Effectiveness of Composting as a Strategy of Waste Management among Livestock Farmers in Galle District

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Abstract - Livestock waste has become an environmental issue in Sri Lanka today. A group of farmers had been given a training to utilize livestock waste for compost production by the Southern Provincial Council. Thus the present study was planned to investigate the effectiveness of composting as a livestock waste management option among the trained farmers. A structured pre-tested questionnaire was used to collect the information from 49 farmers who received training. Compost samples from all the farms which were having active compost piles were analyzed to determine the quality A comparison study was done to evaluate the knowledge on composting using all the farmers involved in composting, agriculture undergraduates who yet to study about composting and a randomly selected sample to represent the general public. Germination index was calculated for all 39 samples collected from the field. Among the farmers surveyed, 84% of famers practice composting as a source of income, whereas the rest (16%) used the compost in their home gardens. All farmers considered composting as the most effective and cheapest strategy for waste management. However, majority had a poor knowledge about moisture and temperature management as well as the maturity of compost. Awareness on the quality of compost was poor. The composting site evaluation revealed that 47.9% sites are located in sloppy lands while 27% sites located close to a wetland or a water body. According to the condition of the site location, 33% of the sites create high level impact and 45% of the sites pose middle level impact on the surrounding environment. Most of compost samples were within the standards stipulated by the SLSI. However, majority (89.7%) of compost samples had standard C:N ratios. It could be concluded that composting could be used as a strategy for livestock waste management. However further training is required to improve the quality of the final product.

Key word: Composting, Effectiveness, End use characteristics, Livestock waste

I. Introduction

Livestock management is one of the most important industries, to fulfill the protein requirement of the nation through milk, meat and egg production. Cattle, buffalo, goat, pig and poultry are the dominant livestock species reared in Sri Lanka.

Livestock rearing is an integrated component section in small scale agricultural enterprises in all agro-ecological zones in Sri Lanka. Livestock production is done under extensive, semi intensive and intensive systems. The dairy cattle and goats are rearing under these three management systems. Similarly, in poultry, broilers and layers are managed under intensive system.However, extensive and semi intensive management systems for poultry rearing are mainly practicing in rural areas. Pigs are managed under intensive system.

Year by year number of livestock animals and amount of livestock waste generation is increased in Sri Lanka. Improper waste disposal cause eutrophication conditions in water bodies and many other health and environmental hazards. Elevated ammonia level cause respiratory problems to the workers. The methane produced due to the improper handling of waste is a common greenhouse gas. Livestock waste piles facilitate breeding of flies, mosquitoes and other creatures. The long-term accumulation of animal waste creates an imbalance in N: P and hamper the nutrient uptake of the plants.

However, animal waste is an important source of nutrients. The raw animal waste is not generally accepted as an organic fertilizer. The reasons are the offensive odor, the presence of pathogenic organisms and harmful effects for plant growth when the raw animal wastes are used.

To overcome these problems, proper livestock waste management strategy is essential. “Composting” is a simple, cost effective approach to minimize the threats created by waste and can earn an additional income as well. A set of selected livestock farmers in Galle District, Sri Lanka had given training on Composting using livestock waste by the Ministry of Fisheries, Animal Production and Development in Southern Province. However, the information on the composting methods, quality of the produced compost and the present status of the trainees are lacking. Therefore, this study was planned within livestock farms where composting was carried out in Galle district. The objectives of this study was to find out the effectiveness of composting as a waste management strategy among the livestock farmers, to determine the level of impacts to the environment and to determine the quality of the compost product in livestock enterprises.

II. Materials and Methods

Data collection and sample collection

Galle district in Southern province, Sri Lanka was selected for the study. A large number of livestock farmers had received prior training on composting and practice composting. Purposive sampling method has adopted to select the sample for the study. The list of livestock farmers who had been received a prior training was taken from the Ministry of Fisheries, Animal Production and Development of Southern Province. Data were collected by personal interview method using pre-

tested questionnaire. The information on the socioeconomics, animal production and composting, the knowledge level of trainees with compared to randomly selected individuals who were not trained for composting and agriculture undergraduates who haven't studies waste management modules were collected from 49 selected farmers through a structured questionnaire. In addition, the impact of composting site on the environment, wells and nearby water bodies were evaluated at the time of site visit by the researcher according to the pre-determined set of criteria laid in the questionnaire.

Before conducting the main survey, a pretest was carried out considering six livestock farmers in Baddegama DS division. Through conducting this pre-test, the questionnaire was further refined before administrating.
The compost samples for laboratory analysis were collected during survey from 39 farms where finished compost samples were available. The laboratory analysis for pH, EC, Total N, Available P and C: N ratios were done according to the standard techniques.

Germination index
According to Zucconi and de Bertoldi (1987) germination index was calculated by using germination percentage and root length by fallowing formula.

$$GI = \frac{Nt}{Ng} \times \frac{AvRLt}{AvRLc} \times 100$$

GI= Germination index
Nt= Number of seeds germinated in the extract
Ng= Number of seeds germinated in the control
AvRLt= Average root length of germinated seeds in the extract
AvRLc= Average root length of germinated seeds in the control
The data was analysis by using Minitab 16 version.

III. Results and discussion

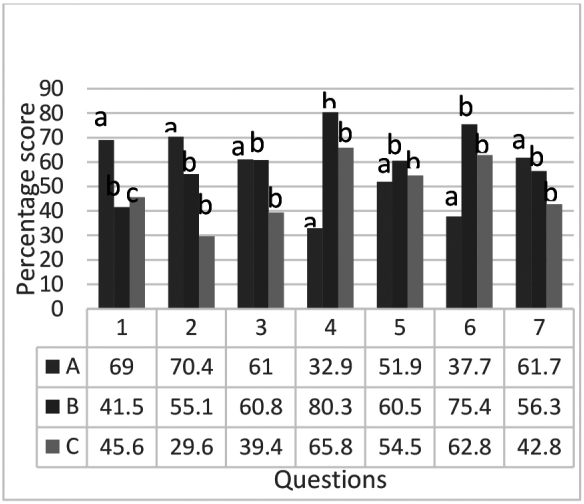
General Information
Among the farmers who engaged in compost production together with livestock farming were purposively selected to the study. The study revealed that 73% (n=40) of the study population had the education up to the G.C.E O/L and another 15% (n=8) had the education up to G.C.E.A/L. Only 7% (n=4) studied up to grade 5 whereas 5% (n=3) had entered in to the higher education.

Among the livestock species reared in the study area 67.27% (n=37) of the respondents raised cattle alone. Others were rearing cattle and poultry (14.54%, n=8), cattle and goats (7.27%, n=4), poultry and goat (1.81%, n=1) and, pig and goat (1.81%, n=1) in combination. In addition, results revealed poultry and goat alone were reared by 3.63%, (n=2) of the holdings each.

The study revealed that cattle were reared using different management systems; intensive (11%), extensive (21%) and semi intensive (68%). However, majority of the farmers managed their poultry and goats under the intensive management system with the proportions of 54.55% and 100% respectively. The village chickens were the common species raised with the extensive management system.

Knowledge level about composting
The knowledge of the trainees, non-trained undergraduates and selected individuals from the society were evaluated based on the questions set on the following aspects of composting.

1. Composting as an effective way of waste management
2. Turning of compost
3. Importance of moisture management
4. Importance of temperature management
5. Pathogen and weed seed control
6. Harmful effect of compost to the crops if not properly managed
7. SLS standards for compost



	1	2	3	4	5	6	7
A	69	70.4	61	32.9	51.9	37.7	61.7
B	41.5	55.1	60.8	80.3	60.5	75.4	56.3
C	45.6	29.6	39.4	65.8	54.5	62.8	42.8

Figure 1: Knowledge level about the composting practices

V alues with in same letters are not significantly different
A- Livestock farmers practicing "composting" in Galle district.
B-Students in faculty of Agriculture, University of Ruhuna who hadn't follow followed the course on waste management.
C-A group people who didn't have formal training about composting.

The knowledge about the composting as a way of waste management is significantly different (P>0.05) among the three groups (Fig 1). Farmers had a significantly better understanding about moisture management, turning the compost pile and the SLS standards than the other two groups. They outperformed farmers in relation to the areas of temperature management, pathogen and weed seed control and harmful effect of improperly managed compost.

Influence of the site on the environment
According to the study, most of lands (47.92%) where the composing activity was carried out are undulated lands. Some lands (14.58%) were having a well. Another 14.58% sites were located near to the water sources and noticeable amount of lands were near to a wetland (27.08%). These data suggest that most of these composting sites are located in ecologically sensitive areas and therefore need special care to avoid the environmental pollution.

Level of impact on water source

According to the study most of lands had no impact on the water source (60.42%). However, 8.33% of lands had strong impact to the water source while 31.25% had mild impacts.

Possible impacts based on the location of the composting site

Most of the compost sites were located in areas where there are fewer chances for contamination. However, 10.42% of the sites are situated in places where strong impacts can occur if the management of piles is done in an unsystematic manner.

Problems faced during compost production

According to the study most of farmers had faced many problems. The odor, processing, marketing, and environmental issues were the problems available within the composting community. The odor and the environmental problems had not reached to a serious level in the study area. However, marketing the compost product was a serious problem for 8.33% of farmers and processing was a serious problem for 6.25% of farmers.

Evaluation of parameters of compost

pH

The standard pH value for mature compost is 6.5-8.5 (ISO 10390). The majority of compost samples was included in standard level (53.8%). Although 46.2% of compost sample were below the standard pH level, non of the samples were beyond the standard pH level for compost.

EC

The standard EC value for compost range between 0.75-2.0 mS/m. Less amount of compost samples (28.2%) were within the standard level. However, the EC values of most of compost samples (71.8%) were lower than the standard value.

Nitrogen (N) content

Standard minimum N content should be 1.0% (SLS 645). According to the evaluation, most of compost samples (84.6%) comply with the standard N level. This would be because of the comparatively higher N content in the animal waste and it is the major component of the comport.

Available phosphorous (P)

The standard P value is more than 0.5% (SLS 645). According to the evaluation most of compost samples (94.8%) comply with the recommended P standard level. The P which is a constituent of waste has contributed to the compost produced from the livestock waste.

C:N Ratio

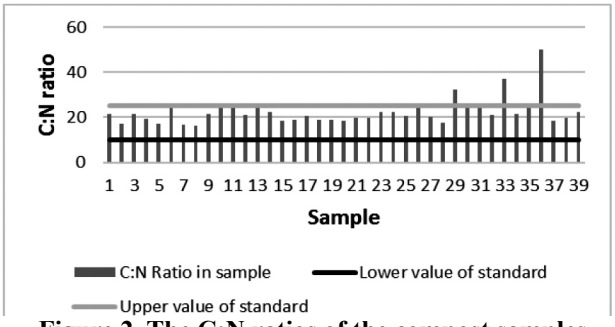


Figure 2. The C:N ratios of the compost samples

The standard C: N ratio in finished compost should be ranged within 10-25(SLS). The C: N ratio was within standard value in most compost samples (89.71%) though 10.3% of compost samples showed C: N more than the standard value (Fig 2). All the farmers had used different organic substrates such as refused grass from the cattle sheds, straw and various other organic matters to mix with animal waste for composting and thereby the C:N ratio had been increased around to 1:30. During the microbial decomposition, utilization of C by microorganisms and the release of CO2 in to the atmosphere had reduced the C:N ratio upto the desired levels.

Germination Index

Germination index (GI) is a valuable tool to determine the phytotoxicity of the finished compost. The non-inhibitory level is achieved if the GI is more than 90%. When considering average germination index value, 66% of compost sample were within the standard level. However, 7% of compost samples reported below the GI value of (50%) which is considered as an extremely inhibitory level.

VI. Conclusion

This study revealed that composting is one of the most effective strategy among farmers for livestock waste management and has less level of impact to environmental pollution. Most of farmers produce compost with acceptable quality and comply with the Sri Lankan Standards.The close observation is needed to improve the quality of compost produce in many sites. Further training should be done to disseminate knowledge on how to maintain the compost quality.

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