Journal of Agriculture and Biological Sciences Vol. 2(6) pp. 193 - 198, September 2011
Available online Available online http://www.globalresearchjournals.org/journal/?a=journal&id=jabs
Copyright ©2011 Global Research Journals.
Case Study.

Economic Analysis of Agricultural Waste Management among Farming Households in Jere Local Government of Borno State, Nigeria.

By

Kwaghe, P.V.[1x]; Gwary, M.M.[1].; Abdulsalam, R.Y.[2]. and Oppong-Yeboah, A[1]

[1]Department of Agricultural Economics and Extension, University of Maiduguri, Nigeria.

[2]Department of Agricultural Economics and Extension, Usmanu Dan Fadio University, Sokoto, Nigeria.

[1x] Corresponding Author:Dr. Patrick V. Kwaghe, E-mail: pkwaghe@gmail.com and pkwaghe@yahoo.com

Accepted 7th June 2011.

This study analysed agricultural waste management in Jere Local Government Area of Borno State, Nigeria. Data generated by the administration of structured questionnaires to 80 farming households were used for the analysis. Descriptive statistics and gross margin analysis were used as the analytical tools. The study revealed that about 62.5% of the respondents indicated that crop residues constitute the major agricultural waste in the study area. Animal waste is also generated in the study area with cattle producing the highest animal waste as attested by 85% of the respondents. Agricultural reuse is the major waste management method while other farmers still practice dumping and burning of their farm waste. The annual quantities of agricultural waste generated from crop residues and animal waste were 161 and 103 tonnes respectively. The major contributing factor to agricultural waste increase was the increase in crop and animal production to feed the ever increasing population. The study further revealed that annual revenue accruing to the respondents from the reuse of the agricultural waste was ₦900,000.00 representing about 4% of their total farm annual revenue. Ignorance on the waste management strategies and its associated benefits is one of the major factors affecting effective utilization of agricultural waste in the study area. Based on these finding the study suggested extensive training on waste management be undertaken for the farmers. It is also suggested that government should involve the farmers and other stakeholders to come up with appropriate policies and legislative measures to discourage dumping and burning of agricultural wastes.

Keywords: Economic Analysis, Agricultural Waste, Management, Farming ,Households, Gross Margin.

INTRODUCTION

A major problem facing most developing nations of the World is to increase agricultural production without degrading the environment. Food is a basic human need and producing enough to feed the growing population of developing nations is one of the biggest challenges facing a large proportion of nations. Hence, there should be a greater intervention in form of environment friendly science and technology in food production (USDA, 2010). One of such environment friendly intervention is effective management of agricultural waste.

It is an undisputable fact that municipal agricultural waste is the most visible and serious environmental problem in Nigeria which dots the roads and disfigures the landscape (Onyediran, 1997). Waste is defined as any material unused and rejected as worthless or unwanted (Jennifer *et al*., 2010). Waste gets generated at the level of household, industries and agricultural farm. Agricultural activities produce many types of wastes in its daily operations such as biological waste, solid waste, hazardous waste, and waste water (SPAGC, 2010). It is important that these wastes are identified and managed properly to protect the dwellers in the community as well as the environment.

Waste is directly linked to human development, both technologically and socially. The compositions of different wastes have varied over time and location, with industrial development and innovation being directly linked to waste materials. The concept of waste as a material “which has no use” is changing to that of a resource by converting into secondary material with modification. Waste can thus be converted into wealth and used at home or even sold.

Over the years due to increase in population, consumerism, urbanization, industrialization, increased agricultural production and other related factors, waste generated has increased substantially. The level of agricultural waste management and recycling in Borno State and Jere Local Government are very low. This could be as a result of inadequate knowledge on agricultural waste disposal, management and recycling strategies by the farmers (Okoye, 1978). Two actions that are required is the challenge to change personal

and public view towards residue utilization and the need to provide the appropriate incentives to stimulate greater use of utilization technologies. The ignorance on how to effectively manage their agricultural wastes and on the benefits that could accrue from such management of wastes has led farmers to dump most of their agricultural waste products in river, backyards, streams, holes, sea and burning (Onyediran, 1997).

Another problem is due to poor and unplanned agricultural waste disposal that makes rural communities unaware of the processing and re-utilization of agricultural waste (Bamidele, 1998 and Nilanthi *et al*., 2010). Inadequate disposal management and re-utilization of agricultural waste causes environmental pollution. Improper agricultural waste disposal in rivers, streams and ponds pollutes the water by introducing bacteria or nitrate which are harmful to man and animals. Odours from animals' dwellings may cause problems with neighbours and create a negative public perception of agriculture. Both Ministries of Environment and Agriculture have a responsibility to enlighten farmers and create awareness on the treatment and reutilization of agricultural waste which minimizes cost and ensures the health status of its citizens.

There are a number of concepts about waste management which vary in their usage between countries or regions. It is suggested that the best option for waste management is to follow the golden rule of 3 Rs Philosophy viz. reduce, reuse and recycle whereby the waste generated is not only minimized but converted into an asset for reuse (Sabri, 1991; Sinha and Sinha, 2000; Julius *et al*., 2010). The aim of waste management is to extract the maximum practical benefits from products and to generate the minimum amount of waste (HRWC, 2010).

Therefore, while there is enough information on the strategies of making agricultural waste useful for sustainable agricultural and environmental protection, there is little information available on the assessment of the economic benefits of these recycling methods particularly in the study area. Therefore, this study sets out to evaluate the economic benefits of agricultural waste management in the study area. The specific objectives considered by the study to generate ideas for the realization of the broad objective of the study includes: the identification of how agricultural wastes are generated and managed; determination of the economic value of recycled agricultural wastes; and the examination of the factors affecting agricultural waste management in the study area.

METHODOLOGY

The Study Area

The study area is Jere Local Government Area, one of the 27 Local Government Areas (LGAs) in Borno State, Nigeria. The study area constitute part of the capital city of the state with her headquarter at Khadammari a few kilometre away from Maiduguri, the state capital. It covers an area of about 160 km^2 with a population of about 22,204 (NPC, 2006). The study area is hot and dry nearly all year round, except for the months of June to September which constitutes the rainy season.

The agricultural activity in the study area can be categorized into arable, tree crop and livestock farming. Crop farming is the main agricultural activity in the area. Crops are produced both during the rainy season and the dry season. A lot of irrigation farming takes place in the study area where most of the vegetables and fruits supplied to the capital city of Maiduguri are produced. The dry season production is facilitated by the availability of water year round in Alau Dam and its down stream low land areas. Livestock farming is one of the commercial activities of the populace of the study area. Livestock reared include cattle, sheep, goats, horses, camels and poultry birds.

Source of Data and Sampling Techniques

The study collected and utilized both primary and secondary data for its analysis. Primary data were collected from the household heads using questionnaires as well as by oral interviews. Data were collected on the socio-economic characteristics of the respondents, their farming enterprises, agricultural wastes generated and management methods, inputs and outputs prices, agricultural wastes sold and reused. While secondary data were collected from journals, books, records and government publications.

Simple random sampling techniques were used to select the respondents from the study area. The study area comprises eight wards and four were randomly selected. The selected wards are Khaddamari, Alau, Dusuman and Dondolon. From each of these four wards, 20 farming households were also randomly selected, bringing the sample size to a total of 80 respondents (the heads of the households).

Analytical Techniques

The analytical techniques used to analyse data collected includes descriptive statistics and gross margin analysis. Descriptive statistics used were frequency distribution, percentages and means. Gross margin analysis was used to determine the financial benefits that accrued to the respondents from the reuse of their agricultural wastes. Gross margin is one of the analytical techniques used to determine the profitability of farming activities where fixed inputs are not considered significant. The formula of the gross margin used is expressed as follows:

$$GM = GR - TVC$$

Where: GM = Gross Margin
GR = Gross Revenue
TVC = Total Variable Cost

RESULTS AND DISCUSSIONS

Types of Agricultural Waste in the Study Area

Agricultural Waste is a waste produced as a result of agricultural activity. There are different types of

agricultural waste that are generated as a result of performance of agricultural activities. Table 1 presents the types, percentages and quantity (tonnage) of agricultural waste generated in the study area by the farming households. The respondents indicated that 62.5% of the agricultural wastes generated in the study area are crop residues while farm animal waste constitutes 37.5%. The table further revealed that 60% of the respondents were of the opinion that grain straw constituted the largest part of crop waste in the area, 18.8% leaves and grasses while grain stalk and dried twigs constituted 15% and 6.2% respectively. Similarly, the respondents indicated that the quantity of crop wastes outweighs that of farm animal. Grain straw constitutes the highest quantity of crop waste while cattle produce the highest tonnage of animal wastes.

Breakdown of farm animal waste by type of farm animals reveals that 85% of the respondents were of the opinion that cattle produce the highest animal waste in the area. This is because cattle rearing constitute the main business of the Shuwa Arab people one of the major tribe in the study area and also the regional cattle market is situated in the area. Other farm animals reported to generate waste are sheep and goats and poultry representing 10% and 5% respectively.

Table 1:Opinion of Respondents on Types of Agricultural Waste Generated in the Study Area

Type of Agricultural Waste	Frequency	Percentage	Quantity Tonnage
Crop Wastes	50	62.5	161
Farm Animal Wastes	30	37.5	103
Total	80	100	264
Types of Crop Wastes			
Grain Straw	48	60.0	73
Leaves and Grasses	15	18.8	38
Grain Stalk	12	15.0	30
Dried twigs	05	06.2	20
Total	80	100	161
Farm Animals/Volumes of Waste			
Cattle	68	85	85
Sheep and Goats	08	10	13
Poultry	04	05	05
Total	80	100	103

The data in Table 2 shows that 66.2% of the respondents indicated that there was an increase in the amount of farm waste generated over the years while 33.8% indicated that there was no increase. Those who indicated that there have been an increase in farm waste generated posited that the increase was as result of an increase in farming activities while lack of sufficient rainfall over the years was the reason given by those who said no increase. Based on the result in Table 2 one can conclude that an agricultural waste in the study area is increasing since 66.2% of the respondents indicated an increase.

Table 2:Opinion of Respondents on increase in Waste Generation in the Past Years

Opinion of Respondents	Frequency	Percentage
Increase	53	66.2
Decrease	27	33.8
Total	**80**	**100**

The opinion of the respondents on the reasons for the increase in the agricultural waste generated in the area was also sought. Information presented in Table 3 also shows that 62.5% of the respondents indicated increase in crop and animal production is the main cause of the increase in farm wastes generated in the area. Non utilization of wastes generated was the cause of the increase in the farm wastes according to18.75% of the respondents. The cause of the increase in the farm wastes is because wastes are not adequately utilized by some of the farmers. This observation points to the importance of waste management, particularly processing and recycling of waste materials. Increase in population was also reported by 18.75% of the respondents as one of the causes of increase in wastes generated. This could be related to increase in crop and animal production as more has to be produced to feed the increasing population.

Table 3:Distribution of the Causes of increase in Wastes Generation

Causes of Increase	Frequency	Percentage
Population Increase	15	18.75
Increase in Crop/Animal Production	50	62.50
Non Utilization of Waste	15	18.75
Total	**80**	**100**

Agricultural Wastes Management in the Study Area

The agricultural wastes in the study area as presented earlier in Table 1 constitute crop residues and animal dung. These wastes are those generated from farming activities and does not include hazardous or complex wastes as in highly mechanized or large scale farming.

Table 4:Agricultural Waste Management Methods in the Study Area

Management Method	Frequency*	Percentage*
Dumping	15	18.75
Burning	13	16.25
Selling	55	68.75
Reuse (Feeds/Manure)	67	83.75
Others	09	11.25

* Multiple responses.

The responses given by the households on how they manage their farm wastes are presented in Table 4. Majority of the households representing 83.75% indicated that they reuse wastes generated from their farming activities. Most of them are mixed farmers and they feed their livestock with the straws and stalks while the dung from their animals is applied to their farm lands. About 69% of respondents indicated that they sell their agricultural wastes while 18.75% and 16.25% revealed that they manage their agricultural wastes by dumping and burning respectively. From this result, it can be seen that huge amount of wastes are mismanaged by the households of the study area. In addition to economic losses because of the dumping and burning, it also causes unhygienic environment and environmental pollution

Gross Margin Analysis

Gross margin analysis was carried out to determine the benefits accruing to farmers from the utilization of agricultural wastes. To do that the variable costs of their farming activities, revenue from their farming activities including that from animal wastes have to be determined. The variable costs of the respondents are presented in Table 5. The total variable cost for the respondents for 2009 growing season was ₦15,000,000.00 with an average of ₦187,500.00. The total revenue of the respondents was ₦25,000,000.00 with the breakdown of ₦16,800,000.00, ₦7,300,000.00 and ₦900,000.00 from crop production, animal production and agricultural waste respectively. The average revenue gotten from farming activities was ₦312,500.00. Details of the revenues are presented in Table 6.

Percentage of agricultural waste revenue to total revenue of the Respondents:
= ₦900,000 ÷ ₦25,000,000.00 x 100
= 3.60%

Table 5:Variable Costs

Items	Cost (₦)	Average Cost (₦)
Labour	3,210,000.00	40,125.00
Seeds	1,900,000.00	23,750.00
Fertilizer	2,140,000.00	26,750.00
Harvesting	2,900,000.00	36,250.00
Feeds	1,600,000.00	20,000.00
Pesticides	1,750,000.00	21,875.00
Vaccination	1,500,000.00	18,750.00
Total	**15,000,000.00**	**187,500.00**

Analysis of the revenue from the farming activities of the respondents shows that about 4% of their revenue comes from the agricultural wastes. Despite the low utilization of agricultural waste in the area about ₦900,000.00 was generated by the farming households. This shows that if farming households are educated on how to manage their agricultural wastes, more revenue could be generated.

Table 6:Revenue from Farming Activities and Agricultural Waste

Farm Activity/Waste	Revenue(₦)	Average Cost (₦)
Farming Activity		
Crop production	16,800,000.00	210,000.00
Animal production	7,300,000.00	91,250.00
Total	**24,100,000.00**	**301,250.00**
Agricultural Waste		
Grain Straw	400,000.00	5,000.00
Leaves and Grasses	40,000.00	500.00
Pods and husks	370,000.00	4,625.00
Animal Dung	70,000.0	875.00
Grain Stalk	20,000.00	250.00
Total	**900,000.00**	**11,250.00**
Grand Total	**25,000,000.00**	**312,5000.00**

The total annual gross margin of the respondents from their farming activities was ₦10,000,000.00 only, while average annual gross margin per each farmer was ₦125,000.00. This result shows that farming activities of the households is profitable, since on the average each household got surplus of 125,000.00 for the 2009 cropping season. Since revenue from agricultural wastes constituted about 4% of the revenue, agricultural waste is beneficial to the farming households in the area.

Gross Margin = Total Revenue - Total Variable Cost
= ₦25,000,000.00 – ₦15,000,000.00
= ₦10,000,000.00

Average Gross Margin = Gross Margin ÷ No. of Respondents
= ₦10,000,000.00 ÷ 80
= ₦125,000.00

Factors Affecting Agricultural Wastes Management

The study also investigated from the respondents some of the possible factors affecting the proper utilization of agricultural wastes in the study area. The responses of the farmers are as presented in Table 7. The results shows about 71% of the respondents reported that ignorance of the management methods and benefits of waste managements is the major factor. Inadequate policy and legislature on waste management was reported by 18.75% and 12.50% of the respondents respectively. While about 13% of the respondents indicated that poor hygienic attitudes of some of the populace is also a factor. Establishment of agro-processing cottage industries was also reported by about 6% of the respondents. The plants used by the cottage industries generate more wastes which are not poorly managed in addition to other wastes emanating from the machines.

Table 7:Factors Affecting Agricultural Wastes Management

Factors Affecting Wastes Management	Frequency*	Percentage*
Ignorance	57	71.25
Inadequate policy	15	18.75
Unhygienic population	10	12.50
Rapid industrialization	05	06.25
Inadequate legislature	10	12.50

* Multiple responses.

CONCLUSION AND SUGGESTIONS

The findings of this study revealed that agricultural wastes are generated in the study area and if properly managed will further enhance the revenue of the farming households as well as reduce environmental pollution. The result of the gross margin analysis clearly shows that their farming business is beneficial as each household had an annual average of ₦125,000.00. Though some of the farming households dump and burn their agricultural wastes, about 4% of their annual revenue from farming activities accrued from agricultural wastes. Since about 71% of the farmers reported that ignorance of the benefits and strategies of agricultural waste management is one of the reason for poor utilization of agricultural wastes in the study area, households will benefit more if they are enlightened. Further more reuse of agricultural wastes will minimise cost and ensure a healthy environment for the farming communities.

Based on the findings of this study, chances are that agricultural wastes management in the study area can be improved. Hence, it is suggested that intensive mass literacy programmes on the economics of waste management be undertaken in the study area. This could be achieved through the extension agents, non governmental organizations, community based organizations or farmers cooperative societies. Awareness activities to educate the communities on the

health hazards and environmental consequences of piled or poorly dumped wastes should also be pursued. By involving the farmers and other stakeholders, government should come up with appropriate policies and legislative measures to discourage dumping and burning of agricultural wastes.

REFERENCES

Bamidele JI, (1998). Disinfection of Sewage Sludge, a Microbial Aspect Proceeding of a C.E.C Workshop held in Zurich, May 11th 1988.

Hiwassee River Watershed Coalition (HRWC)(2010). "Agricultural Waste Management". www.hrwc-net/wastemanagement.htm

Jennifer LP, James RM (2010). Waste Reduction Strategies for Improved Management of Household Solid Waste in Jamaica. *International Journal of Environment and Waste Management* Vol.6, No.½, pp.4-24.

Julius NF, Derick C, Daniel KA, Frederick KR, Sybill (2010). Assessing Municipal Solid Wastes (MSWs) for Composting Programmes in Rapidly Urbanising Areas: A case Study from Accra, Ghana. *International Journal of Environment and Waste Management* Vol.6, No.½, pp.25-40.

National Population Commission (NPC). 2006. Nigeria's Population Census Report.

Nilanthi, JGJ.; Badara, J. and Patrick, A.H. (2010). Environmental Impact with Waste Disposal Practices in a Sub-urban Municipality in Sri Lanka. *International Journal of Environment and Waste Management* Vol.6, No.½, pp.107-116.

Okoye, CO. (1978). *Hand Book on Disinfection of Sewage Sludge*. Second Edition. Pp.26.

Onyediran, AB. (1997). Waste Generation and Disposal in Nigeria. *Proceeding of NEST Annual Workshop*, held in Ibadan.

Sabri MA. (1991). Balancing Development and Ecology. *Social Welfare* 46(3). 37-39.

Sinha R. and Sinha, A. (2000). *Waste Management Preface*. Ina Shree Publishers, Jacphor. India.

South Pacific Applied Geosciences Commission (SPAGC)(2010). "Agricultural waste management and waste management issues for the pacific and its impact on their sustainable development". www.sidnets.org/decshare/.../2003115165315-presentation-cuba.ppt

United States Department of Agriculture (USDA)(2010). "Manure and Nutrient Management" http.//www.csrees.usda.gov/manurenutrientmanagement.cfm