.38	0.70	A	0.63	0.53	NS
55	Convert waste into compost	4.45	0.73	A	0.44	0.65	NS
56	Recycle saw dust, groundnut shells, rice husk into briquettes	4.39	0.77	A	1.57	0.21	NS
57	Recycle animal waste into livestock feeds	4.45	0.78	A	2.38	0.09	NS
58	Recycle agricultural waste to bio-fertilizer	4.40	0.74	A	0.30	0.74	NS
59	Mark maximum level of holding ponds	4.42	0.77	A	0.21	0.82	NS
60	Enforceable regulations in place to regulate agricultural waste disposal	4.36	0.81	A	1.04	0.36	NS
61	Public enlightment to educate the public on the dangers of agricultural waste	4.39	0.85	A	2.10	0.12	NS
62	Agricultural waste tax on agricultural firms based on the amount of wastes produced	4.32	0.87	A	2.30	0.10	NS

The data presented in Table 3 showed that items 51, 52 and 53 had their grand mean values 4.64, 4.54 and 4.56 which are within the range of 4.50 to 5.00. This signifies that livestock farmers, rural women and environmental health workers strongly agree that storage of farm wastes as solids, applying agricultural wastes to farmland when there is no rainfall and conversion of agricultural wastes to biogas are the effective techniques for agricultural wastes management. Similarly, table 3 revealed that items 54 to 62 had their grand means ranging from 4.32 to 4.45 which are within the range of 3.50 to 4.49. This also signifies that the respondents agree that those items are the effective techniques for managing agricultural wastes. The table revealed that the standard deviation ranges from 0.68 to 0.87 with a range difference of 0.19 and this shows that opinions of the respondents are close to each other as there is there is no indication of outliers.

Similarly, table 3 showed that p-values of items 51 to 62 range from 0.05 to 0.82 which are equal or greater than 0.05 level of significance at the appropriate degrees of freedom. This indicates that there is no significant difference ($p>0.05$) in the mean responses of livestock farmers, rural women and environmental health workers on the effective techniques for agricultural wastes management on those items. Therefore, the null hypothesis is accepted.

8. Discussion of the findings

Result presented in table 1 indicated that animal faeces, urine, used litter, beddings, animal carcass, dairy parlor washings, waste milk, wasted feed, feedlot run-off, paunch waste, abattoir waste water, animal viscera, horns, feather, bones, blood, fur, placenta, birth tissues, fetal membranes, aborted fetus among others are the materials that constitute agricultural waste. The findings were in line with International Finance Corporation (IFC) (2007) who reported that waste food, animal waste, or faeces, carcass, sediments and sludge from on-site waste water treatment facilities, various kinds of packaging for feed and pesticides, used ventilation filters, unused/spoilt medications and used clearing materials are generated in the farms. IFC further reported that air emission from poultry production include ammonia, odour and dust which are generated primarily due to denitrification of manure and can be released directly into the atmosphere.

Similarly, it was found in Table 2 that air pollution from burning of agricultural wastes, air pollution from cesspools, dioxins from burning agricultural wastes, dirty environment from heaps of agricultural wastes, poor visibility from smoke of burning agricultural wastes, nitrate seepage from agricultural waste, stench/odour from decaying agricultural waste, defacing of the environment, eutrophication of water bodies, aquatic life destruction, spontaneous abortion, blue-baby syndrome, prolonged mensuration and early menopause, among others are the environmental and health impact of agricultural waste on rural women. The findings were supported by Hriber (2010) who reported that excess production of manure and problems with storage or manure management can affect ground and surface water quality. Emission from degrading manure and livestock digestive processes produce air pollutants that often affect ambient air quality in communities. The author reported that human health can suffer because of contaminated air and degraded water quality, or from diseases spread from farms. Quality of life also suffers because of odours or insect vectors surrounding farms and property values can drop affecting the financial stability of a community.

Furthermore, data presented in Table 3 showed that storage of farm wastes as dry solids; timely drying; conversion of wastes to biogas; conversion of agricultural wastes to compost; recycling of saw dust, groundnut

shells and rice husk into briquettes; recycling of animal wastes to livestock feed, recycling of agricultural waste to bio-fertilizer, enforceable regulations, public enlightment, and agricultural waste tax are the effective techniques for agricultural wastes management. In support of the findings of the study, Alabi, Aghimien, Osasogie and Erie (2014) reported that the huge waste generated by the poultry farms can be converted to inorganic manure using modern recycling facilities. The findings were also in agreement with the International Finance Corporation (2007) who reported that poultry wastes should be managed and disposed off in accordance with rules and regulations to avoid hazardous situations and achieve environmental balance and safety.

9. Conclusion

Agricultural wastes in the form of livestock faeces, urine, and manure, waste feed, among others constitute threat to the health of the people and environment. These wastes introduce harmful gases in the form of carbondioxide, methane, nitrous oxide, hydrogen sulphide to the environment. These subject the environment to climatic variability. When inhaled in a large dose, the health of rural women is affected particularly the pregnant women who may experience spontaneous abortion. Then, if effective techniques for the management of agricultural wastes found in the study are adequately adhered to, the heavy dose of agricultural wastes generated in the farm and pushed into the environment will be reduced. Public enlightment and education is very important to sensitize the farmers on the dangers of agricultural waste to the environment and health of rural women.

10. Recommendations

Based on the findings of the study, it was recommended that:

1. Extension workers should properly educate farmers on the dangers of agricultural wastes and sensitize them on proper disposal methods.
2. Ministry of Agriculture should enact and implement necessary agricultural wastes management regulations that will help to regulate the generation and disposal of agricultural wastes.

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