

**CONSTRAINTS AND SCOPE FOR PRACTICING SANDBAR CROPPING
TECHNOLOGY IN RIVERINE AREAS OF BANGLADESH**

A Thesis
By

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Md. Rubayet Al Ferdous Noman
Student No. 1105088
Session: 2011-2012
Semester: July-December



**MASTER OF SCIENCE
IN
AGRICULTURAL EXTENSION**

**Department of Agricultural Extension
Hajee Mohammad Danesh Science and Technology University
Dinajpur**

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ABSTRACT

Constraints and Scope for Practicing Sandbar Cropping Technology in Riverine Areas of Bangladesh

The study was undertaken to assess the extent of constraints as faced by the farmers engaged in sandbar cropping technology, to explore the relationship of the demographic characteristics (independent variables) with constraints of sandbar cropping technology (dependent variable) and to find out the scope for practicing sandbar cropping technology. Constraints faced by the respondents of sandbar cropping technology were also cross-checked by Scored Causal Diagrams (SCDs). The independent variables were age, educational qualification, family size, annual family income, training received, knowledge on sandbar cropping, aspiration, fatalism, attitude towards PAB. The study was conducted in Gangachara upazila under Rangpur district. Ninety five (95) respondents were selected as sample from a recent list of 271 farmers using random sampling method. Data were collected by a pre-tested interview schedule during 1st September to 15th October 2012. Besides the usual descriptive statistical parameter, Pearson's Product Moment Correlation Coefficient (r) was used for the statistical analysis. Among the total 24 constraints "low price during peak period of pumpkin" occupied the highest (CI= 239) scores and stand top in the ranking while "difficult to identify mature pumpkin" had the lowest (CI= 16) scores. Slightly more than three-fourth (75.8 percent) of the respondents had medium constraints, while 21.0 percent had low constraints and only 3.2 percent had high constraints of sandbar cropping technology. Scored Causal Diagrams (SCDs) explored that the main root causes to 'low practicing sandbar cropping technology' identified were low price during peak period of pumpkin, lack of training and education/awareness and land owner discourage to give the same land for 2nd year. Out of nine independent variables educational qualification, training received and knowledge on sandbar cropping of the respondents showed negative significant relationship with the constraints of sandbar cropping technology. Age and fatalism showed a positive significant relationship with the same. On the other hand, family size, annual family income, aspiration and attitude towards PAB of the respondents did not show any significant relationship with the constraints of sandbar cropping technology. Main scope for practicing sandbar cropping technology as mentioned by the respondents 'production of different crops along with pumpkin' followed by 'food security'.

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CHAPTER 1

INTRODUCTION

1.1 General Background

Bangladesh is the largest deltaic country with a population of 152.5 million with an area of 1, 47,570 square kilometers. Traditionally and predominantly Bangladesh is agriculture based country and about 25.7 percent of her population engaged in agriculture for their livelihood (BBS, 2012). Agriculture is one of the largest sectors of the economy in Bangladesh. The contribution of agriculture to Gross Domestic Product (GDP) in the economy of Bangladesh is 19.29 percent (Bangladesh Economic Survey, 2011-2012).

When the waters subsided, silted sand plains are left behind called '*char lands*' i.e. Sandbars. Innumerable vast sandbars emerge in the riverbeds during the dry season (November-April) in north-western of Bangladesh. Most of these sandbars remain unused and barren because of their unfertile sandy characteristics (Rahman and Reza, 2011). Broadly speaking, these sandbars can be distinguished in the following categories: i) Sandbars covered with sufficient silt have been sandy loam soil characteristics and are ideal for cultivation of tobacco and maize. These types of sandbars are generally located on the banks formed by river erosion. ii) Sandbars located close to water sources can also be lucrative for cultivation. Moisture is retained for longer time here and iii) Sandbars with no silt remain unutilized. However, the sandbar cropping technology adaptation can transform this type of sandbar and render it productive.

In agriculture, sandbar cropping is an innovative practice, which was started in Gaibandha district by some farmers in 2005. Since 2009, a NGO named Practical Action Bangladesh (PAB) has been introducing sandbar cultivation technology suitable for use in unfertile sandbars and supporting extreme poor to cultivate pumpkins. Practical Action, previously known as the Intermediate Technology Development Group (ITDG) is a development charity registered in the United Kingdom which works directly in four regions of the developing world i.e. Latin America, East Africa, Southern Africa and South Asia. In these countries, Practical

Action works with poor communities to develop appropriate technologies in renewable energy, food production, agro-processing, sustainable transport, water, sanitation, small enterprise development, building and shelter, climate change adaptation and disaster risk reduction. Practical Action works in partnership with poor people and their communities, building on their own knowledge and skills to come up with innovative, sustainable and practical solutions. The organization's project work is based around four international programmes:

- **Coping with environmental change and conflict** - reducing the vulnerability of poor people affected by natural disasters, conflict and environmental degradation.
- **Making markets work** - enabling producers to improve their production, processing and marketing.
- **Improving access to services** - helping poor communities gain access to basic services such as clean water, food, housing and electricity.
- **Responding to new technologies** - helping poor communities to access effective new technologies.

Practical Action has been working in Bangladesh for more than sixteen years (Rahman and Reza, 2011). From 2009, a NGO named Stimulating Household Improvements Resulting in Economic Empowerment (Shiree) supported project was scaled-up to create livelihood opportunities for the extreme poor living alongside the flood protection embankment of the Tista and Dhorola rivers in four north-western district of Bangladesh. In the northwest of Bangladesh, there are vast areas of sandbars appears in the dry season, which could provide livelihood opportunities to the extreme poor who lives in the protection embankment of the Tista and Dhorola rivers.

Sandbar cropping is a simple and very low-cost option. Among various vegetables, pumpkins have proved to be particularly suited to these conditions, not only do they yield well but also they can be stored, providing food and income throughout the year. During the initial stage of sandbar cropping, a pit was dug into sandbar, which was one meter deep and one meter in diameter. One jute sack filled with compost was placed into the pit. After a few days, four to six seeds were placed into the compost

filled sack. The pits are then monitored for the next five months and finally farmers got the results i.e. they were able to reap up to ten gourds from each pit. Then, sandbar cropping became popular by the farmers and was started to practice in the vast area by digging pit directly into sandbar. Per pit requires 10kg cow dung, 100gm urea, 100gm TSP, 100gm MoP fertilizers and cow dung is applied as basal dose during pit preparation and 50 percent of others chemical fertilizers are applied as basal dose and 50 percent are applied as top dress method (Bepary, 2006).

The word pumpkin (*Cucurbita muschata*) originates from the word 'pepon', which is Greek for "large melon". The French adapted this word to *pompon*, which the British changed to 'pumpion' and later American colonists changed that to the word we use today, "pumpkin" (The Pumpkin Patch, 2007). The origin of pumpkins is not definitely known, although they are thought to have originated in North America. The oldest evidence, pumpkin-related seeds dating between 7000 and 5500 BC, were found in Mexico (The Columbia Encyclopedia, 2004). Pumpkins are monoecious, having both male and female flowers on the same plant. The small ovaries at the base of the petals distinguish the female flowers. These bright and colorful flowers have extremely short life spans and may only open for as short time as one day. The color of pumpkins is derived from the orange pigments abundant in them. The main nutrients are lutein and both alpha and beta-carotene, the latter of which generates vitamin A in the body (Arnum, 1998).

Pumpkins are very versatile in their uses for cooking. Most parts of the pumpkin are edible, including the fleshy shell, the seeds, the leaves, and even the flowers. In the United States and Canada, pumpkin is a popular Halloween and Thanksgiving staple (Hogan, 2011). When ripe, the pumpkin can be boiled, baked, steamed, or roasted. In its native North America, it is a very important traditional part of the autumn harvest, eaten mashed and making its way into soups and purees. Often, it is made into pie, various kinds of which are a traditional staple of the Canadian and American thanks giving holidays. In Canada, Mexico, the United States, Europe and China, the seeds are often roasted and eaten as a snack.

Pumpkins' are not only delicious food but they are also valued for their vitamins and minerals contents. The nutritional value of 100g pumpkin is shown in the Table 1.1.

Table1.1. Nutritional value per 100 g raw pumpkin (percentages are relative to US recommendations for adults.)

Sl. No.	Nutrients	Amount
1.	Energy	109 kj (26 kcal)
2.	Carbohydrates	6.5 g
3.	Sugars	1.36 g
4.	Dietary fiber	0.5 g
5.	Fat	0.1 g
6.	Protein	1.0 g
7.	Saturated	0.05g
8.	Monounsaturated	0.01g
9.	Polyunsaturated	0.01g
10.	Vitamin A	equiv. 369 µg (46%)
11.	Beta-carotene	3100 µg (29%)
12.	Thiamine (vit. B ₁)	0.05 mg (4%)
13.	Riboflavin (vit. B ₂)	0.110 mg (9%)
14.	Niacin (vit. B ₃)	0.6 mg (4%)
15.	Pantothenic acid (B ₅)	0.298 mg (6%)
16.	Vitamin B ₆	0.061 mg (5%)
17.	Folate (vit. B ₉)	16 µg (4%)
18.	Vitamin C	9 mg (11%)
19.	Vitamin E	1.06 mg (7%)
20.	Calcium	21 mg (2%)
21.	Iron	0.8 mg (6%)
22.	Magnesium	12 mg (3%)
23.	Phosphorus	44 mg (6%)
24.	Potassium	340 mg (7%)
25.	Zinc	0.32 mg (3%)

Source: USDA Nutrient Database (<http://www.foodcoachinstitute.com/food-coach-world/food-facts/nutritional-content-of-popular-produce>)

In Thailand, small pumpkins are steamed with custard inside and served as a dessert. In Italy, it can be used with cheeses as a savory stuffing for ravioli. In addition, pumpkin can be used to flavor both alcoholic and nonalcoholic beverages. In the southwestern United States and Mexico, pumpkin and squash flowers are a popular and widely available food item. They may be used to garnish dishes, and they may be dredged in a batter then fried in oil. Pumpkin leaves are a popular vegetable in the western and central regions of Kenya; they are called 'seveve', and are an ingredient of 'mukimo', respectively, whereas the pumpkin itself is usually boiled or steamed.

Pumpkin seeds, also known as pepitas, are small, flat, green, edible seeds. Pumpkin seeds are a popular snack that can be found hulled or semi-hulled at most grocery stores. However, roasting pumpkin seeds is a popular Halloween treat. Per ounce serving, pumpkin seeds are a good source of protein, magnesium, copper and zinc (Anonymous, 2012).

Landless farmers are the most disadvantaged and vulnerable group suffering from insecurity of food and nutrition. The main cause of malnutrition is low availability and consumption of vegetables. With an average national per capita consumption of 23g of leafy vegetables, 89g of non-leafy vegetables and 14g of fruit, the average Bangladeshi eats a total of 126g of fruit and vegetables daily against the minimum daily consumption of 400g of vegetables and fruit recommended by FAO and the WHO (FAO/WHO, 2003).

So, by adopting this sandbar cropping technology extreme poor farmers can recover their malnutrition problems and food insecurity in the northern Bangladesh. In spite of greater potentiality of sandbar cropping technology, beneficiaries of PAB are not free from constraints in cultivating pumpkin. Thus, in this condition it is necessary to reveal the types of constraints faced by the PAB beneficiaries in practicing sandbar cropping. In order to identify the constraints of sandbar cropping technology and wider scope of this technology, the proposed study has been undertaken.

1.2 Statement of the Problem

In view of the above discussion and facts, the present study was undertaken with the title “Constraints and Scope for Practicing Sandbar Cropping Technology in Riverine Areas of Bangladesh”. The study aimed at providing information regarding the following queries:

1. What are the constraints faced by farmers engaged in sandbar cropping that creating hindrance in wider dissemination of the said technology?
2. What are farmer's characteristics that directly related to their constraints faced?
3. What are the relationships among the farmers faced constraints and their selected characteristics?
4. What are the scopes for wider dissemination of sandbar cropping technology?

1.3 Specific Objectives of the Study

In view of the above circumstances, the present study was undertaken the following specific objectives:

1. To assess the extent of constraints faced by the farmers engaged in sandbar cropping technology.
2. To determine and describe the socio-demographic characteristics of the farmers. The characteristics are:
 - i. Age
 - ii. Educational qualification
 - iii. Family size
 - iv. Annual family income
 - v. Training received
 - vi. Knowledge on sandbar cropping
 - vii. Aspiration
 - viii. Fatalism
 - ix. Attitude towards PAB
3. To explore the relationship between the demographic characteristics of the farmers and constraints of sandbar cropping technology.
4. To find out the scope for practicing sandbar cropping technology.

1.4 Justification of the Study

Bangladesh is a densely populated country and her population growth rate is very high. The annual population growth rate is 1.39 million (BBS, 2011). With the increasing of population the cultivable land is decreasing due to construction of house, industry etc. As a result agricultural production become lower and the contribution of agricultural sectors to GDP in the economy of Bangladesh also decreasing. To overcome this condition there are two ways. One is to increase the production vertically i.e. by increasing the cropping intensity and another is by converting the uncultivable land into cultivable one. Second, one is possible by introducing sandbar cropping technology. Because, sandbars are uncultivable land and through this technology it's become cultivable. They are dynamic in characteristics, depending upon the flood situation and available water flow throughout the year, they are

(sandbar) available for use in the dry season. Extreme poor people are engaged in crop cultivation in the sandbar during this season, which is otherwise barren, abandoned or uncultivable. Sandbar cropping is a challenging job because it is not as like as plain land. Therefore, sandbar cropping can be increased, if constraints faced by the extreme poor farmers in practicing this technology are identified and minimized. As a result, wider dissemination of this technology will become possible. There is an excellent opportunity of sandbar cropping technology because it provides reasonable cash income to the extreme poor farmers, even a part of produced pumpkin may be used for domestic consumption during *monga* (a famine-like situation) season and thus contributes to the nutrition of family members.

1.5 Assumptions of the Study

An assumption is the supposition that an apparent fact of principle is true in the light of the available evidence (Goode and Hatt, 1952). The following assumptions were undertaken by the researcher in conducting the study:

- i. The respondents included in the sample of the study were capable to provide responses to the questions of the questionnaire.
- ii. The responses given by the respondents were reliable. They expressed the truth about their convictions and awareness.
- iii. Views and opinions given by the respondents included in the sample of the study were the representative views and opinions of the whole population of the study area.
- iv. The researcher who play role as interviewer was well adapted to the social and cultural environment of the study area. Hence, the respondents had given their correct and rational opinions without hesitation.
- v. The items, questions and scales included in the questionnaire were relevant and appropriate.

1.6 Limitations of the Study

In order to make the study meaningful and manageable from the point of view of the academic research, it was necessary to impose some limitations:

- i. Since the findings of the study were based on the opinion expression capability and ability to recall of the respondents, the study was confined to both their ability to recall and also their sincerity and honesty in providing the needed information.
- ii. The study was confined to one union of Gangachara upazila under Rangpur District.
- iii. The characteristics of the respondents of the study area are many and varied. But only nine (9) characteristics were taken for investigation in the study.
- iv. Practicing sandbar cropping technology is a challenging job. So various constraints in sandbar cropping are faced by the extreme poor farmers. However, only twenty four (24) constraints have been taken under consideration for investigation in the study.
- v. There are many extreme poor farmers in the study areas, but only the farmers involved in the sandbar cropping of the PAB in the year 2010 and 2011 under Gangachara upazila were selected.

1.7 Definition of Important Terms

For the purpose of clarity, certain terms frequently used throughout the entire study are defined and illustrated as follows:

Age

Age of a respondent defined as the span of his/her life and is measured by the number of years from his/her birth to the time of interviewing.

Educational qualification

Educational qualification referred to the development of desirable knowledge, skill and attitude in an individual through the experience of reading, writing, observation and relative activities.

Family size

It referred to actual number of permanent members in a subject's family who live in a fixed dwelling unit and eat from the same cooking arrangement.

Annual family income

Annual family income referred to the total annual earnings of all the family members of a respondent from agriculture, livestock and fisheries and other accessible resources.

Training received

Training refers to organized instruction aimed at improving knowledge, skill and attitude of an individual so that he/she can perform his/her functions and responsibility more effectively. It referred to the number of days that a respondent had received training from the Practical Action Bangladesh (PAB) or other organizations under different training programmes.

Knowledge on sandbar cropping

Literally, knowledge means knowing or what one knows about a subject, fact, person etc. knowledge on sandbar cropping refers to farmers understanding of the facts, phenomena and methods in different aspects of agriculture on sandbar.

Aspiration

Aspiration referred to the desire or ambition of an individual regarding his/her farm, family and environment.

Fatalism

Fatalism is a philosophical doctrine emphasizing the subjugation of all events or actions to fate. It was a belief that human situations and acts were predetermined by some supernatural power and seldom the influenced by individual volition or by the act of any person.

The term fatalism referred to the view or opinion that all events are predetermined by divine power and therefore human being can do nothing to change the course of events (Rahman, 2002).

Constraint

Constraint refers to a difficult situation about which something to be done. Constraints are the elements, which hinder in doing some activities or operations in a certain field.

The constraints in technology transfer are those, which act as the barriers to the adoption of technologies by the potential users.

Sandbar cropping

When the waters subsided, silted sand plains are left behind called 'char lands' i.e. Sandbars. Sandbar cropping is a simple, innovative and very low-cost option where different types of agricultural crops are grown.

Technology

Technology can be viewed as an activity that forms or changes culture (Borgmann, 2006). Technology involves the design and production of innovative and creative products to meet the needs and wants of others.

The word technology refers to the making, modification, usage, and knowledge of tools, machines, techniques, crafts, systems, and methods of organization, in order to solve a problem, improve a preexisting solution to a problem, achieve a goal, handle an applied input/output relation or perform a specific function.

Practical Action Bangladesh (PAB)

Practical Action, previously known as the Intermediate Technology Development Group (ITDG) is a development charity registered in the United Kingdom. In 1965, economist and philosopher E. F. Schumacher had an article published in the observer, pointing out the limitations of aid based on the transfer of large-scale technologies to developing countries, which did not have the resources to accommodate them. He argued that there should be a shift in emphasis towards intermediate technologies based on the needs and skills possessed by the people of developing countries. Encouraged by the response, Schumacher and a few of his associates, including George McRobie, Alfred Latham-Koenig and Professor Mansur Hoda, decided to create an "advisory centre" to promote the use of efficient labor-intensive techniques, and in 1966 the Intermediate Technology Development Group (ITDG) was born. From its origins as a technical enquiry service, ITDG began to take a greater direct involvement in local projects. Following initial successes in farming, it developed working groups on energy, building materials and rural health, and soon grew to become an international organization. The group now has seven regional offices, working on over 90 projects around the world, with a head office in the UK. In July 2005, ITDG changed its working name to Practical Action, and since 2008, this has been its legal name.



Preparation of pit in sandbar



Seedling stage and watering



Pest control by the farmers



Harvesting of matured pumpkin



Storage at farmers' level



Marketing of pumpkin

Figure 1.1 Overall sandbar cropping (pumpkin) activities

CHAPTER 2

REVIEW OF LITERATURE

This chapter deals with the review of past studies and findings related to the present study. In fact, very few research works have so far been done on constraints and scope of sandbar cropping technology. The present study is concentrated the constraints and scope of sandbar cropping technology in riverine areas of Bangladesh. The researcher therefore made exhaustive effort to review the previous research work directly or indirectly related to the present study by different researcher in home and abroad. Literatures reviewed are presented below in three major sections. The first section deals with review of literature on general context of constraints and second section deals with the review of literature regarding relationship of selected characteristics of the respondents with their constraints. Third and last section of this chapter deals with the conceptual framework of the study.

2.1 Concept of Constraint and Literature Review on General Context of Constraints

2.1.1 Concept of constraint

Constraint is the element factor or a subsystem that works as a bottleneck. It restricts an entity, project, or system (such as a manufacturing or decision making process) from achieving its potential (or higher level of output) with reference to its goal.

The constraint in technology transfer is those, which act as the barriers to the adoption of technologies by the potential users” (Kashem and Halim, 1991). Constraints are the elements, which resist in doing some activities or operations in a certain field. Different authors have classified the constraints in different ways. Some of these are given below:

Kashem (2004) explained constraint in technology transfer mainly in three aspects:

1. Social constraints
2. Psychological constraints
3. Situational constraint

Halim (2003) conducted a study on the “Constraints Faced by the Farmers in Adopting Crop Diversification”. In his study, he selected five aspects of constraints viz.

1. Socio-cultural and psychological constraints
2. Economic constraints
3. Situational and management constraints
4. Constraints regarding inputs availability and
5. Constraints regarding extension services

2.1.2 General context of constraints

Meena *et al.* (2009) conducted a study in Punjab state, which is situated in the North-West of India to identify the constraints in adoption of modern post-harvest technologies. To assess the constraints a likert-type scale was developed which contained five sections viz., namely socio economic; technological; farming; marketing; and extension. They found that socio-economic, technological and farming constraints were more prominent than extension and marketing constraints.

Khan *et al.* (2007) was conducted a study to know the major constraints and problems faced by the farmers in agriculture of Sihore District in India. Severe constraints like unavailability of electricity, higher input cost, limited source of information and unavailability of insecticides pesticides and fertilizers increase the cost of cultivation. They found that unavailability of electricity for irrigation was the most severe problem of the study area.

Singh *et al.* (2007) administered a research work to delineate the constraints faced by the farmers' relation to training. The study revealed that training method was not effective, training subject was not match with current problems, and more distance from the village were the main constraints reported by the trained farmers.

Sawant and Nikam (2007) conducted a survey to study the constraints experienced by the veterinarians while communicating the information. Constraints like non availability of needed literature, lack of time and non availability of funds were experienced in information input, processing and output.

Singh *et al.* (2007) found that high incidence of pests and diseases, non-availability of quality seed material, non-availability of sulphur based phosphatic fertilizer for balanced nutrition, infestation of weeds, non-availability of appropriate plant protection chemicals, non-availability of inputs in time, lack of knowledge about scientific cultivation practices, increasing cost of inputs, soil quality and aberrant weather condition were major constraints as perceived by the respondents in adoption of pigeon pea cultivation practices.

Salam (2003) in his study identified constraints in adopting environmentally friendly farming practices. Top six identified constraints according to their rank order were: 1) low production due to limited use of fertilizer, 2) lack of organic matter in soil, 3) lack of government support for environmentally friendly farming practice, 4) lack of capital and natural resources for integrated farming practices, 5) lack of knowledge on integrated farm management and 6) unavailability of pest resistant varieties of crops.

Halim (2003) conducted a study on constraints faced by the farmers in adopting crop diversification. The top five constraints identified of this study according to their rank order were 1) lack of storage facilities for products and seeds, 2) high price of inputs 3) non-availability of credit for other crops, 4) lack of sufficient training programme in different aspects of crop diversification and 5) most of land are low areas and not suitable for CDP crops.

Khan *et al.* (2003) conducted a study to determine the problem confrontation of the onion growers in the south west coastal area of Bangladesh. Among the identified problems by them lack of good seeds, diseased or insect-infected seeds, high price of improved variety of seeds, high level of soil salinity, low price of onion in local market due to entrance of onion from neighboring were prominent.

Agnew *et al.* (2002) found that the adoption of Harvesting Based Practice (HBP) (specially, lower pour rate and lower extractor fan speed balanced against harvest time) can provide an extra \$ 100/ha to the industry. Several barriers to adoption of HBP include low sugar price, wet weather, orange rust disease, system of harvester payment, insufficient cane quality feedback mechanisms and physical, time and safety upon harvesting.

Ismail (2001) revealed that six top problems in rank order were 1) no arrangement of loan for the farm youth for fishery cultivation, 2) lack of government programmes in agriculture for the farm youth, 3) absence of loan giving agencies for establishing farm in locality, 4) general people face problem for fishery due to government leasing of Jalmohal, 5) lack of government programmes for establishing poultry farm and 6) lack of agricultural loan for the farm youth.

Pramanik (2001) made an extensive, study on the twenty-four problems of farm youth in Muktagacha upazila under Mymensingh district relating to different problems in crop cultivation. Out of twenty-four problems, the top four problems in rank order were: 1) local NGO take high rate of interest against a loan, 2) lack of agricultural machinery and tools, 3) lack of cash and 4) financial inability to arrange improved seeds, fertilizers and irrigation.

Kurishbayev *et al.* (2001) reported that crop diversification is important to stabilize farm income due to erratic production and marketing conditions. So, national and regional agricultural practices policy should address the following points, provide crop and production alternatives for farmers according to their inputs and marketing logistics and degree of diversification.

Alam *et al.* (2000) found that scarcity of quality seeds, high labor wage and low market price of fibre were the major constraints of jute production.

2.2 Relationship between Independent Variables and Constraints of Sandbar Cropping Technology

2.2.1 Age and constraints

Parvez (2009) conducted a research work to assess the nature and extent of constraints as faced by the farmers engaged in small scale aquaculture. He found that there was positive relationship between age and constraints faced by the farmers in small scale aquaculture.

Khan *et al.* (2007) observed that age of the farmers had positive relationship with the constraints faced by the farmers in agriculture.

Halim (2003) in his study found that there was no relationship between age of the farmers and constraints faced by the farmers in adopting crop diversification. Similar finding was also obtained by Yeasmin *et al.* (2002).

Salam (2003) found that there is no relationship between age and constraints faced by the farmers in adopting environmentally friendly farming practices.

Rashid (2003) found that age of the rural-youth had significant negative relationship with their problem confrontation in undertaking selected agricultural activities.

Bhuyian (2002) observed that age of the farmers had positive relationship with constraints faced by the farmers in Banana cultivation. Rahman (1996) also found similar findings.

2.2.2 Educational qualification and constraints

Parvez (2009) observed that educational qualification had negative significant relationship with constraints faced by the farmers in small scale aquaculture.

Khan *et al.* (2007) conducted a study to carry out the constraints and problems faced by the farmers in agriculture. They found that education had significant negative relationship with the constraints faced by the farmers of the study area.

Karmakar (2004) found that education of the farmers had negative significant relationship with the constraints faced by the farmers in adopting aquaculture technologies. Similar findings were achieved by Nahid (2005), Hasan (2005), Haque (2001), Karim (1996) and Rahman (1995) in their respective studies.

Halim (2003) revealed that education of the respondents had no significant relationship with the constraints faced by the farmers in adopting crop diversification. Similar finding was obtained by Yeasmin *et al.* (2002).

Salam (2003) found a negative significant relationship between education and constraints faced by the farmers on adopting environmentally friendly farming practices.

Bhuyian (2002) in his research found that education of the farmers had negative significant relationship with the constraints faced by the farmers in Banana cultivation.

2.2.3 Family size and constraints

Parvez (2009) found in his research work that there was positive significant relationship between family size and constraints faced by the farmers in small scale aquaculture.

Karmakar (2004) conducted a research work to determine the constraints faced by the farmers in adopting aquaculture technologies. He found that there was positive significant relationship between family size and constraints faced by the farmers in adopting aquaculture technologies.

Halim (2003) found that there was no significant relationship between family size and constraints faced by the farmers in adopting crop diversification. Similar findings were obtained by Yeasmin *et al.* (2002), Rashid (1999) and Haque (1995).

Salam (2003) in his research work revealed that family size had positive significant relationship with constraints faced by the farmers in adopting environmentally friendly farming practices.

- Bhuyian (2002) conducted a study to determine the extent of constraints being faced by the farmers in cultivating banana. He observed that family size had no significant relationship with constraints faced by the farmers in Banana cultivation.

2.2.4 Annual family income and constraints

Karmakar (2004) in his research found negative significant relationship between annual income of the farmers and constraints in adopting aquaculture techniques. Similar findings were obtained by Rahman (1995).

Bhuyian (2002) found in his study that there was no significant relationship between annual income of the farmers and their constraints in Banana cultivation. Similar findings were obtained by Halim (2003) and Salam (2003) in their respective studies.

Haque (2001) found in his study that annual income of Farmers Field School (FFS) farmers had a positive significant effect on their problem confrontation. Similar finding was also obtained by Yeasmin *et al.* (2002) and Haque (1995).

2.2.5 Training received and constraints

Halim (2003) found that there was negative significant relationship between training received and constraints faced by the farmers in adopting crop diversification.

Ahmed (2002) showed that training exposure of the farmers had significant negative relationship with their problem confrontation in jute seed production.

Ali (1999) found that training experience of the rural youth had no relationship with their anticipated problem confrontation in self-employment by undertaking selected agricultural income-generating activities. Similar finding was obtained by Yeasmin *et al.* (2002) and Saha (1997).

2.3.6 Knowledge on sandbar cropping and constraints

Karmakar (2004) found that knowledge on aquaculture technologies had significant negative relationship with constraints faced by the farmers in adopting aquaculture technologies. Similar findings were obtained by Rahman (1995), Rabbani (1993) and Monsur (1989) in their respective research.

Salam (2003) found no relationship between knowledge and constraints faced by the farmers in adopting environmentally friendly farming practices. Similar findings were found by Yeasmin *et al.* (2002), Raha (1989), Ali (1978), Rashid (1975) and Karim (1974) in their respective research.

Bhuyian (2002) found significant negative relationship between agricultural knowledge and constraints faced by the farmers in Banana cultivation. Similar findings were found by Rahman (1995), Mansur (1989) and Sarker (1983) in their respective study.

2.2.7 Aspiration and constraints

Hossain *et al.* (2002) found no relationship between aspiration and problem confrontation of the rural women beneficiaries involved in Grameen Bank.

Farouque *et al.* (2002) found that there was significant positive relationship between aspiration in life and constraints faced by the rural youth regarding their employment opportunity.

2.2.8 Fatalism and constraints

Karmaker (2004) found significant positive relationship between fatalism and constraints faced by the farmers in adopting aquaculture technologies.

Haque (1995) found that there was no relationship between fatalism and problem confrontation of the members of Mohila Bittahen Samabaya Sommittee. Similar findings were obtained by Yeasmin *et al.* (2002), Kashem (1977) and Rashid (1975) respectively.

2.2.9 Attitude towards PAB and constraints

After through searching, no information was found on this aspect. Hence, it was not possible to put relationship in this context.

2.3 The Conceptual Framework of the Study

Constraint is something that impedes the normal development and progress. There are many factors which influence, affect and create constraints. Among the various factors socio-economic condition of the char dwellers, agro-climatic variations are affecting sandbar farming. Improved sandbar farming in reverine areas i.e. adoption of better sandbar cropping practices, better income generation through practicing sandbar cropping and sustainable livelihoods of char dwellers are also very important factors.

Floods in Bangladesh don't just destroy homes, villages and lives when they arrive - they also leave a crippling legacy when the waters subside. The 'char' - the silted sand plains that floods leave behind - are too infertile for even the most skilled farmer to tend. The overall structures and textures of the sandy soils in char areas restrict in growing many crops and other livelihood endeavors. But by simply digging holes in these sandy residues and filling them with manure, compost and pumpkin seeds, crops have thrived. The barren sandy river beds are now producing thousands of pumpkins with this simple technology creating an avenue to utilize unused resources for the benefit of poor. Satisfactory outcomes of this practice, in terms of production and income generation, have drawn attraction of many dwellers in the chars through motivational campaign of NGOs working in those areas. As well as giving a high yield and being packed full of health benefits, pumpkins can be stored for up to a year, meaning people have a crop both for their families and also to sell, when employment

In a word, the cultivation of pumpkin has shown a light of hope to the dwellers in cultivating in off season and land.

Yet, the possibility of the enterprise to grow with full benefits is a major concern to sustain the production in the fragile land and ecosystems. This will only be possible when the possible constraints in the sandbar cropping techniques are well understood and cares are duly taken to resolve or minimize the problems.

Thus, this study is concerned with the constraints of sandbar cropping technology. The constraint was the main issue and nine selected characteristics of the respondents were considered as independent variables. Constraints of an individual may affected through interacting forces of many independent variables. It is not possible to deal with all issues in a single study. It was therefore, necessary to limit those as age, educational qualification, family size, annual family income, training received, knowledge on sandbar cropping, fatalism, aspiration and attitude towards PAB.

In light of the foregoing discussion and review of literature, a conceptual framework has been developed for this study, which is diagrammatically shown in the Figure 2.1.

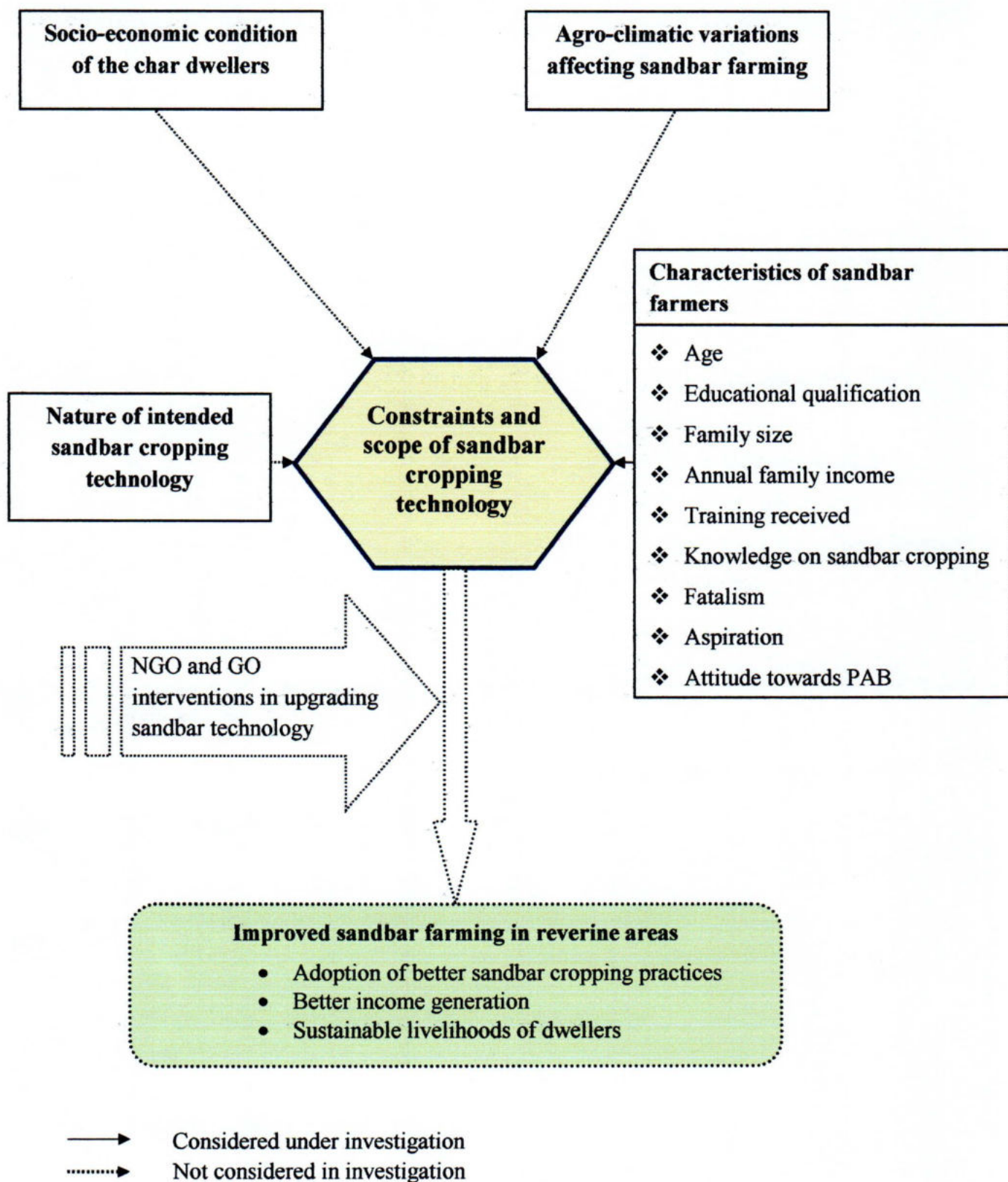


Figure 2.1: The conceptual model of the study

CHAPTER 3

METHODOLOGY

In any scientific research, methodology deserves a very careful consideration. Methodology should be such that enables the researcher to collect valid information and to analyze the same correctly to arrive at appropriate decisions. The methods and procedures followed in conducting this research have been discussed in this chapter.

3.1 Locale of the Study

Gangachara upazila under Rangpur district was selected as the study area for this research. This research aimed at the population of all the respondents under PFP (Pathway from Poverty)-shiree project of this upazila. Gangachara upazila consists of 6 unions namely Balapara, Mornia, Gajgnonta, Laxmitary, Kolkonda, and Alambiditar. Out of these 6 unions Kolkonda was selected purposively for conducting the study. There are five sandbar spots in this union and all five spots viz. South Kolkonda, Mirpara, Alikisamat, Kuribiswa and Southpara were selected as the locale of the study. The area mostly belongs to *Char* land of the Tista river. A map of Rangpur district including its upazilas as well as Bangladesh (inset) and a map of Gangachara upazila are presented in Figure 3.1 and Figure 3.2 respectively.

3.2 Population and Sample

The farmers who were the members of the PFP-Shiree Project of Gangachara upazila under Rangpur district were the population of the study. Rangpur district was purposively selected due to investigators familiarity, language and culture of the respondents. Gangachara upazila was selected randomly. Gangachara upazila consists of 6 unions out of which one union namely Kolkonda was selected randomly. An updated list of 271 respondents of the study area was collected from NGO named Practical Action Bangladesh (PAB). Out of 271 respondents a sample of 95 respondents (around 35%) were selected by random sampling technique. Simultaneously a reserve list of 10 respondents (around 10 percent of the population) was prepared out of this list to use in case of non-availability of sampled respondents. Distribution of respondents constituting the population, sample and reserve list in selected five sandbar spots of Kolkonda union under Gangachara upazila is presented in Table 3.1. The detailed plan of selection and distribution of population and sample are shown in Figure 3.3.

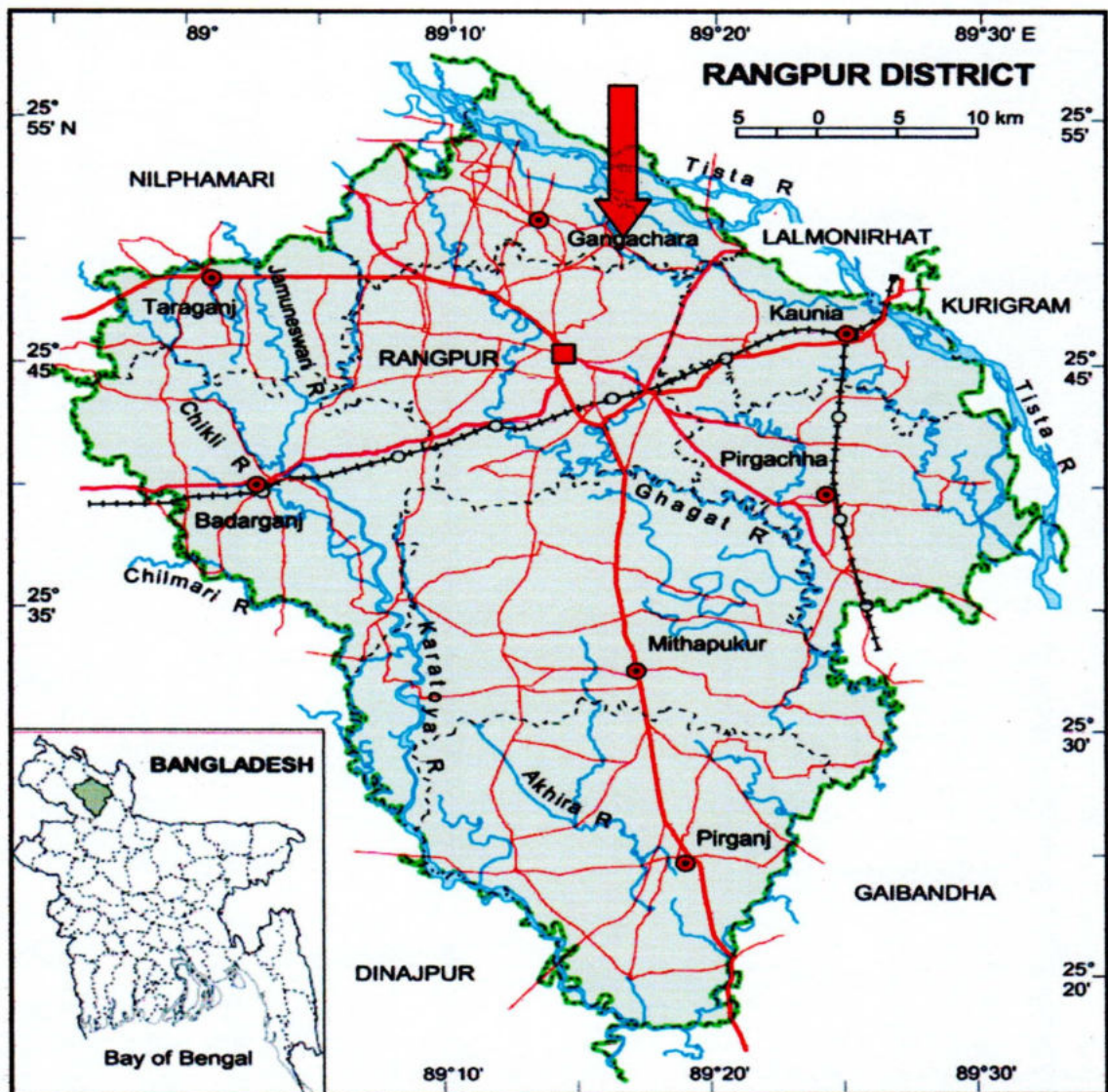


Figure 3.1 Map of Rangpur district showing the study area (Bangladesh inset)

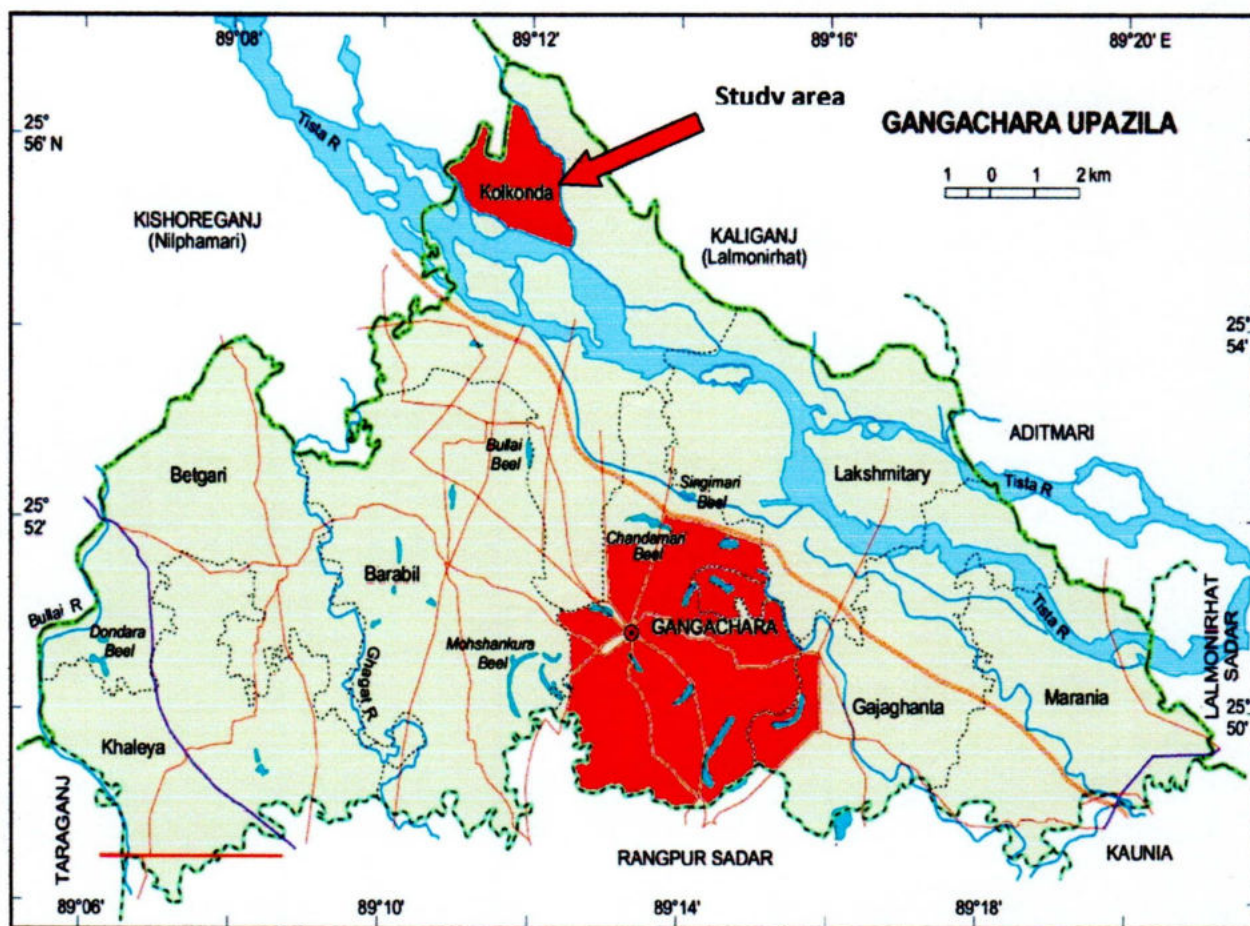


Figure 3.2 Map of Gangachara upazila

Table 3.1. Distribution of the pumpkin growers according to population and sample

Union	Sandbar spots	Population	Sample	Reserve list
Kolkonda	South kolkonda	79	28	3
	Mirpara	68	24	2
	Alikisamat	44	15	2
	Kuribiswa	37	13	1
	Southpara	43	15	2
	Total	271	95	10

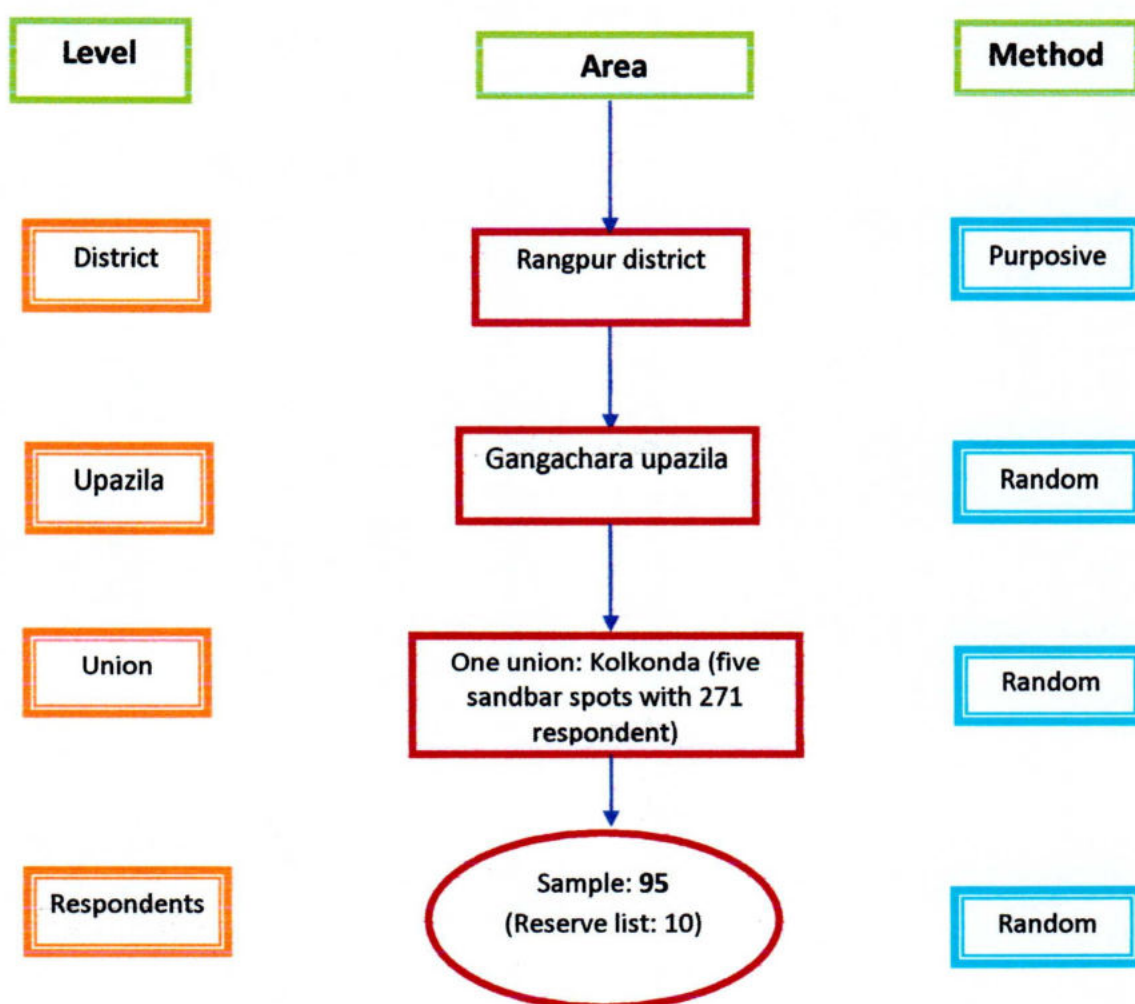


Figure 3.3 Layout of the sampling procedure of the study area

3.3 Instrument for Data Collection

A structured interview schedule was used for collection of relevant information. Only closed form questions were included in the schedule. The questions included were simple and direct to ascertain the opinion of the farmers regarding a number of aspects. To determine the constraints of sandbar cropping technology scales were developed. A draft interview schedule was prepared in accordance with the objectives of the study. The interview schedule was pre-tested with 20 respondents of the study area before finalizing for data collection. Based on the pre-test result necessary correction, addition and modification were made in the interview schedule. The modified, corrected and adjusted interview schedule was printed in the final form in English (Appendix A) which was transferred to Bengali version for clear understanding of the respondents and enumerator. Finally, data were collected from the study area during 1st September to 15th October 2012.

3.4 Data Collection Procedure

Personal interviewing was followed by the researcher himself for data collection. Prior to data collection, the researcher met with the Agriculture Coordinator, Agriculture Officer and Field Assistants (FAs) of Practical Action Bangladesh. Researcher requested them to provide necessary help and co-operation for information collection. Respective FAs of the study area introduced local leader with the researcher who were also very helpful for the researcher in collecting information. The researcher made all possible efforts to establish rapport with the respondents so that they could feel free to respond to the questions contained in the schedule. All possible efforts were made to explain the purpose of the study to the respondents and their answers were recorded sincerely. Whenever, any respondent felt difficulty in understanding any question, care was taken to help them getting understand of the same. The researcher in collecting data faced no serious problem. Though the researcher made every effort to arrive all the respondents' house and field, it was not possible to collect data from five farmers under the samples, as they were not available during interviewing. Therefore, the researcher compelled to replace the unavailable respondents by five farmers from the reserve list.

3.5 Selection of Variables

The researcher employed adequate sincerity and care in selecting the variables of the study. Considering time and resource availability to research, reviewing relevant literature as far as available, discussed with the teachers and experts in the relevant fields, the variables were selected for the study. Constraints of sandbar cropping technology were the main focus of this study and it was considered as the dependent variable. The selected characteristics of the farmers were: age, educational qualification, family size, annual family income, training received, agricultural knowledge, aspiration, fatalism and attitude towards PAB.

3.6 Measurement of Variables

3.6.1 Measurement of dependent variable

Constraints of sandbar cropping technology were the dependent variable of this study. Four point rating scale was used to determine constraints. The scale contained 24 statements of constraints of sandbar cropping technology. Each respondent was asked to express his/her opinion in the form of one of the 4 responses such as high, moderate, low and not at all. Scores of 3, 2, 1 and 0 were assigned respectively in the responses for an item. The overall constraints of sandbar cropping technology were computed by adding together all the individual scores obtained by him/her for all the questions. Therefore, the possible overall constraints score of a respondent could range from '0 to 72' where 0 indicating no constraint and 72 indicating very high constraint.

A Constraint Index (CI) for each 24 selected constraints was computed using the following formula:

$$CI = (C_h \times 3) + (C_m \times 2) + (C_l \times 1) + (C_n \times 0)$$

Where,

C_h = Number of respondents indicating the constraint as 'high'

C_m = Number of respondents indicating constraint as 'moderate'

C_l = Number of respondents indicating constraint as 'low'

C_n = Number of respondents indicating constraint as 'not at all'

Constraint Index (CI) for any one of the selected constraint could range from 0 to 285, where, 0 indicated no constraint and 285 indicated highest constraint.

To cross-check constraints of sandbar cropping technology, Scored Causal Diagrams (SCDs) of Participatory Farm Management (PFM) were used (Galpin *et al.*, 2000). SCDs were used to examine in detail the causes and effects of constraints and to identify the 'root' cause which need to be addressed and to analyze the relative importance of the constraints and prioritize them.

At first the topic, constraints of sandbar cropping technology was critically discussed with the participants in a small group containing six members in order to construct the SCDs. Various constraints given by the participants of sandbar cropping technology were listed through discussion with the participants. Assuming the end constraint 'low dissemination of sandbar cropping technology and writing it on an elliptical card, they were asked to mention the direct causes of this constraint. As the direct causes were identified and written on separate cards by the farmers, the cards were placed on a large paper on the ground and arrows were drawn to represent the causal relationships between the problems. Each constraint was represented on the ground once only. The causes of those constraints were identified and added to the diagram. These might be from the original list or might be newly identified. The process was continued until the participants were satisfied that all the problems had been included and all the connections identified. The constraint at the edge of the diagram with no identified 'causes' were determined as the 'root' causes. Scoring was done by moving counters (pumpkin seeds) up from the end constraint by dividing them between the causes of each subsequent constraint. In the present study one hundred pumpkin seeds were used as counters as the total score for the end constraint.

The procedural steps of scoring used in this research study were as follows:

1. After drawing the causal diagram, even number (100) of pumpkin seeds were placed on the end constraint.
2. The farmers were asked to divide the 100 seeds between the causes of that constraint (i.e. the arrows entering the constraint), to represent how important the causes of that constraint were.

3. The scores were then taken back a further step and divided between the causes of the next constraint using the same procedure as in step-2.
4. If no causes of the constraint had been identified on the diagram i.e. there was no arrow entering the constraint, then the score remained on that constraint. If there was only one cause of the constraint, the whole score is moved back to that cause. At each stage the scores were written on the diagram before the seeds were moved on.
5. If a cause had more than one effect, then the scores from those effect arrows were added together. This total was then divided between the different causes of the constraint, as in step-2.
6. The scoring was continued until all the constraint on the diagram had been scored. The beans were ended up on the 'root' causes.
7. On completion of the scoring process, the relative scores of the 'root' causes were compared. The higher the score the more important the constraint. These scores and the reasoning behind the scores (i.e. the causes and effects on the diagram) were clarified with the participants.

3.6.2 Measurement of independent variables

The nine selected characteristics of the respondent's constitute the independent variables of this study. The procedure followed for measuring these selected characteristics are presented below:

3.6.2.1 Age

Age of the respondents were measured in terms of years from his birth to the time of interview was taken. A score of one was assigned for each year of age. It was measured in a complete years on the basis of responses of the respondents.

3.6.2.2 Educational qualification

Years of schooling was used to measure educational qualification completed by an individual in educational institutes. If a respondent did not know how to read and write his score was taken as zero (0). A score of 0.5 was assigned to that respondent

who could sign his name only. Besides this, a respondent was given actual score of one for every year of schooling i.e. 1 for class one, 2 for class two and so on.

3.6.2.3 Family size

The family size of the respondent was measured on the basis of the number of family members including himself, his wife, children and other dependents living in a nuclear family. For example, if a respondent had five members in his family the score of the family size was taken as five.

3.6.2.4 Annual family income

The annual family income of a respondent was measured in taka and was taken 1 (One) for every 1,000/- of annual family income on the basis of total yearly earning of the respondents and member of his/her family. For determining the annual family income of a respondent from agriculture, it was first necessary to identify his annual production from different farm outputs like sandbar cropping, cropping in plain land, livestock and poultry etc. The price of each unit was determined on the basis of market price at the time of interviewing. Income from other sources like business, labor etc. of each respondent and other members of family was also determined.

3.6.2.5 Training received

Training received was determined by total number of days a respondent received training in his/her entire life on sandbar cropping technologies. For example, if a respondent received three (3) days training then the score was given 3 and so on.

3.6.2.6 Knowledge on sandbar cropping

On the basis of responses to 10 questions, the agricultural knowledge of the respondent was computed. The questions covered different aspects of agricultural knowledge. For correct response to all 10 questions a respondent could secure total score of 20 and for wrong responses to all the questions he could secure zero (0). So the agricultural knowledge of the respondents could range from 0 to 20, 0 indicated no agricultural knowledge and 20 indicated very high agricultural knowledge.

3.6.2.7 Aspiration

Aspiration usually refers to a person's or a group of person's orientation towards a goal. Islam (2005) constructed an 8 (eight) items levels of aspiration for getting response from garo women in Bangladesh. Khatun (2004) and Sarker (2007) selected 5 aspects for measuring aspiration level of the respondent. However, considering the above methods of aspiration rating, 8 (eight) items have chosen for getting the opinion of the respondents. Among the eight statements, four were positive and four were negative. The respondents indicated for each statements of the scale to the extent of their agreement. For positive statements, scores assigned to the responses were 4, 3, 2, 1 and 0 respectively. For negative statements, the scoring system was reverse. A 5 (five) point rating scale was used for computing the aspiration score. Thus, the possible aspiration score of the respondents could range from 0 to 32, where zero (0) indicated no aspiration and 32 indicated very high aspiration.

3.6.2.8 Fatalism

The term fatalism referred to the view or opinion that all events are predetermined by divine power and therefore human being can do nothing to change the course of events (Rahman, 2002). Fatalism score was computed by using a five (5) point rating scale. Among the eight statements, four were positive and four were negative to fatalism. The respondents indicated for each statements of the scale to the extent of their agreement. For positive statements, scores assigned to the responses were 4, 3, 2, 1 and 0 respectively. For negative statements, the scoring system was reverse. Fatalistic score of a respondent was determined by summing the scores for responses to all the eight statements in the scale. Fatalistic scores of the respondents could range from 0 to 32, where 0 score indicating no fatalism and 32 indicating high fatalism.

3.6.2.9 Attitude towards PAB

According to Thurstone (1946), attitude may be defined as "the degree of positive or negative effect associated with psychological object like symbol, phrase, slogan, person, institution, ideal or ideas towards which people can differ in varying degrees". Attitude towards PAB of the respondents was measured by using eight different statements. The statements have been selected based on perception about PAB

activities by the beneficiaries. The selected statements had either positive or negative view. The respondents given their opinion against 5-point rating scale as 'strongly agree', 'agree', and 'no opinion', 'disagree' and 'strongly disagree'. The scores were assigned as 4, 3, 2, 1 and 0 respectively for a positive statement and a reverse score was given for all negative statements. Thus, the possible score could range from 0 to 32, where 0 indicated strongly disagree or unfavorable attitude and 32 indicated strongly agree or highly favorable attitude towards PAB.

3.6.3 Scope for practicing sandbar cropping technology

Focus Group Discussion (FGD) was conducted among a group of 20 respondents to identify the perception of scope for practicing sandbar cropping technology. At first the group was divided into four sub-groups and each sub-group was asked about their perception regarding scope for practicing sandbar cropping technology. Each group was allowed to work through discussion among themselves. One of the group members was selected to list down the perception about the scopes for practicing sandbar cropping technology. Each group was closely monitored. After completing the discussion, all identified perception of scopes were listed down and finally included in the interview schedule. The respondents was asked to indicate the importance of their perception about scope by mentioning whether it was high, moderate, low or not at all with the corresponding scores of 3, 2, 1, 0 respectively. A 'Perception Index of Scope' was prepared for analyzing the degree of severity using the following formula:

$$PIS = f_h \times 3 + f_m \times 2 + f_l \times 1 + f_n \times 0$$

Where,

PIS = Perception Index of Scope

f_h = frequency of respondents mentioning the perception of scope as 'high'

f_m = frequency of respondents mentioning the perception of scope as 'moderate'

f_l = frequency of respondents mentioning the perception of scope as 'low'

f_n = frequency of respondents mentioning the perception of scope as 'not at all'

3.7 Hypothesis

A hypothesis is a proposition, which can be put to a test to determine its validity (Goode and Hätt, 1981). According to Kerlinger (1973) a hypothesis is a conjectural statement of the relation between or more variables. It may prove to be correct or incorrect. In any event, it leads to an empirical test. Hypothesis may be broadly classified into two types, namely research hypothesis (H_a) and null hypothesis (H_0).

Research hypothesis (H_a) states anticipated relationships between concerned variables. Based on review literature and development of conceptual framework, the research hypothesis was: "there are relationships between nine selected characteristics of the respondents with the constraints of sandbar cropping technology".

Null hypothesis (H_0) states that there is no relationship between the concerned variables. Therefore, the null hypothesis of this study if there are no relationships between nine selected characteristics of the respondents with the constraints of sandbar cropping technology.

3.8 Data Processing and Analysis

3.8.1 Compilation of data

After completion of field survey, data from all the interview schedules were coded, compiled, tabulated and analyzed in accordance with the objectives of the study. In this process, all the responses in the interview schedule were given numerical coded value. Local units were converted into standard units and qualitative data were converted into quantitative ones by means of suitable scoring whenever necessary. The responses to the questions in the interview schedules were transferred to a master sheet to facilitate tabulation.

3.8.2 Categorization of data

For describing the different characteristics and their constraint, the respondents were classified into several categories. These categories were developed by considering the nature of distribution of data, general understanding prevailing in the social system and possible scores system. The procedure for categorization of data in respect of different variables will be elaborately discussed while describing those variables in Chapter 4.

3.8.3 Statistical analysis

The analysis was performed using Statistical Package for Social Science (SPSS) computer package. Descriptive analysis such as range, number, percentage, mean, standard deviation and rank order were used whenever necessary. For clarity of understanding tables were also used for presenting the data. Pearson's Product Moment Correlation Co-efficient (r) was used to examine the relationships of independent variables of the respondents with the constraints of sandbar cropping technology.

CHAPTER 4

RESULTS AND DISCUSSION

The results of the study have been presented in four separate sections in this chapter with the help of proper statistical analysis along with their logical interpretations. The first section deals with the extent of constraints (dependent variable) as faced by the respondents. The second section deals with the description of selected individual characteristics of the farmers' (independent variables) of the study. The third section deals with the relationships between constraints of sandbar cropping technology and the selected characteristics of the respondents. The last section deals with the determination of scope for wider dissemination of sandbar cropping technology.

4.1 Constraints of Sandbar Cropping Technology

4.1.1 Comparison among the individual constraints

For having the better understanding regarding constraints of sandbar cropping technology, it was necessary to have an idea about the comparative constraint in 24 selected constraints. For this purpose, Constraint Index (CI) was computed (cf. Chapter 3). The computed CI of the 24 constraints ranged from 16 to 239 (against a possible range from 0 to 285) which are arranged in rank order according to their CI as shown in Table 4.1.

Data in Table 4.1 indicate that "low price during the peak period of pumpkin" was number one constraint. Majority of the respondents of the study area are extreme poor. They cultivate pumpkin for the hope of instant profit. But during the harvesting period, the price remains low. In the study area, out of 95 respondents 54 respondents faced this constraint at high extent, 36 respondents faced at moderate extent and 5 respondents faced at low extent i.e. all the respondents faced any level of constraints. (Table 4.1)

Table 4.1 Rank order of 24 selected constraints of sandbar cropping technology

Sl. No.	Constraints	Extents of constraints				CI	Rank order
		High	Moderate	Low	Not at all		
1.	Low price during peak period of pumpkin	54	36	5	0	239	1
2.	Attack of insect and pathogen	54	31	9	1	233	2
3.	Lack of irrigation facilities	50	36	3	6	225	3
4.	Rotting of immature pumpkin in the field	42	40	12	1	218	4
5.	Difficult to find out soil layer	33	49	12	1	208	5.5
6.	Requiring more labor in pumpkin cultivation in sandbar	48	30	4	13	208	5.5
7.	Lack of fuel	38	43	7	7	207	7
8.	Facing constraints in getting fair price for middle men	26	56	12	1	202	8
9.	Land owner discourage to provide same land for next year cultivation	39	27	21	8	192	9
10.	Rotting of pumpkin during storage	19	34	39	3	164	10
11.	Lack of proper communication facilities	6	53	29	7	153	11
12.	Demanding share of crops by land owner	12	36	39	8	147	12
13.	Non-availability of seeds in time	9	24	50	12	125	13
14.	Facing constraints for stealing of pumpkin	15	18	40	22	121	14
15.	Damage of pumpkin by rodent and insects during storage	8	17	61	9	119	15
16.	Lack of store-house facilities for pumpkin	1	42	29	23	116	16
17.	Improper land demarcation	10	29	27	29	115	17.5
18.	Lack of manures in time	7	21	51	16	115	17.5
19.	Inadequate knowledge regarding the control of pests and diseases	3	27	42	23	105	19
20.	Individual harvesting require more time and labor	1	9	66	19	87	20
21.	Pit preparation in sand is laborious	4	22	29	40	85	21
22.	Insufficient training on pumpkin cultivation	2	19	30	44	74	22
23.	Improper grading of pumpkin during selling	0	1	30	64	32	23
24.	Difficult to identify mature pumpkin	0	4	8	83	16	24

Foot Note: CI= Constraints Index (possible score range 0 to 285)

Most of the respondents complained about “attack of insects and pathogen” as their constraint of sandbar cropping technology. Sandbar is not as like as plain land. Temperatures during day time remain very high and during night remain low. So, the “attack of insect and pathogen” is occurred in high extent and it become second in the Table 4.1.

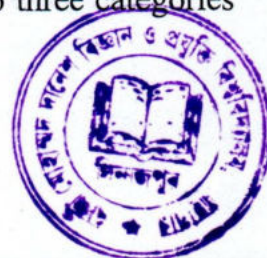
The CI of “lack of irrigation facilities” is 225 and ranked third in the table. During the primary stage of the crops, two times irrigation has to give to the crops during morning and evening, which is very laborious. Table 4.1 revealed that 50 respondents faced this constraint in high extent, 36 respondents faced this constraint in moderate extent, and 3 respondents faced this constraint in low extent in the study area, where as 6 respondents faced no constraints.

“Difficult to identify mature pumpkin”, “Improper grading of pumpkin during selling” and “Insufficient training on pumpkin” are the last three constraints i.e. 24th, 23rd and 22nd in the Table 4.1. Their CI becomes 16, 32 and 74 respectively. The PAB personnel might have regular contact with the farmers regarding identification and grading of mature pumpkin as well as arranging training program that help them to a certain extent i.e. why the above mentioned three constraints perceived as low by the respondents.

More the three-fifths (64.2 percent) respondents of the study area are illiterate to can sign only (Table 4.5). For this reason, the knowledge levels of the respondents are very low and sandbar cropping system is new to the respondents. As a result, they are facing different kinds of constraints on this aspects and dissemination of this technology is being hampered.

4.1.2 Overall constraints of sandbar cropping technology

Overall constraints scores for 24 selected constraints of sandbar cropping technology could theoretically range from 0 to 72, where 0 indicating no constraints and 72 indicating high constraints. However, the observed constraints scores of the respondents ranged from 22 to 57 with a mean of 36.91 and standard deviation 7.21. Based on their constraint scores, the respondents were classified into three categories viz. ‘low’, ‘medium’ and ‘high’ has been presented in the Figure 4.1.



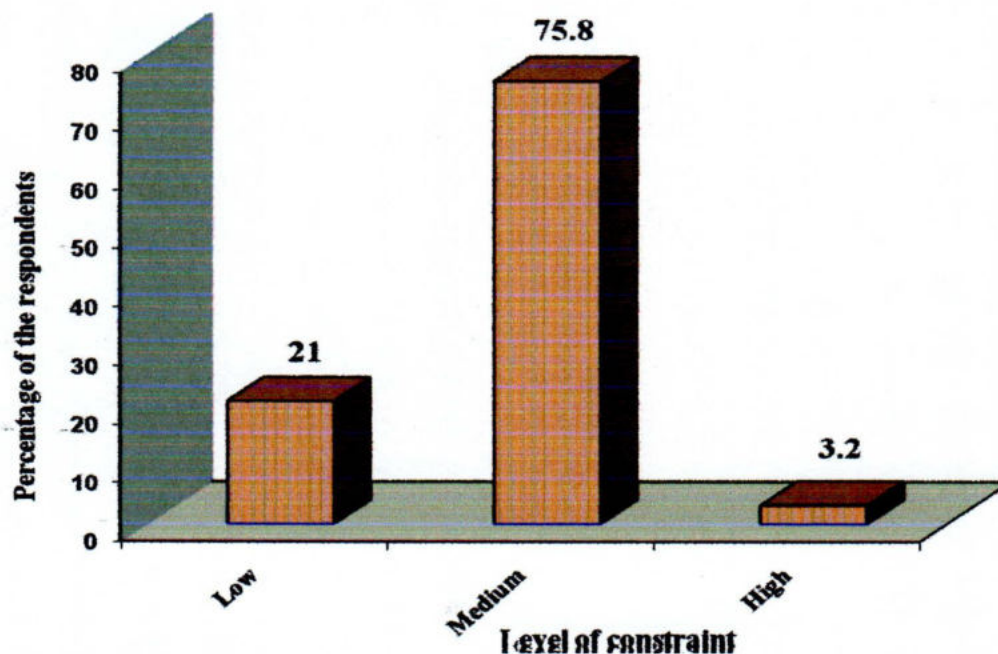


Figure 4.1 Distribution of the respondents according to their overall constraints of sandbar cropping technology

Data furnished in the Figure 4.1 reveal that slightly more than three-fourth (75.8 percent) of the respondents had medium constraints while 21.0 percent had low constraints and only 3.2 percent had high constraints. The average (mean) value of the constraints indicates that the respondents in average had medium constraints of sandbar cropping technology. So, from this finding, it can be said that the desired level dissemination of sandbar cropping will not occur if the various constraints of the respondents are not minimized by the concerned authority.

Constraints faced by the respondents of sandbar cropping technology were cross-checked through making Scored Causal Diagrams (SCDs) of Participatory Farm Management (PFM). Constraints were discussed with the respondents, assuming the 'end problem' being 'low dissemination of sandbar cropping technology'. Firstly the constraints mentioned by the respondents were listed, secondly diagrams were drawn by them on the plain ground to show causal relationships between the constraints, and finally scoring of selected constraints were performed again by them. In this way SCDs was prepared by the group of respondents (Figure 4.2). The constraints

identified by the group has been listed here with their relative importance indicated by the original score numbers as shown inside the parentheses.

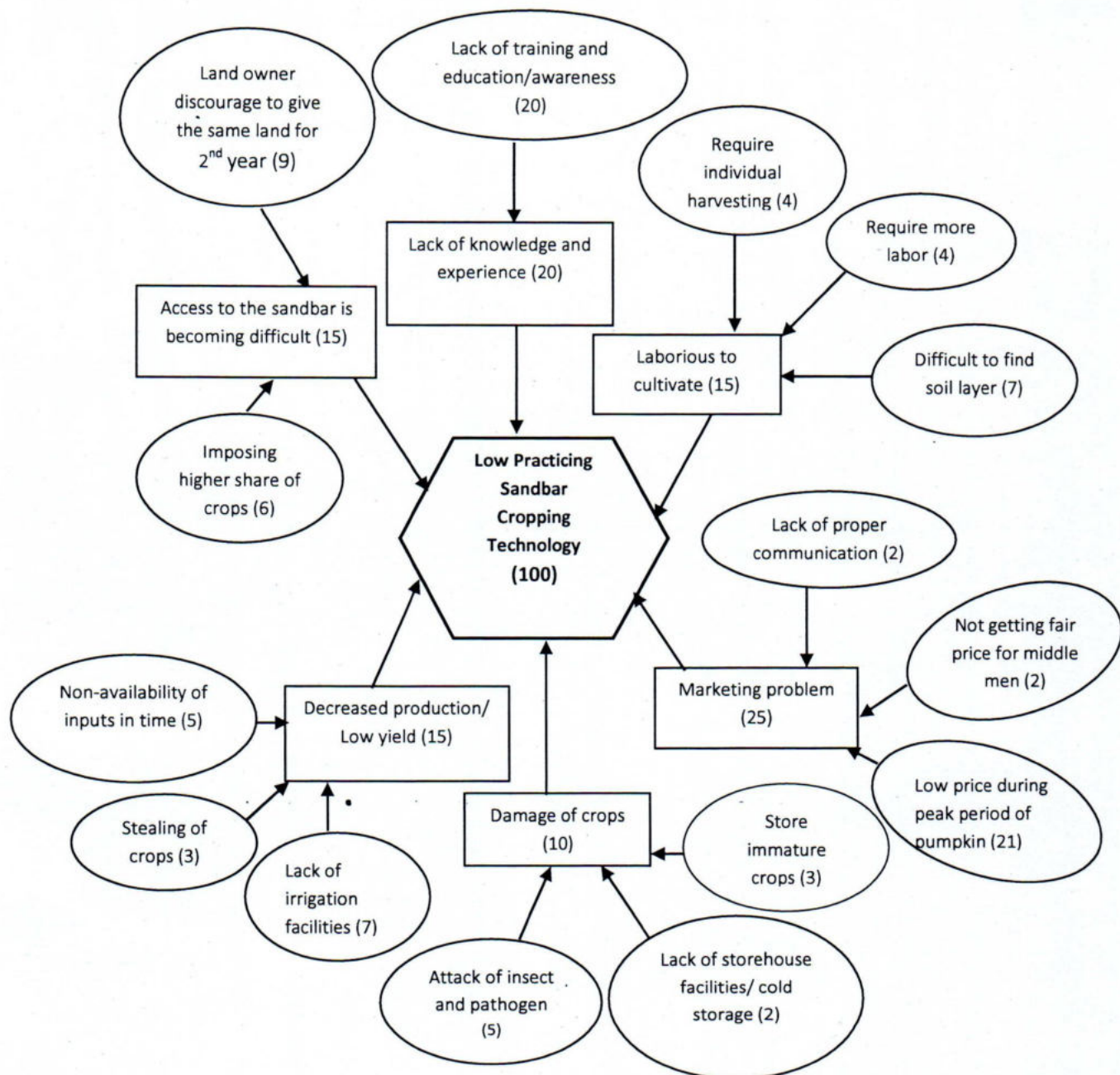
End constraint: low practicing sandbar cropping technology (100)

Intermediary constraints:

- i. Lack of knowledge and experience (20)
- ii. Laborious to cultivate (15)
- iii. Marketing problem (25)
- iv. Damage of crops (10)
- v. Decreased production/ low yield (15)
- vi. Access to the sandbar is becoming difficult (15)

Root causes:

- i. Low price during peak period of pumpkin (21)
- ii. Lack of training and education/awareness (20)
- iii. Land owner discourage to give the same land for 2nd year (9)
- iv. Difficult to find soil layer (7)
- v. Lack of irrigation facilities (7)
- vi. Imposing higher share of crops (6)
- vii. Attack of insect and pathogen (5)
- viii. Non-availability of inputs in time (5)
- ix. Require more labor (4)
- x. Not getting fair price for middle men (4)
- xi. Store immature crops (3)
- xii. Stealing of crops (3)
- xiii. Lack of proper communication (2)
- xiv. Not getting fair price for middle men (2)
- xv. Lack of storehouse facilities /cold storage (2)



= Intermediary Constraint,
 = Root Constraint,
 = End Constraint

—→ = Causal relationship between constraints and the number of parenthesis indicates score of the concerned constraints

Figure 4.2 Scored Causal Diagram (SCDs) prepared by the beneficiaries of Practical Action Bangladesh (PAB)

On exploration of the root causes of sandbar cropping technology, 15 root causes have been identified by the farmers. Among the 'root' causes 'low price during peak period of pumpkin' got the highest score (21) and was the most crucial root causes. Then 'lack of training and education/awareness' was the second root cause with a score of 20. It was highly logical because lack of training caused lack of knowledge and experience resulting in constraints facing and accordingly there was low dissemination of sandbar cropping.

Though the other root causes such as 'lack of proper communication', 'not getting fair price for middle men' and 'lack of storehouse facilities/cold storage' bear less significance but these could never be avoided. These cause also some sorts of influences on the dissemination of sandbar cropping technology.

4.2 Selected Characteristics of the Respondents

Nine selected characteristics of the respondents were studied in this research, which were the independent variables. The descriptive statistics of the selected characteristics of the respondents have been described in the subsequent sections.

4.2.1 Age

The age of the respondents varied from 24 to 75 years with a mean and standard deviation were 40.60 and 11.81 respectively. The respondents were classified into three categories on the basis of their age: 'young (up to 35 years); 'middle aged' (36-50 years) and 'old' (>50 years). On the basis of the age, the respondents were distributed into three categories as presented in Table 4.2.

Table 4.2 Distribution of the respondents according to their age

Range	Categories	Respondents		Mean	Standard Deviation
		Frequency	Percent		
24-75	Young (Up to 35 years)	42	44.3	40.6	11.81
	Middle aged (36-50 years)	37	38.9		
	Old (>50 years)	16	16.8		

More than three-fourth (83.2 percent) of the total respondents belonged to the young to middle-aged group and 16.8 percent were under old category. Sandbar cropping is a very much laborious job compare to plain land cultivation. That's why; maximum of

the respondents belonged to active age group (young and middle) having strong encouragement and hard working ability.

4.2.2 Educational qualification

The educational qualification scores of the respondents ranged from 0 to 12, the mean being 2.10 and standard deviation 2.95. Based on the educational qualification scores, the respondents were classified into five categories like 'illiterate (0)'; 'can sign only' (0.5); 'primary education' (1-5); 'secondary education' (6-10) and 'above secondary education' (>10). The distribution of the respondents on the basis of their level of educational qualification has been presented in Table 4.3.

Table 4.3 Distribution of the respondents according to their educational qualification

Range	Categories	Respondents		Mean	Standard Deviation
		Frequency	Percent		
0-12	Illiterate (0)	20	21.0	2.10	2.95
	Can sign only (0.5)	41	43.2		
	Primary education (1-5)	21	22.1		
	Secondary (6-10)	12	12.6		
	Above secondary (>10)	1	1.1		

Data presented in the above Table indicate that 43.2 percent were can sign only, 22.1 percent had primary education 21.0 percent of the respondents were illiterate, 12.6 percent had secondary education and only 1.1 percent were above secondary education level.

Education helps the respondents obtain useful information related to agricultural practice, especially about the unusual sandbar cropping through reading leaflets, booklets, books and other printed materials. The findings of the study indicate that majority of the respondents (64.2 percent) are illiterate to can sign only, who are supposed to face a great difficulty in practicing sandbar cropping. Such considerations indicate that there is a need for improving literacy level among the respondents for enhancing adoption of sandbar cropping.

4.2.3 Family size

The minimum and maximum family size scores were 2 and 8 respectively. The average family size was 4.73 with a standard deviation 1.25. The respondents were classified into three categories like 'small family' (up to 4); 'medium family' (5-6); 'large family' (>7) are presented in Table 4.4.

Table 4.4 Distribution of the respondents according to their family size

Range	Categories	Respondents		Mean	Standard Deviation
		Frequency	Percent		
2-8	Small family (Up to 4)	46	48.4	4.73	1.25
	Medium family (5-6)	39	41.1		
	Large family (>6)	10	10.5		

The data furnished in the above Table reveal that near about half (48.4 percent) of the respondents had small family size, 41.1 percent had medium family size and 10.5 percent had large family. The national average family size in Bangladesh is 4.63 (BBS, 2012) which is near the mean value of the present study (4.73). Almost similar result was found in the study of Huda (2011).

4.2.4 Annual family income

The annual family income scores of the respondents ranged from 24 to 99 with a mean of 49.53 and standard deviation 17.92. According to the annual family income, the respondents were classified into three categories such as 'low income' (<31); 'medium income' (31-70); and 'high income' (>70) as presented in the Table 4.5.

Table 4.5 Distribution of the respondents according to their annual family income

Range	Categories	Respondents		Mean	Standard Deviation
		Frequency	Percent		
24-99	Low income (<31)	5	5.3	49.53	17.92
	Medium income (31-70)	76	80.0		
	High income (>70)	14	14.7		

Data presented in the Table 4.5 indicate that exactly four-fifth proportion (80.0 percent) of the respondents earned medium income and 14.7 percent of the respondents earned high income while only 5.3 percent of the respondents earned low income. This might be due to fact that the active family members were engaged in the sandbar cropping during the period, when there was no work.

4.2.5 Training received

Training received score of the respondents computed as days of participating in training. The training received scores of the respondents ranged from 0 to 6 with a mean of 1.48 and standard deviation 1.46. According to the training received, respondents were classified into three categories like 'short' (up to 2 days); 'medium' (3-5 days) and 'long' (>5 days) as presented in Table 4.6.

Table 4.6 Distribution of the respondents according to their training received

Range	Categories	Respondents		Mean	Standard Deviation
		Frequency	Percent		
0-6	Short (up to 2 days)	77	81.0	1.48	1.46
	Medium (3-5 days)	15	15.8		
	Long (>5 days)	3	3.2		

Data presented in the Table 4.6 revealed that majority (81.0 percent) of the respondents received short training on sandbar cropping followed by 15.8 percent received medium training and only 3.2 percent of the respondents received long period training. Training plays an important role in motivating the individuals and encourages them to participate in sandbar cropping practice. Training increases skills and knowledge about the sandbar cropping technology of the farmers which makes the respondents much more competent in performing different sandbar cropping activities.

4.2.6 Knowledge on sandbar cropping

The knowledge on sandbar cropping of the respondents ranged from 6 to 18 with the mean of 12.21 and standard deviation 2.68 against the possible range of 0-20. According to the knowledge on sandbar cropping, respondents are classified into three categories viz. 'poor knowledge' (0-8); 'moderate knowledge' (9-15); 'high knowledge' (>15) as presented in Table 4.7.

Table 4.7 Distribution of the respondents according to their knowledge on sandbar cropping

Range		Categories	Respondents		Mean	Standard Deviation
			Frequency	Percent		
Possible	Observed					
0-20	6-18	Poor knowledge (0-8)	9	9.5	12.21	2.68
		Moderate knowledge (9-15)	76	80.0		
		High knowledge (>15)	10	10.5		

Data furnished in the above Table revealed that exactly four-fifth (80 percent) of the respondents had moderate knowledge followed by 10.5 percent of the respondents had high knowledge and 9.5 percent had poor knowledge on sandbar cropping technology. If knowledge and awareness on sandbar cropping is increased among the respondents then the technology will be more disseminated.

4.2.7 Aspiration

The aspiration scores of the respondents ranged from 9 to 26 against the possible range 0-32 with a mean and standard deviation 18.23 and 3.41 respectively. Based on their aspiration scores, the respondent were classified as 'low aspiration' (up to 14); 'medium aspiration' (15-20) and 'high aspiration' (>20) which is presented in the Table 4.8.

Table 4.8 Distribution of the respondents according to their aspiration

Range		Categories	Respondents		Mean	Standard Deviation
Possible	Observed		Frequency	Percent		
0-32	9-26	Low aspiration (Up to 14)	12	12.6	18.23	3.41
		Medium aspiration (15-20)	57	60.0		
		High aspiration (>20)	26	27.4		

It is revealed from the Table 4.8 that exact three-fifths (60.0 percent) of the respondents had medium aspiration, 12.6 percent of the respondents had low and slightly more than one-fourth (27.4 percent) of the respondents had high aspiration respectively. Findings showed that majority of the farmers possessed their aspiration which was the effect of low educational status of the respondents.

4.2.8 Fatalism

Fatalism is a mental condition that leads a person to believe that human situation and acts are predetermined by some supernatural power and could never or seldom be influenced by individual or by the act if any persons. The fatalism score of the respondents varied from 7 to 21 and the possible range was 0 to 32. The mean score was 13.12 and standard deviation 3.17. On the basis of the fatalistic scores, the respondents were classified into three categories such as 'low fatalism' (<10);

‘medium fatalism’ (10-15) and ‘high fatalism’ (>15). The distribution of the respondents according to their fatalistic score has been presented in the Table 4.9.

Table 4.9 Distribution of the respondents according to their fatalism

Range		Categories	Respondents		Mean	Standard Deviation
Possible	Observed		Frequency	Percent		
0-32	7-21	Low fatalism (<10)	23	24.2	13.12	3.17
		Medium fatalism (10-15)	51	53.7		
		High fatalism (>15)	21	22.1		

Table 4.9 indicate that about three-fourth (75.8 percent) of the respondents were medium to high fatalistic and near about one-fourth (24.2 percent) of the respondents were low fatalistic. Sandbar cropping is not as like as plain land cropping, so respondents who highly depends on fate faced more constraints than the respondents who did not depends on fate and did hard work in the field for higher production. This is a contradictory mental stage of the respondents in the study area because 87.4 percent had medium to high aspiration. Concerned PAB personnel have a great scope to work on this phenomenon for wider dissemination of sandbar cropping technology.

4.2.9 Attitude towards PAB

The score of attitude towards PAB of the respondents could range from 0 to 32, while the observed scores ranged from 10 to 29. The average score was 21.68 and standard deviation 4.83. The respondents were categorized as ‘less favorable’ (<15); ‘moderately favorable’ (16-20) and ‘highly favorable’ (>20) as shown in the following Table 4.10.

Table 4.10 Distribution of the respondents according to their attitude towards PAB

Range		Categories	Respondents		Mean	Standard Deviation
Possible	Observed		Frequency	Percent		
0-32	10-29	Less favorable (<15)	15	15.8	21.68	4.83
		Moderately favorable (16-20)	18	18.9		
		Highly favorable (>20)	62	65.3		

Data presented in Table 4.10 show that the highest portion (65.3 percent) of the respondents had highly favorable attitude towards PAB, followed by 18.9 percent had moderately favorable and 15.8 percent had less favorable attitude towards PAB. As

the respondents had favorable attitude towards PAB, they are engaged in sandbar cropping. The respondents strongly said that they were engaged in sandbar cropping and became benefited. If they were not, they would not be in the group. They have also said that PAB has assisted them in providing inputs for cultivating in the sandbar.

4.3 Relationship of the Nine Selected Characteristics (Independent Variables) with Constraints of Sandbar Cropping Technology (Dependent Variable)

This section deals with the relationship between the nine selected characteristics of the respondents i.e. Independent Variables and constraints of sandbar cropping technology i.e. dependent variable. To determine the relationship between independent variables and dependent variable, the following null hypothesis was tested, "There is no relationship between nine independent variables and constraints of sandbar cropping technology". Pearson's Product Moment Co-efficient of correlation (r) has been used to explore the relationship.

The relationships of independent variables and constraints of sandbar cropping technology have been shown on Table 4.11. For descriptive interpretation of meaning of 'r', the given guidelines as laid down in Table 4.12 have been followed. However, a correlation matrix for all variables has been presented in *Appendix-B*.

Table 4.11 Co-efficient of correlation between constraints of sandbar cropping technology and the selected characteristics of respondents (N=95)

Dependent variable	Independent variables	Pearson Correlation (r) values with 93df	Tabulated value of 'r'	
			0.05 level	0.01 level
Constraints of sandbar cropping technology	Age	0.430**	± 0.210	±0.274
	Educational qualification	-0.243*		
	Family size	0.050 ^{NS}		
	Annual family income	-0.168 ^{NS}		
	Training received	-0.311**		
	Knowledge on sandbar cropping	-0.388**		
	Aspiration	-0.072 ^{NS}		
	Fatalism	0.245*		
	Attitude towards PAB	0.040 ^{NS}		

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

**= Correlation is significant at the 0.01 level (2-tailed)

NS= Non significant

Table 4.12 The meaning of 'r' value

'r' value	Meaning
0.00 to 0.19	A very low correlation
0.20 to 0.39	A low correlation
0.40 to 0.69	A moderate correlation
0.70 to 0.89	A high correlation
0.90 to 1.00	A very high correlation

Source: Cohen and Holiday, 1982

4.3.1 Relationship between age and constraints of sandbar cropping technology

The computed value of the coefficient of correlation was found to be 0.430 as shown in the table 4.11, which led to the following observations on the basis of computed value 'r':

Firstly, a positive relationship was found to exist between the variables. Secondly, there was a moderate relationship. Thirdly, the computed value of 'r' ($r = 0.430$) was found to be larger than the table value ($r = 0.274$) with 93 degree of freedom (df) at 0.01 level of probability. Thus, statistically the relationship was significant at 0.01 level.

Based on the above findings, the null hypothesis was rejected and hence researcher concluded that age of the respondents had significant positive relationship with constraints of sandbar cropping technology. This indicates that the higher age of the respondents, the higher was their constraints.

4.3.2 Relationship between educational qualification and constraints of sandbar cropping technology

The coefficient of correlation was found to be -0.243 as shown in the table 4.11. The following observations can be inferred from this finding:

Firstly, the relationship between the concerned variables was negative. Secondly, the relationship was low. Thirdly, the computed value of 'r' ($r = -0.243$) was found to be larger than the table value ($r = 0.210$) with 93 degree of freedom (df) at 0.05 level of probability. Thus, statistically the relationship was significant at 0.05 level.

Based on the above findings, the null hypothesis was rejected and hence researcher concluded that educational qualification of the respondents had significant negative relationship with their constraints of sandbar cropping technology. The findings

indicated that the higher the educational qualification of the respondents, the lower was their constraints.

4.3.3 Relationship between family size and constraints of sandbar cropping technology

The coefficient of correlation was found to be 0.050 as shown in the table 4.11. The following observations can be made from this finding:

Firstly, the relationship between the concerned variables was negative. Secondly, the relationship was very low. Thirdly, the computed value of 'r' ($r = 0.050$) with 93 degree of freedom (df) was not significant even at 0.05 level of probability.

Based on the above findings, the null hypothesis was not rejected and hence researcher concluded that family member had no significant relationship with constraints of sandbar cropping technology.

4.3.4 Relationship between annual family income and constraints of sandbar cropping technology

The coefficient of correlation was found to be -0.168 as shown in the table 4.11 and this leads to the following findings:

Firstly, the relationship between the concerned variables was negative. Secondly, the relationship was very low. Thirdly, the computed value of 'r' ($r = -0.168$) was found to be smaller than the table value ($r = 0.210$) with 93 degree of freedom (df) at 0.05 level of probability.

Based on the above findings, the null hypothesis could not be rejected and hence researcher concluded that annual family income of the respondents had no significant relationship with constraints of sandbar cropping technology. The findings indicated that the higher the annual family income of the respondents, the lower was their constraints of sandbar cropping technology.

4.3.5 Relationship between training received and constraints of sandbar cropping technology

The coefficient of correlation was found to be -0.311 as shown in the table 4.11. The following observations can be inferred from this finding:

Firstly, the relationship between the concerned variables was negative. Secondly, the relationship was low. Thirdly, the computed value of 'r' ($r = -0.311$) was found to be larger than the table value ($r = 0.274$) with 93 degree of freedom (df) at 0.01 level of probability. Thus, statistically the relationship was significant at 0.01 level.

Based on the above findings, the null hypothesis was rejected and hence researcher concluded that training received of the respondents had significant negative relationship with constraints of sandbar cropping technology. The findings indicated that the more the training received of the respondents, the lower was their constraints.

4.3.6 Relationship between knowledge on sandbar cropping and constraints of sandbar cropping technology

The coefficient of correlation was found to be -0.388 as shown in the table 4.11. The following observations can be inferred from this finding:

Firstly, the relationship between the concerned variables was negative. Secondly, the relationship was low. Thirdly, the computed value of 'r' ($r = -0.388$) was found to be larger than the table value ($r = 0.274$) with 93 degree of freedom (df) at 0.01 level of probability. Thus, statistically the relationship was significant at 0.01 level.

Based on the above findings, the null hypothesis was rejected and hence researcher concluded that agricultural knowledge of the respondents had significant negative relationship with constraints of sandbar cropping technology. The findings indicated that the higher the agricultural knowledge of the respondents, the lower was their constraints.

4.3.7 Relationship between aspiration and constraints of sandbar cropping technology

The coefficient of correlation was found to be -0.072 as shown in the table 4.11. The following observations can be inferred from this finding:

Firstly, the relationship between the concerned variables was negative. Secondly, the relationship was low. Thirdly, the computed value of 'r' ($r = -0.072$) was found to be smaller than the table value ($r = 0.210$) with 93 degree of freedom (df) even at 0.05 level of probability.

Based on the above findings, the null hypothesis could not be rejected and hence researcher concluded that aspiration of the respondents had not significant relationship with constraints of sandbar cropping technology.

4.3.8 Relationship between fatalism and constraints of sandbar cropping technology

The coefficient of correlation was found to be 0.245 as shown in the table 4.11. The following observations can be inferred from this finding:

Firstly, the relationship between the concerned variables was positive. Secondly, the relationship was low. Thirdly, the computed value of 'r' ($r = 0.245$) was found to be larger than the table value ($r = 0.210$) with 93 degree of freedom (df) at 0.01 level of probability. Thus, statistically the relationship was significant at 0.01 level.

Based on the above findings, the null hypothesis was rejected and hence researcher concluded that fatalism of the respondents had significant positive relationship with constraints of sandbar cropping technology. The findings indicated that the more depends on the fate of the respondents, the higher was their constraints of sandbar cropping technology.

4.3.9 Relationship between attitude towards PAB and constraints of sandbar cropping technology

The coefficient of correlation was found to be 0.040 as shown in the table 4.11. The following observations can be inferred from this finding:

Firstly, the relationship between the concerned variables was positive. Secondly, the relationship was very low. Thirdly, the computed value of 'r' ($r = 0.040$) was found to be smaller than the table value ($r = 0.210$) with 93 degree of freedom (df) even 0.05 level of probability.

Based on the above findings, the null hypothesis could not be rejected and hence the researcher concluded that attitude towards PAB of the respondents had no significant relationship with constraints of sandbar cropping technology. The findings indicated that attitude toward PAB of the respondents and constraints of sandbar cropping technology are independent to each other.

4.4 Scope for Practicing Sandbar Cropping Technology

The respondents expressed their opinion regarding scope for practicing sandbar cropping technology and the “Perception Index of Scope” i. e. PIS (cf. chapter 3) has been presented in Table 4.13.

Table 4.13 Perception Index of Scope for practicing sandbar cropping technology

Sl. No.	Statements	Extent of perception of scope				PIS	Rank
		High	Moderate	Low	Not at all		
1.	Production of different crops along with pumpkin	70	15	10	0	250	1
2.	Food security	40	30	15	10	195	2
3.	Employment opportunity for youth	35	30	20	10	185	3
4.	Marketing	25	35	20	15	165	4
5.	Development of leadership	20	25	20	30	130	5

Attempts were made to ascertain the perception index of scope for practicing sandbar cropping technology.

- 1. Production of different crops along with pumpkin:** Sandbar is different as compared to plain land. There might be a great scope of sandbar for production of different types of crops. Pumpkin, Squash, Lettuce, etc. can be cultivated in sandbar and they yield well. Among the crops, pumpkin is suited as best for sandbar. It yields well and it can be stored for long time in house. PAB has been working with farmers to develop a simple and effective solution for improving their livelihood status. Holes, each no more than a metre across, dug into the sand bars, then filled with compost, make the pit. Into these, farmers are able to plant seeds; from which can grow crops that the families can eat, store, even sell to make money. They can then put this money towards medicine, clothes, livestock or schooling for their children. Probably due to this

reason 'production of different crops' has PIS (Perception Index of Scope) of 250 and appeared as the number one perception of scope for practicing sandbar cropping technology.

2. **Food security:** Food security refers to the availability of food and one's access to it. The World Health Organization defines three facets of food security: food availability, food access, and food use. Food availability is having available sufficient quantities of food on a consistent basis. Food access is having sufficient resources, both economic and physical, to obtain appropriate foods for a nutritious diet. Food use is the appropriate use based on knowledge of basic nutrition and care, as well as adequate water and sanitation. The FAO adds a fourth facet: the stability of the first three dimensions of food security over time. (FAO, 2012).

In case of food security, sandbar cropping has great importance. Sandbar cropping increase food production, strengthening the capacity of the respondents to cope with the extreme poverty situation. They can store the pumpkin and sell them during *monga* (a famine like situation) season in the market to buy food for family. The introduction of squash cultivation as a middle crop to be harvested gives an extra income before the harvesting of the pumpkin. May be due to this fact, it appeared second in the table with PIS of 195.

3. **Employment opportunity for youth:** The world is facing a worsening youth employment crisis, young people are almost three times more likely to be unemployed than adults.

Sandbar cropping is an innovative, profitable and challenging job. If youth can engage in sandbar cropping through their own initiative, there is a great scope for improving themselves and improving their financial and livelihood status. They can also have intermediary business scope by the cultivated product of sandbar. This is the reason; it appeared as third position with PIS of 185.

4. **Marketing:** There is a scope of development of marketing system by sandbar crops. If marketing system is not developed then the farmers will ultimately be

loser. Because, there is a probability to overflow the market with the product during the harvesting period and ultimately reducing the price. An extreme poor friendly market strategy is required to ensure the profitability of crops produced in the sandbars. Thus, this statement becomes fourth in the ranking with 165 PIS.

5. **Development of leadership:** Leadership characteristics of the beneficiaries is developed and increased through sandbar cropping technology. This is not a scope, directly related to sandbar cropping, although the respondents indicated it as a scope of this technology. They indicate it as a scope because, in sandbar practice, there are various sandbar spots and in each spots there is a group leader who manages all the members of his group. He organizes them and helps them by providing irrigation, pesticides and other inputs which is provided by the concerned PAB authority. By this way leadership characteristics develop among them. For this reason, it occupying the last position in the perception index of scope with PIS of 130.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Findings

This study was undertaken to assess the extent of constraints of sandbar cropping, to explore the relationship of the demographic characteristics with constraints of sandbar cropping technology and to find out the scope for practicing sandbar cropping technology. The study was carried out in Gangachara upazila under Rangpur district. Ninety five (95) respondents were selected as sample from an updated list of 271 farmers using random sampling method. Data were collected by a pre-tested interview schedule during 1st September to 15th October 2012. A summary of the major findings is given in the subsequent sections.

5.1.1 Constraints of sandbar cropping technology

The Constraints Index (CI) scores of the 24 constraints ranged from 16 to 239 against a possible range from 0 to 285. 'low price during peak period of pumpkin' occupied the highest CI (239) scores and stand top in the ranking while 'difficult to identify mature pumpkin' showed lowest score (CI=16) occupying the last position in the ranking.

The overall constraints scores of the respondents ranged from 22 to 57 against the possible range of 0 to 72. The average constraints score was 36.91 and standard deviation is 7.21. Slightly more than three-fourths (75.8 percent) of the respondents had medium constraints, 21.0 percent had low constraints and only 3.2 percent had high constraints of sandbar cropping technology.

Constraints faced by the respondents of sandbar cropping technology were cross-checked through making Scored Causal Diagrams (SCDs) of Participatory Farm Management (PFM). Among the 'root' causes 'low price during peak period of pumpkin' got the highest score followed by 'lack of training and education/awareness'.

5.1.2 Selected characteristics of the respondents

Age: The age of the respondents varied from 24 to 75 years with a mean and standard deviation were 40.60 and 11.81 respectively. More than three-fourths (83.2 percent) of the total respondents belonged to the young to middle-aged group and 16.8 percent were under old category.

Educational qualification: The educational qualification scores of the respondents ranged from 0 to 12, with a mean and standard deviation of 2.10 and 2.95 respectively. Majority of the respondents (64.2 percent) were illiterate to can sign only where as 22.1 had primary education. The percentages of secondary and above secondary education were 12.6 and 1.1 respectively.

Family size: The minimum and maximum family size scores were 2 and 8 respectively. The average family size was 4.73 with a standard deviation 1.25. About half (48.4 percent) of the respondents had small family size, 41.1 percent had medium family size and 10.5 percent had large family.

Annual family income: The annual family income scores of the respondents ranged from 24 to 99 with a mean of 49.53 and standard deviation 17.92. Among the respondents, exactly four-fifths (80.0 percent) earned medium income and 14.7 percent belonged to high income category while only 5.3 percent of the respondents earned low income.

Training received: The training received scores of the respondents ranged from 0 to 6 with a mean of 1.48 and standard deviation 1.46. Overwhelming majority (81.0 percent) of the respondents received short training on sandbar cropping followed by 15.8 percent received medium training and only 3.2 percent of the respondents received long period training.

Knowledge on sandbar cropping: The knowledge on sandbar cropping of the respondents ranged from 6 to 18 against the possible range of 0 to 20 with the mean of 12.21 and standard deviation 2.68. Exactly four-fifths (80 percent) of the respondents had moderate knowledge followed by 10.5 percent had high knowledge and 9.5 percent had poor knowledge on sandbar cropping technology.

Aspiration: The aspiration scores of the respondents ranged from 9 to 26 against the possible range 0 to 32 with a mean and standard deviation 18.23 and 3.41 respectively. Three-fourths (60.0 percent) of the respondents had medium aspiration while 12.6 percent had low, and slightly more than one-fourths (27.4 percent) of them had high aspiration respectively.

Fatalism: The fatalism score of the respondents varied from 7 to 21 and the possible range was 0 to 32. The mean score was 13.12 and standard deviation 3.17. About three-fourths (75.8 percent) of the respondents were medium to high fatalistic and near about one-fourths (24.2 percent) of the respondents were low fatalistic.

Attitude towards PAB: The score of attitude towards PAB of the respondents could range from 0 to 32, while the observed scores ranged from 10 to 29. The average score was 21.68 and standard deviation 4.83. Highest portion (65.3 percent) of the respondents had highly favorable attitude towards PAB, followed by 18.9 percent had moderately favorable and 15.8 percent had less favorable attitude towards PAB.

5.1.3 Relationship between selected characteristics and constraints of sandbar cropping technology

Nine null hypotheses were tested to explore the relationship between the selected characteristic of the respondents and constraints of sandbar cropping technology. Out of nine tested null hypotheses, five were rejected. Among these, educational qualification, training received and knowledge on sandbar cropping of the respondents showed negative significant relationship with the constraints of sandbar cropping technology. Age and fatalism showed a positive significant relationship with their constraints of sandbar cropping technology. On the other hand, family size, annual family income, aspiration and attitude towards PAB of the respondents did not show any significant relationship with the constraints of sandbar cropping technology.

5.1.4 Scope for practicing sandbar cropping technology

The respondents mentioned their opinion on five scopes of sandbar cropping technology. 'Production of different crops along with pumpkin' ranked first followed

by 'food security' obtaining PIS of 250 and 195 respectively. 'Development of leadership' becomes lowest in the perception index of scope table with PIS of 130.

5.2 Conclusions

Conclusions drawn on the basis of the findings and their logical interpretation in the light of the other relevant facts are presented below:

1. Finding indicates that the respondents faced considerable constraints in all 24 selected constraints. However, the extent of constraints for "low price during the peak period of pumpkin" was the highest. Regarding overall constraints of sandbar cropping technology, about three-fourths (75.8 percent) of the farmers faced medium constraints. From this finding, it may be concluded that until the farmers are free from different constraints of sandbar cropping, dissemination of this technology may be hampered.
2. As farmers' age showed a positive significant relationship with their constraint of sandbar cropping technology. Thus, it could be told that old farmers faced more constraints in sandbar cropping than the younger farmers. Sandbar cropping is a very much laborious task. Probably due to less energy and more fatalistic characteristics, old farmers faced greater constraints than that of younger ones.
3. Level of education and agricultural knowledge of the farmers had significant negative correlation with the constraints of sandbar cropping technology. This means that higher the educational qualification of the farmers and their agricultural knowledge, lower were their constraints. So, it may be concluded that unless the literacy rate of the farmers is increased, they might continue to face constraints in practicing sandbar cropping. Agricultural knowledge level also appeared to be very important in conducting sandbar techniques.
4. Significant negative correlation of annual family income of the farmers with the constraints of sandbar cropping technology may lead to an understanding that they face less constraint if their family income is higher. In other words, farmers having low family income face more constraints. Thus, financial

support from family for the sandbar farmers is important towards facing lesser problems in practicing sandbar techniques.

5. Fatalism level of the respondents showed significant positive relationship with their constraints faced in sandbar farming. This means the farmers, who were more fatalists, faced more constraints. Thus, it may mean that fatalistic attitudes of the farmers stood on way of practicing improved sandbar farming.

5.3 Recommendations

5.3.1 Recommendations for policy implication

1. It was observed that farmers received low market price during peak of harvest of pumpkins. Steps might be taken so that reasonable price can be ensured to the farmers, otherwise the intermediaries would be benefited. As a result, farmers would be discouraged to practice this technology. The concerned policy makers of PAB, other NGOs and local government should improve the marketing system so that farmers could get the fair price from their product round the year especially during the peak period of production.

In general, about three-fourths of the farmers had been facing medium constraints. Thus, the concerned NGOs and DAE should have their strategic actions in order to identify the constraints associated with this specialized farming and minimize the constraints towards appropriate dissemination of this technology.

2. As the sandbar cropping system is laborious and the constraint facing in it is related more to the old farmers, any initiatives related to this may be started with the younger farmers. DAE and concerned NGO may care for it.
3. A major part of the respondents were illiterate or could sign only. And their situation of problem facing was linked to their literacy. Hence, it is recommended that concerned PAB authority, GOs and other NGOs may come forward to provide functional literacy to the farmers so that they can at least read and write. The adult farmers should be encouraged to increasingly take part in adult education program. The minimal literacy of the farmers may bring them to a state to face less constraint.

Similarly, the farmers who received higher training on sandbar cropping technology seem to face low constraints on this aspect. Also, enhanced agricultural knowledge of the farmers was associated with less problem confrontation. Therefore, more training programs on sandbar cropping should be arranged to upgrade knowledge and skills of the farmers on sandbar cropping technology and its related issues.

4. Annual family income played a role towards facing lesser constraints. If possible PAB should manage credit for the farmers from any commercial bank or NGOs working in the study area without or with least interest so that their limited income may not stand against the proper flourishing of this farming.
5. Sandbar cropping is now practiced under NGO (PAB) and private level and has already gained its popularity. So, the government should give special emphasis on this issue and take necessary supportive measures for ensuring easy availability of inputs at reasonable prices.

5.3.2 Recommendations for further study

1. The present study was carried out in five sandbar spots of Kolkonda union under Gangachara upazila of Rangpur district. Similar study may be conducted in other part of the riverine areas of the country, which could be helpful for all to better understanding and generalization of constraints regarding sandbar cropping technology.
2. The present research included 24 selected constraints regarding sandbar cropping technology. Further research may be undertaken for investigation of the more constraints of the said technology.
3. There are many independent characteristics of the respondents and only nine were selected to conduct the present study. The research explored the relationship of nine independent variables with constraints of sandbar cropping technology. Further study may be conducted by selecting other independent variables to observe relationship with the constraints.
4. The research was conducted in the farmers' level only. Similar study may be conducted by taking data from the all personnel who are directly or indirectly

involve in this technology (stakeholders) for getting their opinion about the scope of the sandbar cropping technology.

5. Constraints of sandbar cropping technology i.e. dependent variable and nine selected characteristics of the respondents' i.e. independent variables relationship was determined by using only correlation co-efficient method which showed the relationships between the selected characteristics concerned and not 'cause and effect' relationship. Thus, to determine the other phenomena, it is necessary and recommended that other sophisticated research design using higher level of parametric measurement be implemented.

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APPENDIX-A

An English Version of Interview Schedule

Department of Agricultural Extension

Hajee Mohammad Danesh Science and Technology University, Dinajpur

An interview schedule on “Constraints and Scope for Practicing Sandbar Cropping Technology in Riverine Areas of Bangladesh”

Serial no.....

(Please answer the following questions)

Name of the respondent..... Village.....

Union..... Upazilla.....

1. Age

What is your present age?Years

2. Educational qualification

(Please mention your educational qualification)

- a) I can't read and write (.....)
- b) I can sign name only (.....)
- c) I have studied up to class (.....)

3. Family size

Please mention your total number of family members (including yourself)

Family member	Numbers
Male	
Female	
Total	

4. Annual family income

Please mention your annual family income from the followings:

Sl. No.	Source of income	Production	Market price	Total(TK.)
1.	Crops			
2.	Vegetables			
3.	Fruits			
4.	Poultry			
5.	Fish culture			
6.	Domestic Animals			
7.	Service			
8.	Business			
9.	Day labor			
10.	Rickshaw/Auto-Rickshaw driving			
11.	Others(if any)			
Total (TK.)				

5. Training received

Did you receive any training from this or any other organization?

- ☐ Yes
☐ No

If yes, please give the following information

Sl. No.	Subject of the training	Duration	Sponsoring agency
1.			
2.			
3.			

6. Knowledge on sandbar cropping: Please answer the following questions

Sl. No.	Questions	Marks	Obtained marks
1.	Which crops do you cultivate in the sandbar?	1.0	
2.	Mention two pumpkin varieties.	2.0	
3.	Mention two insects name that attack in the pumpkin.	2.0	
4.	Mention two disease names of sandbar crops.	2.0	
5.	How do you convert uncultivable sandbar into cultivable?	3.0	
6.	How do you sow crops in the sandbar?	2.0	
7.	What spacing do you follow in case of sandbar crops?	1.0	
8.	What kinds of fertilizer do you use?	2.0	
9.	How do you manage the insect pest and diseases?	3.0	
10.	How and when do you harvest the crops?	2.0	

7. Aspiration

Please indicate the degree of your agreement with the following statement:

Sl. No.	Statements	Extent of agreement/disagreement				
		Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
1. (+)	If one works carefully, success will surely knock at his door.					
2. (-)	I do not prefer to adopt new technology.					
3. (+)	Special training on this technology will be helpful for me for better production					
4. (-)	By doing agricultural activities I do not want to improve my social status					
5. (+)	I want that everybody should accept my suggestion					
6. (-)	Establishment in life is not possible by sandbar cropping technology					
7. (+)	By practicing sandbar cropping I can improve my status					
8. (-)	Production will be low even with a balanced fertilization					

8. Fatalism

Please indicate the degree of your agreement with the following statement:

Sl. No.	Statements	Extent of agreement/disagreement				
		Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
1. (+)	Man is born by the wish of Allah, so birth control is a great sin					
2. (-)	Dependence on fate is not enough to educate the children					
3. (+)	If fate is well the god will protect the crops					
4. (-)	If one want to develop in life, he has to work hard, do not depend on fate					
5. (+)	For high production in the sandbar proper management is not necessary, if fate is well than production will be automatically high					
6. (-)	For controlling pest and diseases, necessary steps should take, should not depend on fate					
7. (+)	If fate is well, development in the life will be accomplished automatically, do not need to adopt sandbar cropping technology					
8. (-)	Development in the life is possible without practicing agriculture					

9. Attitude towards PAB

Please mention you attitude about the followings:

Sl. No.	Statements	Extent of agreement/disagreement				
		Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
1. (+)	PAB activities are very reliable and beneficial to the people					
2. (-)	I do not find interest from my heart to work with the sandbar cropping technology of PAB					
3. (+)	I think sandbar cropping is a suitable and time need technology					
4. (-)	PAB do not think for the development of the standard of living of the poorest people					
5. (+)	PAB increases agricultural knowledge and efficiency through training					
6. (-)	I am not benefited by involving myself with Sandbar cropping technology					
7. (+)	PAB create job opportunity during off season					
8. (-)	Management of PAB is not satisfactory					

APPENDIX-B

Correlation matrix of the dependent and independent variables

	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	Y
X ₁	1									
X ₂	-.261*	1								
X ₃	.285**	-.007	1							
X ₄	-.114	.125	.245*	1						
X ₅	-.008	-.074	-.217*	-.056	1					
X ₆	-.691**	.245*	-.288**	-.073	.088	1				
X ₇	-.102	.110	.048	.168	-.027	.061	1			
X ₈	.299**	-.207*	.068	-.294**	-.121	-.239*	-.170	1		
X ₉	.062	.027	.116	.073	-.107	-.069	.101	-.104	1	
Y	.430**	-.243*	.050	-.168	-.311**	-.388**	-.072	.245*	.040	1

** Correlation is significant at the 0.01 level; * Correlation is significant at the 0.05 level.

X₁ = Age

X₈ = Fatalism

X₂ = Educational qualification

X₉ = Attitude towards PAB

X₃ = Family size

Y = Constraints of sandbar cropping technology

X₄ = Annual family income

X₅ = Training received

X₆ = Knowledge on sandbar cropping

X₇ = Aspiration