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Full Length Research Paper

Challenges of open dumping of animal wastes on the environment: A case study of S and D farms, Odeda, Nigeria

James Akintola, Balogun Lateef and Jude Abiola

Department of Environmental Science, Citygate University, Ibadan, Oyo State, Nigeria.

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The study investigated the effect of open dumping of animal wastes on the farm workers' health and the environment. The study employed Chi-Square's test of result reliability revealed on hypothesis tests. The χ^2 calculated value 0.013 for hypothesis I which is less than χ^2 tabulated value of 3.84 at level of significance 0.05, indicates that the open dumping of animal wastes as a method of disposal has significant effect on health of the workers and the environment. Similarly for hypothesis II; χ^2 calculated value of 0.06 is far less than the χ^2 tabulated value of 3.84 at level of significance 0.05. This implies that level of waste disposal education of the workers significantly affects the method of disposal being employed on the farm. For the Hypothesis III; χ^2 calculated value of 0.05 is also less than the χ^2 tabulated value of 3.84 at level of significance 0.05, implying that the industrial training being given to the workers on waste disposal methods is not adequate.

Keywords: Animal waste, open dumping, waste disposal, waste management.

INTRODUCTION

Animal wastes include livestock and poultry manure, bedding and litter, waste water, feedlot runoff and even wasted feed (Ajayi, 2008). Animal wastes abound when too much waste is produced by farm animals in a particular environment with no safe or cost-effective means to either use the wastes productively or dispose off overtime (David, 1993). These wastes can affect the air or water quality if proper practices are not followed. Waste from animal concentrations which are not protected can wash into nearby streams. Such diffused flow of animal waste is referred to as non-point source (NPS) pollution (Downing and Gibson, 1984 and Oreyemi, 1988). Non-point source pollution is the largest remaining water quality problem in United States (John and Steven, 1999).

In Nigeria, approximately one third of the agricultural NPS pollution is caused by animal waste run-off from feedlots, holding areas and pastures (John and Steven, 1999). Such waste in surface waters reduces dissolved oxygen (DO) and endangers aquatic life. The added nutrient produces excessive algae growth therefore causing eutrophication, unpleasant taste and odours.

Drinking of water with nitrate concentration above 10ppm can cause development deficiencies in infants and death in severe cases due to oxygen deprivation (Akinsanmi, 2000). High nitrate concentration is also believed to have caused spontaneous abortion and possibly cancer in farm animals (Rached *et al*., 2001). Animal waste should therefore be disposed off properly and regularly to avoid wastes emitting pungent obnoxious odour and also prevent favourable breeding place for microbes, which could aid the spread of diseases (Barth, 1995). A waste management system should be a part of the total soil and water conservation plan for farms producing livestock and poultry. Therefore, it is important to examine and evaluate vividly the nature of waste generated, as well as disposal methods employed by the farm to determine whether it is adequate or not.

MATERIALS AND METHODS

Study Area

Serah and Deborah (S and D) Farms is situated along Abeokuta-Ibadan road in Odeda Local Government Area of Ogun State, Southwestern Nigeria.

Corresponding author. E-mail:james_akintola@gmail.com

Table 1. Effect of Open Dumping on Workers and Environment

Variables	Agreed	Not Agreed	Total
H_a	25	32	57
H_o	27	36	63
Total	52	68	120

The farm covers 0.5km^2 expanse of land with staff strength of 250. The farm consists of livestock, fishery and poultry sections which are well equipped for mass production of meat, fish and poultry products.

Research Methodology

120 copies of questionnaire were randomly distributed among the staff of the component units of the farm. They were later retrieved and processed. Observation of the work process and environment was also carried out vis-à-vis the waste disposal method adopted by the farm.

Hypotheses

Three hypotheses were tested and are listed below:

- Hypothesis I
  H_a: Open dumping disposal of waste tends to have negative effect on the workers and the environment
  H_o: Open dumping disposal of waste does not tend to have negative effect on the workers and the environment.
- Hypothesis II
  H_a: Level of waste disposal education of the workers affects the method being used.
  H_o: Level of waste disposal education of the workers does not affect the method being used.
- Hypothesis III
  H_a: Industrial training on waste disposal methods in the farm is inadequate
  H_o: Industrial training on waste disposal methods in the farm is adequate

Chi-Square Test

In order to validate the hypothesis, chi-square or goodness of fit test was used to test data collected quantitatively.

$$\chi^2 = \Sigma \frac{(O-E)^2}{E}$$

where:

χ^2 = test statistics
Σ = summation
O =observed frequency
E = expected frequency
(r) = no. of rows
(c) = no. of columns
Df = degree of freedom
Df = (r – 1) (c – 1)
= (2 – 1) (2 – 1)
= (1) (1)
= 1

RESULTS

The response to the effect of open dumping of animal wastes, as a method of disposal, on workers and the environment is presented in Table 1. 25 out of 57 respondents agreed with H_a while 32 out of 57 did not, 27 out 63 respondents agreed with H_o while 36 out of 63 did not.

Hypothesis I

H_a: Open dumping disposal of waste tends to have negative effect on the workers and the environment
H_o: Open dumping disposal of waste does not tend to have negative effect on the workers and the environment

Level of significance at 0.05
Let test statistics be

$$\chi^2 = \Sigma \frac{(O-E)^2}{E}$$

Df = (r – 1) (c – 1
= (r – 1) (c – 1)
= (2 – 1) (2 – 1)
= (1) (1)
= 1
Decision rule: reject H_o if χ^2 calculated is greater than χ^2 tabulated.
Compute test statistics

E_1 = ——— = 24.7
E_2 = ——— = 32.3
E_3 = ——— = 27.3
E_4 = ——— = 35.7

OE		O – E(O – E)^2		$\frac{(O-E)^2}{E}$
25	24.7	0.3	0.09	0.004
32	32.3	-0.3	0.09	0.003
27	27.3	-0.3	0.09	0.003
36	35.7	0.3	0.09	0.003
				0.013

χ^2 calculated = 0.013
χ^2 tabulated (0.05) = 3.84

Table III. Level of Industrial Training of the workers on **Table 2.** Effect of Waste Disposal Education on Method Waste Disposal Methods Adopted

Variables	Agreed	Not Agreed	Total
H_a	26	32	58
H_o	29	33	62
Total	55	65	120

Variables	Agreed	Not Agreed	Total
Yes	25	32	57
No	29	34	63
Total	54	66	120

Since χ^2 calculated is less than χ^2 tabulated (i.e. 0.013 < 3.84 respectively)

We reject the H_o and conclude that open dumping method of waste disposal tends to have negative effect on the workers and the environment.

Hypothesis II

H_a: Level of waste disposal education of the workers affects the method being used.

H_o: Level of waste disposal education of the workers does not affect the method being used.

The effect of waste disposal education given to the workers on method adopted by the respondents is shown on Table 2. 32 out of 58 respondents did not agree with Ha while 29 out of 62 agreed with Ho; this invariably implies that 61/120 x 100 (i.e.

Level of significance = 0.05

Let test statistics be

$\chi^2 = \Sigma$

Df = (r – 1) (c – 1)

Decision Rule: Reject Ho if χ^2 calculated is greater than χ^2 tabulated

Compute test statistics

E_1 = = 26.9

E_2 = = 31.4

E_3 = = 28.4

E_4 = = 33.6

O	E	O – E	$(O – E)^2$	
26	26.9	-0.9	0.81	0.03
32	31.4	0.6	0.36	0.01
29	28.4	0.6	0.36	0.01
33	33.6	-0.6	0.36	0.01
				0.06

χ^2 calculated = 0.06

χ^2 tabulated = 3.84

Since χ^2 calculated is less than χ^2 tabulated (i.e. 0.06 < 3.84) we reject the null hypothesis and conclude that the level of waste disposal education of the workers significantly affects the method of the disposal being employed.

Hypothesis III

H_a: Industrial Training on waste disposal methods in the farm is inadequate

H_o: Industrial Training on waste disposal methods in the farm is adequate (See table 3)

Level of significance at 0.05

Let test statistics be

$\chi^2 = \Sigma$

Df = (r – 1) (c – 1)

= (2 – 1) (2 – 1)

= (1) (1)

= 1

Decision Rule: Reject H_o if χ^2 calculated is greater than χ^2 tabulated

Compute test statistics

E_1 = = 25.7

E_2 = = 31.4

E_3 = = 28.4

E_4 = = 34.7

O	E	O – E	$(O – E)^2$	
25	25.7	-0.7	0.49	0.02
32	31.4	0.6	0.36	0.01
29	28.4	0.6	0.36	0.01
34	34.7	-0.7	0.49	0.01
				0.05

χ^2 calculated = 0.05

χ^2 tabulated = 3.84

Since χ^2 calculated is less than χ^2 tabulated (i.e. 0.05 < 3.84) we reject the null hypothesis and conclude that industrial training on waste disposal methods in the farm is significantly inadequate.

DISCUSSION

The open dumping method of waste disposal adopted in the farm has significant effect on the workers and the

environment. This is evident from the result of Hypothesis I. The dumping site creates growth conditions for disease vectors, insect pests also lay their eggs on the rotten wastes. This later hatch and invade the farm animals (Olusi, 1998) and workers inclusive.

Result of Hypothesis II shows that the workers adopted the open dumping method because they had little knowledge about any other safer and more hygienic methods of waste disposal. The farm has been using this method year-in year-out since its inception; they possibly consider open dumping method as the cheapest. Moreover, the wastes generated while the farm was still small, at the inception, were considerably low to what is being generated now when the farm is big. Hence, the farm needs to review and change the open dumping method being used year long (Ajayi, 2008).

Hypothesis III shows that the workers were not adequately informed on various safer and more hygienic waste management methods. Hence they are limited to open dumping, thereby recording low waste management and poor prevention of air-pollution and air-borne diseases. The whole heap of the dump site creates obnoxious odour and encourage the growth of pathogens and insect pests lay their eggs on the heap (Madukwe *et al*., 1996).

RECOMMENDATION

Agricultural wastes can be used as a form of resource recovery; the waste can be reused in the term of waste recycling. Waste management in form of organic manure can improve overall farming operations as well as improving the environment while reducing fertilizer costs.

Frequent and up-to-date waste disposal review is also very important so as to check the impact of a waste disposal method being used. S and D Farms should therefore embark on waste management plan, which allows the farmers to fully utilize the plant and animal waste to reduce cost.

The management should also organize seminars on regular basis to keep their workers abreast of safe and hygienic methods of waste disposal.

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