Pig manure management practices in South-East Benin (West Africa)

Abstract

The aim of this study was to investigate pig manure use practices on pig farms in Benin. Data on the socio-economic characteristics of the farmers, herd structure and pig manure management practices were collected using a structured questionnaire. It was addressed to one hundred fifty-seven (157) randomly selected pig farmers in the departments of Ouémé and Plateau in south-eastern Benin. The data were analyzed using descriptive statistics and multinomial logit model. Results showed that majority of the farmers (55 %) used pig manure burial. Complaints about poor manure management were the reason for the change of site, 82.9% in Ouémé and 78.3% in Plateau (p-value > 0.05). Gender of pig farmer, area of the farm, frequency of pigsty maintenance and herd size were important variables influencing manure management. This study showed that farmers' knowledge of pig waste management was insufficient. Pig farmers need to be trained on manure management techniques for efficient and effective recovery of animal waste in an environment friendly way.

Key words: Pig, manure management techniques, environment, pig farmers, Benin

1. Introduction

Livestock is very important in contributing to the sustainability of agricultural systems as an integral part of traditional farming system by using crop residues and other feeds that are not used by humans and process them into milk and meat [1; 2]. In many countries, livestock composed mainly of ruminants, non-ruminants and aquatic animals. Benin's cattle, sheep, goat, pig and poultry populations were reported at 2.339; 0.915; 1.836; 0.466 and 20 million

respectively in 2016 [3]. The intensification of livestock production has led to a considerable amount of manure. Quantities of 1 630 600 tons Dry Matter (DM) of cattle manure, 227 800 tons DM of sheep manure, 136 900 tons DM of goat manure, 122 400 tons DM of pig manure and 36 500 tons DM of poultry manure are annually available in Benin [4].

In this context, management of waste has become an important problem for development research due to its role in reducing the feeding and unemployment problems of the growing urban population. Recent studies have provided evidences of environmental, social and economic contributions of using waste for urban food production. However, a major challenge is how waste (sewage and animal waste) can best be managed for healthy living and minimal negative health implications. According to Omowumi et al. [5], waste management incorporates "collection, transportation, storage, treatment, recovery and disposal of waste". Pig waste disposal offers substantial environmental, biological, and financial problems in the pig farming areas [6]. Without an effective and efficient waste management program, the waste generated from breeding activities can result in health risks and have a negative impact on the environment. In pig farming, in addition to unpleasant odour, hydrogen sulphide, ammonia and other gases emitted from stored pig manure can reduce air quality [7]. The unpleasant odour can also lead to tensions between pig producers and their neighbours, which can result in disputes and risk production stoppages [8]. Furthermore, manure generates heat as it decomposes, and can in fact spontaneously combust when stored in massive piles, [9]. Emissions or smoke from a large pile of burning manure pollute the air over a very large area and requires a great deal of effort to extinguish, thus polluting the air with attendant greenhouse gas effect. There is little information on pig waste disposal in Benin. Therefore, a study was undertaken to investigate the pig manure management practices.

This paper explores the manure management implications of pig and the consequences on environment if attention is not paid to it. Specifically, the paper seeks to: firstly, summarize

several practices in the pig manure management by pig farmers in the study area, highlighting the factors that determine the choice of management which pig farmers adopt in the disposal of their pig dung. Secondly to assess the consequences of poor manure management on the living environment of farmers and pigs.

The study is a contribution to knowledge on the various consequences of the waste management practices already adopted by pig farmers on the environment and on the general population. Results of the study provide information for policy makers, including community organizations, government and various agricultural stakeholders, so as to make adequate decisions in relation to waste and animal manure management in urban municipalities.

2. Material and Methods

2.1. Ethical approval

The manuscript does not contain clinical studies or patient data, ethics committee approval was not required.

2.2. Study area and data collection

In Benin, the department of Ouémé is located between 6° 40 ‘0 “Latitude North and 2° 30’ 0” East Longitude and covers an area of 1281 km² (1.12% of the national territory) with a population of 1,100,404 inhabitants. The Plateau department is between 7°10’0 “North Latitude and 2° 34’ 60”East Longitude and covers an area of 3264 km², for about 3% of the national territory with a total population of 622,372 inhabitants [10].

This study on pig production and pig waste management practices was conducted in 157 farms (from July to December 2021) conveniently selected by their willingness to make their farms and farm records available to the researchers. A total of 50, 45, 30 and 32 farms were sampled in Sèmè-Podji, Adjarra, Sakété and Adja-Ouèrè respectively (figure 1). A structured questionnaire was used to collect data on socio-economic characteristics of the farmers, such

as gender, occupation, level of education and farming experience, pig-production, livestock structure and pig manure management practices. The questionnaire was translated to farmers who could not read or write in their native language, and their responses were recorded. Only farmers that gladly welcomed the researchers and provided the necessary information were sampled. The farmers who responded were assured of the confidentiality of the information provided. Farmers were informed that they had the right to refuse to participate. However, participation was encouraged by the promise made during the pilot survey that the researchers would provide veterinary services to the farms after sampling, eg, advice on production and herd-health management problems when the study results were shared to the farms.

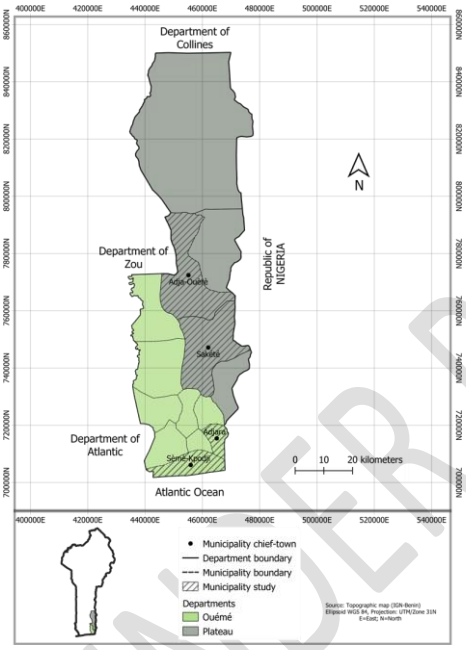

Figure 1: Map of study area

2.5. Data analysis

The statistical analysis tools used included descriptive statistics and multinomial logit model.

i. Descriptive statistics: Descriptive statistics such as tables, frequencies, mean and percentages were used for socioeconomic characteristics of pig farmers and pig farming management activities calculated by the Proc Freq procedure of SAS. Proportions of the two

departments were compared by the bilateral Z test. For each relative frequency, a 95% confidence interval was calculated according to the formula:

$$\mathrm{CI} = 1.96\sqrt{\frac{[\mathrm{P}(1-\mathrm{P})]}{\mathrm{n}}}$$

Where, CI is Confidence Interval, p is the relative frequency and n is the sample size.

ii. Multinomial Logit Model: The determinants of waste management technique employed by pig farmers in the area were analyzed using Multinomial Logit (MNL) model. This model was adopted from Mpuga [11]. The model is used to handle the case of dependent variables with more than two classes. The various waste management techniques used by pig farmers are classified as the dependent variables. It is supposed that the dependent variable Qit can take on one of j categories 1, 2... k (the different alternative choices waste management available to farmers).

In this study, four distinct categories of waste management practices employed by pig farmers are 'burying', 'self-use', 'sale', and 'discard'. It is assumed that all the alternative waste management are mutually exclusive (in this case, waste management mostly used by pig farmers) [11].

If Pr (Qit = M/X) is the probability of observing outcome M given X, the probability model for Dit can be constructed as follows:

$$Pr\ (Qit\ =\ M/X) = \frac{\exp \beta 0 + \beta 1 X 2i + \ldots\ldots\ldots\ldots \beta 1 k X m I}{\sum_{j=1}^{K} \exp\ (\beta 0 \gamma + \beta i j X 2 i + \ldots\ldots\ldots + \beta k j X n i}$$

For j= 1, 2, …… k. The parameters are not all identified since more than one set of parameters generate the same probabilities of the observed outcomes unless we impose contraints on the model which is achieved by setting parameters. For example, those of the

first choice category j = 1 to all be zero: β01 = β2 = βk1 = 0. In other words, parameters of the first choice category are used as the base against which the other choices are compared.

The log-likelihood function for the multinomial logit can be written as follows:

$l=\sum_{i=1}^{n}\sum_{j=1}^{k} dilLog(Pij)$

Where dij is a dummy variable that takes the value 1 if observation i has chosen alternative j; 0 otherwise. The first-order conditions are:

$\frac{\delta l}{\delta \beta kj}=\sum_{i=1}^{n}(qij - Pij)Xkj$

In our case, the choice of waste management techniques is modelled as a function of socio-economic characteristics and pig management activities. This can be presented as a general form equation:

$Qit = f(Xi)$

However the MNL model is empirically operationalized in this study with the following equations:

$Qit = \alpha 0 + \beta ijXi + \ldots\ldots\ldots + \beta iXn + \epsilon i$ ~~(5)~~

The dependent variable Qi is when household sourced credits from source i and 0 when otherwise. Thus Q1, Q2, Q3, and Q4 represent probabilities of farmers using 'burying', 'self-use', 'sale', and 'discard' management practices respectively.

Xi…….. Xn represents vector of the explanatory variables where n= 1…….. 9

B1……..β2 represents the parameters or coefficients

ϵi represents the independent distributed error term and α_1, α_2, α_3, α_4 shows the intercept or constant term.

The Explanatory Variables are:

X1 = Gender (Male=1, Female = 0)

X2 = Age of pig farmer (Years)

X3 = Household size

X4 = Years spent in school (years)

X5 = Pig farming experience (years)

X6 = Number of pigs

X7 = Area site (ha)

X8 = Frequency of maintenance of pigsty 1= Always, 0= occasionally

X9 = Marital status (Married =1, otherwise =0)

3. Results

3.1. Socio-demographic factors of Pig Farmers

The result of selected personal factors of the respondents shows that if old farmers are defined as those who are above 50 years of age, 10.5% and 19.4% of pig farmers can be said to be old in Ouémé and Plateau respectively ($p > 0.05$). The average age of pig farmers was 42.74 years and 16.6% of farmers are below this age. The table 1 also shows that only 6.3% of pig farmers in Ouémé and 17.7% in the Plateau were women. It is indicated that less than 7% (Plateau) and 4% (Ouémé) ($p > 0.05$) of the respondents were single or widowed. Rest of the respondents was married. More than 79.9% in Ouémé and 83.8% in the Plateau have at least primary education level. More than 74% of the respondents have more than 5 years of experience. Most households of the pig farmers were between 6 and 10 people. (Table 1).

Table 1: Socio-economic characteristics of pig famers

Variable	**Ouémé**			**Plateau**		
	n	Percentage	CI	n	Percentage	CI
Sex						
Male	89	93.7a	9.8	51	82.3b	13.14
Female	6	6.3a	4.9	11	17.7b	9.91
Age (years)						
20-30	7	7.4a	5,3	4	6.5a	6,1
31-40	32	33.7a	10,7	18	29.0a	12,1
41-50	46	48.4a	11,9	28	45.2a	14,0

51-60	10	10.5a	6,3	12	19.4a	10,3
Marital status						
Married	92	96.8a	8.2	58	93.5a	10,5
Otherwise	3	3.2a	3.5	4	6.5a	6,1
Household size						
1-5	20	21.1a	8,8	27	43.5b	13,8
6-10	64	67.4a	12,3	32	51.6b	14,3
Greater than 10	11	11.6a	6,6	3	4.8a	5,2
Education level						
No formal education	20	21.1a	8,8	10	16.1a	9,4
Primary	63	66.3a	12,3	41	66.1a	14,4
Secondary	12	12.6a	6,9	11	17.7a	9,91
Main source of income						
Agriculture	12	12.6b	6.9	25	40.3a	13.6
Pig breeding	12	12.6a	6.9	8	12.9a	8.5
Fish farming	11	11.6a	6.6	0	0.0b	0.0
Market gardening	17	17.9a	8.2	1	1.6b	3,0
Others	43	45.3a	11.7	28	45.2a	14,0
Years of Experience						
Less than 5 years	6	6.3a	4.9	4	6.5a	6.1
5-9 years	31	32.6a	10.5	11	17.7b	9.9
10-14 years	43	45.3a	11.7	21	33.9a	12.8
15-19 years	10	10.5b	6.3	23	37.1a	13.2
Above 19 years	5	5.3a	4.5	3	4.8a	5.2

CI= Confidence Interval; n= Number of surveyed breeders, the percentages of the same row followed by different letters differ significantly at the threshold of 5%

3.2. Pig farming and different pig waste management techniques among pig farmers in Ouémé and Plateau

Most respondents bred pigs of improved breeds. They were 87.4% in Ouémé and 61.7% in the Plateau. Local pigs were not raised in the department of Ouémé but only a small percentage (17.7%) was raised in the plateau. Pigsties are mostly improved in Ouémé (74.7%) and semi-improved in the Plateau 54.8% where we also find traditional pigsties. Pig manure was collected daily in Ouémé, while 21% of farmers in the Plateau do not collect it every day (table 2).

Table 2: Breeds reared, type of pigsty and frequency of maintenance

Variable	Ouémé			Plateau		
	n	Percentage	CI	n	Percentage	CI
Breed						
Improved	83	87.4a	10.7	38	61.7b	14.6
Local	0	0.0b	0.0	11	17.7a	9.9
Crossbred	12	12.6a	6.5	13	21.0a	10.6
Pigsty						
Improved	71	74.7a	12.0	17	27.4b	11.9
Semi-improved	24	25.3a	9.5	34	54.8b	14.5
Traditional	0	0.0b	0.0	11	17.7a	9.9
Frequency of maintenance						
Always	95	100a	5.0	49	79.0b	13.5
Occasionally	0	0.0b		13	21.0a	10.6

CI= Confidence interval; n= Number of surveyed breeders, the percentages of the same row followed by different letters differ significantly at the threshold of 5%

The result reveals different pig waste management techniques among farms. The farmers chose for self-consumption (8.9%), sale (7.4%), rejection (17.9%) and burial (55.8%) as pig waste methods of valorization in Ouémé (table 3). Wheras in Plateau, the same valorization techniques are respectively 12.9%, 0.0%, 32.3% and 54.8% ($p > 0.05$). Most farmers bury manure and they have small farms (0.1-0.5 ha) as shown in Table 5. Thus, manure is stored in pits by 52.6% of breeders in Ouémé against 43.2% who throw it on the ground in heaps. In the plateau, 77.4% of farmers store manure in heaps and 22.6% store it in pits ($p < 0.05$). The duration of storage is 6 months and more. Complaints about pour manure management (table 4) were 82.9% in Ouémé and 78.3% in Plateau ($p > 0.05$). In this regard, 51.6% of breeders have already changed sites once and 20% are on their third site in Ouémé (table 3). Only 37.1% of farmers have already changed sites once in Plateau.

Table 3 : Manure management practices adpoted

Variable	Ouémé			Plateau		
	n	Percentage	CI	n	Percentage	CI
Storage						
Pit	50	52.6a	12.1	14	22.6b	11.0
Landscaped	4	4.2a	4.0	0a	0.0b	0.0

area						
On the ground	41	43.2a	11.6	48	77.4b	13.7
Storage time						
0- 3 months	0	0.0a	0.0	1	1.6a	3.0
3- 6 months	2	2.1a	2.8	4	6.5a	6.1
6- 12 months	42	44.2a	11.6	17	27.4a	11.9
Above 12 months	51	53.7a	12.2	40	64.5a	14.5
Valorization						
Self-use	18	18.9a	8.4	8	12.9a	8,5
Sale	7	7.4a	5.3	0	0.0b	0.0
Discard	17	17.9a	8.2	20	32.3b	12,6
Burying	53	55.8a	12.2	34	54.8a	14,5

CI= Confidence interval; n= Number of surveyed breeders, the percentages of the same row followed by different letters differ significantly at the threshold of 5%

Table 4: Reasons for changing pig farming site

Variable	**Ouémé**			**Plateau**		
	n	Percentage	CI	n	Percentage	CI
Reason						
Populations complaint	58	82.9a	12.5	18	78.3a	19.9
Breeder relocation	5	7.1a	6.0	0	0.0a	0.0
Increased herd size	7	10.0a	7.1	5	21.7a	17.0
Change of site						
No change	25	26.3a	9,7	39	62.9b	14.6
Second site	49	51.6a	12,1	23	37.1a	13.2
Third site	19	20.0a	8,6	0	0.0b	0.0
Fourth site	2	2.1a	2,8	0	0.0a	0.0

CI= Confidence interval; n= Number of surveyed breeders, the percentages of the same row followed by different letters differ significantly at the threshold of 5%

Table 5: area of pig breeding sites

Variable	**Ouémé**			**Plateau**		
	n	Percentage	CI	n	Percentage	CI
Less than 0.1 ha	22	23.2a	9.2	22	35.5a	13.1
0.1-0.5 ha	63	66.3a	12.3	35	56.5a	14.5
Above 0.5 ha	10	10.5a	6.3	5	8.1a	6.8

CI= Confidence interval; n= Number of surveyed breeders, the percentages of the same row followed by different letters differ significantly at the threshold of 5%

The multinomial analysis of the impact of pig production scale and other factors on pig manure management allowed to obtain the regression coefficients, standard errors, marginal effects were estimated. The likelihood ratio index $p^2 = 0.247$ confirmed that allexplanatory variables are collectively significant ($p < 0.001$). Chi-square distributions used to test overall model adequacy at specific significant level was 71.831. The dependent variable self-use was used as the base category or reference cell. Gender of farmer, area of the site, frequency pigsty maintenance and herd size are important variables influencing pig manure management technique. For the pig farmers who adopted burying technique management, area of the farm, frequency of maintenance of pigsty and herd size are the significant variables when self-use is used as base category. The daily collection of pig manure increases by 10.3% the probability of getting it buried as a management method. Increasing of site area by one unit significantly reduces the probability of burying pig manure. However, increasing the size of the herd increases the probability of manure management by the burial method by 28.3%. The same observations are made with the option of disposing of manure off-site. The larger the area of the farm, the less the option of disposing of manure is chosen. Pig farmers get rid of manure by rejection as soon as there is an increase in the size of the herd (12.5%). We observed with this pig slurry management technique that when the farmer is a man, the probability of choosing to throw away the manure decreases by 6.2%. The size of the farm site is negative and significantly affects the option of selling pig manure. Thus, we note that an increase in surface area reduces the possibility of selling pig manure by 9.6% (table 6).

Table 6: Determinants of pig manure management techniques used by farmers

Variables	**Burying**		**Discard**		**Sale**	
	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
Farmer gender	-1.11 (-1.76)	0.033	-4.16 (-1.96) **	0.062	-2.85 (-3.4)	0.036
Age of farmer	-0.06 (-0.07)	0.094	-0.05 (-0.12)	0.095	-0.03 (-0.18)	0.096

Household size	-041 (-0.35)	0.66	0.58 (0.42)	0.178	0.49 (1.9)	0.016
Years spent in school	-0.34 (-0.29)	0.071	0.46 (0.25)	0.158	0.72 (0.27)	9.61e-^{11}
Pig farming experience (year)	-0.12 (-0.17)	0.088	0.21 (0.17)	0.124	0.18 (0.63)	0.010
Area site (ha)	-0.78 (-1.3) ***	8.18e-^{08}	-5.39 (-1.5)***	0.051	-5.48 (-1.2) **	0.096
Herd size	1.04 (0.25)***	0.283	0.02 (0.11)**	0.125	2.3 (0.65)	0.024
Frequency of pigsty maintenance	1.88 (0.79)*	0.103	-0.03 (0.21)	0.07	0.08 (0.41)	0.088
Marital status	-2.16 (-1.77)	-0.128	-0.96 (-0.20)	0.009	0.06 (0.029)	0.003
Constant	16.31 (5.94)		2.25 (3.6)		5.37 (1.21)	
Observations	157					
Pseudo R^2	0.247					
Log likelihood	-274.890					
Chi-squared	71.831					
Significance level	0.000					

Z-statistics in parentheses; * *p*-value = 0.1; ** *p*-value = 0.05; *** *p*-value = 0.01; Omitted category in the dependent variables are the (Self-use)

4. Discussion

Overall, pig farming was a predominantly male activity. This observation was also made by Youssao et al. [12] in pig farms in peri-urban areas of Cotonou and Abomey-Calavi in southern Benin; by Houndonougbo et al. [13] in south-eastern Benin; Mopaté and Kaboré-Zoungrana [14] in the city of N'Djamena in Chad and by Munzhelele et al. [15] in South Africa. The low representation of women can be explained by their involvement in other income-generating activities, including trade and crafts. Although this result shows that pig farming is mostly carried out by males probably because of the stressful nature of rearing it, it does not mean that females were not highly involved in pig production in the study area. Females in this study area were usually involved as helpers or suppliers of labour in light farm operations such as serving of feed, water or cleaning of the piggery. However, women who raised pigs on their own account, processed oil palm fruits into palm oil and raised pigs to add

value to the by-products, thus reducing the cost of their animals feeding. A similar observation was made by Mopaté and Kaboré-Zoungrana [14] in Chad and by Munzhelele et al. [15] in South Africa. As they they reported, the proportion of women raising pigs is significant in urban, peri-urban or rural areas where the activities of processing agricultural products, the production of traditional beer and alcohol proliferate, activities generally practiced by women. In these localities, food processing residues, spent grains and other by-products from the production of local alcohol and beer were widely used for pig production [16; 17]. The level of education of farmers can influence the breeding and herds management because it can promote the adoption and success of innovative techniques [20]. A small proportion of the respondents considered pig farming to be their main activity. This observation was also made by Mopaté and Koussou et al. [17], Youssao et al. [12], Ndebi et al. [18], Mopaté et al. [19] and Houndonougbo et al. [13]. However, the socio-economic importance of pig farming is justified by the fact that this breeding is a personal activity initiated on own funds by almost all breeders. This survey made it possible to understand that the majority of breeders were not affiliated with a producer association. This justifies the absence of a truly well-organized “pork sector”. Indeed, belonging to a producer organization should enable members to benefit from technical or financial support from pork production development programs [13; 20]. The high percentages of married respondents is conform to Dahouda et al.’s (2019) study that majority of the adult population of a society consists of married people. The implication of this is that housewives were still predominantly used as family labour for light farm operations.

Traditional piggeries observed in Plateau department confirm that the farmers of Ouémé are in a peri-urban area while those in Plateau are in rural area. Indeed, in the Plateau department we have farmers who use of agri-food resources by raising pigs. Most respondents raise pigs of improved breeds. This choice was made according to the zootechnical performance and the

economic profitability offered by the improved breeds. Moreover, maintenance of the pockets is not regular in the traditional breeding buildings. Indeed, these pigsties are not cemented and the pigs mix the droppings with the mud. Besides, many breeders on the plateau are concerned about their crop fields and invest less in the construction of buildings [21]. The lack of maintenance of the pigsties is a sign of wrong manure management and a source of contamination of pig diseases which causes a lot of mortality.

Four pig manure management techniques are identified such as self-use, burial, sale and rejection. Breeders who use of manure were the truck farmers or fish farmers and rarely farmers. Indeed, the fields and pig farms are usually not together. They all listed as constraints related to the management of pig manure, the lack of technical knowledge, and the lack of space and the lack of means of conveyance of manure from breeding sites to other valorization sites. As a result, farmers were forced to find alternative ways of disposing of waste from their farms such as discard and construction of disposal pits within some farms, thus compromising hygiene on farms and biosecurity. Pig manure is made easier to be handled and to convey by composting and eventually allowed for higher application rates due to more stable, slow release and nature of nitrogen in compost [22]. Farmers who hold large areas are those who use manure. Indeed, it was noted that transport of manure from farms to other places is regarded as uneasy task and that pig manure transport in one livestock region has gradually disappeared due to bad smell [23].

Therefore, even the owner of pig farms and large arable lands can only use part of the produced pig manure for fertilization. To increase nutrient conservation, recommendations are to compost [24], and to limit storage time [25]. Bio-digesters on farms to provide energy for light and cooking are still new to Benin, but will produce a new type of manure to be managed. There is a need to promote waste management methods that would protect the environment and also allow the recycling of manure. In this context, excreted piggery waste

must be stored and applied to agricultural land in such way that contamination of adjacent water, air and crops are reduced [26]. Apart from those who use pig manure, it have identified in the study area that most breeders bury manure in the ground or throw it into waterways or in the open air in the nature. These practices should be discouraged. Animal production such as pig production causes serious water pollution through runoff and leaching of minerals from the soil as well as by disposing wastes into water courses directly [1; 2].

5. Conclusion

The study revealed that majority of the pig farmers' use burying as management technique in their farms. They adopted this method because of smell and sight of pig waste which is offensive and often becomes a breeding ground for a variety of pests, rodents and also generate polluted runoff into water ways and to the environment. The narrowness of breeding farms is a very decisive aspect in the management of pig manure. Collaboration between farmers and pig breeders and capacity building of breeders on animal manure management techniques are necessary. Regular Organizing of seminars basis to keep pig farmers abreast of safe and hygienic methods of waste disposal is also necessary. Pig manure 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. Finally, research programs are required to test and demonstrate the suitability and benefits of manure management in various regions to provide evidence on the benefits of good manure management practices.

6. Acknowledgements

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7. Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as or result in a potential conflict of interest.

8. Authors' contributions

This work was carried out in collaboration between all authors. Author BG designed the study, collected the data, performed the statistical analysis and wrote the first draft of the manuscript. Authors MD, AK and KK performed the statistical analysis, carried out the analysis of results and proof read the first draft manuscript and author SA managed the literature search, and proof read the first draft manuscript. All authors read and approved the final manuscript.

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