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AGRICULTURAL WASTE MANAGEMENT PRACTICES IN TRISHAL UPAZILLA, MYMENSINGH

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ABSTRACT

A study was conducted to assess the present status of agricultural waste management by farmers in Trishal upazila of Mymensingh district, Bangladesh. During April to May 2015 and data were collected from the sample of 70 farmers and 5 farms. A structured interview schedule was used for collection of data. The study explored the relationship between the four selected type farming (independent variable) of farmers with their generation of agricultural waste (dependent variable). In this study the highest amount waste (straw and husk production) is closely related with the size of cropland. Straw production less than or equal 1000 kg is 36.62%, straw production less than or equal 10000 kg is 54.92%, straw production less than or equal 20000 kg is 5.63% and straw production less than or equal 30000 is 2.81% and husk production less than or equal 1000 kg is 35.71%, husk production less than or equal 10000 kg is 55.71%, husk production less than or equal 15000 kg is 8.57%. So as the dairy and poultry waste is also relate with the number of cows and birds. Average amount of dung is 8.87 kg per day and average amount of used litter was 46.36 kg per 800 bird production. For management biogas was suggested by 12.5 percent respondent. Composting and fish culture were suggested individually by 4.17 and 8.3 percent respectively. Due to manage agricultural waste efficiently it is necessary to initiating program to introduce the economic benefits of waste management and start training programs for farmers.

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INTRODUCTION

Waste management is all the activities and actions required to manage waste from its inception to its final disposal. This includes amongst other things, collection, transport, treatment and disposal of waste together with monitoring and regulation. It also encompasses the legal and regulatory framework that relates to waste management encompassing guidance on recycling etc. The term normally relates to all kinds of waste, whether generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, or other human activities, including municipal (residential, institutional, commercial), agricultural, and social (health care, household hazardous wastes, sewage sludge). Waste management is intended to reduce adverse effects of waste on health, the environment or aesthetics. Waste management practices are not uniform among countries (developed and developing nations); regions (urban and rural area) etc. The legal definition of "agricultural waste" is: - "waste from premises used for agriculture within the meaning of the Agriculture Act 1947." Waste is a pejorative term for unwanted materials. The term can be described as subjective and inaccurate because waste to one person is not waste to another (Wikipedia, 2013). Commercial poultry industry is growing rapidly in Bangladesh and annual growth rate of chicken population is 5.3 percent (GoB, 2010). Anaerobic digestion process is the most efficient process for biogas production from poultry waste because carbon dioxide (greenhouse gas) never produced in this process (Parmanik, 2000).

Agricultural waste typically associated with animals includes but is not limited to manure, bedding and litter, wasted feed, runoff from feedlots and holding areas, and wastewater from buildings like dairy parlors. Best management practices (BMPs) such as rotational grazing , and pasture renovation to maintain adequate vegetative cover ,riparian buffers and structures built to trap or retain waste should be utilized in order to prevent contamination of both surface waters and groundwater. Wastes are those substances or objects which fall out of the commercial cycle or chain of utility (EIB, 1995). Waste is defined as any substance which constitutes a scrap material or other unwanted surplus substance arising from the application of any process. Waste is defined as any substance which constitutes a scrap material or other unwanted surplus substances coming up from the application of any process. Hazardous waste is defined as any waste or combination of wastes, which could cause or significantly contribute to adverse effects in the health and safety of humans or the environment if improperly managed (EPA, 1990). Waste management includes three steps: transport, treatment and disposal of waste; control, monitoring and regulation of the production, collection, transport, treatment and disposal of waste; and prevention of waste production through in-process modification, reuse and recycling. Supported by Bangladesh Council of Scientific & Industrial Research (BCSIR), he used a bio gasification device to convert 500kg of poultry waste from 9000 birds, per day to generate 7.5 kw of power (Rahman and Zubayer, 2002). A sustainable poultry waste electricity plant established in Faridpur. GTZ Bangladesh has installed a flagship project at Raj Poultry Farm which is situated in Faridpur district. The farm has 15000 birds from which it can produce 105 m^3 biogas per day. The farm has 3 X 35 m^3 or total 105 m^3 biogas plant. GTZ installed 2 X 5 kw i.e. total 10 kW generators to produce electricity (Zaman S.A. *et al*, 2007).

Litter should be stacked 6 to 8 feet high for 3 to 5 weeks depending on environmental temperature before feeding. Stacking allows the litter to build up heat, thus killing pathogens and improves the palatability to cattle (Hossain et al., 2005). Dried poultry manure has been used as an animal feed for ruminants (Thomas *et al.,* 1972; Alam et al., 2008).There is an increasing rate of waste generation in Bangladesh and it is projected to reach 47, 064 tons per day by 2025. The Waste Generation Rate (kg/cap/day) is expected to increase to 0.6 in 2025. A significant percentage of the population has zero access to proper waste disposal services, which will in effect lead to the problem of waste mismanagement. Bangladesh has minimal waste collection coverage which forces majority of the waste to be dumped in open lands. These wastes are not disposed of properly, where general waste is often mixed with hazardous waste such as hospital waste. In a report on solid waste management in Asia, the data showed that, in Dhaka, only about 42% of generated waste is collected and dumped at landfill sites, and the rest are left uncollected. As much as 400 tons are dumped on the roadside and in open space. Recycling of pesticide waste is not viable due to product quality requirements and the environmental risks involved.

MATERIALS AND METHODS

Study area

Trishal upazila with an area of 338.98 sq km, located in between 24°28´ and 24°41´ north latitudes and in between 90°18´ and 90°32´ east longitudes is bounded by Mymensingh sadar upazila on the north, Bhaluka and Gaffargoan upazilas on the south, Ishwargonj, Nandail and Gaffargaon upazilas on the east, Fulbariaupazila on the west. Main rivers are Old Brahmaputra, Sutia and Banar (Banglapedia, 2013). The study was conducted in different areas randomly. The study involves 75 farmers, various farms situated in different areas of Trishal upazilla. The study considers all type of farmers having cropland, fishery, dairy and poultry etc.

Data collection and analysis

The area of cropland, fishery, dairy and poultry farms of this area were selected at random and the farms are constituted the population for this study. The population constituted 70 farmers and 5 farms. In order to collect relevant information, a semi-structured interview schedule was prepared to collect data. The schedule was carefully designed keeping the objectives of the study in view. Before finalizing the schedule, it was pretested first judging the suitability of schedule to respondents. Necessary correction, modification and alterations were done accordingly.

Data were collected through personal interview during March to April 2015. The researcher explained the purpose of the study and requested necessary help and co-operation in collecting data from the respondents. In order to minimize the response error questions were asked in simple Bangla. After completion of each interview, it was checked to be sure that information had been recorded properly. After completion of the field survey, the information obtained from all the respondents were coded, compiled and tabulated. The responses to the questions in the interview schedule were transferred to a master sheet to facilitate tabulation for statistical analysis. Statistical means such as number and percentage distribution, mean, graph and correlation were calculated and finally analysis of variance were performed to find out the differences between selected variables of the rural areas. The correlation-regression and analysis of variance between dependent and independent variables were carried out to find the relationship and to measure the strength (Gomez and Gomez, 1984).

RESULTS

Age: Age of the respondents ranged from 16 to above 60 years. The respondents were classified into five categories were 16-25, 26-35, 36-45, 46-60 and above 60 years respectively. The highest proportion (33.33%) was in (26 to 35) year range and the lowest (5.33%) respondent's age were above 60 years. In the study area, 13.33, 21.33 and 26.67 percent were in the range of 16-25, 36-45 and 46-60 years respectively (Table 1).

Education level: The level of education undergoes 7 categories. These were can sign only, can read only, primary, secondary, higher secondary, graduate, post graduate. 25% people could sign only and 6% people had reading ability. About 13.33% of respondents have primary education and there were also 13.33% of respondent under secondary level. The percentage under higher secondary level was also same as secondary. There were some graduates who were involved with poultry firming and their percentage was 6.66%. It is very important that there was no respondent who completed post graduate (Table 2). Education broadens outlook of individuals and leads them to explore new ideas for better litter management. The literacy rate in this country is 56.9% (BBS, 2013). Thus, it seemed that rate of literacy of the respondents in the study area was higher than the national context since 100% of individuals had different kind of formal education.

Farming experience: The duration of firming ranged from 8 month to 22 years. Based on their duration of firming, the respondents were classified into three categories. These were less than 5 years, 5 to 10 years and more than 10 years. The duration of firming of 33.33% respondent was less than 5 years. About 26.67% farmers were in the range of 5-10 years while 40% farmer's farming experience was more than 10 years (Table 3).

Table 1. Distribution of respondents according to their age

Age range (years)	Respondents	
	Number	Percentage
16-25	10	13.33
26-35	25	33.33
36-45	16	21.33
46-60	20	26.66
Above 60	04	5.33
Total	75	100

Table 2. Distribution of education level of respondent in study area

Level of education	Respondents	
	number	percentage
Can sign only	15	20
Can read only	25	33.33
Primary	10	13.33
Secondary	10	13.33
Higher secondary	10	13.33
Graduate	5	6.66
Post Graduate	0	0

Table 3. Distribution of firming duration of farmer in the study area

Farming experience	Respondents		Observed range
	Number	Percentage	
Less than 5 years	25	33.33	8 months to 22 years
5 to 10 years	20	26.67	
More than 10 years	30	40	
Total	75	100	

Table 4. Litter management knowledge of farmer in study area

Do you know about litter management?	Respondents	
	Number	Percent
Yes	24	66.66
No	12	33.33

Size of crop land: Total size of crop land is 34125 decimal and the size of cropland varies from the farmers to farmers. Here we find the lowest size of cropland is 71 decimal and the highest size was 3000 decimal. A graph was shown in figure 1 as the size of cropland of the farmers in the selected area. And we get the size less than or equal 100 decimal is 28.98%, size less than or equal 500 decimal is 50.72% and the size less than or equal 1000 decimal is 15.94% and the size less than or equal 2000 decimal is 2.89% and the size less than or equal 3000 decimal is 1.44%.

Table 5. Distribution of animal waste in the study area

Using type of animal waste	Respondents	
	Number	Percent
Bio gas	03	12.5
Composting	01	4.17
Fish culture	02	8.3
Bio gas and Composting	03	12.5
Composting and Crop field	01	4.17
Fish culture and crop field	03	12.5
Bio gas, Composting and Fish culture	02	8.3
Bio gas, Fish culture and Crop field	03	12.5
Composting, Fish culture and Crop field	01	4.17
Bio gas, Composting and Crop field	02	8.3
Bio gas, Composting, Fish culture and Crop field	03	12.5
Total	**24**	**100**

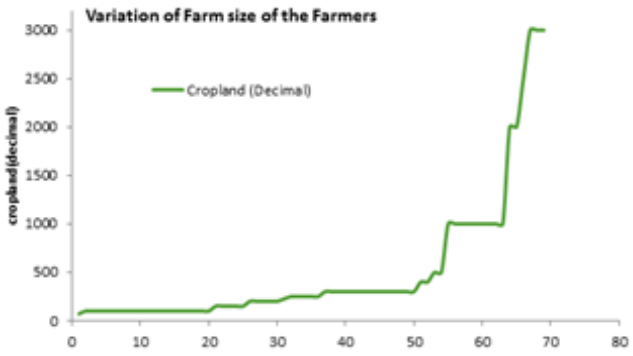

Figure 1. Relationship between the farm size and the farmers

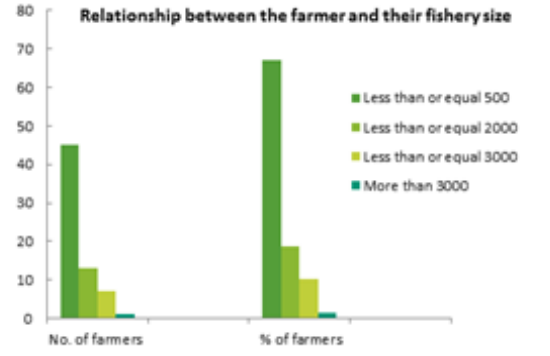

Figure 2. Relationship between the number of farmers and their fishery

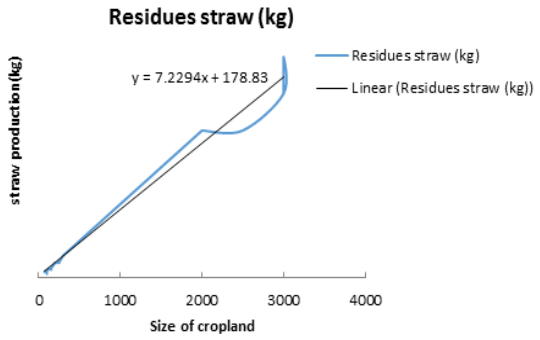

Figure 3. Relationship between cropland and straw

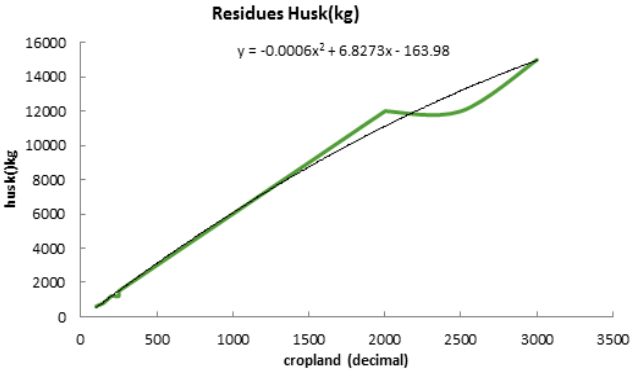

Figure 4. Relationship between cropland and husk

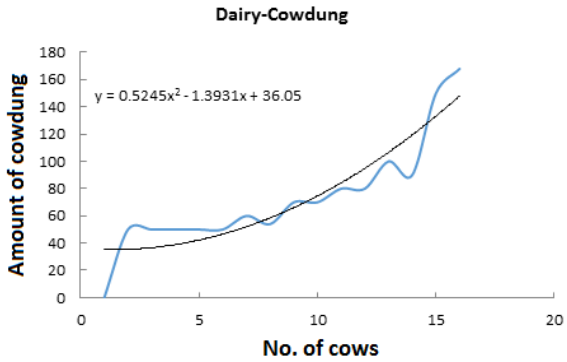

Figure 5. Relationship between dairy and cow dung

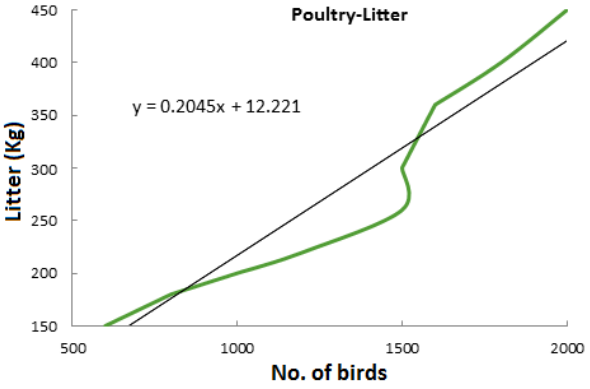

Figure 6. Relationship between the poultry and litter

Amount of fishery: Total size of fishery is 11978 decimal and the lowest size is 50 decimal and the highest size is 4000 decimal. The size of fishery less than or equal 500 decimal is 67.16%,size of fishery less than or equal 2000 decimal is18.84 %,size of fishery less than or equal 3000 decimal is 10.14% and the size of fishery more than 3000 decimal is 1.14% (Figure 2).

Relationship between cropland and straw: The production of straw is closely related with the size of cropland. The total size at the survey area is 35496 decimal and the total straw production at this site is 270250 kg. Here we find that the more size of cropland produce more straw than the less size cropland. We also find that every 100 decimal of cropland produce around 800kg of straw. Straw production less than or equal 1000 kg is 36.62%, straw production less than or equal 10000 kg is 54.92%, straw production less than or equal 20000 kg is 5.63% and straw production less than or equal 30000 is 2.81% (Figure 3).

Relationship between cropland and husk: The production of husk is related with the size of cropland. The total size at the survey area is 35496 decimal and the total husk production at this site is 20900 kg. Here we find that the more size of cropland produce more straw than the less size cropland. We also find that every 100 decimal of cropland produce around 600kg of husk. Husk production less than or equal 1000 kg is 35.71%, husk production less than or equal 10000 kg is 55.71%, husk production less than or equal 15000 kg is 8.57% (Figure 4). The amount of cow dung is related with the number of cows. The number of cows in survey was 132 and the total production of cow dung was 1172 kg, average amount of dung is 8.87kg per day. Here we get the more number of cows produce the more amount of dung. A graph is given below to show the relationship between the dairy and cow dung (Figure 5).

Relationship between poultry and litter: The amount of litter is related with the number of birds. The number of birds in survey was 38600 and the total litter used as one production (800 birds) was 8320 kg, average amount of used litter was 46.36 kg per 800 bird production. Here we get the more number of cows produce the more amount of litter (Figure 6).

Litter management knowledge: About 48% percent people had litter management knowledge and rest 52% percent people had no knowledge about litter management (Table 4).

The respondent used animal waste in composting, biogas, fish culture and crop field (Table 5).

DISCUSSION

Cropland: The lowest size of cropland is 71 decimal and the highest size was 3000 decimal. And the size less than or equal 100 decimal is 28.98%, size less than or equal 500 decimal is 50.72% and the size less than or equal 1000 decimal is 15.94% and the size less than or equal 2000 decimal is 2.89% and the size less than or equal 3000 decimal is 1.44%. Wastes from the cropland are straw and husk. The production of straw is closely related with the size of cropland. The total size at the survey area is 35496 decimal and the total straw production

at this site is 270250 kg. Here we find that the more size of cropland produce more straw than the less size cropland. We also find that every 100 decimal of cropland produce around 800kg of straw. Straw production less than or equal 1000 kg is 36.62%, straw production less than or equal 10000 kg is 54.92%, straw production less than or equal 20000 kg is 5.63% and straw production less than or equal 30000 is 2.81%. And the production of husk is related with the size of cropland. The total size at the survey area is 35496 decimal. And the total husk production at this site is 20900kg. Here we find that the more size of cropland produce more straw than the less size cropland. We also find that every 100 decimal of cropland produce around 600kg of husk. Husk production less than or equal 1000 kg is 35.71%, husk production less than or equal 10000 kg is 55.71%, husk production Less than or equal 15000 kg is 8.57%. Farmers generally use straw for dairy feed and fuel. Most of the farmers use this for feeding their own dairy and cattle and they sell the excess straw to the farmers having dairy and cattle or to the dairy farms. And husk is mainly use as fuel in Trishal upazilla. Almost every house used this waste for cooking. So the wastes from cropland are used to feeding (dairy and cattle) and cooking (fuel).

Fishery: Total sizeof fishery is 11978 decimal and the lowest size is 50 decimal and the highest size is 4000 decimal. the size of fishery less than or equal 500 decimal is 67.16%, size of fishery less than or equal 2000 decimal is18.84 %, size of fishery less than or equal 3000 decimal is 10.14% and the size of fishery more than 3000 decimal is 1.14%.Waste generate from the fisheries is mainly pond bottom sediment and it is widely used at this upazilla as binding the pond sidewall. Very few of them used this for gardening as it increase the fertility of soil and the other farmers keep remains it at the pond.

Dairy: The amount of cow dung is related with the number of cows. The number of cows in survey was 132 and the total production of cow dung was 1172 kg, average amount of dung is 8.87kg per day. Here we get the number of cows produce the more amount of dung and the dung is mainly used as bio fuel and composting and the widely use this as natural fertilizer. Few of the farmers are interested to produce biogas because it is expensive to build a biogas plant.

Poultry: The amount of litter is related with the number of birds. The number of birds in survey was 38600 and the total litter used as one production (800 birds) was 8320 kg, average amount of used litter was 46.36 kg per 800 bird production. Here we get the more number of cows produce the more amount of litter, About 66% percent people had litter management knowledge and rest 33.33% percent people had no knowledge about litter management

Management of animal waste: Biogas was suggested by 12.5 percent respondent. Composting and fish culture were suggested individually by 4.17 and 8.3 percent respectively. About 12.5 percent respondent suggested both biogas and composting and 4.17percent was for both composting and crop field where fish culture and crop 32 field both was for 12.5 percent. About 8.3 percent respondent preferred biogas, composting and fish culture. About 12.5 percent respondent preferred biogas, fish culture and crop field. Composting, fish culture and crop field were suggested by 4.17 percent respondent where biogas, composting and crop field were suggested by 8.3 percent respondent. Only 12.5 percent respondent suggested all the methods.

CONCLUSION

Critically, a number of potential barriers to the options at the higher end of the waste hierarchy (that is reduction and recovery) exist. These include: low farmer awareness and motivation; limited cost-effective techniques for on-farm waste recovery; high logistics costs for off-farm recovery and poor markets, high reprocessing costs and limited facilities. So, it is necessary to initiating program to introduce the economic benefits of waste management and start training programs for farmer awareness.

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