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## FARMERS' PERCEPTION OF BENEFICIAL EFFECTS AND LIMITATIONS OF VERMICOMPOST

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### ABSTRACT

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Vermicompost is very useful manure which is becoming popular day by day. However, its perception by the farmers is not yet assessed in the southwestern region of Bangladesh. The main objectives of this study were to determine the farmers' perception of beneficial effects and limitations of vermicompost and to explore the relationship between selected characteristics of the farmers' and their perception of beneficial effects and limitations of vermicompost. Data were collected using an interview schedule from randomly selected 60 respondents. Locale was three villages namely Lokhpur, Bollokhpur and Vobna under Fakirhat upazila of Bagerhat district. Face-to-face interview was conducted during 7 to 29 May, 2016. Farmers' perception regarding the beneficial effects and limitations of vermicompost was measured using 5-point Likert type scale. Data were analyzed using SPSS software and farmers' perception index was calculated. Majority (66.7 percent) of the respondents had moderate perception while 18.3 percent and 15 percent of them had less and high perception, respectively, on the beneficial effects and limitations of vermicompost. Among seven selected characteristics of the respondents, age showed a significant negative relationship with their perception of beneficial effects and limitations of vermicompost while training experience of the respondents showed a significant positive relationship with their overall perception. Thus, arrangement of training could pave the way of high perception of beneficial effects and limitations of vermicompost.

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## INTRODUCTION

Vermicompost is the product of the composting process using various species of earthworms. Usually red wigglers, white worms, and other earthworms are used to create vermicompost. It is a heterogeneous mixture of decomposing vegetable or food waste, bedding materials and vermicast, also called worm castings, worm humus or worm manure. It is the end-product of the breakdown of organic matter by an earthworm (Allen, 2016). These castings have been shown to contain reduced levels of contaminants and a higher saturation of nutrients than do organic materials before vermicomposting. Containing water-soluble nutrients, vermicompost is an excellent, nutrient-rich organic fertilizer and soil conditioner (Sherman, 2003). The process of producing vermicompost is called vermicomposting (Ndegwa et al., 1998; Ndegwa and Thompson, 2001).

Vermicomposting is the biological degradation and stabilization of organic waste by earthworms and microorganisms to form vermicompost. This is an essential part in organic farming today. It can be easily prepared, has excellent properties, and is harmless to plants. The earthworms fragment the organic waste substrates, stimulate microbial activity greatly and increase rates of mineralization (Aira et al., 2007). These rapidly convert the waste into humus-like substances with finer structure than thermophilic composts but possessing a greater and more diverse microbial activity. Vermicompost being a stable fine granular organic matter, when added to clay soil loosens the soil and improves the passage for the entry of air. The mucus associated with the cast being hygroscopic absorbs water and prevents water logging and improves water holding capacity. The organic carbon in vermicompost releases the nutrients slowly and steadily into the system and enables the plant to absorb these nutrients. The soil enriched with vermicompost provides additional substances that are not found in chemical fertilizers (Kale, 1998).

The practice of vermiculture is at least a century old but it is now being received worldwide with diverse ecological objectives such as waste management, soil detoxification, regeneration and sustainable agriculture (Chauhan and Joshi, 2010). The growth of industries and ever increasing human population has led to an increased accumulation of waste materials (Joshi and Chauhan, 2006). Under the present condition of environmental degradation 'vermicomposting' technology offers recovery of valuable resources like 'manure' from such biodegradable waste. Recycling of wastes through vermitechnology reduces the problem of dumping of huge quantities of wastes and vermicompost has higher economic value compared with compost derived from traditional methods (Chauhan et al., 2010).

Vegetable and fruit in our market are not always safe for health due to excessive use of agrochemicals. Farmers' can produce safe foods by using vermicompost. It can play a great role to our economy. On the basis of our extension visit experience, we found that the farmers' of rural area of Bangladesh are eager to use vermicompost. Farmer of all ages can start this work at their farm. Mahmud et al., (2016) found that combination of vermicompost and chemical fertilizers increased the organic matter, P, K and S status of post harvest soil significantly. Hasanuzzaman et al., (2010) showed that wetland rice productivity could be increased through the application of vermicompost instead of other conventional manures. All these are the views of the researchers regarding the performance of vermicompost. Besides, the practical field situation is revealing that the availability of suitable earthworm species for vermicomposting and large scale production of vermicompost are still challenges for the rural farmers. It can be said that vermicompost is of huge potential to play an important role in our agriculture. However, we do not have any evidence whether the rural farmers' are aware of its potential or have clear perception regarding the beneficial effects and limitations. Considering these points in view, the researchers intended to conduct this study. Followings are the specific objectives of the study:

1. To determine and describe the selected characteristics of the farmers.
2. To determine farmers' perception regarding the beneficial effects and limitations of vermicompost.
3. To explore the relationship between selected characteristics of the farmers' and their perception of beneficial effects and limitations of vermicompost.

## METHODOLOGY

Fakirhat upazila of Bagerhat district is situated at the convenient distance from Khulna University. Lokhpur union of Fakirhat upazila is a known place for the researchers where around 300 farmers, as per information received from the Upazila Agriculture Office, were involved in using and/or producing vermicompost who had been considered as the population of the research. Among them 20 % (i.e., 60 farmers) were randomly selected as the sample of the study. Data were collected from those randomly selected farmers of Lokhpur, Bollokhpur and Vobna villages of Lokhpur union during 7 to 29 May, 2016. Data were collected using a pretested interview schedule through face-to-face interview. Data were collected on socioeconomic characteristics of the respondents which were treated as independent variable viz., age (years), educational qualification (schooling year), farming experience (years), innovativeness (month, i.e., after how many months the technology was adopted after knowing about it), extension media contact (score), knowledge on vermicompost (score), and training exposure (score).

The innovativeness of the respondents was determined on the basis of time (months) required to adopt vermicompost from first hearing to final adoption of it. Then, the required time was categorized following the adopter categories suggested by Rogers (1983). For that purpose mean ( $\bar{X}$ ) and standard deviation (SD) were calculated and the categorization was done as follows: (i) innovator  $\leq (\bar{X} - 2SD)$ , (ii) early adopter  $(\bar{X} - 2SD)$  to  $(\bar{X} - SD)$ , (iii) early majority  $(\bar{X} - SD)$  to  $(\bar{X})$ , (iv) late majority  $(\bar{X})$  to  $(\bar{X} + SD)$  and (v) laggard  $> (\bar{X} + SD)$ . To measure perception of beneficial effects and limitations of vermicompost a number of 13 (10 beneficial effects + 3 limitations) statements were included. To measure farmers' perception of the beneficial effects and limitations of vermicompost a five point Likert type rating scale such as strongly agree, agree, undecided, disagree and strongly disagree was used and assigned against each of the statements related to perception and a score of 5, 4, 3, 2 and 1 was assigned against each of the point respectively (Likert, 1932). The perception score of a respondent was determined by summing up all the scores obtained by the respondent against the all statements. The perception score of the respondent could range from 13-65 where 13 indicate less perception while 65 indicate high perception. For categorization mean ( $\bar{X}$ ) and standard deviation (SD) were calculated and the perception was categorized as follows: (i) less perception " $\leq (\bar{X} - SD)$ ", (ii) moderate perception " $(\bar{X} - SD)$  to  $(\bar{X} + SD)$ " and (iii) high perception " $> (\bar{X} + SD)$ ".

To compare the statements related to perception of beneficial effects and limitations of vermicompost Farmers' Perception Index (FPI) was calculated by using the following formula:

$$FPI = N_{sa} \times 5 + N_a \times 4 + N_u \times 3 + N_{da} \times 2 + N_{sda} \times 1$$

Where,

FPI = Farmers' Perception Index

$N_{sa}$  = Number of respondents rated the statement as strongly agree

$N_a$  = Number of respondents rated the statement as agree

$N_u$  = Number of respondents were undecided to rate the statement

$N_{da}$  = Number of respondents rated the statement as disagree

$N_{sda}$  = Number of respondents rated the statement as strongly disagree

The FPI score of the respondents could range from '1' to '300' where '1' indicate less perception while '300' indicate the high perception of a particular statement related to perception. Statistical analyses such as number, percent, rank order, range, mean and standard deviation were used to interpret data. To explore relationship between any two variables Pearson's Product Moment correlation coefficient 'r' was employed. Data were analyzed using Microsoft Excel and Statistical Package for Social Science (SPSS).

## RESULTS AND DISCUSSION

### Selected socioeconomic characteristics

Majority (56.7%) of the respondents were middle aged as compared to 30 percent being young and 13.3 percent old. Considering the categorization percentages of the sample respondents, it might be said that middle aged people of that locality were more interested to use vermicompost in their field. Majority (70%) of the respondents had primary to secondary level of education followed by illiterate (30%). Literacy level is considered to be an important factor for performing any technology like vermicompost preparation and application. Thus, the respondents having primary to secondary level of literacy were found to be interested to use vermicompost (Table 1).

**Table 1.** Distribution of the respondents on the basis of selected socio-economic characteristics

Characteristics	Categories	Score	Respondent (N=99)		Min.	Max.	Mean ( $\bar{X}$ )	SD
			Number	Percent (%)				
Age (Years)	Young	≤ 35	18	30	26	65	41.30	8.98
	Middle	36-50	34	56.7				
	Old	>50	8	13.3				
Educational qualification (Schooling year)	Illiterate	0	18	30	0	9	4.12	3.45
	Primary	1-5	19	31.7				
	Secondary	6-10	23	38.3				
	Higher secondary Above HSC	11-12 >12	0 0	0 0				
Farming experience (Year)	Low	≤10	18	30	4	32	17.82	8.37
	Medium	11-20	17	28.3				
	High	>20	25	41.7				
Innovativeness (Month)	Innovator $\leq(\bar{X} - 2SD)$	≤1.8	0	0	2	25	15	6.6
	Early Adopter $(\bar{X} - 2SD)$ to $(\bar{X} - SD)$	1.9-8.4	12	20				
	Early Majority $(\bar{X} - SD)$ to $(\bar{X})$	8.5-15	20	33.4				
	Late Majority $(\bar{X})$ to $(\bar{X} + SD)$	16-21.6	23	38.3				
	Laggard $>(\bar{X} + SD)$	>21.6	5	8.3				
Farming experience (Year)	Low	≤10	12.00	12.10	5	55	24.52	12.45
	Medium	11-30	63.00	63.60				
	High	>30	24.00	24.30				
Extension media contact (Score)	Very Low	1-8	2	3.3	7	21	16.40	2.91
	Low	9-16	23	38.3				
	Medium	17-24	35	58.3				
	High	25-32	0	0				
Knowledge on vermicompost (Score)	Low	≤3	5	8.3	3	10	6.23	1.77
	Medium	4-8	46	76.7				
	High	>8	9	15				
Training exposure (Score)	No	0	45	75	0	1	0.25	0.43
	Low	1	15	25				

Highest proportion of the respondents (41.7%) were highly experienced in farming followed by low experience (30%), and 28.3% respondents had medium experience. The respondents (71.7%) were early majority to late majority in adopting vermicompost followed by early adopter (20%) and laggards (8.3%). None of the respondent was innovator. Though there was no innovator for adopting vermicompost but the numbers of laggards were fewer than that of Rogers' (1983) findings. Rogers (1983) found 2.5%, 13.5%, 34%, 34% and 16% of farmers' as innovator, early adopter, early majority, late majority and laggards, respectively for adoption of an innovation. However, no other studies were available to the researchers containing such or related categorization regarding vermicompost adoption. Majority of the respondents (58.3%) had medium scale extension media contact followed by low scale extension media contact (38.3%) and very low extension contact (3.3%). None of the respondents belonged to high contact categories. Majority of the respondents (76.7%) had medium scale knowledge level followed by high scale knowledge level (15%) and only 8.3 percent respondents had low level of knowledge regarding vermicompost. About three-fourths (75%) of the respondents had no training on vermicompost. However, one fourth (25%) of the respondents had one training on vermicompost. None of the respondents had more than one training experience on vermicompost (Table 1).

**Table 2.** Distribution of respondents according to their perception regarding beneficial effects and limitation of vermicompost

Categories	Score	Respondent (N=60)		Mean ( $\bar{X}$ )	SD	Range	
		Number	Percent (%)			Min.	Max.
Less perception $\leq (\bar{X}-SD)$	$\leq 44$	11	18.3				
Moderate perception $(\bar{X}-SD \text{ to } \bar{X}+SD)$	45-51	45	66.7	48.03	3.75	40	56
High perception $> (\bar{X}+SD)$	$> 51$	5	15				
Total		60	100.00				

**Table 3.** Relative position (rank order) of the statements related to perception regarding beneficial effects and limitation of vermicompost

Serial	Statement	FPI	Rank
1.	It is environment friendly	286	1 <sup>st</sup>
2.	Creates low-skill jobs at local level	283	2 <sup>nd</sup>
3.	Enhances germination, plant growth, and crop yield	281	3 <sup>rd</sup>
4.	It requires high maintenance than that of traditional compost process ( <i>Limitation</i> )	276	4 <sup>th</sup>
5.	Improves root growth and structure	257	5 <sup>th</sup>
6.	Improves water holding capacity	235	6 <sup>th</sup>
7.	Low capital investment	228	7 <sup>th</sup>
8.	Enriches soil with micro-organisms	223	8 <sup>th</sup>
9.	Easy to use than chemical fertilizer	209	9 <sup>th</sup>
10.	Improves soil aeration	197	10 <sup>th</sup>
11.	Attracts deep-burrowing earthworms already present in the soil	178	11 <sup>th</sup>
11.	An unpleasant odor comes from the bin ( <i>Limitation</i> )	162	12 <sup>th</sup>
12.	It requires at four to six months for preparation ( <i>Limitation</i> )	96	13 <sup>th</sup>

**Table 4.** Computed coefficient of correlation (  $r$  ) between the selected characteristics of the respondents and their overall perception

Characteristics (Independent variable)	Dependent variable	Correlation coefficient
Age	Perception	- 0.383**
Educational qualification		-0.102 <sup>NS</sup>
Farming Experience		-0.223 <sup>NS</sup>
Innovativeness		0.161 <sup>NS</sup>
Extension media contact		0.243 <sup>NS</sup>
Knowledge on vermicompost		0.194 <sup>NS</sup>
Training on vermicompost		0.274*

NS= Non-significant; \*\* Correlation is significant at the 0.01 level (2-tailed);

\* Correlation is significant at the 0.05 level (2-tailed)

#### Farmers' perception of beneficial effects and limitations of vermicompost

The perception score of the respondent varied from 40 to 60 with a mean and standard deviation of 48.03 and 3.75, respectively. On the basis of perception score the respondents were classified into three categories which are presented in Table 2. It was revealed from the study that majority (66.7%) of the respondents had moderate perception followed by less perception (18.3%) and high perception (15%). Vermicompost has been introduced recently in the study area. Besides, there is scanty opportunity of training on vermicompost. Educational qualification of the respondents also was limited within secondary level or less. Thus, these reasons might have imposed hindrance to the perception of beneficial effects and limitations of vermicompost by the respondents. The findings of the study have harmony with the findings of Ahmed (2003). He found that majority (61%) of the farmers had moderately clear perception followed by less clear perception (24%) and high clear perception (15%).

#### Rank order of the statements based on perception score of the farmers related to beneficial effects and limitations of vermicompost

Based on the Farmers' Perception Index (PI) score, the statements were also arranged in rank order as shown in the Table 3. Data presented in Table 3 indicate that the farmers' had high perception regarding beneficial effects i.e., '*vermicompost is environment friendly*' followed by '*it creates low-skill jobs at local level*', '*enhances germination, plant growth and crop yield*', '*requires high maintenance than traditional compost processing*' (limitation). The farmers' also expressed their less perception of beneficial effects i.e., '*it improves soil aeration*' and '*attract deep burrowing earthworms*' and some for limitations i.e., '*an unpleasant odor comes from the bin*' and '*it requires four to six months for preparation*'.

#### Relationship between the selected characteristics of the respondents and their overall perception regarding beneficial effect and limitation of vermicompost

The findings related to relationship of the selected characteristics of the respondents with their perception appear in Table 4. Data presented in Table 4 show that among 7 selected characteristics of the respondents, only age showed a significant negative relationship with their overall perception. Usually we know that the aged persons have less capability to grab and understand any new innovation. It is also associated with the level of educational attainment. Our finding is also in the line with this usual phenomenon. It means, perception of vermicompost decreases with increasing age of the farmers at 0.01 level of significance. Besides, training experience showed a positive significant relationship with the perception at 0.05 level of significance. This relationship indicates that, those who have received training on vermicompost have higher perception. Thus, it might be said that training could have been a way to increase perception of any innovation and subsequent adoption.

## CONCLUSION

Majority of the respondents had moderate perception followed by less perception and high perception of beneficial effects and limitations of vermicompost. Age of the respondent showed a significant negative relationship while training experience showed a significant positive relationship with their overall perception. Thus, it might be concluded on the basis of findings that, the perception of the technology of vermicomposting is yet to be made clearer among the farmers, and arrangement of training could pave the way of high perception of beneficial effects and limitations of vermicompost.

## COMPETING INTERESTS

There is none competing for the interests regarding the submitted manuscript, and the conducted research, except the authors mentioned in the author list.

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