

Farmers' Income Generation through Vermicomposting in Chapainawabgonj

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Dedicated
to My
Beloved Parents
&
Younger Sister



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CERTIFICATE

This is to certify that the thesis entitled. “**Farmers’ Income Generation through Vermicomposting in Chapainawabgonj**” submitted to the faculty of agriculture, Sher-e-Bangla Agricultural University, Dhaka in partial fulfilment of the requirements for the degree of **Master of Science (MS) in Agricultural Extension & Information System**, embodies the result of a piece of bona-fide research work conducted by **SAJID BIN NUR, Registration No. 19-10113** under my supervision and guidance. No part of this thesis has been submitted for any other degree or diploma.

I further certify that any help or source of information, received during the course of this study has been dully acknowledgement by him.

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ABBREVIATION AND ACRONYMS

DAE	Department of Agricultural Extension
SPSS	Statistical Package for Social Sciences
BCR	Benefit Cost Ratio
GOs	Governmental Organizations
NGOs	Non-governmental Organizations
FYM	Farm Yard Manure
NPK	Nitrogen Phosphorus Potassium
CSR&TI	Corporate Social Responsibility & Technical Abstract
SAAO	Sub Assistant Agriculture Officer
AEO	Agricultural Extension Officer
UAO	Upazila Agricultural Officer
UISC	Union Information Service Centre
AICC	Agricultural Information and Communication Centre
et al.	And Others (at elli)
Ha	Hectare
TK	Taka

Farmers' Income Generation through Vermicomposting in Chapainawabgonj

Sajid Bin Nur

ABSTRACT

The main thrust of the study was to determine the extent of farmers' income generation through vermicomposting. It further determines the factors that influence farmers' income generation through vermicomposting. The study was conducted at three (3) upazila of Chapainawabgonj district namely Chapainawabgonj Sadar, Sibgonj and Bholahat. Sixty-nine (69) farmers who were cultivated vermicompost commercially were selected using Convenience Sampling method from the farmers list (120) collected from the help of local Department of Agricultural Extension (DAE) office. Data were collected by using an interview schedule during 20th January to 20th February, 2020. Multiple linear regression was computed using SPSS (v.23). The vermicomposting farmers showed a remarkable individual difference in their characteristics. The highest proportion (95.65%) of the farmers had medium increase in income after vermicomposting whereas 4.35% of the farmers had highly increase in income. Production of vermicasts, media contact and attitude had positive significant relationship with BCR (Benefit Cost Ratio) and marketing facilities had a negative significant relationship with BCR while age, education, vermicomposting experience, vermicomposting area, income before vermicomposting, training, knowledge and increase in income after vermicomposting had no significant relationship with BCR. Income generation was the dependent variable for this study. All the factors cooperatively contribute 41.2% of the variance of BCR ($R^2 = 0.412$). Final result showed that most of the vermicomposting farmers belonged to medium production of vermicompost, medium to high media contacts, low to medium attitude towards vermicompost productions and low to medium marketing facilities. From the result, it may be recommended that if GOs and NGOs organize training program and method demonstration, easy availability of raw materials and marketing facilities, it may be more profitable for the vermicomposting farmers than now.

CHAPTER I

INTRODUCTION

1.1 General Background

Bangladesh is predominantly an agricultural country where agriculture sector plays a vital role in accelerating the economic growth. It is therefore important to have a profitable, sustainable and environment-friendly agricultural system in order to ensure long-term food security for people. Accurate statistics are central support to the design of policies for development of agriculture sector as well as for eradication of poverty and improving food security. It also plays a key factor for proper planning and successful implementation of activities of all sub-sectors of agriculture. This sector is the building block and main food source for the vast majority of the rural people in Bangladesh. With the increasing number of people, amount of food materials is also increasing to feed the extra people. However, food safety and security is not kept obtained due to the excess use of chemical pesticides and chemical based fertilizers. Traditional agriculture is currently characterized by excessive inputs of chemical fertilizers, pesticides and herbicides, while the insufficient application of organic fertilizers (Li et al. 2007; Gill and Grag. 2014). The common use of pesticide is a major challenge in trying to accomplish sustainable agriculture (Kabir and Rainis. 2014) resulted in the contamination of all necessities of life, i.e. air, water and food (Sharma et al. 2010, Yang and Lee. 2010) and could pose potential risks to food and the environmental safety as well as to human health and losses of agricultural biodiversity (Minuto et al. 2006; Gill and Grag. 2014).

Several natural elements could be used as fertilizer to increase the soil quality. Such as vermicompost, green manure, cow dung, leaf manure etc. that could be treated as natural fertilizer. Vermicomposting has been reported to be a cost-effective, viable and rapid technique for the efficient management of livestock manure (Grag et al. 2014). Composting generally defined as the biological aerobic transformation of an organic by-product into a different organic product that can be added to soil without detrimental effects on crop growth (Eghball et al. 1977). Earthworms are often referred to as farmer's friends and nature's ploughmen and in soil formation process, earthworms are extremely important. Earthworm activity not only accelerates the

decomposition of the organic matter (Atiyeh et al. 2001; Lv et al. 2013) but also makes nutrient available for plant growth (Tripathi and Bhardwaj. 2014; Grag et al. 2006). During their feeding, earthworms promote microbial activity greatly, which in turn accelerates the breakdown of organic matter and stabilization of soil aggregates. Earthworms have the ability to consume a wide range of organic residues such as sewage sludge, animal wastes, crop residues and industrial refuse that has been fully established.

Vermicomposting technology for composting of organic wastes is remarkably effective for the reduction in the processing time of decomposition and produce good quality compost in terms of nutrients. Vermicomposting is a very simple and interesting technique. First, lots of cow dung are stored in a pit or biogas plant. There cow dung kept to get rotten so that the bad ammonia smell gets out from cow dung. When cow dung becomes odorless, it is then taken to the vermicomposting chamber where earthworms are already present there. Earthworms eat this odorless cow dung and increase their number by producing next generation. Each earthworm weighs about 0.5 g to 0.6 g, can eat cow dung one and a half times of its body weight, and can produce 50% of its consumption per day. It generally takes 45 days to complete vermicasts production cycle but it is said that the more number of earthworms the less number of days to ready the vermicasts. Therefore, it may take fewer days if farmer increases the number of earthworm in the pit. When vermicasts are ready for collection, top layer appears somewhat dark brown, granular as if used dry tea leaves have been spread over the layer. This process is faster during summer season and slower during winter season. The excreta they left after eating the cow dung is known as vermicompost, vermicasts or castings.

It serves as an important component of integrated plant nutrient supply system for balanced fertilization along with maintaining health to sustain the productivity of soil. Vermicompost contain nutrients in forms that are readily taken up by the plants such as nitrates, exchangeable phosphorus and soluble potassium, calcium and magnesium. Vermicomposting is an eco-friendly technology and has a tremendous scope in the recycling of soil health. Organic wastes returned to soil as vermicompost contributed to reduce the fertilizer requirement of crop. Poultry manure, cattle dung, pig manure as well as agricultural waste like sugarcane trash are such organic wastes that are fed to earthworm to hasten the process of decomposition.

Vermicomposting is a process of bio-transforming and stabilizing organic materials (often waste) into humus by the combined activity of earthworms and microorganisms (Aira M. 2008). Earthworms excrete partially digested materials known as vermicasts or castings, which are more homogeneous in composition than the source material, have reduced levels of combination and contain elevated levels of plant growth regulators or symbiotic microbes and organic acids such as humic and fulvic acids (Edward CA et al. 1988).

Earthworms consume various organic wastes and reduce the volume by 40-60%. These worm castings have been analyzed for chemical and biological properties. The moisture content of castings ranges between 30% and 66% and the pH is around 7.0. The worm castings contain higher percentages (nearly two-fold) of both macro and micronutrients than the garden compost (Table 1). Several reports on vermicomposting are available utilizing semi decomposed agricultural waste and cow dung. The available reports revealed that application of vermicompost in combination with 25% reduced dose of chemical fertilizer enhanced production in wheat, guinea grass and ridge gourd over the application of FYM in the combination with NPK (Ranwa and Singh. 1999; George and Pillai. 2000; Sreenivas et al. 2000).

Vermicomposting is an eco-friendly natural fertilizer prepared from biodegradable organic wastes and contains fewer amounts of chemical inputs (Table 2). Generally, it has no harmful effect on soil, plant, air and environment rather it increases the overall fertility of the soil. It also increases soil's organic matter content percentages thus increases water retention capacity which leads to better root growth and nutrient absorption. It also increases micronutrient and macronutrient availability.

Table 1.1 Nutrient Profile of Vermicomposting and Farm Yard Manure

Sl. No.	Nutrient	Vermicomposting	Farm Yard Manure
1.	N (%)	1.8-2.05	0.5
2.	P (%)	0.6-0.9	0.2
3.	K (%)	1.28-1.5	0.5
4.	Ca (%)	0.5	0.9
5.	Mg (%)	0.2	0.2

6.	Fe (ppm)	175.0	146.5
7.	Mn (ppm)	96.5	69.0
8.	Zn (ppm)	24.5	14.5
9.	Cu (ppm)	5.0	2.8
10.	C:N ratio	14.5:1	31.3:1

(Source: Bulletin of CSR&TI, Mysore on composting and vermicomposting)

Table 1.2 Chemical Profile of Vermicompost

Sl. No.	Chemical	%
1.	Ph	6.5-7.5
2.	Organic Carbon	20.43 – 30.31
3.	Sodium	0.02 – 0.30
4.	Sulphur	Traces to 0.40
5.	Iron	0.3 – 0.7
6.	Zinc	0.028 – 0.036
7.	Manganese	Traces to 0.40
8.	Copper	0.0027 – 0.0123
9.	Boron	0.0034 – 0.0075
10.	Aluminium	Traces to 0.071
11.	Cobalt, Molybdenum	Present in available form

(Source: Bulletin of CSR&TI, Mysore on composting and vermicomposting)

While there are many advantages, there are some disadvantages also. However, farmer can remove these disadvantage part by taking precaution measures. Such as sun light is very harmful for vermicompost pit, thus they can build the vermicompost pit under shade. A perfect moisture level should be maintained and thus water should be applied whenever it is necessary. One of the most important precautions could be protecting the chamber from rat, ant and bird because they may eat the earthworms and destroy the pit or vermicasts.

1.2 Statement of the Problem

To form a research question, it is very much important to determine what type of research will be conducted such as qualitative, quantitative or mixed study. Answering the research questions may help to address a research problem. It determines where and what kind of research the writer will be looking for along with the specific objectives of the research paper. This research has been conducted on income generation through vermicompost in Chapainawabgonj district. From the “Justification of the Problem” part, some questions are raised to complete the research. The purposes of the study were to answer to the following research questions:

- i. What are the factors that influence the farmers’ income generation through vermicomposting?
- ii. To what extent farmers are able to generate income through vermicomposting?
- iii. To what extent the selected factors influence farmers’ income generation through vermicompost?

1.3 Objectives of the Study

Research is an organized investigation of a problem in which there is an attempt to gain a solution to a problem. To get right solution of a right problem, clearly defined objectives are very important. The final part of clarifying a research project involves thinking in more details about research objectives that enlighten the way in which the researcher has to proceed. Generally, it summarizes what is to be achieved by the study. Based on the research questions, the accompanying research goals were detailed to direct the research. The following specific objectives were set forth in order to proper direction to the study;

- i. To determine the extent of farmers’ income generation (here BCR) through Vermicomposting;
- ii. To determine the factors that influence the farmers’ income generation through Vermicomposting;
- iii. To explore the contribution of the selected factors to farmers’ income generation through vermicompost.

1.4 Justification of the Problem

Agriculture policy aiming at a more sustainable agriculture will only be successful if it corresponds to farmers' value and convictions. By the study, we will come to know about the farmers' income generation through vermicomposting in Chapainawabgonj District. Farmers' producing vermicompost and selling them to the markets thus increases the income and on the other hand when farmers' use this on their land, it lowers the cost of chemical fertilizers. Farmers' are engaging in this business as it is benefited in both the way and higher their income generation. Farmers' income and opportunities can be bridged by better understanding of the system and government provision of enabling environments (e.g. provision of credit facilities, training on technicalities) to farmers. This study will be helpful to find outcomes such as cost associated with vermicompost does affect farmer's income or not or if affect then how much.

1.5 Assumptions of the Study

Assumptions are things that are accepted as true or at least plausible by researcher and peers who will read the thesis. According to Good (1945), an assumption is the supposition that an apparent fact or principle is true in the light of the available evidence. Assumptions generally refer to the characteristics of the data, such as distributions, co-relational trend, variable type etc. violating these assumptions can be drastically invalid results though this often depends on sample size and other considerations. The researcher made the accompanying suspicions while undertaking this study:

- i. The responses furnished by the respondents were reliable. The truth about their opinion and interest were expressed by them;
- ii. The researcher who acted as interviewer adjusted to social and environmental conditions of the study area. Hence, the collected data by him from the respondents were free from bias;
- iii. The respondents included in the sample for the study were competent enough to furnish proper responses to the queries included in the interview schedule;

- iv. Views and options furnished by vermicompost farmers included in the sample selected those of the population of the study.

1.6 Limitations of the Study

Limitations of a research are potential weaknesses in a study that are mostly out of researcher's control. Due to the time, money and other necessary resources availability to the researcher and to make the study manageable and meaningful, there became necessary to impose certain limitation as noted below:

- i. The sample size is 69 that are limited for this study due to the farmers' unavailability in their farm or working place or busy working schedules.
- ii. The area of the study is limited to the five Upazila of Chapainawabgonj district only.
- iii. The study depends upon primary data and these data is valuated based on the response by the respondents.
- iv. No secondary data were input there.
- v. Majority of the respondents are poor, landless and with the primary level of Educational background.

1.7 Definition of the Terms

Vermicompost: Vermicompost is the decomposed products processed from using various species like Earthworm, White Worm, Red Worm to create a mixture of decomposing vegetable or food waste, bedding materials and cow dung.

Vermiculture: Vermiculture is the artificial cultivation of worms for using them for the betterment of human beings.

Vermicasts: The end product of the breakdown of organic matter such as vegetables or food wastes, cow dung is known as vermicasts or castings.

Vermicomposting: The process of producing vermicasts from the breakdown of organic matter such as vegetables or food wastes, cow dung is known vermicomposting.

Income Generation: Income generation means a derivative transaction involving the writing.

Fertilizer: Any organic or inorganic material added to the soil to enhance the growth of plants.

Organic fertilizer: Organic fertilizer is the fertilizer which is derived from animal matter, animal excreta (manure), human excreta, and vegetable matter (e.g. compost and crop residues). Naturally, produced fertilizers are generally known as organic fertilizer.

Agricultural Biodiversity: Agricultural biodiversity is a broad term that includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agricultural ecosystems, also named agro-ecosystems: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agro-ecosystem, its structure and processes.

Micronutrient: Elements that are required for growth in trace amounts. These include copper, iron, zinc etc.

Microorganism: An organism that is too small to be seen by the naked eye. Also called microbes, these include bacteria, fungi, protozoans, algae and viruses.

Soil texture: The relative percentage of sand, silt and clay in a soil is called soil texture.

Soil pH: Soil pH is defined as the negative logarithm of hydrogen ion concentration.

C: N ratio: The ratio of carbon and nitrogen in a soil is called C: N ratio.

Organic matter: Organic matter is the decomposed and partially decomposed remains of plants and animals in the soil.

CHAPTER II

REVIEW OF LITERATURE

A literature review is a survey of scholarly sources on a specific topic. It provides an overview of current knowledge, allowing researcher to identify relevant theories, methods and gaps in the existing research. Conducting a literature review involves collecting, evaluating and analyzing publications (such as books and journal articles) that relate to research questions. The researcher made an elaborated search of available literature for this research. However, no study was found to be specially undertaken in this direction. This present chapter has portrayed some reviews of interlinked knowledge on this aspect that is endeavored. The interlinked reviews easily portrayed basic objectives of the study as far as possible. All the reviews in this chapter are from secondary sources and no new or original experimental work is reported there. Review of Literature of this study is presented in three (3) sections. First section deals with the various past research findings on income generation. Second section contains the selected characteristics of farmers and their relationship to vermicompost production. And the third section is for the conceptual framework of the study.

2.1 Farmers' Selected Characteristics and their Relationship to Income Generation

2.1.1 Age

Yadkikar (1991) found that more than half of the respondents at KVK were from middle age category, while 24.00 per cent were from young age category. Thus, meager percent (12.00%) of the respondents were observed from old age category.

Shirsat (1992) reported that majority (62.50%) of the respondents were belonged to middle age category.

Ingle and Kubde (1995) observed that relatively higher proportion KVK trainees were young in age i.e. up to 25 years age (30.30%) and in 26 to 35 years age group (33.33%) group.

Desai et. al., (1996) observed that the majority of KVK trainees were young in age of up to 35 years (75.5%).

Wase (2001) observed that majority of chili growers (52.50%) were in the age group of 36 to 50 years that is middle age category.

Raghunandan (2004) in his study a study on knowledge and adoption level of soil and water conservation practices by farmers in northern Karnataka reported that 45.00 per cent of the respondents (45.33%) belonged to the middle age group, followed by old age (36.25%) and young age group (18.75%), respectively.

Pandict et al. (2013) conducted a study to identify the relationship between the personal characteristics and constraints facing in vegetable marketing of TrishalUpazila under Mymensingh district found that there was no significant relationship between the age of the farmers and their faced constraints in vegetable cultivation and marketing.

Azad et al. (2014) also found that age of the vegetable growers has no significant relationship with problem faced in vegetable cultivation.

2.1.2 Education

Lokhande (1990) found that the substantial percent of the respondents (27.50%) were educated up to middle school level, 19.16 per cent respondents were educated up to college level, 16.67 per cent respondents were of the category of high school and primary school and 20.10 per cent of the respondents were observed illiterate.

Yadkikar (1991) found that 32.00 per cent of the KVK respondents had education up to graduate level, whereas 42.50 per cent of the respondents had educated up to 12th standard, while, more than one fourth of the respondents (36.50%) had education up to middle school level.

Raghunandan (2004) reported that majority (73.75%) of the respondents are literates of which 22.50 per cent studied up to primary school. 20.00 per cent studied middle school, 15.00 per cent respondents up to high school, 11.25 per cent of respondents up to pre-university, whereas, 5 per cent respondents had graduation, whereas, 23.28 per cent of the respondents were illiterate.

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Azad et al. (2014) also found that age of the vegetable growers has no significant relationship with problem faced in vegetable cultivation.

2.1.3 Extension media contact

Sakharkar (1995) found that, 36.00 per cent of the respondents had participated in one or more extension activities whereas, two third (63.33%) of the respondents did not participate in any extension activities.

Sakharkar (1995) indicated that 61.00 and 43.00 per cent of the respondents possessed radio and T.V., respectively of which, 13.66 and 12.02 per cent of them were regular listener of the general and agricultural, program from radio, 39.23 and 30.00 per cent of them were regular viewers of general and agricultural program on TV. Further, he reported that as high as 63.08 and 58.33 per cent of the respondents' regular readers of newspaper and farm magazines, respectively.

Patil (1995) noticed that 47.50 per cent, 20.00 per cent and 18.75 per cent of commercial growers of sunflower were daily users of radio, T.V. and newspaper respectively. On the contrary, 43.75 per cent, 25.00 per cent and 23.75 per cent of seed producers were regularly using radio, newspaper and T.V., respectively.

Angadi (1999) reported that majority of the respondents had not participated in various extension activities namely, discussion with extension personnel (98.76%), group meeting (75.23%) and training programs (72.50% only (43.75%) and (38.13%) of the respondents participated regularly in extension activities like method demonstrations and Krishimela respectively.

Gupta (1999) reported that about (74.00%) of respondents were aware of training programs of which only (36.00%) respondents had participated in training programs, whereas, 56.00 per cent respondents were aware of demonstrations and only 4.66 per cent of farmers had participated, but none of the respondents had participated in field days and field visits.

Panditet al. (2013) found a significant negative relationship between the extension media contact and problem faced of the vegetable growers in vegetable cultivation and marketing.

2.1.4 Farming experiences

Dangi (1983) in his study on impact of training in adoption of improved practices by the farmers in command area development program in Rajasthan Canal Project area reported that 69.84 per cent of the contact farmers had high knowledge level, whereas in case of followers only 30.16 per cent had high knowledge. The results further showed that there was a significant difference in knowledge between two categories of farmers.

Nikam and Rahad (1991) found in their study on lab to land program those 70.10 per cent beneficiaries and 25.00 per cent non-beneficiaries were having medium knowledge level, while 15.00 per cent beneficiaries and 65.0 per cent non-beneficiaries had low knowledge level. Only 15.00 per cent and 10.00 per cent beneficiaries and non-beneficiaries respectively were having high knowledge level.

Sundaraswamy and Balamatti (1991) reported that majority of respondents (57.00%) belonged to medium knowledge level category. Almost equal numbers of respondents were in high and low level of knowledge regarding dry land farming practices.

Venkaria and Mahajan (1991) reported on the basis of their study on farmers' knowledge about agricultural technology, that nearly half of the respondents (49.00%) had medium level knowledge. Further, they found that comparatively less percent of respondents were observed in low level knowledge group (32.00%) and high level knowledge group (19.00%).

Venkaria et al. (1993) concluded that half of the farmers had medium level of knowledge regarding agricultural technology. Whereas majority of the farmers had favorable attitude towards agricultural technology. Thus, knowledge and attitude towards agricultural technology were positively and significantly related with the inputs use behavior of all the categories of farmers.

Parmar (2014) has a findings on vermicomposting is the term given to the process of conversion of biodegradable matter by earthworms into vermicasts. A total of 120

vermicompost farmers were selected from 6 villages of 2 talukas. Majority (71.67 per cent) of the respondents were having medium level of knowledge followed by 15.83 per cent of them had low level of knowledge and 12.50 per cent of the respondents had high level of knowledge.

Suryawanshi A. (2017) conducted a study In India; Higher percentage (46.56%) of the trainees possessed medium level of knowledge about the vermicompost, the mean Score of various packages of practices of vermicompost technology were ranged from 0.87 to 1.48. that majority of the trainees have knowledge of application of vermicompost in field and type of raw material used in preparation of vermicompost technology, whereas the least number trainees knowledge Precaution taken during its preparation.

2.1.5 Training

Hossain (2001) found that the length of the training of the respondents had positive relationship with their knowledge of crop cultivation and marketing.

Van der Walt (2005) as cited by Ortmann and King (2007) indicated that poor management, lack of training, conflict among members (due mainly to poor service delivery), and lack of funds were important contributory factors to the smallholder cooperative failures in Limpopo province.

Van der Walt (2005) and Hossain (2001) have found positive significant relationship between training received and marketing problem.

Azad et al. (2014) also found that training exposure of the vegetable growers has no relationship with problem faced in vegetable cultivation.

Azad et al. (2014) have found no significant relationship between training received and marketing problem. So further research should be taken related to this issue.

2.1.6 Marketing facilities

Uddin (1997) conducted a study of Boro paddy marketing in some selected areas of Jamalpur district and found that profit and marketing cost were highest for the millers. The study reveals that lack of communication, lack of adequate market functionaries,

and lack of adequate market information, price fluctuation, lack of marketing facilities and lack of adequate storage facilities along with higher market toll and uncertainty in electricity supply were the major marketing problems.

Islam (1998) examined the marketing channels, estimated marketing costs and margin and identified the problems faced by the aromatic rice producer and intermediaries in Dinajpur district. Major marketing problems faced by the producers and intermediaries were low price, lack of capital, poor communication and transportation system, inadequate credit facilities etc.

Zaman et al. (2000) conducted a case study on “The benefits of market participation and the rice marketing systems in Bangladesh”. The analysis shows that small farmers benefit the least from open market participation and the price support program. They observed different marketing channels for different groups based on farm size in the research area.

Yadav et al., (2007) carried out an investigation to assess the level of knowledge of mango orchardists regarding postharvest processing and marketing practices. The percentages of the orchardists had knowledge on postharvest management and grading were 52.13% and 51.06%, respectively. Most of the orchardists (60.64%) were not familiar with storage of fruits after harvesting.

Abay (2007) conducted a study on vegetable marketing and found that improving vegetables marketing in developing countries is vital for a number of reasons: the income raising opportunities it offer to small farmers and the contribution to employment made by its labor intensive production, handling and sales requirement are some to mention.

Khandaker et al., (2009) found in a study that appropriate marketing infrastructure is crucial for efficient marketing of perishable agricultural commodities. Efficient transportation and product handling are needed for the trade of agricultural product and is an important factor in assuring good prices and poverty alleviation in rural areas.

Devkota (2018) conducted a research with the aim to assess the production and marketing aspect of vermicompost in Chitwan district during the year 2013. The total respondents' size was 64. The non-producers were farmers with few of them

vermicompost users. The volume of earthworm reared and labor use was to be increased by 300% and 1.48% respectively to obtain optimum economic advantage.

2.1.7 Attitude

Reddy (1989) found that 45.00 per cent of the trained farmers were in the high adoption group, 41.76 per cent were in medium adoption group and only 13.33 per cent were in low adoption group. Whereas, only 3.33 per cent of untrained farmers were medium adopters. The difference between two means was found to be significant.

Ingle (1997) it was found that, about 55.00 per cent of the trained farmers and 63.33 per cent of the untrained farmers were located in medium adoption level group, while 31.68 per cent and 32.00 per cent of the trained and untrained farmers in high level of adoption. Whereas, only 13.33 per cent trained and 5.00 per cent untrained farmers were grouped in low level adoption.

Jondhale et al., (2000) indicated that the adoption of improved practices of summer groundnut was higher among trained farmers than untrained farmers.

Wase (2001) observed that majority of the respondents (56.67 %) were medium level of adoption about jayanti chili cultivation technology. The percentage of the respondents having high level of adoption been 23.33 per cent and 20.00 per cent of respondents were having low level of adoption.

Pagaria Pradeep (2014) conducted a study in Barmer Panchayat Samiti area of Barmer district. The study revealed that majority of the farmers (84%) was having moderate level of knowledge and favorable attitude about advantages of vermicompost technology. The major constraints noticed were the non-availability of worms in nearby market, lack of knowledge about preparation of vermicompost and high temperature during summer season.

Kumar (2016) in his article measures the attitude of farmer towards Organic Farming. The conclusion is that very much necessary to know the attitude of farmers, and for the same purpose, a scale has been developed comprising of 21 statements that can be used to measure the attitude of farmers towards organic farming.

Priyadharshini (2016) in her study designed a scale to measure the attitude of farmers towards organic farming practices in Tamil Nadu. Edward's equally appearing intervals scale was adopted to develop the scale. The final scale comprised ten statements. This scale was standardized for administration.

2.2 Review of Literature on Farmers' Income Generation

Mande (1991) observed that 71.25 per cent respondents had annual income above Rs.10,000 per year.

Nandanwankar (1991) reported that the majority of the beneficiaries (37.50 %) were from higher (above Rs. 9000) income group. Whereas 26.67 percent non-beneficiaries' respondents were from Rs. 5000 to 7000 income group. In case of non-beneficiaries, 38.75 per cent and 33.75 per cent had annual income between Rs. 5000 to 7000 and Rs. 3001 to 5000 respectively.

Ingle (1997) reported that nearly half of the KVK respondents from both categories had income in the range of 12001 to 24,000. It was noticed that 28.33 per cent of the trained farmers, had income more than Rs. 24,000 whereas in case of untrained farmers there was negligible proportion of respondents having income more than Rs. 24,000.

Kamble (1998) noted that most of the KVK respondents had medium income (55.00 %) followed by high income (35.83 %) while only (9.16 %) had low income.

Kapse (1998) observed that the majority of the farmers (61.67 per cent) belong to medium income group whereas 20.83 per cent belongs to low income group and 17.50 per cent farmers were belong to high income group.

Rajanita (2012) conducted an investigation on vermicomposting as one of the methods of generating additional source of income, economic empowerment and assuring sustainable livelihood approach along with the already known environmental benefits, has been newly found to be one of the most appropriate and successful models for the rural or not so socio-economically resourceful communities.

Jain (2018) studied which is focused on "Impact of Vermicompost production in terms of Income and Employment generation in Hoshangabad district (M.P.) 96 respondents producing vermicompost were selected to know the impact of

vermicompost production in terms of income and employment generation. Higher percentage of respondents had generated medium level of employment whereas medium level of income by using vermicompost production technology.

2.3 Conceptual Framework of the Study

A conceptual framework may be defined as the framework illustrates what one expect to find through a research. It defines the relevant variables for a study and maps out how they might relate to each other. This study tried to focus on income generation and selected factors to farmers' income generation through vermicomposting. A dependent variable may be influenced and affected through interacting forces of many characteristics in its surroundings. It is possible to deal with all characteristics in a single study.

The conceptual framework of Rosenberg and Hovland (1960) was done by framing the structural arrangement for the dependent and independent variables. This study was expected that farmers' income generation through vermicomposting as a dependent variable, which was influenced by selected characteristics of the farmers as independent variables. Such as age, level of education, vermicomposting experience, vermicomposting area, production of vermicasts, income before vermicomposting, training, knowledge, marketing facilities, media contact, attitude and increase in income after vermicomposting. The conceptual framework or model of the study has been presented in figure 2.1.

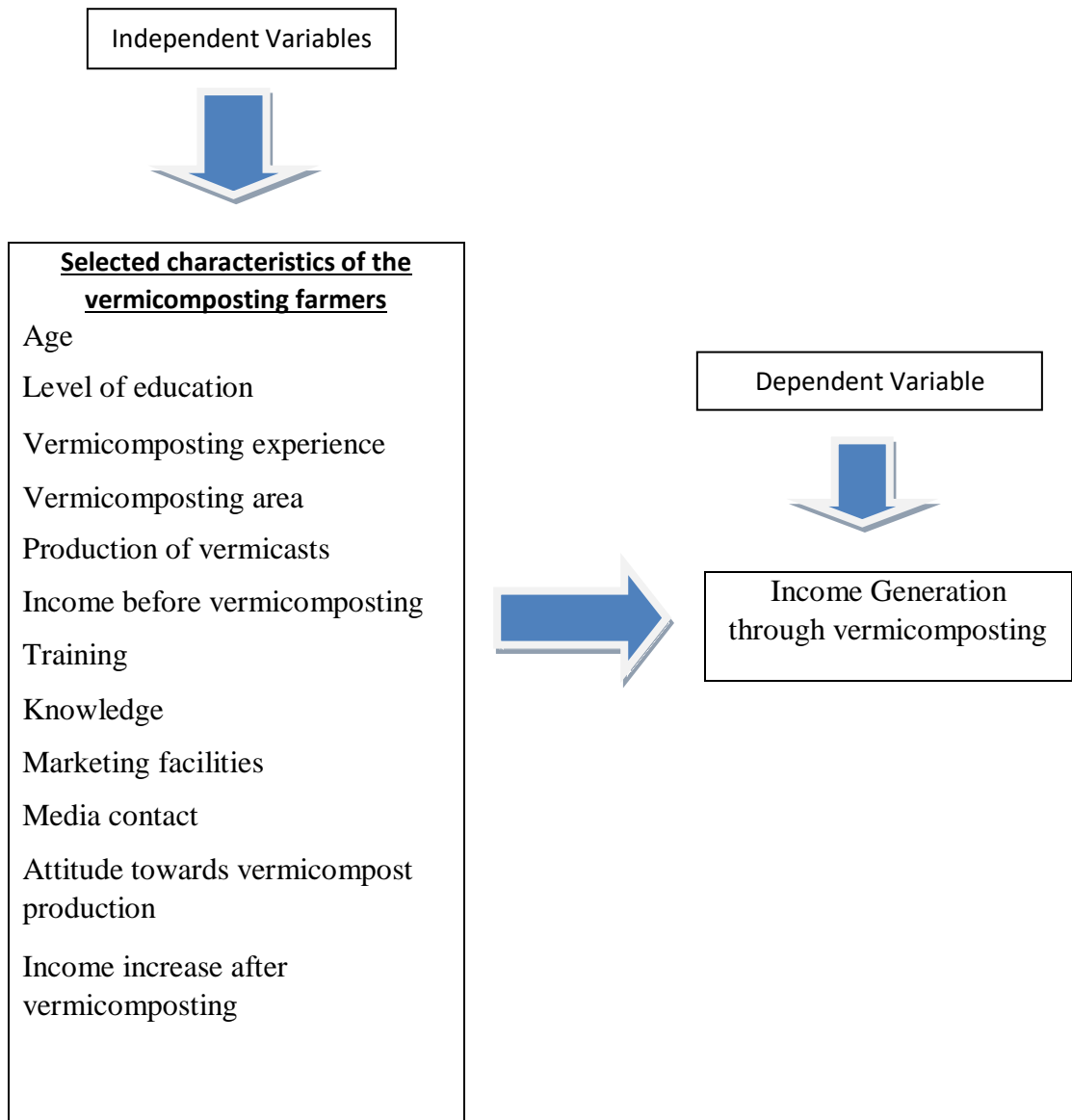


Figure 2.1 The conceptual framework of the study

CHAPTER III

METHODOLOGY

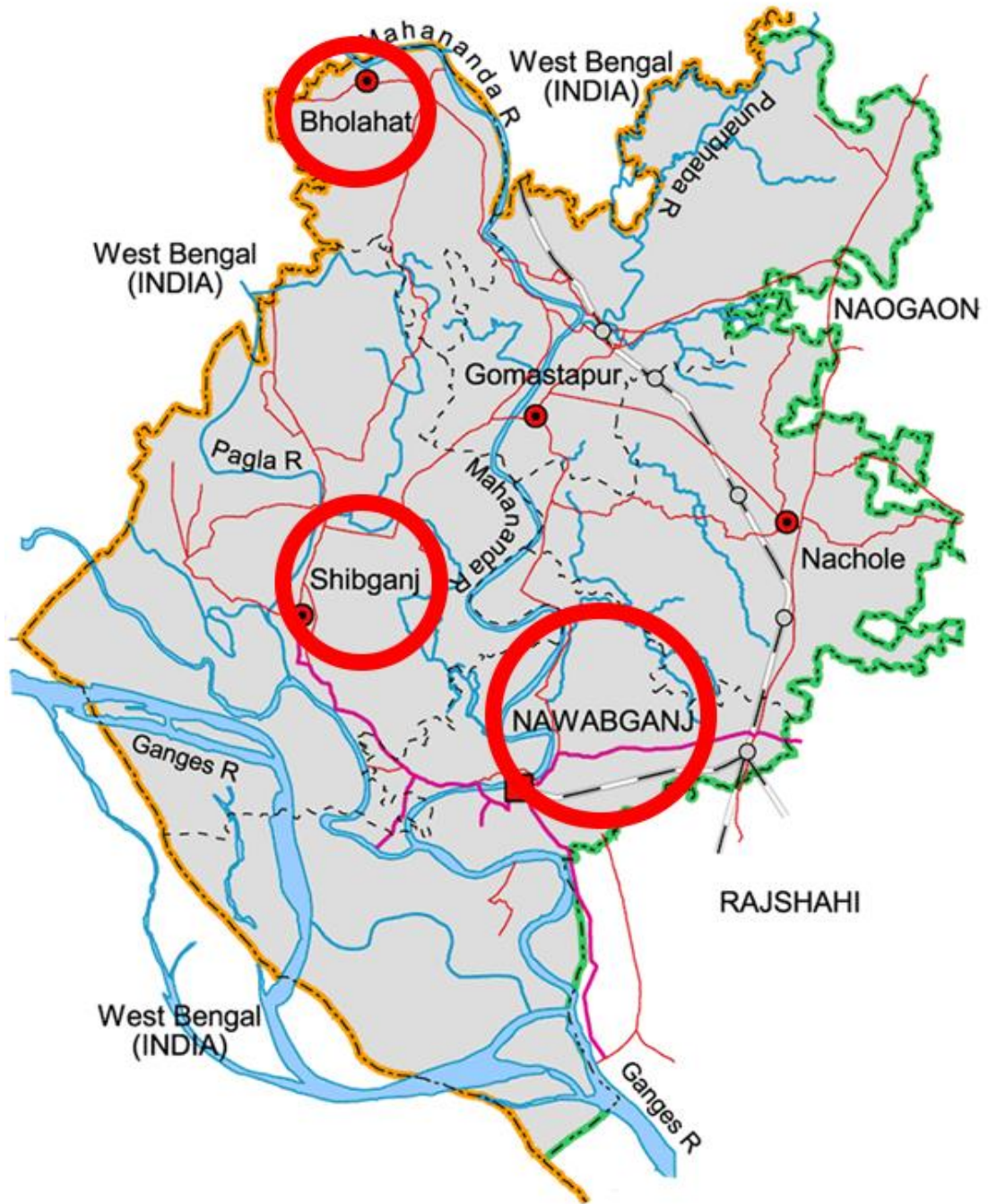
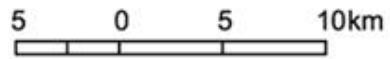
Research methodology is the way to systematically solve a research problem. It is a science of studying how research is done scientifically. The researcher goes about his work of describing, evaluating and predicting phenomenon by the procedure. It actually gives the plan of work of research. Collection of valid information as well as procedure of data coding and analysis of data are main dealt of this chapter. The methods and procedures that followed in conducting this research are given below:

3.1 Research Design

3.1.1 Locale of the area

The locale of the study was Chapainawabgonj District of Rajshahi Division. It is in the north-west region of Bangladesh. That district was selected or chosen due to some reasons. Such as limitation of time, easy accessible, financial shortage etc. 3 out of 5 Upazila of Chapainawabgonj district were selected after considering the limitations of the research with respective time and other facilities. These are Chapainawabgonj Sadar Upazila, Bholahat Upazila and Sibgonj Upazila as these areas were under large vermicompost farming practices. A map of Bangladesh indicating Chapainawabgonj district and another map indicating 3 out of 5 Upazila that were taken into account as study area have been presented in Map 3.1.

NAWABGANJ DISTRICT



Map 3.1 A map of Chapainawabgonj District indicating 3 study Upazila

3.1.2 Population and sampling techniques

For the determination of the farmers' income generation through vermicomposting and to identify the present situation of vermicompost production in Chapainawabgonj, a survey was conducted. An update list of all vermicomposting farmers who cultivated vermicompost commercially were collected from the Department of Agricultural Extension, Deputy Director's Office, Chapainawabgonj, NGO's and other different upazila agricultural office with the help of Sub Assistant Agriculture Officers (SAAOs). The total numbers of vermicomposting farmers in those three upazila were 120. Data were collected from 69 vermicomposting farmers based on their availability on the working places. Farmers were selected using convenience sampling technique for the study which is a non-probability sampling method where the sample is taken from a group of people easy to contact or to reach.

Table 3.1 No. of vermicompost farmers from each upazila

Sl. No.	Upazila Name	Population Size (According to Upazila)	No. of Populations	%
1	Chapainawabgonj Sadar	30	19	27.53
2	Shibgonj	65	42	60.87
3	Gomostopur	25	8	11.60
Total		120	69	100

All the respondents were informed previously to arrange the meeting time and face-to-face interview method was used by a pre-prepared structured interview schedule to obtain the data from 20th January, 2020 to 20th February, 2020.

3.1.3 Data collection instruments

A cross-section survey strategy was operationalized for the study to test the hypotheses and to measure the variances. Through a pre-organized meeting plan, data was gathered. A pre-test was conducted with the previously prepared interview schedule, which was made accordance with the objectives of the study. Some correction, alterations, additions and rearrangements were taken place in the schedule wherever it is needed because of experiences of the pre-test. Closed forms of questions were used in maximum time and these questions were arranged systematically so that it becomes very easy to understand to the farmers. Appropriate

scales of each construct were adopted from prior literature, whenever possible and were exhibited in an English version of the interview schedule attached in the Appendix-A.

3.1.4 Data collection

Researcher himself collected the data. To conduct the interviews, researcher went to the respondents' house during their ensured time. All possible care was taken by the researcher to build good rapport with the respondents while starting the interview. It was helpful for the researcher so that they might not feel any hesitation. They were asked the questions in an ascending order and questions were explained whenever it was necessary. The answers given by the interviewee was collected and recorded very carefully and sincerely. The researcher faced in some serious problem as maximum of them is illiterate and taking in their as usual term.

3.1.5 Summarization, tabulation and analysis of data

Crosschecking was done for the collected data before shifting them to the main sheet. Data were classified and tabulated very carefully. It was then analyzed by special software named SPSS (Statistical Package for the Social Sciences) computer program, version 23 to bring out the specific objectives of this study. Data were tabulated in such a way that it becomes simple to calculation and easy to understand. Qualitative data were converted into quantitative one by means of suitable scoring wherever it is necessary.

3.1.6 Variables of the study

Variables are the basic elements that are measured in any study. These observable or measurable characteristics of persons or objects are capable of taking several values or of being expressed in different categories. There are different types of variables but amongst them dependent and independent variables are most common and important. Independent variables (aka treatment variables) are that factors which the researcher manipulates in his attempt to ascertain its relationship to an observed phenomenon. It may affect the outcome of the experiment. The variables that depend on other factors

are known as dependent variables (aka response variables). These variables may change as a result of an experimental manipulation of the independent variables. In a social research, selection and measurement of variables are very important task to lead the research in right way.

Two types of variables were used for this study:

- i. Dependent variable:** As mentioned earlier that dependent variable may affect the outcome of the study or experiments that is generally known as reliant or response variables, effect, outcomes, consequences, result etc. It has a direct relation with the estimation of alternate factors. “Farmers’ BCR through vermicomposting” is the dependent variable in this study.
- ii. Independent variable:** The alternate name of this variable is indicator variable that means that these variables indicate the way a research is going on. The alternative names of this variable are cause, input, predisposing factor, risk factor, determinant, antecedent, attributes etc. There are a few independent variables chosen for this study when the questionnaire was made prepared. These are age, marital status, family member, educational qualification, farming experience, farm size and total farm size, land under vermicompost production, production of vermicompost, unit price of vermicompost, cost of production, income generation through vermicomposting, annual family income, income before vermicompost production, training on vermicompost production, knowledge on vermicomposting, extension media contact, attitude towards vermicompost production and marketing facilities. All these independent variables will lead the study to achieve the dependent variable and to fulfill the objectives of the study.

3.2 Measurement for Variables

Variables are measured in different parameter. The measuring processes or methods for the variables of this study are given below:

3.2.1 Measurement for independent variables

As different parameters are used to measure different variables for the study, they are described separately below:

3.2.1.1 Age

The time period from the farmer's birth to the time period of carrying out the interview is measured as the age of the respondent or vermicomposting farmer. The parameter was complete years on the basis of their response to measure this variable. Each year of age was scored one (1) point for this variable (Akter, 2003) and took place in the number 1 position of the interview schedule given in Appendix part.

3.2.1.2 Marital status

Marital status was measured by either farmer is married or unmarried or other marital condition. It was measured by giving 1 point for unmarried, 2 points for married, 3 points for divorced, 4 points for separated and 5 points for widowed. However, after completing data collection, it was seen that all the respondents or farmers' marital status was confined in between married and unmarried. This variable took place in the number 2 position of the interview schedule given in Appendix part.

3.2.1.3 Family member

Family member was measured in terms of number of persons live together under same roof or share same kitchen including the farmer himself/herself. Each of the family members was assigned 1 point for himself/herself (Kabir, 2001) and thus total score of farmers express the total family member. For example, 4 point of score was assigned for a farmer's family when the farmer has 4 members in his family. This variable took place in item number three (3) in the interview schedule given in Appendix part.

3.2.1.4 Education

Education was measured in terms of years of schooling finished by the vermicomposting farmer in educational institutions. Passing each level of education in educational institution was scored by one (1) point (Sharmin, 2005). But zero (0) point was assigned for the farmers who "can't read and write" and 0.5 point was

assigned for those who “can sign only”. H.S.C (Higher Secondary Certificate) passed farmers were scored 12 points, Diploma and B.S.S (Bachelor of Social Science) passed farmers were scored with 15 points and M.S (Masters of Science) passed farmers were scores with 18 points for their educational qualification. This variable took place in the number 4 position of the interview schedule given in Appendix part.

3.2.1.5 Farming experience

Farming experience was determined by the duration of each farmer’s engagement in the agricultural work and particularly in the vermicompost production. It was measured and expressed in year. For example, a farmer has 5 years of agricultural working experiences and 2 years of vermicompost production experiences, the farmer was assigned 5 points of score for agricultural working experience and 2 points of score for vermicompost production experiences. This variable took place in the item no. 5 in interview schedule given in Appendix part.

3.2.1.6 Farm size

The total land area possessed by the farmer under farm and homestead either his own or taken from other as borga or lease was the basis of measuring the total farm size. It was measured in hectare scale by using the following formula for each farmer.

$$\text{Total Farm Size} = A_1 + A_2 + \frac{1}{2} (A_3 + A_4) + A_5$$

Where, A1 = Homestead area;

A2 = Own land under own cultivation;

A3 = Land taken from others on Borga system;

A4 = Land given to others on Borga system;

A5 = Land taken from others on lease.

Data was first gathered in local measurement units such as decimal, katha, bigha etc. and then converted into hectare. Thus, the total farm size was obtained by the above mentioned formula (giving a score of one point for each hectare of land). This variable took place in the item no. 6 in the interview schedule given in Appendix part.

3.2.1.7 Land under vermicomposting

While total farm size was measured by adding the farm size of farmer's own, barga and lease land, land under vermicompost was measured by only the land used for vermicompost production and it was recorded in local measurement unit and converted into hectare scale. This variable took place in the item no. 7 in the interview schedule given in Appendix part.

3.2.1.8 Production of vermicompost

Production of vermicompost was determined by the total production of vermicompost or vermicasts in a single year. Farmers were asked to say the amount of vermicasts production and they replied in their own term that a vermicasts production cycle takes 45 days to complete and then the amount was converted to production in a year. It was measured in kilogram (KG) scale. Each kg of vermicasts was scored one (1) point. This variable took place in the item no. 8 in the interview schedule given in Appendix part.

3.2.1.9 Income generation through vermicomposting

The yearly income of a farmer only from selling his/her produced vermicasts was measured as the income generation through vermicomposting. This variable was measured in the scale of taka. One thousands of taka got one (1) point of score for this variable. This variable took place in the item no. 11 in the interview schedule given in Appendix part.

3.2.1.10 Annual family income

The yearly income of a farmer from different sources either agriculture including income from vermicompost or non-agriculture (approximate) was measured as the annual family income of the farmer. This variable was measured in the scale of taka. One thousands of taka got one point of score for this variable (Akter, 2003). This variable took place in the item no. 13 in the interview schedule given in Appendix part.

3.2.1.11 Income before vermicompost production

Income before vermicompost production was measured by asking the farmers about their previous income (approximate) when they did not start production of vermicompost. This variable was measured in the scale of taka. One thousands of taka got one (1) point of score for this variable. This variable took place in the item no. 14 in the interview schedule given in Appendix part.

3.2.1.12 Training on vermicompost

Training on vermicomposting of a farmer was measured by asking them how much days of training they took from different training program on either agriculture or vermicompost. A unit score of one was assigned for each day of training attended (Akter, 2003). If he/she takes 3 days of training, he/she gets 3 points of score. This variable took place in the item no. 15 in the interview schedule given in Appendix part.

3.2.1.13 Knowledge on vermicompost production

Knowledge on vermicompost production of a farmer was measured by asking them 12 different questions using bloom's taxonomy type question (Bloom et. al. 1956) format after consulting relevant experts and review of literatures as exhibited in appendix part and each of the question was for 2 marks. They were asked 6 different levels of questions such as remembering, understanding, applying, analyzing, evaluating and creativity level and all the questions were related to the production of vermicompost. The farmer got 2 marks if he/she delivered correct answer and 0 (zero) for wrong answer and some judicial marks also given for partial answer. Knowledge score on vermicompost production of the farmer could range from 0 to 24, where "0" defined as very low knowledge on vermicompost production and "24" defined as very high knowledge on vermicompost production. This variable took place in the item no. 15 in the interview schedule given in Appendix part.

3.2.1.14 Extension media contact

Extent of contact with the following information sources for receiving farm related information was the measurement of extension media contact. It was measured in point scale. The farmers were asked how much contact they kept with different

information sources such as SAAO, AEO/AAEO, UAO, NGO Worker, Peer farmers, Agriculture Fair/Workshop/Meeting, Farm Radio Listening, Farm TV Program and Others (e.g. ICTs, Krishi Call Centre, UISC and AICC) or vice-versa.

Following scores were allotted for each of the information sources:

Information Sources	Allotted Scores
Not at all	0
Regularly	1
Often	2
Occasionally	3
Rarely	4

Therefore, the total score could be range from 0 to 36 for the extension media contact of vermicomposting farmers where the score “0” refers to no contact with extension media and the score “36” refers to high contact with extension media. This variable took place in the item no. 17 in the interview schedule given in Appendix part.

3.2.1.15 Attitude towards vermicompost production

For measuring the Attitude of the farmers toward vermicompost production, 5 points of Likert scale (Likert, 1932) was used. There were 5 extrinsic motives type and 5 intrinsic motives type statements including both positive and negative statements. Each farmer was asked to reveal his extent of agreement or disagreement against each statement along a 5 points scale: strongly agree, agree, neutral, disagree and strongly disagree. The total score of a farmer was determined by summing up the weights for responses against all statements using following formula.

$$\text{Attitude score} = \Sigma (5 \times \text{SA} + 4 \times \text{A} + 3 \times \text{N} + 2 \times \text{DA} + 1 \times \text{SDA})$$

Where,

SA= Farmer expressed his/her attitude ‘strongly agree’ for the statement and assigned a score of 5 points;

A= Farmer expressed his/her attitude ‘agree’ for the statement and assigned a score of 4 points;

N= Farmer expressed his/her attitude ‘Neutral’ for the statement and assigned a score of 3 points;

DA= Farmer expressed his/her attitude 'disagree' for the statement and assigned a score of 2 points;

SDA= Farmer expressed his/her attitude 'strongly disagree' for the statement and assigned a score of 1 point.

So, the total score could range from 10 to 50 for the Attitude of vermicomposting farmers where the score "0" refers to unfavorable attitude and the score "36" refers to favorable attitude towards vermicompost production. This variable took place in the item no. 18 in the interview schedule given in Appendix part.

3.2.1.16 Marketing facilities

Marketing facilities was measured by asking the farmer about their opinion towards 7 statements on marketing facilities like how they marketing their produced vermicasts or are there any obstacles in marketing or not. The opinions for these statements were asked using 5 points of Likert scale as used to know the attitude of the farmers where the opinion options were 'strongly agree', 'agree', 'neutral', 'disagree' and 'strongly disagree'. The total score of a farmer was determined by summing up the weights for responses against all statements using following formula as used to measure the attitude of the farmers.

$$\text{Marketing facilities score} = \Sigma (5 \times \text{SA} + 4 \times \text{A} + 3 \times \text{N} + 2 \times \text{DA} + 1 \times \text{SDA})$$

Thus, the marketing facilities score could range from 7 to 35 of the farmers where the score "7" defines low marketing facilities and the score "35" defines high marketing facilities for their produced vermicasts. This variable took place in the item no. 19 in the interview schedule given in Appendix part.

3.2.2 Measurement of dependent variable

Changes in the dependent variables are due to systematic changes in the independent variables rather than to change in any uncontrolled extraneous variables (Sidman, 1960). "Farmers' BCR through vermicomposting" was the dependent variable of this study. It was measured to know how much benefit a farmer got from vermicompost

production in a single year and was calculated by dividing the income from vermicompost by the cost of vermicompost production.

$$\text{Farmers' BCR through vermicomposting} = \frac{\text{Income from Vermicompost}}{\text{Cost of Vermicompost Production}}$$

This variable took place in the item no. 12 in the interview schedule given in Appendix part.

3.3 Hypothesis of the Study

According to Kerlinger (1973), “a hypothesis is a conjectural statement of the relation between two or more variables”. It represents a declarative statement of the relations between two or more variables. Hypothesis is not meant to be haphazard guesses, but should reflect the depth of knowledge, imagination and experience of the researcher. In the process of formulating the hypothesis, all variables relevant to the study must be identified. There are two types of hypothesis used in social science: these are

- i. Research Hypothesis; and
- ii. Null Hypothesis.

3.3.1 Research hypothesis

Based on review of literature and the conceptual framework developed, the following research hypothesis was formulated:

Each of the selected characteristics (age, marital status, family member, educational qualification, farming experience, farm size and total farm size, land under vermicompost production, production of vermicompost, unit price of vermicompost, cost of production, Income generation through vermicomposting, annual family income, income before vermicompost production, training on vermicompost production, knowledge on vermicompost, extension media contact, attitude towards vermicompost production and marketing facilities) of vermicompost farmers had a significant influence to the BCR through vermicomposting.

Nevertheless, when a statistical test tried to perform by the researcher, it deserves to formulate null hypothesis.

3.3.2 Null hypothesis

The null hypothesis reflects that there will be no observed effects of a research or it states that there is no contribution between the concern variables. Therefore, in order to conduct tests, the previously formed research hypothesis was converted into null form as given below:

“There is no contribution of the selected characteristics (age, marital status, family member, educational qualification, farming experience, farm size and total farm size, land under vermicompost production, production of vermicompost, unit price of vermicompost, cost of production, income generation through vermicomposting, annual family income, income before vermicompost production, training on vermicompost production, knowledge on vermicompost, extension media contact, attitude towards vermicompost production and marketing facilities) of BCR through vermicompost of the farmers”.

CHAPTER IV

RESULTS AND DISCUSSION

The results or the findings of this study and its explanation or illustration have been presented here in this chapter. According to the objectives of the study, collected data were surveyed, analyzed, tabulated and statistically treated which were obtained from the respondents. These are presented in two section according to the objectives of the study. The first section deals with the socio-economic determination of the vermicomposting farmers and the second section deals with the relationship between BCR (Benefit Cost Ratio) and the socio-economic determinants to the extent of income generation through vermicomposting of the farmers.

4.1 Selected Socio-economic Determinations of the Vermicomposting Farmers

This section deals with the classification of the farmers according to their various characteristics. BCR of an individual largely depends on these characteristics. These characteristics of an individual contribute largely in the matter of shaping of one's income generation through vermicomposting. 12 selected characteristics have been discussed from the findings in this chapter. These selected characteristics are age, education, vermicomposting experiences, vermicomposting area, and production of vermicasts, income from vermicompost, training, knowledge, marketing facilities, media contact, Attitude and increase in income after vermicomposting. Therefore, the major hypothesis was the BCR of the farmer that would also be influenced by various characteristics of the farmers. Range, mean and standard deviations of these characteristics of the farmers have been described in the following sub-sections. Table 4.1 shows a summery profile of the farmers' characteristics.

Table 4.1 The salient features of the selected Characteristics of the farmers

Categories	Measuring Unit	Range		Mean	S.D
		Possible	Observed		
Age	Actual Year	-	27-72	39.43	8.96
Level of Education	Year of Schooling	-	0.5-18	8.25	4.56
Vermicomposting Experiences	Year of Vermicomposting	-	1-7	3.37	1.49

Vermicomposting Area	Ha	-	0.02-0.101	0.04	0.02
Production of vermicasts	Kg	-	240-110000	16143.62	17558.56
Income before Vermicomposting	000' Taka	-	50-1000	272.17	197.08
Training	No. of Days	-	2-4	3.43	0.88
Knowledge	Score	0-24	15.5-22.5	19.92	1.37
Marketing facilities	Score	7-35	20-33	29.13	2.75
Media Contact	Score	0-36	3-19	8.55	4.21
Attitude	Score	10-50	28-48	44.01	4.84
Increase in Income after Vermicomposting	000' Taka	-	32-2370	316.52	310.95

4.1.1 Age

The range of age of the vermicomposting farmers was found between 27 to 72 years and the average of age was 39.43 years with the standard deviation of 8.96. Age classification was done according to the People's Republic of Bangladesh; the farmers were classified into three categories based on their age: young aged (up to 35 years), middle aged (36 to 50 years) and old aged (above 51 years). The categories and the distribution of the farmers according to their age are shown in Table 4.2.

Table 4.2 Distribution of the farmers according to their age

Category	Number of Farmers	%	Observed Range	Mean	S.D
Young Aged (up to 35 years)	27	39.13	27-72	39.43	8.96
Middle Aged (36 to 50 years)	37	53.62			
Old Aged (Above 51 years)	5	7.25			
Total	69	100			

Categorization was done based on youth classification of Bangladesh. Data presented in Table 4.2 indicates that the highest proportion (53.62%) of the farmers were in Middle aged category, 39.13% of farmers were of young aged and rest 7.25% of farmers are of old aged category. However, data also revealed that 92.75% of the

farmers in the study area were of middle to young aged. This study found that middle to young aged farmers are more interested and engaged in vermicompost production.

4.1.2 Level of education

The range of education of the vermicomposting farmers was found between 0.5 to 18 and the average of education was 8.25 years with the standard deviation of 4.56. Farmers were classified into five categories based on their education: can't read and write (0), can sign only (0.5), primary level (1-5), secondary level (6-10) and above secondary level (above 10). The categories and the distribution of the farmers according to their education are shown in Table 4.3.

Table 4.3 Distribution of the farmers according to their education

Category	Number of Farmers	%	Observed Range	Mean	S.D
Can't Read and Write (0)	0	0	0.5-18	8.25	4.56
Can Sign Only (0.5)	6	8.70			
Primary Level (1-5)	24	34.78			
Secondary Level (6-10)	22	31.88			
Above Secondary	17	24.64			
Total	69	100			

Categorization was done based on schooling in educational institutions calculated from the collected data. Data presented in Table 4.3 indicates that the highest proportion (34.78%) of the farmers fall under the category of primary level of education whereas 31.88% of the farmers fall under the category of secondary level, 24.64% fall under above secondary category, 8.70% fall under can sign only and none of the farmer fall under the can't read and write category. The findings indicate that 66.66% of the farmers' education level varied from primary to secondary levels. Thus, it can be said that the less education level, more interested and engaged in vermicompost production.

4.1.3 Vermicomposting experiences

The range of vermicomposting experiences of the farmers was found between 1 to 7 and the average of experiences was 3.37 years with the standard deviation of 1.49. Farmers were classified into three categories based on their vermicomposting experiences: low experienced (up to 1 years), medium experienced (1.1 to 4 years) and highly experienced (above 4.1 years). The categorization and the distribution of the farmers done according to their vermicomposting experienced are shown in Table 4.4.

Table 4.4 Distribution of the Farmers according to their Vermicomposting Experiences

Category	Number of Farmers	%	Observed Range	Mean	SD
Low experienced (Up to 1 years)	5	7.25	1-7	3.37	1.49
Medium experienced (1.1 to 4 years)	49	71.01			
Highly experienced (Above 4.1 years)	15	21.74			
Total	69	100			

Categorization was based on Standard Deviation calculated from the collected data. Data presented in Table 4.4 indicates that the highest proportion (71.01%) of the farmers fall under the category of medium experienced of vermicomposting whereas 21.74% of the farmers fall under the category of highly experienced and the rest 7.25% of the farmers fall under the category of low experienced. Medium experienced farmers are more interested and engaged in vermicompost production whereas highly experienced farmers kept vermicompost production as their secondary business.

4.1.4 Vermicomposting area

The range of farmers' vermicomposting area was found between 0.02 to 0.101 ha and the average of area was 0.04 ha with the standard deviation of 0.02. Farmers were classified into three categories based on their vermicomposting area: low vermicomposting area (up to 0.01 ha), medium vermicomposting area (0.011 to 0.06 ha) and high vermicomposting area (above 0.061 ha). The categorization and the

distribution of the farmers done according to their vermicomposting area are shown in Table 4.5.

Table 4.5 Distribution of the Farmers according to their Vermicomposting Area

Category	Number of Farmers	%	Observed Range	Mean	SD
Low Vermicomposting Area (Up to 0.01 ha)	0	0	0.02-0.101	0.04	0.02
Medium Vermicomposting Area (0.011 ha to 0.06 ha)	52	75.36			
High Vermicomposting Area (Above 0.061 ha)	17	24.64			
Total	69	100			

Categorization was based on Standard Deviation calculated from the collected data. Data presented in Table 4.5 indicates that the highest proportion (75.36%) of the farmers fall under the category of medium vermicomposting area whereas rest 24.64% of the farmers fall under the category of high vermicomposting area. There was no farmer with low vermicomposting area in the category. 0.011 ha to 0.06 ha (medium vermicomposting area) of land area is very much suitable for vermicompost production. Farmers of different study area continuing their vermicompost production either in their own land or in lease land.

4.1.5 Production of vermicasts

The range of farmers' production of vermicasts was found between 240 to 110000 kg and the average of production of vermicasts was 16143.62 kg with the standard deviation of 17558.56. Farmers were classified into three categories based on their production of vermicasts: low production (up to 1414 kg), medium production (1415 to 33702 kg) and high production (above 33703 kg). The categorization and the distribution of the farmers done according to their production of vermicasts are shown in Table 4.6.

Table 4.6 Distribution of the Farmers according to their Production of Vermicasts

Category	Number of Farmers	%	Observed Range	Mean	SD
Low Production (Up to 1414 kg)	14	20.29	240-110000	16143.62	17558.56
Medium Production (1415 kg to 33702 kg)	45	65.22			
High Production (Above 33703 kg)	10	14.49			
Total	69	100			

Categorization was based on Standard Deviation calculated from the collected data. Data presented in Table 4.6 indicates that the highest proportion (65.22%) of the farmers fall under the category of medium production of vermicasts whereas 20.29% of the farmers fall under the category of low production of vermicasts. There are 14.49% of the farmers in high production category. As all of the farmers are from rural area or their production field is in rural area, there are scarcity of raw material. They face some problem during production such as death of worm, vermicasts eaten by ant or damage due to warm weather that reduce a small amount of production of vermicasts. Even then, most of their fertilizer production is limited to 1415 kg to 33702 kg which is a huge amount.

4.1.6 Income before vermicomposting

The range of farmers' income before vermicomposting was found between 50 to 1000 TK (in thousands of TK) and the average of income was 272.17 TK (in thousands of TK) with the standard deviation of 197.08. Farmers were classified into three categories based on their income before vermicomposting: low income (up to 75 thousands of TK), medium income (76 to 469 thousands of TK) and high income (above 470 thousands of TK). The categorization and the distribution of the farmers done according to their income before vermicomposting are shown in Table 4.7.

Table 4.7 Distribution of the farmers according to their income before vermicomposting

Category	Number of Farmers	%	Observed Range	Mean	SD
Low income (Up to 75)	4	5.80	50 to 1000 (thousand) TK	272.17 (thousand) TK	197.08
Medium income (76 to 469)	55	79.71			
High income (Above 470)	10	14.49			
Total	69	100			

Categorization was based on Standard Deviation calculated from the collected data. Data presented in Table 4.7 indicates that the highest proportion (79.71%) of the farmers had medium income before vermicomposting whereas 14.49% of the farmers had higher income before vermicomposting. There are 5.80% of the farmers who had lower income before vermicomposting. 79.71% of the farmers had medium income before vermicomposting as engaged with other business rather than vermicomposting and after hearing from friends or relatives or neighbor or taking training from different NGOs or GOs, they started vermicomposting.

4.1.7 Training

The range of farmers' training was found between 2 to 4 days and the average of training was 3.43 days with the standard deviation of 0.88. Farmers were classified into three categories based on their training days: low training (up to 2 days), medium training (3 to 4 days) and high training (above 4 days). The categorization and the distribution of the farmers done according to their training on vermicomposting are shown in Table 4.8.

Table 4.8 Distribution of the farmers according to their training

Category	Number of Farmers	%	Observed Range	Mean	SD
Low Training (Up to 2 days)	18	26.09	2-4 days	3.43 days	0.88
Medium Training (3 to 4 days)	51	73.91			
High Training (Above 4 days)	0	0			
Total	69	100			

Categorization was based on Standard Deviation calculated from the collected data. Data presented in Table 4.8 indicates that the highest proportion (73.91%) of the farmers fall under the category of medium training whereas 26.09% of the farmers fall under the category of low training. There was none of the farmers in high training category. Generally, GOs and NGOs offered some training program for 2 or 3 days on vermicomposting and its related field. Therefore, a large number of farmers took their training from GOs and NGOs. However, some them took training from their friend's or neighbor's farm.

4.1.8 Knowledge

The range of farmers' knowledge was found between a score of 15.5 to 22.5 and the average score of knowledge was 19.92 with the standard deviation of 1.37. Farmers were classified into three categories based on their knowledge: low knowledge (up to a score of 18), medium knowledge (a score of 19-21) and high knowledge (above a score of 22). The categorization and the distribution of the farmers done according to their knowledge are shown in Table 4.9.

Table 4.9 Distribution of the farmers according to their knowledge

Category	Number of Farmers	%	Observed Range	Mean	SD
Low Knowledge (Up to 18)	6	8.70	15.5 to	19.92	1.37
Medium Knowledge (19 to 21)	61	88.40			

High Knowledge (Above 22)	2	2.90	22.5		
Total	69	100			

Categorization was based on Standard Deviation calculated from the collected data. Data presented in Table 4.9 indicates that the highest proportion (88.40%) of the farmers had medium knowledge whereas 8.70% of the farmers had low knowledge. There were only 2.90% of the farmers who had higher knowledge on vermicomposting. Farmers were asked a few questions on vermicompost production and its use during face-to-face data collection. From their responses, it was found that 88.40% of the farmers had a medium level of knowledge on vermicompost production.

4.1.9 Marketing facilities

The range of farmers' marketing facilities was found between a score of 20 to 33 and the average score of marketing facilities was 29.13 with the standard deviation of 2.75. Farmers were classified into three categories based on their knowledge: low marketing facilities (up to a score of 26), medium marketing facilities (a score of 27 to 31) and high marketing facilities (above a score of 32). The categorization and the distribution of the farmers done according to their marketing facilities are shown in Table 4.10.

Table 4.10 Distribution of the farmers according to their marketing facilities

Category	Number of Farmers	%	Observed Range	Mean	SD
Low marketing facilities (up to 26)	8	11.59	20 to 33	29.13	2.75
medium marketing facilities (27 to 31)	56	81.16			
high marketing facilities (above 32)	5	7.25			
Total	69	100			

Categorization was based on Standard Deviation Calculated from the Collected Data. Data presented in Table 4.10 indicates that the highest proportion (81.16%) of the

farmers had medium marketing facilities of their produced vermicasts whereas 11.59% of the farmers had low marketing facilities. There are only 7.25% of the farmers who had higher marketing facilities. As maximum of the farmers are from rural area or their farm land is in rural area, they faced a few problems during marketing their produces. Such as poor road conditions, less availability of vehicles, sometimes lack of buyers etc. hinder their marketing facilities. Thus 81.16% of them got medium marketing facilities.

4.1.10 Media contact

The range of farmers' media contact was found between a score of 3 to 19 and the average score of media contact was 8.55 with the standard deviation of 4.21. Farmers were classified into three categories based on their media contact: low media contact (up to a score of 4), medium media contact (a score of 5 to 12) and high media contact (above a score of 13). The categorization and the distribution of the farmers done according to their media contact are shown in Table 4.11.

Table 4.11 Distribution of the farmers according to their media contact

Category	Number of Farmers	%	Observed Range	Mean	SD
low media contact (up to 4)	13	18.84	3 to 19	8.55	4.21
medium media contact (5 to 12)	45	65.22			
high media contact (above 13)	11	15.94			
Total	69	100			

Categorization was based on Standard Deviation calculated from the collected data. Data presented in Table 4.11 indicates that the highest proportion (65.22%) of the farmers had medium media contact with different GOs and NGOs whereas 18.84% of the farmers had low media contact. There are 15.94% of the farmers who had higher media contact. Lower availability of the network, it was very difficult to use technology for different updates of their produces. On the other hand, due to farmers' farm location in the rural area, many times they could not contact with the agricultural extension officers or the officers could not visit the farmers. However, 65.22% of the farmers got medium level of media contact.

4.1.11 Attitude towards vermicompost production

Attitude of the farmers towards vermicomposting was found to range from a score of 28 to 48 and the average score of attitude were 44.01 with the standard deviation of 4.84. Farmers were classified into three categories based on their attitude: unfavorable attitude (up to a score of 39), medium Attitude (a score of 40 to 47) and favorable attitude (above a score of 48). The categorization and the distribution of the farmers done according to their attitude are shown in Table 4.12.

Table 4.12 Distribution of the farmers according to their attitude

Category	Number of Farmers	%	Observed Range	Mean	SD
unfavorable attitude (up to 39)	14	20.29	28-48	44.01	4.84
medium Attitude (40 to 47)	54	78.26			
favorable attitude (above 48)	1	1.45			
Total	69	100			

Categorization was based on Standard Deviation calculated from the collected data. Data presented in Table 4.12 indicates that the highest proportion (78.26%) of the farmers had medium attitude towards vermicomposting whereas 20.29% of the farmers had unfavorable attitude. There are 1.45% of the farmers who had favorable attitude towards vermicomposting. Initially, farmers were reluctant to production of vermicompost, but over time, it has become more and more popular. This is because of simple production process, good price of the produced product, comparatively higher profit in this business etc.

4.1.12 Increase in income after vermicomposting

Increase in income of the farmers after vermicomposting was found to range from a score of 32 to 2370 (in thousands) TK and the average of increase in income was 316.52 (in thousands) TK with the standard deviation of 310.95. Farmers were classified into three categories based on their increase in income: lower increase in income {up to 5 (In thousands of TK)}, medium increase in income {6 to 627 (In thousands of TK)} and highly increase in income (above 628 (In thousands of TK)).

The categories and the distribution of the farmers according to their increase in income are shown in Table 4.13.

Table 4.13 Distribution of the farmers according to their increase in income after Vermicomposting

Category	Number of Farmers	%	Observed Range	Mean	SD
Lower increase in income (up to 5)	0	0	32-2370	316.52	310.95
Medium increase in income (6 to 627)	66	95.65			
Highly increase in income (Above 628)	3	4.35			
Total	69	100			

Categorization was based on Standard Deviation calculated from the collected data. Data presented in Table 4.13 indicates that the highest proportion (95.65%) of the farmers had medium increase in income after vermicomposting whereas 4.35% of the farmers had highly increase in income. There was none of the farmers who had lower increase in income after vermicomposting. It is easy to see from the above information that income generation through vermicompost production is a very lucrative business. A huge 95.65% of the farmers' income increases after vermicomposting. Seeing the lucrative situation in this business, people are leaning towards vermicomposting day by day.

4.2 Contribution of the socio-economic determinants of the vermicomposting farmers to the BCR (Benefit Cost Ratio)

In contemplation of deciding, the contribution of socio-economic determinants of vermicomposting farmers to their extent of income generation through vermicomposting, regression analysis was accomplished which is presented in Table 4.14.

4.14 Linear regression coefficients of the selected factors indicating contribution to BCR of vermicomposting farmers

Dependent Variable	Independent Variable	β	P	R^2	Adj. R^2	F
BCR	Age	-0.164	0.202	0.412	0.285	3.264
	Level of Education	0.20	0.869			
	Vermicomposting Experiences	0.102	0.436			
	Vermicomposting Area	-0.066	0.696			
	Production of Vermicasts	0.646	0.050*			
	Income before Vermicomposting	0.169	0.280			
	Training	-0.110	0.506			
	Knowledge	-0.013	0.932			
	Marketing Facilities	-0.570	0.013*			
	Media Contact	0.330	0.025*			
	Attitude	0.671	0.007**			
	Increase in Income after Vermicomposting	-0.313	0.272			

** Significant at $p < 0.01$;

* Significant at $p > 0.05$

From the twelve (12) hypothesized relationship, four (4) variables namely, Production of vermicasts, media contact, attitude towards vermicomposting and marketing facilities of vermicompost were found significant contribution to BCR of vermicomposting farmers while rest of the variables found having no significant contribution (Table 4.14). Among them production of vermicasts, media contact, attitude towards vermicomposting had positive significant contribution and marketing facilities had negative significant contribution to the BCR. All the factors cooperatively contribute 41.2% of the variance of BCR ($R^2 = 0.412$). Each of the independent variable may explain some of the variance of BCR of vermicomposting farmers.

4.2.1 Significance contribution of production of vermicasts of the vermicomposting farmers to BCR in Chapainawabgonj district

The contribution of production of vermicasts of the vermicomposting farmers was calculated by testing the following null hypothesis, “there is no contribution of

production of vermicasts of the vermicomposting farmers to BCR in Chapainawabgonj District”.

The p-value of the concerned variable was found 0.050 with $\beta = 0.646$. It was found that there was a negligible relationship exist between the BCR and production of vermicasts. The following observation was made based on the value of concerned variable of the study under consideration.

1. The contribution of the production of vermicasts was at 5% significance level.
2. So, the null hypothesis could be rejected.

Production of vermicasts had a positive influence on farmers BCR in vermicomposting. It had minor significant contribution on the BCR. Thus, it could be concluded that the more production of vermicasts on the same cost of production may lead to more income from vermicompost that leads to increase of BCR of farmers.

4.2.2 Significance contribution of media contact of the vermicomposting farmers to BCR in Chapainawabgonj district

From the linear regression, it may be summarized that the contribution of media contact of the vermicomposting farmers was calculated by testing the following null hypothesis, “there is no contribution of production of vermicasts of the vermicomposting farmers to BCR in Chapainawabgonj District”.

The p-value of the concerned variable was found 0.025 with $\beta = 0.330$. The following observation was made based on the value of concerned variable of the study under consideration.

1. The contribution of the media contact was at 5% significance level (0.025).
2. So, the null hypothesis could be rejected.

Media contact had a positive influence on farmers BCR in vermicomposting. Thus, it may be concluded that the more media contact with GOs and NGOs leads a farmer to get more information about his/her production technology, price of vermicasts, possible buyers, problems faced in production and their solutions etc. it increases his/her production and vermicasts selling possibility that leads to increases his/her income from vermicomposting and BCR.

4.2.3 Significance contribution of attitude of the vermicomposting farmers to BCR in Chapainawabgonj district

The contribution of attitude of farmers towards vermicomposting was calculated by testing the following null hypothesis, “there is no contribution of attitude towards vermicomposting to BCR in Chapainawabgonj District”.

The p-value of the concerned variable was found 0.007 with $\beta = 0.671$. It had the most significant contribution to BCR. The following observation was made based on the value of concerned variable of the study under consideration.

1. The contribution of the media contact was at 1% significance level (0.007).
2. So, the null hypothesis could be rejected.

Based on the above discussion, it is clear that attitude towards vermicomposting had a positive influence on farmers BCR. As vermicomposting is a very easy technology and with a little investment, farmer can earn some healthy profit, it accelerates farmers in intensive vermiculture that increase the production of vermicasts. Increase in production of vermicasts means increase in income and BCR also.

4.2.4 Significance contribution of marketing facilities of the produced vermicasts to BCR in Chapainawabgonj District

The contribution of marketing facilities of the produced vermicasts was calculated by testing the following null hypothesis, “there is no contribution of marketing facilities of the produced vermicasts to BCR in Chapainawabgonj District”.

The p-value of the concerned variable was found 0.013 at 5% level of significance with $\beta = -0.570$. It had a negative significant contribution to BCR. The following observation was made based on the value of concerned variable of the study under consideration.

1. The contribution of the media contact was at 5% significance level (0.013).
2. So, the null hypothesis could be rejected.

Based on the above discussion, the relation between marketing facilities and BCR of vermicomposting farmers was significant and there was a negative contribution on each other. This indicates that when marketing facilities decreases, BCR increases and vice-versa. However, it should be BCR increases with the increases of marketing

facilities, but in this case, the difference is seen. This happens because maximum farmers sold their produced vermicasts from their farmyard and buyers took it to their own land with own supervision. Therefore, farmers did not to worry about the marketing facilities; particularly they did not face any difficulty in marketing of vermicasts. During the interview, they were asked how they found their potential buyers or sold their products and the transportation facilities related to marketing. As they have no relation with transportation facilities and finding potential buyers for vermicompost selling, the negative significance result comes. In fact, the vermicompost sellers of the locality are not that many. Therefore, they normally face no or very less competition in marketing their produce. This relationship might be different for the other crops grow in the locality. Therefore, this researcher suggests to re-examine this finding for other crops or replicate this study in other parts of the country.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The summary of findings, conclusions and recommendations of this study are the main discussible subjects of this chapter. Proposed hypotheses were tested by regression analysis by using SPSS v.23. The summary of the findings are presented below:

5.1 Summery of the findings

The major findings of the study are summarized below:

5.1.1 Selected factors influencing the BCR of the vermicomposting farmers

Age

The middle aged vermicomposting farmers covered the highest proportion (53.62%) whereas 39.13% of farmers were of young aged and rest 7.25% of farmers are of old aged category.

Level of Education

The highest proportion (34.78%) of the farmers fall under the category of primary level of education followed by 31.88% of the farmers under the category of secondary level. On the other hand, 24.64% were of above secondary category compared to 8.70% were of can sign only category. There was no farmer in can't read and write category.

Vermicomposting Experiences

Farmers having medium experienced of vermicomposting occupied the Supreme proportion (71.01%) compared to 21.74% occupied by the farmers having highly experienced and the rest 7.25% of the farmers had low experiences in vermicomposting.

Vermicomposting Area

The highest proportion (75.36%) of the farmers fall under the category of medium vermicomposting area whereas rest 24.64% of the farmers fall under the category of high vermicomposting area. There was no farmer with low vermicomposting area in the category.

Production of Vermicasts

Medium production of vermicasts category constituted the highest proportion (65.22%) of the farmers followed by 20.29% of the farmers in low production of vermicasts category and 14.49% of the farmers in high production category.

Income before vermicomposting

Findings revealed that 79.71% of the farmers had medium income before vermicomposting whereas 14.49% had higher income before vermicomposting and 5.80% had lower income before vermicomposting.

Training

The highest proportion (73.91%) of the farmers had medium training compared to 26.09% with low training. There was none of the farmers with high training category.

Knowledge

Findings revealed that 88.40% of the farmers had medium knowledge followed 8.70% of the farmers had low knowledge and 2.90% had higher knowledge on vermicomposting.

Marketing Facilities

81.16% of the farmers had medium marketing facilities of their produced vermicasts whereas 11.59% of the farmers had low marketing facilities and 7.25% had higher marketing facilities.

Media Contact

The highest proportion (65.22%) of the farmers had medium media contact with different GOs and NGOs followed by 18.84% of the farmers had low media contact and 15.94% had higher media contact.

Attitude

Findings revealed that 78.26% of the farmers had medium attitude towards vermicomposting followed by 20.29% of the farmers had unfavorable attitude and 1.45% had favorable attitude towards vermicomposting.

Increase in Income after Vermicomposting

The highest proportion (95.65%) of the farmers had medium increase in income after vermicomposting whereas 4.35% had highly increase in income and there is no farmers in the lower increase in income after vermicomposting category.

5.1.2 Contribution of the Selected Characteristics of the Vermicomposting Farmers to BCR

Production of vermicasts, media contact and attitude towards vermicomposting had positive significant contribution on BCR of the vermicomposting farmers. Marketing facilities had negative significant contribution on BCR of the vermicomposting farmers. Age, education, vermicomposting experiences, vermicomposting area, income from vermicompost, training, knowledge and increase in income after vermicomposting had no contribution on BCR of the vermicomposting farmers.

5.2 Conclusions

Based on the findings of the study, conclusion was plotted and their logical interpretation in the light of the other relevant factors are prepared below:

- i. A majority of the farmers (85.51%) had low to medium production of vermicasts. Production of the vermicasts showed a positive significant contribution on BCR of the vermicomposting farmers. However, taking into account that most of the vermicomposting farmers belonged to medium production of vermicasts group than low and high production group. Thus, there was further scope for increasing the production of vermicasts. Some of the reasons of their low to medium production of vermicasts were rat and ant attack on earthworms, warm temperature, heavy rainfall, lack of proper and enough maintenance etc. Thus, there is ample scope for working on these problems, bring some solutions and increase the production of vermicasts.
- ii. A majority portion (84.06%) of the farmers had medium to high media contact with different GOs and NGOs, while there had a positive significant contribution on BCR. Therefore, it may be concluded that the more media contact, the more information gathering from different sources, thus the more use of these information in higher production and BCR. If the

vermicomposting farmers could be provided with more media contact with different GOs and NGOs, they can improve their knowledge on vermicomposting and thus can improve their skill and efficiency that will lead to better production of vermicasts and better BCR.

- iii. Attitude towards vermicomposting had a positive significant contribution with BCR. Majority of the farmers (98.55%) belonged to unfavorable to medium attitude. Therefore, it may be concluded that the more attitude towards vermicomposting, the more intensive vermiculture thus increases in production and BCR. Thus, there was further scope for increasing the farmers' attitude towards vermicomposting. Some of the reasons of their unfavorable to medium attitude were deception of traders, relatively low price of their produce product, lack of public and private incentives etc. Thus, there is ample scope for working on these problems, bring some solutions and increase the attitude of farmers' towards vermicomposting.
- iv. Majority of the farmers (92.75%) belonged to low to medium marketing facilities for their produced vermicasts and it had a negative significant contribution with BCR. It may be concluded that when marketing facilities decreases, BCR increases because maximum farmers sold their product from farmyard. Thus, there was also some further scope for increasing the farmers' marketing facilities. From the answers given by the farmers, it was known that a large part of their produce vermicompost, they sold from their own production land because there was no enough marketing facilities. However, selling from the market would have fetched a comparatively higher price and farmers would have benefited more. Thus, there is also ample scope for working on these problems, bring some solutions and increase the marketing facilities of farmers'.

5.3 Recommendations

From the above discussion and findings of the study, it can be clearly said that production of vermicompost and income generation from vermicomposting is become very popular now a days and one of the strongest part in agricultural economy. However, different agricultural organizations are paying relatively little attention or not being able to organize training programs and cannot ensure other benefit for

everyone due to some circumstance. To overcome the challenges and better environment in vermicomposting business for farmers, some approaches may need to take at different level:

5.3.1 Recommendations for policy

Recommendations based on findings and conclusions of the study are presented below:

1. A majority of the farmers (85.51%) had low to medium production of vermicasts. All the sample farmers are more or less involved in vermiculture but maximum of their production is not satisfactory. Therefore, it may be recommended that GOs and NGOs should ensure some training or method demonstration program on vermiculture and its related technology. Farmers should be provided with enough equipment to enhance the production and to increase the income generation by increasing the BCR.
2. Media contact had a positive significant contribution with BCR. Majority of the farmers (86.04%) had low to medium media contact on vermiculture with different GOs, NGOs and different electronic media like television, radio, mobile phone etc. Government organizations worker like AEO, UAO, SAAO and non-government workers should a regular (or once in a week) visit to the vermiculture farm or enough arrangement should be made so that farmers can pay a visit to the GOs and NGOs easily for suggestions or solutions. On the other hand, farmers should be taught or trained with the use of electronic media like television, radio, mobile phone etc.
3. Attitude towards vermicomposting also had a positive significant contribution with BCR. Majority of the farmers (98.55%) belonged to unfavorable to medium attitude. Therefore, it may be recommended that farmers should be made aware of the importance and uses of vermicompost and vermicomposting. They should be provided with enough training and facilities so that their attitude might develop towards this technology.
4. A large number of farmers (92.75%) had low to medium marketing facilities of their produced and had a negative significant contribution with BCR. This finding needs to be interpreted with cautions. Farmers were asked about their transportation facilities, market distance and market condition but they sold it from their production field. Furthermore, farmers face less competition in

selling vermicompost as few numbers of farmers engaged in this business from the study area. Therefore, some questioning gap was created and such result found. However, marketing facilities should be improved in the long run than before to enhance the selling of vermicasts and increases the farmers' income and BCR.

5.3.2 Recommendations for Further Studies

Based on the scope and limitations of the present study and inspection made by the researcher, the following recommendations should be developed for future further study. The main purposes of this study was to investigate the income generation through vermicomposting in Chapainawabgonj district. The study period was only six (6) months. Due to a limited area and time, this present research cannot provide much information about the present scenario. Further studies should be undertaken to gather more information in the relevant matters. Therefore, the following suggestions were put forth for further research:

1. Chapainawabgonj district was the main study area which is a very small area compared to the whole country. Similar studies should be conducted in other part of the country to get a clear scenario of the whole activities that will be helpful for effective policy formulation.
2. The present study was conducted with only sixty-nine (69) vermicomposting farmers due to time limitation and unavailability of the farmers. Therefore, it should be recommended that further studies should be conducted with a long period of time in hand and with more vermicomposting farmers.
3. The present study investigated the contribution of only twelve (12) characteristics of the vermicomposting farmers with BCR (Income from vermicomposting/cost of vermicomposting). Therefore, it is recommended that further research would be conducted with more and other dependent and independent variables.
4. Further research should be undertaken on the effectiveness of extension services and other related organizations in helping farmers for increasing the BCR, thus increasing the income generation from vermicomposting.

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APPENDIX-A

An English Version of the Interview Schedule
Department of Agricultural Extension & Information System
Sher-e-Bangla Agricultural University
Dhaka-1207

Interview Schedule for data collection for the Research on
“Farmers’ Income Generation through Vermicomposting in Chapainawabgonj”
(This interview schedule is entitled to a research study. Collected data will only be
used for research purpose and will be published aggregately)

Serial No.

Name:

Father/Spouse Name:

Village:

Union:

Upazila:

Cell:

1. **Age:** Years

2. **Marital Status:** Please mention your marital status.

a) Unmarried b) Married c) Divorced d) Separated e) Widowed

3. **Family Members:** Please mention the following information about your family.

Members	No of members	No of earning members
Adult (>18 years)		
Children (<12 years)		
Adolescents (12-18 years)		
Total		

4. Education Qualification: Please mention the following information about your education.

- a. Can't read and write
- b. Can sign only
- c. Did not go to school but read & write which equal to years
- d. I have studied up to class

5. Farming Experience: Please mention the following information about your farming Experience.

- a. How long have you been engaged in agriculture/farming? years
- b. How long have you been engaged in Vermicompost production?..... years

6. Farm size: Please mention here about your farm size.

Sl. No.	Use of land	Measuring unit	
		Local unit	Hectare
1.	Homestead area (A ₁)		
2.	Own land under own cultivation (A ₂)		
3.	Land taken from others on Borga system (A ₃)		
4.	Land given to others on Borga system (A ₄)		
5.	Land taken from others on lease (A ₅)		

Total farm size= $A_1 + A_2 + 1/2 (A_3 + A_4) + A_5 =$

7. Land under Vermicompost: ha.

8. Production of Vermicompost: Please mention the production of Vermicompost in last year..... (Kg)

9. Unit Price of Vermicompost: Please mention the price of Vermicompost per Kg..... Taka

10. Cost of Vermicompost: Please mention the cost (approx.) or your investment on Vermicompost production..... (Thousand Taka). Please answer either (a) or (b).

a. Total cost:

b. Cost per ha:

11. Income from Vermicompost: Please mention your income from Vermicompost in the last financial year. (Thousand Taka)

12. BCR (Benefit Cost Ratio) {(Income/Cost)*100}:

a. Income: _____ b. cost _____

b. BCR: _____

13. Annual Family Income: Please mention your annual family income.

Sl. No.	Sources of Incomes	Amount of Thousand Taka
A) Agricultural Sources		
i.	Crops	
ii.	Livestock	
iii.	Poultry	
iv.	Fish	
v.	Vermicompost	
Total (A)		
B) Non-agricultural Sources		
i.	Business	
ii.	Services	
iii.	Labor	
iv.	Remittance	
v.	Others (if any).....	
Total (B)		
Total (A+B)		

14. Income before Vermicompost Production: Please mention what was your annual family income before you engaged in Vermicompost production. (Thousand Taka)

15. Training on Vermicompost Production: Have you even been received any training on Vermicompost production and marketing? If yes, please mention the following.

Sl. No.	Name of the Training	Name of the Organization	No. of Days
1.			
2.			
3.			
4.			
5.			

16. Knowledge in Vermicompost Production: Please answer the following question regarding Vermicompost production.....

Sl. No.	Questions	Full Marks(2)	Marks Obtained
A. Remembering			
1.	How many days it requires to produce Vermicompost?	2	
2.	What are the elements that you need for Vermicompost production?	2	
B. Understanding			
3.	What is Vermicompost?	2	
4.	Why is Vermicompost better than synthetic fertilizers?	2	
C. Applying			
5.	When to apply Vermicompost in the field?	2	
6.	What is the procedure of using Vermicompost?	2	
D. Analyzing			
7.	What are the market demand of Vermicompost?	2	
8.	How do you find your buyers for Vermicompost?	2	
E. Evaluating			
9.	What is the residual effect of Vermicompost compare to other available fertilizers?	2	
10.	How Does Vermicompost help to retain soil health?	2	
F. Creativity			
11.	Can any other microorganism be used to produce this type of compost other than worms?	2	
12.	Is large scale Vermicompost production possible? How?	2	
Total Marks Obtained			

17. Extension Media Contact: Please mention your extent of contact with the following sources for receiving farm-related information.

Sl. No.	Place of Visit	Not at all (0)	Regularly	Often	Occasionally	Rarely
1.	SAAO		More than 5 times/month	4-5 times/month	2-3 times/month	1 time/month
2.	AEO/AAEO		More than 6 times/year	5-6 times/year	3-4 times/year	1-2 times/year
3.	UAO		More than 6 times/year	5-6 times/year	4-5 times/year	1-2 times/year
4.	NGO Workers		More than 5 times/month	4-5 times/month	2-3 times/month	1 time/month
5.	Peer Farmers		More than 6 times/month	5-6 times/month	3-4 times/month	1-2 times/month
6.	Agril. Fair/Worksh		More than 5 times/year	4-5 times/year	2-3 times/year	1 time/year

	op/Meeting					
7	Farm Radio Listening		More than 5 times/month	4-5 times/month	2-3 times/month	1 time/month
8	Farm TV Programme		More than 5 times/month	4-5 times/month	2-3 times/month	1 time/month
9	Others (e.g. ICTs, Krishi Call Centre, UISC, AICC)		More than 5 times/month	4-5 times/month	2-3 times/month	1 time/month

18. Attitude towards Vermicompost Production: Please mention your degree of agreement or disagreement with the following statements (Strongly Agree to Strongly Disagree)

Sl. No.	Statements	Extent of response				
		SA	A	N	DA	SDA
A. Extrinsic motives						
1	Vermicompost farming increases my income					
2	Vermicompost farming improves my livelihoods					
3	Vermicompost farming helps me to increase my other agricultural production					
4	I can better able to manage my farm due to production of Vermicompost					
5	Vermicompost reduces my costs of chemical fertilizers					
B. Intrinsic motives						
1.	Vermicompost farming helps me to improve my social status in the society					
2.	My peers/neighbors value me more due to the farming of Vermicompost					
3.	Use of Vermicompost for farming is better than the synthetic or chemical farming					
4.	Vermicompost farming requires special skills and training (RA)					
5.	Future farming will be organic, and therefore I would like to continue Vermicompost production					

19. Marketing Facilities: Please mention your degree of agreement or disagreement with the following statements (Strongly Agree to Strongly Disagree)

Sl. No.	Statements	Extent of response				
		SA	A	N	DA	SDA
1.	The demand for Vermicompost is relatively higher in the market					
2.	The distance between the production field and the market is not so far					
3.	There are sufficient marketing facilities available to sell Vermicompost					
4.	Transportation facilities is good enough for marketing					
5.	I have less concern about the sales of Vermicompost					
6.	I have no difficulty in selling Vermicompost in the market					
7.	I can easily find potential buyers of Vermicompost					

(Thank you for your kind cooperation)

Respondent's contact no.:

.....
Name and Signature of the Enumerator