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Adaptability Trial of Some Strawberry Varieties at RDA Farm

Md. Feroz Hossain[1]
Dr. Ranajit C. Adhikary[2]

Abstract

In order to select suitable strawberry variety/ varieties *for the Barind Tract Soil, a variety trial of the same was conducted at RDA Demonstration Farm in 2008-09. Five varieties of strawberry (BARI-1, Camarosa, Andana, RABI-3 and Aromas) were tested. The soil of the farm was acidic (pH 5.5) with low organic matter (0.40%) content. The total N, available P and exchangeable K were below the critical level. Unlike other plants, the strawberry plant is shallow rooted crop and tends to use nutrients which are available near the top of the soil. So for good crop regular irrigation and supplement of nutrients were applied. With the pre-conditions above the top performers of strawberry trial were the varieties V_1 (BARI-1) and V_4 (RABI-3). These two varieties produced higher yield in respect of plant height (19.41 and 18.90 cm), canopy coverage (27.04 and 22.85 cm), petiole length (8.14 and 8.05 cm), number of fruits per plant (13 and 12 no.), weight of fruits per plant (150.29 and149.33 g) fruit yield per plot (2.48 and 2.36 kg) and ultimately fruit yield per hectare (8.28 and 7.88 t/ha). On the contrary these two varieties needed lowest number of days to first flowering. From this trial it was identified that V_1 (BARI-1) and V_4 (RABI-3) varieties of strawberry were good yielder, adapted in sandy clay loam soil of Level Barind Tract under Agro Ecological Zone 25.*

Introduction

Strawberry is a false fruit derived from some adjacent swollen tissue (not from the plant's ovary) that belongs to species Fragaria and family Rosaceae. Strawberry is the most popular delicious soft fruit for growing at home and homestead areas. It is luscious and attractive with sweet smell. Its shape and size looks like litchi but colour is dark red. There is no skin (epicarp) of this fruit; therefore, whole fruit can be taken without wasting anything. The seeds are attached with the outer skin of the fruit, which is called "Achene". Achenes are similar to tiny sunflower seeds. Fruit mature rapidly, ripening occurs in 20 to 50 days after pollination. There are a number of achene fruits like Blackberry, Rubusberry, Cloudberry etc. but they are not alike strawberry in respect of attractiveness, sweetness and even luscious and sweet smell (Chattapadday et.al., 1984). It is usually consumed as raw or used in preparing ice cream, jam, jelly, pickles, chocolates, biscuits, cakes etc.

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In Bangladesh strawberry is a newly introduced fruit crop and cultivated mainly in a few areas like Gazipur, Savar (Dhaka), Dinajpur, RDA (Bogra), Matiranga (Khagrachori), Jessore and some other places. There is no statistics about the area and production of this crop, since it has recently been introduced into the country. But its demand is increasing day by day. Different varieties of strawberry differ in taste, color and size are cultivated around the world. In Bangladesh, farmers need suitable varieties of strawberry those suite in agro-climatic condition and meet the demand.

Strawberries are adapted to a wide range of soil types provided they are well drained. Strawberry needs full sun for maximum production and should not be planted under or near shaded area. Light or sandy soil is suitable for commercial production when irrigation is available and attention to be paid to the nutritional needs of the crop. Strawberry likes slightly acidic (around pH 6.5) soil. Plants grow well on well-drained soil with a pH range of 6.0 to 6.5.

Strawberry plants need about 20-26^{0}C in day time and 12-16^{0}C in night time temperature to produce high yield with high quality fruits. Growth rates will be reduced if the recommended day time or night time temperatures go above or bellow this ranges. Strawberry grows best in a location receiving at least 8 hours + direct sunlight per day. Plant growth, yield and fruit quality are also influenced by soil moisture, soil temperature and soil fertility content in different regions of different types of soils.

Strawberry is a perennial, stoloniferous herb, meaning that they spread via stolons or "runners". The leaves are trifoliate and arise from the crown. Leaflets are ovate or broadly oval, obtuse, dentate or coarsely serrate. The runners produce "daughter" plants at every alternate node.

Objectives

The study was undertaken with the following objectives:

i) To observe the varietal performance and growth of strawberry; and
ii) To identify high yielding variety/varieties those perform well in AEZ 25.

Materials and Methods

The experiment was conducted at RDA Demonstration Farm, Bogra during Rabi season of 2008-09. The study was carried out in a randomized complete design with three replications. Unit plot size was 2.0 m x 1.5 m. Five cultivars namely V_1 (BARI-1), V_2 (Camarosa), V_3 (Andana), V_4 (RABI-3), and V_5 (Aromas) were included in the study. Fertilizers were applied @ 385, 350, 450 kg/ hectare of TSP, MOP and DAP respectively (Hossain, 2008). Cowdung was applied @15.0 t/ha. In 3.0 sq.m plot of land 4.5 kg CD, 115 g TSP, 105 g MOP and 135g DAP were applied. Cowdung was applied at the time of opening the

land and TSP, MOP and DAP just before last tillering and laddering the soil. Healthy and uniform sizes of seedlings of 35-days old were transplanted. The beds were sprinkled with water before uprooting the plants to minimize the root injury. During transplanting a spacing of 45cm × 45cm was maintained. Light irrigation was applied immediately after transplanting. For gap filling and to check the border effect, some extra seedlings were also transplanted around the border area of the experimental field. The different intercultural operations such as weeding, mulching, gap filling, removal of runners, netting etc. were done manually. Irrigation and plant protection measures were taken as and when necessary.

Data Collection

The following data were collected: i) Plant height (cm), ii) Canopy coverage (cm), iii) Petiole length (cm), iv) Days to first flowering, v) No. of fruits /plant, vi) Weight of fruits/ plant (g) vii) Fruit yield/ plot (kg). Plot yield was converted to yield per hectare. Data on different parameters were recorded and analyzed statistically following MSTAT-C package (Gomez and Gomez, 1984).

Results and Discussions

The present study was carried out to investigate the vegetative growth and yield performance of strawberry at Level Barind Tract and discussed in this chapter. The analysis of variance and DMRT of the data obtained from present investigation were presented in the tables.

Plant Height

The plant height was recorded at 75 days after planting. The height varied from 13.39 to 19.41 cm. The different varieties of strawberries caused significant variation in plant height at 1% level of significance. The highest plant height (19.41cm) was recorded from BARI-1 followed by RABI-3 (18.90 cm), Camarosa (15.40 cm), and Aromas (14.28 cm). The lowest plant height (13.39 cm) was recorded from Andana (Table 1). The variation of plant height was also shown through figure 1.

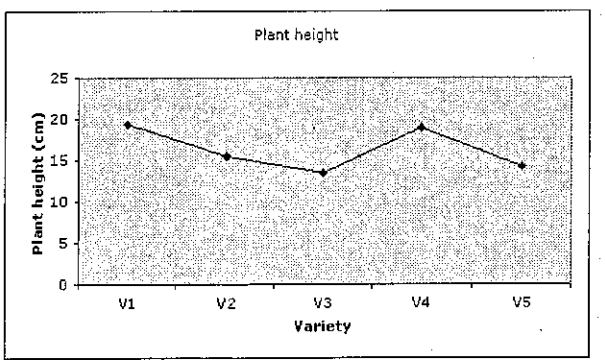

Fig.1: Plant height variations of different varieties of strawberry

Canopy Coverage

The growth and productivity of strawberry plants are directly related to canopy coverage. Good canopy coverage indicate good yield because it is related to production of higher photosynthetic values. Different varieties of strawberry showed significant variation on canopy coverage at vegetative growth stage. The highest (27.04 cm) canopy coverage was recorded from BARI-1 followed by RABI-3 (22.85 cm), Andana (22.07 cm) and Camarosa (21.59 cm). The lowest canopy coverage (20.75 cm) was recorded from Aromas (Table 1). All the five varieties were significantly different from 1% level of significance.

Table 1: Growth Performance of Different Varieties of Strawberry

Treatment (Variety)	Plant height (cm)	Canopy coverage (cm)	Petiole length (cm)	Days to first flowering (no.)
V_1- (BARI-1)	19.41 a	27.04 a	8.14 a	39 b
V_2- (Camarosa)	15.40 b	21.59 b	7.27 abc	43ab
V_3- (Andana)	13.39 c	22.07 b	6.96 bc	43ab
V_4- (RABI-3)	18.90 a	22.85 ab	8.05 ab	39 b
V_5- (Aromas)	14.28 bc	20.75 b	6.68 c	44 a
LSD at 0.05	1.28	3.09	0.74	2.57
LSD at 0.01	1.86	4.50	1.08	3.73
Level of significance	**	**	**	**

Petiole Length

Petiole is the measure of nutrient uptake. There is a general hypothesis that the plants which bear more vigorous petioles, they produce more fruits, because they uptake more nutrients. From the study we observed significant variations in petiole length among different varieties of strawberry and they were significantly varied at 1% level of significance. The highest petiole length (8.14 cm) was recorded from V_1 (BARI-1) and the lowest (6.68 cm) was recorded from V_5 (Aromas) (Table-2). Petiole lengths 8.05 cm, 7.27 cm and 6.96 cm were recorded from V_4 (RABI-3), V_2 (Camarosa) and V_3 (Andana) respectively and significantly varied among them.

Days to First Flowering

There was a significant variation on number of days required for first flowering among the varieties. The highest number of days (44 days) was required for first flowering recorded from Aromas followed by Andana (43 days) and Camarosa (43 days) and no significant difference was found among them. The same was true for V_4 (RABI-3) and V_1 (BARI-1) i.e., lowest number of days (39 days) were required for first flowering recorded from

RABI-3 (39 days) and BARI-1 (39 days), no significant difference was found between them (Table 1 and figure 2).

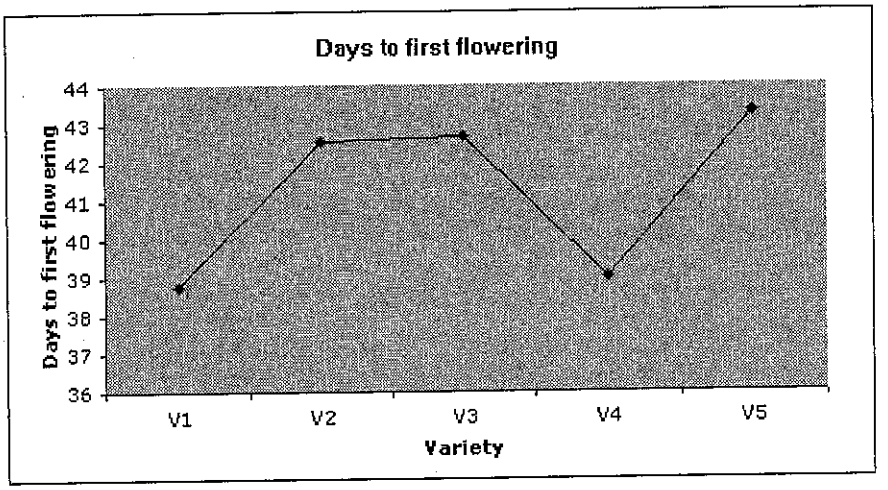

Fig. 2: Effect of varieties on days to first flowering of strawberry

Number of Fruits per Plant

Number of fruits per plant varied significantly due to different varieties of strawberry. The maximum number of fruits per plant (12.63 no.) was recorded from BARI-1followed by the varieties RABI-3 (12.20 no.), Aromas (10.67 no.) and Andana (9.25 no.) and the minimum number of fruits per plant (8.99 no.) was recorded from Camarosa (Table 2 and figure 3).

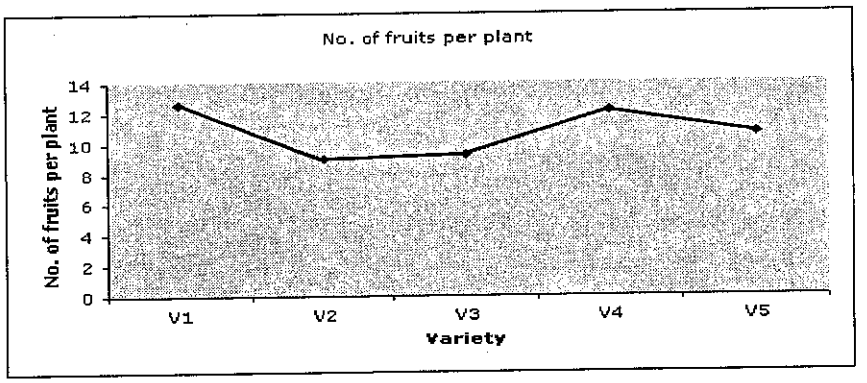

Fig.3: Number of fruits per plant of five strawberry varieties

Weight of Fruits per Plant

There were significant variations among varieties of fruit weight per plant. The maximum weight of fruits per plant (150.29 g) was recorded from BARI-1 followed by the varieties RABI-3 (149.33 g), Andana (137.02 g) and Camarosa (134.34 g) and minimum weight of fruits per plant (130.57g) was recorded from Aromas (Table 2).

Table 2: Yield and Yield Components of Strawberry

Treatment (Variety)	No. of fruits/ plant (no.)	Weight of fruits/ plant (g)	Fruit yield (kg/plot)	Fruit yield (t/ ha)
V_1- (BARI-1)	12.63 a	150.29 a	2.48 a	8.28 a
V_2-(Camarosa)	8.99 b	134.34 b	1.51 b	5.03 b
V_3- (Andana)	9.25 b	137.02 ab	1.72 b	5.74 b
V_4-(RABI-3)	12.20 a	149.33 a	2.36 a	7.88 a
V_5- (Aromas)	10.67 ab	130.57 b	1.70 b	5.67 b
LSD at 0.05	1.69	9.43	0.43	1.43
LSD at 0.01	2.46	13.72	0.62	2.08
Level of significance	**	**	**	**

Fruit Yield per Plot

Yield of fruits per plot was significantly influenced by different varieties of strawberry. The maximum yield of fruits per plot (2.48 kg) was obtained from BARI-1 followed by the varieties RABI-3 (2.36 kg), Andana (1.72 kg) and Aromas (1.70 kg) and minimum yield of fruits per plot (1.51 kg) was obtained from Camarosa (Table 2 and figure 4).

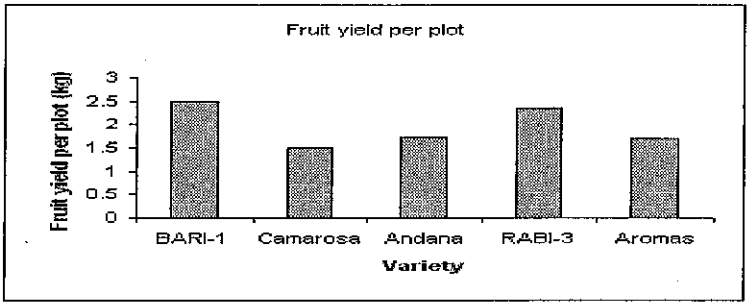

Fig. 4: Yield of fruit per plot (3.00 sq.m) of five strawberry varieties

Fruit Yield per Hectare

Yield of fruits per hectare was significantly influenced by different varieties of strawberry. The maximum yield of berries 8.28 t/ha was obtained from BARI-1 followed by the varieties RABI-3 (7.88 t/ha), Andana (5.74 t/ha) and Aromas (5.67 t/ha) and minimum yield 5.03 t/ha was obtained from Camarosa (Table 2). It is evident that the maximum yield of BARI-1 (8.28 t/ha) and RABI-3 (7.88 t/ha) were favored by all of its yield contributing characters such as plant height, canopy coverage, petiole length, no. of fruits per plant, wt. of fruits per plant. Plot yield has a direct relationship with yield.

Conclusion

Top performers in 2008-09 strawberry trial were the varieties V_1 (BARI-1) and V_4 (RABI-3) that produced higher yield (8.28 and 7.88 t/ha), higher fruit weight (11.20 and 10.77g/ fruit), higher fruit numbers per plant (13 and 12 no. fruits/plant), canopy coverage (27.04 and 22.85 cm), petiole length (8.14 and 8.05 cm). From this trial it was identified that V_1 (BARI-1) and V_4 (RABI-3) varieties of strawberry were good yielder, adapted in sandy clay loam soil of Level Barind Tract under Agro-Ecological Zone-25. It is very interesting to know that the higher yielder of BARI-1 and RABI-3 required lowest number of days to first flowering than low yielders of Andana, Aromas and Camarosa which required highest no. of days to first flowering.

Recommendations

The strawberry varieties BARI-1 and RABI-3 may be recommended for cultivation in Level Barind Tract soil of Agro-Ecological Zone 25. These varieties are winter hardiness with good yield, better fruit quality and reasonable berry size. Strawberries are among the favorite fruits farmers would love to grow in the field and in the garden also. Strawberry can be grown in almost all gardens where cold climate and sunny sky exist. But to enjoy these ripe, juicy and red berries, the plants need regular care and attention, like watering, additional nutrient supplements, fertilizers, etc.

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Upazila Development Plan: Lessons of Experience

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Abstract

Rural Development Academy, Bogra with support of UNDP completed a collaborative action research project with Sherpur Upazila Prishad (Bogra) and Gobindaganj Upazila Parishad (Gaibanda) for formulating Upazila Development Plan. Objectives of the action research project were to: provide broad development vision and mission for the Upazilas, capacity development of Upazila Parishads to formulate their annual plan and budget.

A culture of budget preparation and development plan formulation did not grow up in the UZPs. Towards preparing a comprehensive plan and consolidated budget the strategy was to portray all physical and human resources being spent within its periphery by all government and non-government agencies in the plan document keeping the control of the resources with the concerned agencies.

Researchers faced initial problem in rapport building, application of methodology, getting attention of the Government Officers and such others. However, the effects were minimised through rapport building and revision of methodology.

Introduction

Project Genesis and Profile: A Letter of Agreement (LoA) was signed between United Nations Development Programme (UNDP), Bangladesh and Rural Development Academy (RDA), Bogra (as the specialised agency in this sector for the Government of Bangladesh – GoB) for the Preparatory Assistance (PA) Project for "Strengthening Upazila Parishad (UZP) through Capacity Building Initiatives and Policy Advocacy" (PA – SUZP).

The PA-SUZP had three major outputs, viz., Capacity Development, Advocacy & Communication and Policy Input. Beginning with July 2009 the following steps were taken to materialise the Capacity Development or Training part of the Project:

1 Director (Rural Governance and Gender), RDA, Bogra
2 Former Joint Director, RDA, Bogra
3 Former Joint Director, RDA, Bogra

- Formation of Core Team;
- Review of Existing rules and regulations;
- Study the functioning of an Upazila Parishad; and
- Training Needs Assessment (TNA) Workshop, Formulation of Course Contents and Implementation of the Orientation Course.

Action Research for UZDP

Lessons and experience gained through UZP study, TNA and Orientation Course led to taking up the task of action research on Upazila Development Plan **(UZDP)** Formulation. Because in spite of the existence of the three Sections of Upazila Act 1998 (as amended and reintroduced in 2009) pertinent for UZDP, viz., Section 29 (formation of 14 Standing Committees), Section 38 (UZ Budget preparation) and 42 (UZDP preparation), in reality, no UZP prepared any UZDP or annual budget.

Objectives of Action Research for UZDP: The broad objective of the project was to device a methodology and framework for formulating an Upazila Development Plan (UZDP). Specific Objectives were to:

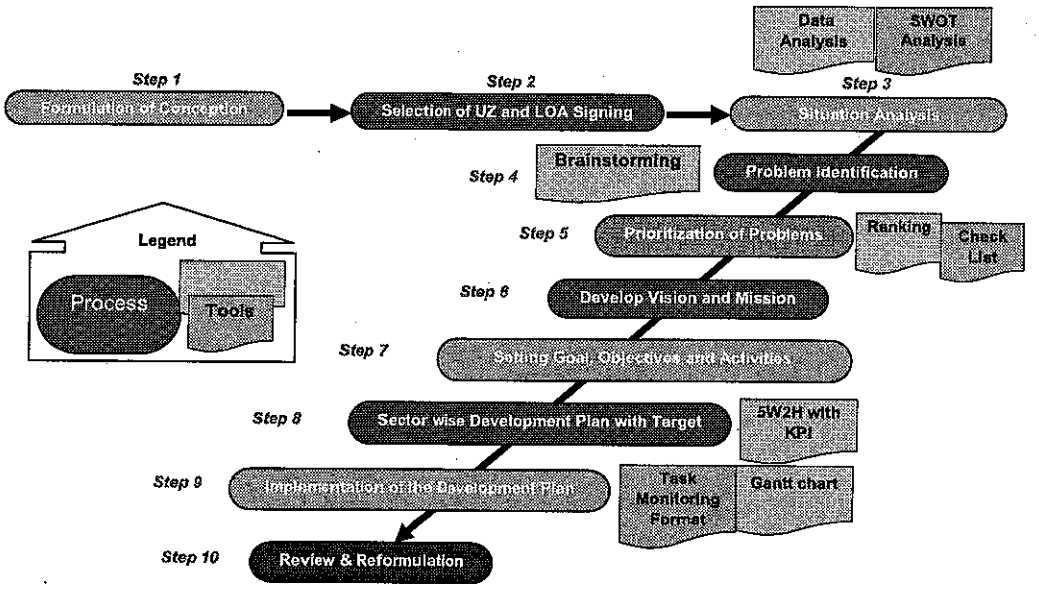
i) Provide a broad view about Vision and Mission of the development plan and facilitate UZP implement it;
ii) Facilitate UZPs formulate their own UZDP framework;
iii) Provide effective help for concerned UZP Members and Functionaries in their capacity building for UZDP formulation; and
iv) Help project UZPs with technical assistance to prepare the annual budget in line with the UZDP.

Upazila Development Plan Formulation Methodology

Initial Steps for UZDP Formulation Action Research: RDA formed an 8-Member Team of Faculty Members from multi-disciplinary background for the action research. After many discussions among themselves and with experts the Team came up with a tentative series of activities that included:

The flowchart of UZDP Methodology: Tools used at each step according to the process of the development plan:

Flowchart of the Methodology for UZDP



***Source*: WIP from EPSD Project of BPATC sponsored by JICA**

Description of Tools Used for UZDP Action Research

- ***Formulation of Conception:*** At the outset planning concept was presentation, discussed and revised by UNDP UNDP consultants. Inclusion of MDGs, PRS and their relevance to UZDP was considered during its preparation as a requirement of development plan.
- ***Selection of Upazilas and Signing of LOA:*** Two Upazilas were selected for action research based on their interest shown for the Project and their overall performance. Sherpur, among these two UZPs, was especially chosen as it is the "Social-laboratory Area" of RDA. Meeting was held with a proposal for preparing and confirmation of the Upazila Development Plan with two UZP Chair-Members in presence of all officers of line departments and stakeholders. After a couple of meetings and discussions on responsibilities of both the parties, an LOA was signed with the selected two Upazilas.
- ***Inception Workshops at UZ and Orientation at District Level:*** Orientation workshops with the district level officers and an Inception workshop with the UZP Chair-Members, Officials were held to make the personnel familiar with the objectives, methodology, tools and tasks of the UZDP.

- ***Formulation of Standing Committee:*** UZPs were requested to form standing committees according to the article 29 of UZ act. UZP could not formulate any Standing Committee and make them functioning.

- ***Workshop with the Stakeholders:*** Consultations with key Stakeholders (e.g. Nation Building Departments, Members of Civil Society, NGOs and such others) through brainstorming sessions were organised. This was aimed at gaining first hand knowledge from them as well as making them partners in the whole process through getting feedback from them. One focal person was assigned to liaison with the team members of the action research.

- ***Situation Analysis:*** The steps that included in this were: (a) all line departments were given a format, a set of dummy tables, for presenting a primary database on the current situation of their relevant sub-sectors to initiate the planning process. Oral presentations with filled-in tables were made accordingly; (b) a SWOT analysis on situation of Upazila was done with all the relevant officials, and Chair and Vice-chair to orient them on use of this tool for Upazila planning and (c) all the relevant departments were supplied the format to make a SWOT of their own department with their officials, field workers and relevant clients.

- ***Identification of Problems, their Prioritisation and selection by using Checklist:*** During SWOT analysis problems were identified mainly from identified "weakness" and "threat" of concerned departments. At first, Problems and Critical Issues were identified by using a brainstorming session and their causes were discussed. Secondly, Prioritisation of the problems was made by giving weight in a scale of 1-3. Mainly, the participants gave weightage and then those were summarised to make the priority list of the problems. At last, using a checklist, the problems and critical issues were classified on different categories (e.g. own mandate or others, availability of resources and expertise, support of higher authority etc).

- ***Formulation of Vision and Mission:*** The nation building departments formulated their own vision and mission based on SWOT Analysis and problems or issues identified through discussion among UZ level government officials and other stakeholders.

- ***Setting goal, objectives and Activities:*** According to the selected issues/problems from the priority list concerned departments fixed their activities derived from goal and objectives.

- ***Sector wise Development Plan:*** At this stage a simple 5W2H Format was used to write implementation strategy and budget for every step of respective activities. All most all the departments showed their keen interest in developing Five Year

Plan according to their Vision. Even they did not consider the factor of possible availability of fund for implementation of this plan.

- ***Workshop for Plan Validation:*** A compilation of vision, mission, goal-objectives and approaches for implementation of each activity of all departments was presented as a draft plan in a validation workshop attended by all stakeholders. The plan was finalised after a discussion held on the basis of necessary, reality and justification of each activity, department by department.

Limitations of the Action Research

In spite of the best efforts of the Team of Researchers, there still remained some limitations in the course of the research. For example: inclusion of Key Performance Indicators (KPIs) would facilitate the department personnel implement the plan as Targets. At the same token, addition of Task Monitoring Format (TMF) would help monitor the project implementation. A Gantt Chart prepared on the basis of schedule of tasks would come within the purview of daily chore. Besides the Upazila departments still needs time to establish a data base for a proper and suitable plan formulation. This kind of a data base is still under preparation. So, the Team could not benefit from the use of it. The UZPs could not formulate Standing Committees or make them functioning during the time of action research. Participation of such Standing Committees is a sine qua non for the preparation of a development plan.

Lessons of Experience from UZDP Action Research at Different Stages

Assessing the Respondents' Opinion of the Upazila Study: RDA along with 10 other Institutions or individual researchers and experts took up a study of the functioning of 12 newly formed Upazila Parishads (UZPs). The Gabtali Upazila in Bogra was studied by RDA. The findings of the study that relate to UZDP were basically:

- UZP currently did not prepare any annual/multi year budget or development plans because they thought that the Chair of UZP (CUZP) has not got the authority for drawing and disbursement of the fund. The fund received from the centre, especially under ADP, is simply divided and handed down to the UPs in various ways.
- UZP forum is mainly used for discussing ADP, FWP, Old-age allowance, Food for Education, other allowances. However, the files are not routed through the CUZP/ VCUZP, it is said. As a result, they are not informed and they are bypassed they felt.

Comments of Participants of Orientation Course for UZP Vice-Chairpersons: The trend of comments collected through end-of-course views and supplemented by Course

Coordinators' observations of, the Training Course Participants was wide and varied. However, the views pertinent to UZDP were:

- Most of the UZPs participating at the Orientation Course did not form Standing Committees, prepare UZ budget or annual/five-year development plans.
- Cross-cutting issues, viz., socio-economic development programmes for the UZP, mainstreaming gender in development, disaster management, cooperatives and NGOs, and the like were illuminating for them and they would prepare projects on these ideas. They gained a useful hands-on from visit to the various development projects. They can now even discuss these ideas with the people of their area for their socio-economic development.
- Towards the end of the Course, the Participations had discussed thoroughly and presented a list of activities that would form their annual/multi year development plan. The major portion of the projected plan is depicted below:

Sl. No.	List of Major Actions Planned by Vice-Chairmen	Participants (%)
1.	Help youths become self-reliant through training	97.50
2.	Ensure provisions for health services and treatment	95.00
3.	Motivate in cultivation of modern fish farming	94.00
4.	Take up adequate measures and provide supports for arsenic free water	93.25
5.	Oversee distribution of benefits for: senior citizens, widow, physically challenged, etc.	92.00
6.	Management of govt. relief to disaster affected areas.	91.50
7.	Construction of physical infrastructure for developing communication network	90.25
8.	Provide training on modern methods of cattle and poultry rearing	80.75
9.	Campaign and develop awareness for family planning	77.75
10.	Awareness building and motivation for the guardians to increase school enrolment	75.25

(n = 400)

Lessons of Using Methods/Tools/Techniques

At the outset, the Research Team prepared a draft research proposal that included a number of processes, tools, techniques and such others like: brainstorming sessions, data-base of the nation building departments (NBDs), SWOT (Strength, Weakness, Opportunity and Threat) analysis, priority ranking of problems, checklists of problems, 5W2H, Gantt chart, etc. Experience from using those processes/tools/techniques at the field level with the stakeholders is narrated briefly below:

Data-base of NBDs: Data-base necessarily forms the first step towards formulating a viable development plan. However, in reality, the Research Team found no credible data-base (consisting of a time-series data) of the concerned NBDs. A "one-shot game" was the usual practice. So, the Research Team had to compromise to a certain extent, generate and rely on the existing data and then put in place the follow-up tools for plan formulation. Importance of initiating data base for future use can hardly be overemphasised.

Brainstorming Sessions: This tool of initiating the concept of UZDP to the stakeholders (UZP Chair-Members, Government and Non-government Functionaries, etc.) and hold open threadbare discussions to get their feedback proved useful. This led the way for further adaptation of the original concept of UZDP formulation and identification of problems and issues before planning. This exercise was carried out somewhat subjectively in a situation where reliable data base did not exist.

SWOT Analysis: The use of SWOT (Strength, Weakness, Opportunity and Threat) analysis, of an Organisation, as a tool for situation analysis leading to plan/project formulation and implementation, was known to some of the Personnel of the Upazila Parishad, but they did not use or work with SWOT even for their situation analysis or for any other purpose. They were trained to be able to use this tool in the plan formulation processes. SWOT was used at this stage as UZ personnel were not able to formulate vision and mission of their concerned departments and consequently take up departmental planning.

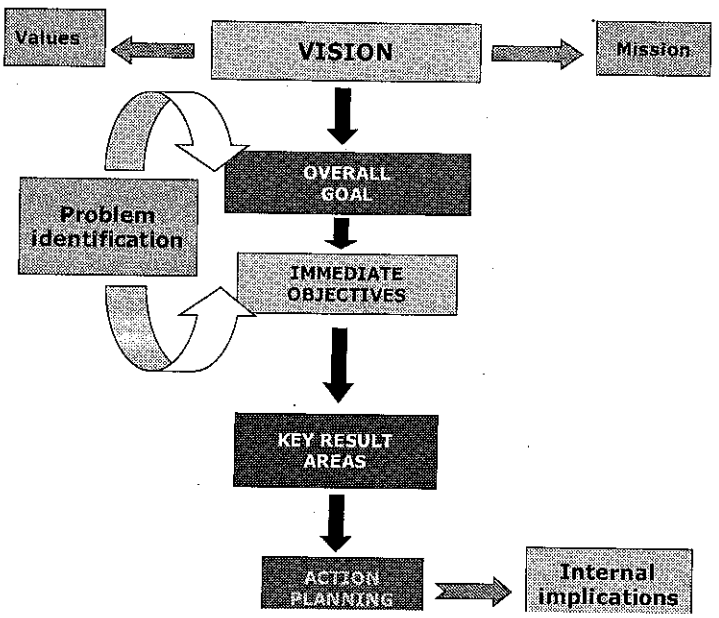
Priority Ranking and Checklist of Problems: The importance of priority ranking by giving weightage to problems and use of checklist of problems is of crucial importance for selection of issues during preparation of development plan in any given situation of scare resources. The concerned UZP Chair, Members and Functionaries usually realised and addressed this aspect of development plan, barring some People's Representatives (perhaps due to their earlier electoral commitments). It was observed that the concerned officials often could not single out the issues of grassroots importance rather they confused it with macro priorities. Besides that, problems and opportunities identified from SWOT analysis can be the main basis for the planning process.

5W2H Format: The 5W2H tool (what, who, when, where, which, how much money/ resources, and how: process or approach) for a plan/project preparation was new, brief and handy for the UZP personnel to work with. Their capacity was built in this respect to be able to use this tool. As the problems/issues were prioritised and selected through a checklist, it then became convenient to set goal and objectives. Accordingly, they formulated their activities, indicated resource requirements and timeframe using this tool.

Formulation of Vision and Mission: The priority list of the problems of the line departments was basically very useful for preparation of sectoral plan. More fruitful became the use of

the checklist for making major decisions in selection, rejection and relocation of critical issues over years. For example, the Agriculture department of an Upazila was found to have sufficient experience and data base for analysis of the agricultural situation of the Upazila. So they were able to formulate their vision and mission with the help of a short orientation. But other departments having little necessary updated information and without any orientation for situation analysis could not develop their vision and mission. So, bench-mark data and SWOT analysis are instrumental before building Vision and Mission and the diagrammatic approach (shown below) used initially had to be revised and the Team followed the Flow-chart mentioned above in methodology.

First diagrammatic attempt of the process of UZDP



Source: Strategic Planning Toolkit by Jenet Shapiro, 28p (email: toolkits@civicus.org)

Learning of Joint Workshops and Meetings on UZDP Action Research

Based on RDA experiences and observation of the exercises mentioned above, however, it may be viewed that generally UZPs in Bangladesh do not undertake the three relevant mandatory functions (viz. formation of Standing Committees, Annual Budget and Development Plan formulation) even after the passage of more than two years of its formation.

Keeping this scenario in the background, RDA and BARD undertook the action research for formulating Upazila Development Plan (UZDP) with the financial and technical support of UNDP- Bangladesh. Several inception and preparatory workshops and meetings were organised at Bangladesh Academy for Rural Development (BARD) and UNDP Office in Dhaka under the auspices of UNDP. The first preparatory workshop was held during 3-4th November 2011. The inception workshop was followed up by several others at the UNDP Office, Dhaka. More academics and professionals on local governance and local/UZ Development Plan joined and contributed to the UZDP formulation process and designing of formats. Later, RDA Team also benefited from the experience of several other field-level action researches going on in the arena of UZDP and secondary information-sources. These field-level experiences included: Hunger Project Experience at Akkelpur (Joypurhat), UZDP experience at Ulipur (Kurigram), digital data-base facilitating UZDP at Sadullapur (Gaibandha) and others.

Reviews and Realisation at different levels

The team have gained a wealth of resources during the processes of workshops at Upazilas and elsewhere, meetings and other informal interactions with people's representatives, experts, parishioners, villagers and other stakeholders. The major lessons of experience that come out prominently during the course of interactions and of this action research project for formulating UZDP:

Working with UZP

- Members of Upazila Parishad and Government functionaries were found to be enthusiastic and cooperative in general. Nevertheless, orientation workshop with the district level officers was not equally participated by both the Upazilas.
- UZPs were responsive and capable of arranging meetings, workshops etc. even at a short notice. Focusing more on this issue, Sherpur UZP was relatively responsive and Gobindaganj relatively good organiser.
- Area of involvements of UZ officials encompassed a vast field. For example, the officers have to conduct election related duties, various national functions, chore of departmental regulatory functions, protocol, etc. that dilute their focus on their departmental functions in general and UZP development plan in particular.
- UZP elected members get involved in various political, social and other engagements on regular basis (all at a time) that is why they become difficult to reach or continue with their development commitments.

- Preparation of UZP budget, development plan has been a requirement for long, since the early 1980s. However, these plans consist of construction and maintenance projects in all sectors (as one of the UZ Engineers of these two project UZPs showed the plan in a practice workshop) that is prepared by the LGED. The plan book is there, consisting of physical infrastructural development, but hardly used. So, in practice, none of the UZPs were found to either prepare budget or development plan in a proper way.
- They seem to have mindset towards construction of physical infrastructures, in all sectors, neglecting their software components. For example, in the primary education sector construction of buildings, furniture, etc., are given importance neglecting the aspects of capacity development of School Management Committees (SMC), improvement of quality education, motivating all stakeholders for supporting primary education, etc. Same goes true with agriculture, women's development, health, etc.
- Some departmental plans are there. These are formulated, monitored and implemented centrally. These plan allocations could be included in the UZ development plan even keeping the fund and control with the respective departments.
- Lack of adequate and timely allocation of human and material resources posed to be a problem for UZ development plan formulation, as viewed by the UZP members and officials.
- Both officers and elected members of UZP wished to be ensured about availability of fund while preparing development plans. Because they think their efforts would be futile in the absence of an ensured resource base. They often are reluctant to explore and mobilise their own available and potential resources.
- Some of the officers were reluctant to get involve in the plan formulation process. This could have happened due to a number of reasons like: pre-conceived notion of preparing of traditional annual development plan coming in conflict with better plans derived from "vision and mission" exercises, lack of adequate time at their disposal, etc.
- Currently, the development fund allocations are made and spent in two major channels: ADP fund of the central government and departmental fund allocation. The ADP fund is apparently handled and accounted for by the UZP Chairperson, UNO and Upazila Engineer (from LGED). The departmental fund follow a, pre-determined by respective departments, processes and heads of utilisation. Other fund allocations, like: VGD, VGF, Food for Work, etc. are considered minor areas

that are welfare oriented in nature. It will take some massive efforts and a great deal of time before the trend can be transformed towards the coveted direction of utilisation of national resources.

- The role of MP would have to be redefined or accommodated with the UZ planning process.

Working with UNDP

- The basic mode of operation of UNDP is flexible ("non-bureaucratic"), supportive and friendly, which supports the progression of work.
- There was regular and helpful communication for implementation and follow-up advice for the project. However, perhaps, more field visits could be arranged for the UNDP staff for enabling greater sharing of experience.
- They were found to be helpful for plan formulation, and follow-up of works, technical advice and guidance.
- Realizing the lateral and vertical depth of UZP development plan, the duration for plan preparation could have been longer.
- Further plan for action research is suggested towards integrating the UZ development plan, may be in a chronological/ hierarchical order, with the national development plan.

Conclusion and Recommendations

A number of issues and challenges may be highlighted towards the end of the UZDP action research venture. Like:

- The current exercise of UZDP preparation was, in a way, a path-breaking effort towards grassroots development plan formulation, as this practice could never took its roots either in the 1960s or even in the 1980s. It will, so, open up a new horizon of development plan at the grassroots if carried out properly. It was both an educative and interesting experience for the Research Team also.
- The budget prepared based on the development plan, derived through is action research, is much bigger in terms of items of expenditure and quantum of fund than the UZP approved one. It is because the plan based on action research reflects their needs and vision. On the other hand, budget approved by UZP is prepared on department/sector wise based on the UZ development assistance fund.
- Participation in the plan formulation process still remained limited to UZ Officials (e.g. UZP Chair, UNO, UZ Engineer, Accountant, PIO and such others). Participation of all possible stakeholders is essential for the success of the plan.

- The UZP Standing Committees are non-functioning and there is no strong drive for local resource mobilisation. Perhaps because the dominant concepts that UZP is a body corporate and UZP Chair/Members are public officers are missing in the mindset of all stakeholders, particularly the UZP Chair, Vice-Chair and Members.
- The role of MPs for grassroots development, as provisioned by current act should be re-examined. The MP's development grant for the UZ could be reflected and utilised through the UZDP.
- The government officers at the Upazila level should be considering themselves as technical experts/advisors/executives instead of "Task-masters" for the UZPs. The people's representatives, accordingly, should be aware of their role of policy formulators and decision makers for the UZPs. The government officers should be allowed greater leverage to enjoy at this level from the centre. Because remaining at the grassroots these officers know "where the shoe pinches".
- For the sake of national development, in its real terms, the centre should think of democratic decentralisation both as a process and as a means. It should no more consider the local governments, in general and Upazila Parishad in particular, as an extended arm of the central government. UZPs should be allowed the authority, resources and expertise to carry out it mandated functions.
- NGOs, as an important stakeholder, should more effectively be incorporated with UZDP. Because NGOs too in their turn undertake development projects that are not generally incorporated or reflected in the total UZ plan. In spite of efforts made in the relevant workshops concerning NGOs, the Research Team did not succeed in creating an atmosphere of reciprocity for development without any resource allocation for plan. If it succeeded, this could initiate a process of better utilisation of scarce resources through avoidance of duplication or void in allocation. However, this culture of GO-NGO collaboration in development is yet to be established.
- In sum, we can say that a culture of appreciating the works of local government bodies in the face of resource limitation, inadequate legislation and others should be developed instead of holding a shallow idea about them (like: subjectively considering them as inefficient or irresponsible).

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Strategic Planning Toolkit by Jenet Shapiro, 28p (email: toolkits@civicus.org)

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Farmers' Perception and Preparedness on the Impact of Climate Change: Study in Selected Rural Areas of Bogra District

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Abstract

The study assessed farmers' perception and preparedness on impact of climate change and their coping pattern. Data were collected from three selected villages through purposive sampling. The study revealed that farmers understand climate change impacts and they prepare themselves with some innovative practices to cope with the challenges. Farmers claimed crop production is adversely affected by destruction of soil texture, degradation of soil fertility, change in rainfall pattern, extreme temperature, river erosion etc. All of which are likely to happen as a result of climate change. Farmers also indicated some changes in their occupation and some had migrated to another place in search of a new job.

Introduction

Rapid global warming has caused fundamental changes to climate. Bangladesh is recognized worldwide as one of the most vulnerable countries to the climate change (Harmeling, 2008). Impacts of global warming have the potential to frustrate our development efforts, food security and livelihoods. The majority of the population is still dependent on agriculture the most climate sensitive sector for income and livelihood. Our assumption is that people are suffering much from the climate change impact. What the people especially farmers and women are observing and what they think about the consequences of the impacts was the research issue.

Several studies were conducted in Bangladesh to assess the climate change impacts on different sectors. But what the farmers themselves are thinking about the climate change issues; what the preparedness situation is at the village level to face the problems and how the livelihood and habitat is being facing hazardous situation are yet to know definitely. Not much information is available about the preparedness of farmers' coping mechanism for climate change impacts. All those need to be studied in depth for equipping people to cope with the adverse effect of climate change and also to select appropriate development interventions matching with people's aspirations.

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Bangladesh is located between the Himalayas and the Bay of Bengal and demonstrates prone to natural disasters. Bangladesh today is set to face the disastrous fallout from climate change. Climate change and its impact on agriculture is not a future issue. The farmers are already affected in many ways which resulted even in crop losses. The people, in general, and the rural communities in particular, need to be given the information and knowledge about the impacts of climate change and matters concerning the mitigation of the problem. With this background the study was undertaken to make common understanding about climate change vulnerability.

Objectives

The major objectives were to:

i) Find out how climate change affects rural livelihoods;
ii) Know farmer's perception about climate change and impacts of climate change on their livelihoods and habitat; and
iii) Assess the preparedness at the village level to cope with climate change.

Methodology

The study was conducted in three purposively selected villages of Sherpur upazila under Bogra district where climate change impacts are visible. Table- 01 shows the study location and population.

Table-1: Study Location and Population

Sl. no.	Study Village	Respondents		Union
		Male	Female	
	Kanupur	15	10	Garidaha
	Rajapur	15	10	Mirzapur
	Ghordour	10	5	Khamarkandi
	Total	40	25	

A total 65 male and female farmers were selected. Data were collected by the researchers themselves. Interview schedule was used to collect the data during 30 December 2012 to 04 June 2013. After collection of data, it was processed using Microsoft Office Excel. Data were collected from farmers interviewed in the field and female farmers interviewed in their homestead. Data were also collected through focus group discussion (FGD) and observations. Sherpur is an Upazila of Bogra District in the Division of Rajshahi, Bangladesh. It has 45,258 households and a total area of 296.27 km^2 and has a comparatively large proportion of cultivable waste land. The soil of this part is generally suited to grow paddy. This part is situated on the bank of the river Karotoa. Agriculture is the main occupation of the people of the selected villages.

Results and Discussions

Perception of Farmers about Impact of Climate Change on Soil Productivity

As shown in the table- 2, every farmer opined that water holding capacity of soil in the study area decreased (100%). Regarding soil fertility 94% of the farmers perceived decrease of soil fertility occurred due to climate change followed by destruction of soil texture (63%) and increase of soil acidity (63%) than ten years before. The survey result reveals that, 37% farmers negatively opined regarding soil texture destruction and increase of soil acidity, while only few of them (6%) told soil fertility had not decreased.

Table- 2: Perception of Male and Female Farmers about Impact of Climate Change on Soil Productivity

Perception about soil property in relation to climate change impacts	Positive opinion (agreed)			Negative opinion (disagreed)		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
Soil texture destructed	56	44	63	71	29	37
Soil fertility decreased	59	41	94	100	0	6
Water holding capacity decreased	62	38	100	0	0	0
Soil acidity increased	66	34	63	54	46	37

They observed continuous crop cultivation and over use of chemical fertilizers as reasons for destruction of soil texture. Using *paush* (compost) after each harvest they tried to mitigate the problem. They also observed less productivity without fertilizer, so they had started crop diversification and using manure to increase the productivity. A few farmers are using *Dolo choon* and borax to treat their soil from increasing acidity.

Perception of Farmers about Impact of Climate Change on Ground Water

Intergovernmental Panel on Climate Change (IPCC) in one of its technical paper on "Climate Change and Water" indentified several gaps in knowledge exist in terms of observations and research needs related to climate change. In a densely populated country like Bangladesh, the effects of climate change on the surface and ground water resources will be very severe and alarming. Change of hydrology will have a significant impact on the country's economy, where people mostly depend on the ground water for irrigation, fishery, industrial production, navigation and similar other activities.

Table- 3: Perception of Male and Female Farmers about Impact of Climate Change on Ground Water

Statements about climate change symptom	Positive opinion (agreed)			Negative opinion (disagreed)		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
Drawdown of ground water level happened	60	40	97	100	-	3
Decreased quality of water	57	43	71	74	26	29
Efficacy of irrigation equipments reduced	63	37	92	40	60	8
Presence of arsenic and iron happened	70	30	40	53	47	60
Rivers and ponds are drying in off season	62	38	100	-	-	-
Drying of water embankments : scarcity of fish observed	62	38	100	-	-	-

As shown in the table- 3, farmers mentioned that rivers and ponds are drying in off season (100%), drying of water embankments: scarcity of fish (100%) and also ground water level going down (97%) as consequences of climate change. Some of them told water pollution is happening for the climate change while most of the farmers (60%) observed no changes. Farmers observed quality of water degrading (71%); irrigation machines were not working due to the level of water going down in dry season.

As the farmers face problems of water scarcity in dry season, they use ground water excessively and water level is going down. Thus the agricultural production cost is increasing. The fisheries sector is also experiencing an adverse effect because of the impacts of climate change. Thus the main source of protein of rural people is shrinking day by day due to drying of water embankments.

Perception of Farmers about Climate Change Impact on Change in Natural Calamities

Crop production is adversely influenced by erratic rainfall, extreme temperature, draught, floods and river erosion. All of which are likely to increase as a result of climate change.

As shown in table- 4, most of the respondents stated the overall temperature has increased than before (100%), number of frogs and birds decreased (98%), rainfall pattern changed (92%), intensity of cold increased (92%) and also prevalence of drought increased (92%). They thought it was due to climatic changes. Farmers also mentioned increasing frequency of earthquake (87%) as consequence of climate change. Most of them opined negatively on off-season flood occurrence (60%) and erosion of river bank (52%). The table illustrates farmers' opinion regarding increase of cyclone occurrence (65%), erosion of river bank (48%) as the impact of climate changes in selected area.

Farmers do nothing but prayed to the Almighty to save them from these natural disasters. To adapt with changing pattern of rainfall they were using shallow and deep tube well; and to save their plants and vegetables they spray insecticides.

Perception of Farmers about Impact of Climate Change on Agricultural Production and Livelihood

Most rural households depend on weather-sensitive sectors agriculture, fisheries, and other natural resources-for their livelihood. Destruction of their assets and livelihoods leaves the poor with a limited capacity to recover. The importance of adapting to these climate risks to maintain economic growth and reduce poverty is thus very clear (ECCA-Bangladesh-world bank.pdf).

Agriculture is the backbone of the economy of Bangladesh and is synonymous to the food security of the country. Apart from food security, the sector alone contributes about 12% of the GDP and employ 44% workforce of the country (climate change and agriculture of Bangladesh). Agriculture sector is directly related to the rural poverty as the sector benefits livelihood of the rural poor people who account for majority of the population. So, the overall impact of climate change on agricultural production in Bangladesh would be wide spread and devastating for the country's economy.

Table- 4: Perception of Male and Female Farmers about Climate Change Impact on Change in Natural Calamities

Statements about climate change symptom	Positive opinion (agreed)			Negative opinion (disagreed)		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
Cyclone occurance increased	67	33	65	52	48	35
Earthquake occurrence increased	71	29	87	86	14	13
Off-season flood occurrence increased	70	30	40	53	47	60
Rainfall pattern changed	63	37	92	40	60	8
Intensity of cold increased	58	42	92	100	-	8
Atmospheric temperature increased	62	38	100	-	-	-
Population of frogs and birds decreased	63	37	98	-	100	2
Erosion of river bank happened	83	17	48	38	62	52
Prevalence of drought increased	61	39	92	50	50	8

Table- 5 shows, the farmers' opinion about new species of insects and diseases increased (90%), fertilizers are not working effectively now a day (78%) and farmers do use more

insecticides and more fertilizers (89%) which increased the agricultural production cost (92%). The table also demonstrates that, farmers started to cultivate diversified crops (83%) to cope with climatic changes. As agriculture became challenging in these areas, farmers are now migrating to other jobs (78%) and according to these rural people, unemployment rate has been increasing (72%).

Table-5: Perception of Male and Female Farmers about Impact of Climate Change on Agricultural Production and Livelihood

Statements about climate change symptom	Positive opinion (agreed)			Negative opinion (disagreed)		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
New species of insects and diseases appeared	59	41	90	83	17	10
Cropping pattern changed (diversified crop cultivation)	63	37	83	54	46	17
Efficacy of fertilizer decreased	61	39	78	64	36	22
Use of chemical pesticides increased	65	35	89	28	72	11
Production cost increased	63	37	92	40	60	8
Unemployment increased	68	32	72	44	56	28
Migration to other places increased	65	35	78	50	50	22

Conclusion and Recommendations

Bangladesh will continue to depend on agriculture for sustenance of its economy. Farming provides bread and butter to millions of families though farmers are not adequately prepared at rural areas to cope with climate change. Climate change has intensified familiar threats such as drought, agricultural production losses, natural calamities etc. and will continue to do so. It brings completely new challenges to rural areas like the selected area. Crop insurance should be promoted for protecting the greater interests of our farmers. Adaptations to climate change for agricultural sectors includes the resilient variety, cropping pattern, irrigation techniques, sustainable land management, early warning, tree plantation, using organic manure instead of chemical fertilizer, etc. This needs more research and investigation.

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Comprehensive Village Development Co-operatives: A Social Technology to Poverty Reduction

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Abstract

Comprehensive Village Development Programme is recognized as a model concept for rural development now being implemented in 4275 villages of 64 districts by BARD, RDA, BRDB and Department of Cooperatives. It is observed that cooperatives under CVDP have taken a new shape through its long process of experimentation having strong institutional framework that can render services to its members without extensive monitoring and supervision. Subsequently these cooperatives play a role as 'social technology' highly characterized by more training, micro-credit from own fund and building linkage with NBDs. Upazila level departments mostly use this organization as a platform to extend their support and services to the villagers. All these have made CVD cooperatives more effective and sustainable rural institution towards poverty reduction.

Introduction

Co-operative Movement in this sub-continent started its journey by enactment of *Cooperative Credit Societies Act, 1904* aiming to provide credit facilities to the poor, landless and small farmers. Broadly, cooperatives in Bangladesh are known as traditional cooperatives under Department of Cooperatives and two-tier cooperatives under Bangladesh Rural Development Board (BRDB). Besides a considerable number of cooperatives were also formed under some project/programmes. These cooperatives are being operated in target group approach mainly based on economic class and professional groups. A huge number of NGOs work towards achieving same goal, but in different ways. That means, they do not belong to a single organization, rather they are divided into many. So a group of people of a village belonging to any class or profession are left out from any of the organizations. As a result, there is created a discrepancy or disparity among the villagers in respect of resource allocation and distribution, access to membership, group cohesiveness and solidarity. Because of huge number of organizations in a village conflict and chaos were increased by manifold. On this backdrop, an idea of 'comprehensive village development' was generated by Bangladesh Academy for Rural Development (BARD) first in 1975. Then Rural Development Academy (RDA), Bogra was involved with the process of

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experiment in 1991. Through a long process of extensive experiment on Comprehensive Village Development Programme (CVDP) RDA have been able to evolve a new village development institutional framework called Comprehensive Village Development Cooperative Society (CVDCS) characterized by comprehensiveness, multi-dimensional and highly participatory. Having all these features CVD cooperative societies have been playing a vital role to make a positive change in socio-economic and cultural arena of the villagers in a comprehensive and integrated manner. Now it has taken a shape of effective social institution which can render services to all section of people through mobilizing local resources and distributing profit and benefit. Thus, CVD cooperative is being developed as 'Social Technology' and found very effective to address social issues and problems with active participation and involvement of the villagers irrespective of age, sex, class and professions.

The term 'Social Technology' was first used at the University of Chicago by Albion Woodbury Small and Charles Richmond Henderson around the end of the 19th century. Small (1898) spoke of social technology as being the use of knowledge of the facts and laws of social life to bring about rational social aims and Henderson (1895) had coined the term 'social art' for the methods by which improvements to society are and may be introduced. Again in 1901 Henderson renamed this social art as 'social technology' and described it as a system of conscious and purposeful organization of persons in which every actual, natural social organization finds its true place and all factors in harmony cooperate to realize an increasing aggregate and better proportions of the "health, wealth, beauty, knowledge, sociability and rightness" desires. MacKenzie (1986) in his book 'The social shaping of technology' introduced the relation of technology to society as the technology of production, domestic, reproductive technology, and military technology. In general, social technology covers many other terms in social science, as some authors use "social technique", "social pedagogy", "administrative technique", "technocracy", "socio-technique", "social engineering", and "social and economic planning" (http://en. wikipedia.org/wik/Social_technology). Here social technology means a 'rural institution' evolved through long experimentation which is capable and empowered enough to exercise its power having every right and control over general management, finance and resources within the purview of its By-laws in order to facilitate the better livelihoods. It has inherent strength to provide services to its members and the villagers as well through using skill and appropriate technology.

CVDP, a model concept for rural development is now under implementation as a national programme by BARD, RDA, BRDB and Co-operative Department of Rural Development and Co-operative Division. During the experimental phase there were 80 villages of 08 Upazilas and 1575 villages of 21 Upazilas under national programme (Phase-1) and 4275

villages of 66 Upazilas under Phase-II. RDA covers 1020 villages of 16 Upazilas. The main objective of CVDP is to reduce poverty through creating employment and to enhance income in a planned way under a village-based Comprehensive Village Development Cooperative Society comprising the villagers of all class and professions of each village. And thus they have been able to improve the standard of living by self-effort in a sustainable way. To achieve the cherished goal CVDP follows mainly three principles: a) one village one society; b) no credit but more training; and c) building linkage between Nation Building Departments (NBDs) and village cooperatives. The report intends to highlight some especial impacts (RDA part) in the light of social technology.

Objectives

The specific objectives of the study were to:

i) Show the institutional strength of CVD cooperative as social technology; and
ii) Assess socio-economic implications on the co-operators at the field.

Methodology

Data were collected from both primary and secondary sources. Primary data were generated through interview and face to face discussion with the co-operators during regular field visits.

Findings of the Study

New Institutional Framework: CVDP is a cooperative-based programme having multi-dimensional activities. The CVD cooperatives are registered under the Co-operative Act and Rules. Membership of the co-operative societies is open to all villagers irrespective of age, sex, profession and class. The societies are operated as per the By-laws. They used to holding weekly and annual general meetings, collecting share and savings, undertaking income generating activities (IGAs) and making investment from their accumulated capital. They are very regular to address different issues related to social development of the village as a whole. In some cases computerized accounting system has been introduced. The organizations are found self-managed, self-financed and highly self-driven. It has a strong linkage with the nation building departments at the field level. The members consider it as a platform for their total development and self-reliance. This institution is found highly instrumental and capable to address all the issues of rural life. It is inherently sustainable. Now it is popularly known as 'new generation' cooperatives. Thus, CVD cooperatives provide a platform of networking service to build social networks or social relations among people who, for example, share interest, activities, backgrounds or real life connections.

Training as a Means of Changes : Bangladesh is one of the most densely populated countries having 150 million people, 26% of whom live below the national poverty line (http//en.wikipedia/Poverty_in_Bangladesh). Considering its depth and dimension the government has emphasized the need to take various programmes for poverty reduction. It was targeted to reduce the rate of poverty to 50% by the year 2015. Though it is achieved by now, the efforts should be faster towards hundred percent achievements by 2021 so that Bangladesh would be termed as a country of middle-income. In order to achieve this goal, the poor have to be provided with productive job, they have to be involved in income generation activities so that they can create their self-employment and generate increased income as an entitlement to food and other necessities of life. As the poor are moving along with the vicious circle they need credit and training support to run the activities to be undertaken by them. The programme has emphasized more on training than credit. Because it believes that credit alone cannot bring a success up to the level unless skill training on particular IGA is given. Taking this view in mind, CVDP has provided sufficient training to the beneficiaries. Thus, training is considered as means of transfer knowledge, skill and technology. These training programmes play a pivotal role to make a bridge between cooperators and officials of the Upazilas.

Beneficiaries under CVDP are given both managerial and skill development training at the Upazila level primarily in order to bring the change in the mind-set of rural people. Training includes mainly co-operative management, leadership development, credit management, accounts keeping etc. Besides, different skill development courses for the beneficiaries like poultry and cattle rearing, pisciculture, vegetables and fruits production, health and sanitation, mushroom cultivation, tailoring, handicrafts, electrical house wiring, basic electronics, plumbing and pipe fitting, solar energy, community biogas, trichodarma were arranged. A total of 8795 cooperators have been imparted training during last three years. They are working as sector-wise trained development workers. Different studies showed that 98.13% of trained cooperators on skill development and technology transfer got self-employment and being able to raise their income level high. They are transformed into skilled human resources from unskilled or semi-skilled status (Hussain & others, 1998, 2002).

Seventeen trained cooperators on tailoring, electrical house wiring; radio, television and mobile repairing, plumbing and pipefitting, beef fattening were asked during field visits in 14 villages of five Upazilas. Fifteen of them had been able to utilize acquired knowledge and skill. They earned on an average Taka 3100.00 per month. One of them got overseas job in a Malaysian company this year.

Self-operated Micro Credit : CVDP gives more emphasis to build up the capital base comprising share, savings and other fund of the co-operatives so that the CVDCS itself

could operate credit programme with their own. The societies have some long term investment on fisheries, biogas, plantation, irrigation etc. Credit is given to undertake activities like poultry rearing, beef fattening, milk cow rearing, pisciculture, nursery development, petty business, vegetable production and marketing, tailoring, rickshaw/ van purchase, solar panel installation, bloc-batik, handicrafts and artificial insemination. Credit is also provided to buy agricultural inputs like fertilizer, pesticides and agricultural implements like thresher, power tiller, spray machine etc. These have created opportunities for employment and income generation. An amount of Taka 1600.10 lakh (89% of total capital) is disbursed to 26566 cooperators from their own fund for as many as 14 types of income generating activities. Thus, the co-operative societies show their competency to handle credit approval, disbursement and realization and the credit programme as a whole (Rahman, 2007).

An investigation on 25 recipients by sudden selection was conducted to know the implication of micro-credit. Of these 99% had been able to raise their income at a rate of Taka 2,340.00 per month. The important IGAs were poultry farm, van pulling, milch cow, fruit and vegetable cultivation and handicrafts. Through conducting a FGD it came to know that the loan money is their money consisting of share and savings; they got loan from own fund with easy conditions. Almost in all cases the recipients utilize the loan properly and so they have been able to repay loan timely. The strength is that the service charge of loan is got back to the societies' account which, in turn, paid as dividends to the co-operators. Thus, the CVD co-operatives have established the self-controlled credit management system at the field.

Linkage as Change Vehicle : Comprehensive Village Development Co-operative Society is formed in each village comprising all the villagers. These organizations are interacting with all the Nation Building Departments (NBDs) and Local Government Institutions (LGIs) like Union and Upazila Parishads. On the other hand, all departments extend their hands with all supports to the villagers through the cooperative platform in education. NGOs can also work closely with the village co-operatives particularly in education. Thus, CVD cooperatives itself are emerged as a 'social technology center' in the village to bring a breakthrough in providing some essential inputs which, in turn, help towards improving the standard of life of the cooperators.

There are some provisions for holding meetings both at the Upazila and the society levels which are participated by the UP leaders, Upazila level officials and cooperators. This forum works for establishing a good linkage between the service providers and service recipients. This is the Monthly Joint and Union Coordination meeting, popularly known as *'Mashik Milon Mela'*. Thus, CVDP has brought close tie between village level cooperatives and NBDs for the betterment of the rural people. The trained cooperators and village

workers act as a change agent in the villages. This could be strengthened if there would be a provision of community radio and television to make the people aware.

Employment, Income and Social Development : Employment and income are considered as important indicators of development. Keeping this in view, CVDP has made an endeavor to create employment and generate income for the cooperators through providing training and societies' self operated credit. CVDP has been able to create a lot of self-employment for co-operators. Total number of beneficiaries is more than 1.17 lac. The credit programme of CVD cooperatives has exerted positive impact on the socio-economic status of the co-operators. An investigation shows that about 20000 unemployed youth including women got employment as a result of micro credit and training during last five years in RDA part. Knowledge and skills acquired from training have brought a positive change in their mind-set towards adoption of technology, education, health, family planning, sanitation, environmental protection programme. As a result of increased income, they have been able to send their children to school install hand tube wells for safe drinking water and water-sealed latrine for defecation, produce vegetables to meet up their nutritional gap. They are also found more enthusiastic to use technologies like solar panel, biogas, organic manure, healthy seed, irrigation etc. to improve their livelihoods. Because of awareness building through training the poor has become aware of their power, values and role in the society. These should be brought into practice more and more.

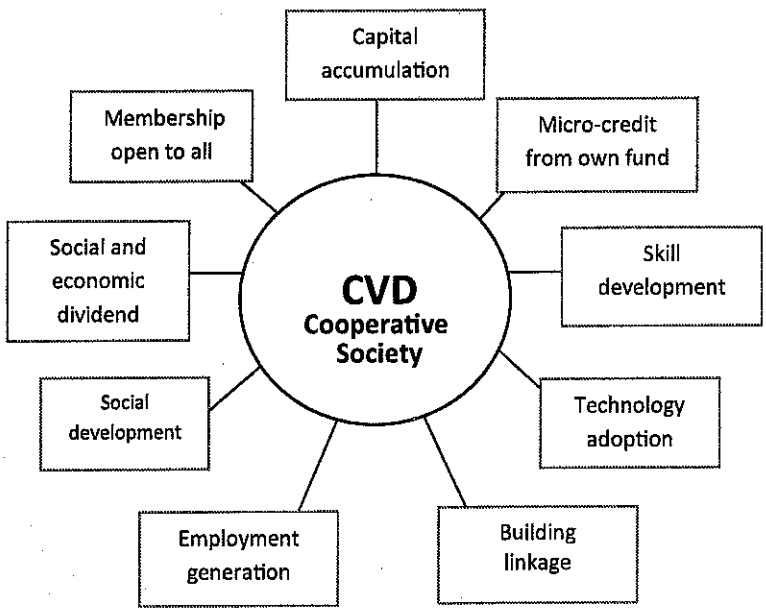

Fig.-1: Features of CVD cooperatives as a Social Technology

CVD cooperatives have been able to create such a forum where each of the villagers from different cross-section has the access to become a member. Total members are 117377 from 82415 house holds. That means 23% of the population from 58% households took the membership. The thrift deposits are being used as a major source of micro-credit and investment. The numbers of WSL and tube well have increased by 1.62% and 1.36% compared to 3.1% and 2.8% respectively (Bench Mark Survey 2006 and 2011). Enrolment to school has increased by 93% while it was 79% at the beginning of the program. Adoption rate of birth control measure is about 93%. The picture has endorsed a strong linkage between village level organization and Nation Building Departments.

Technology has been found blessings for the CVD cooperatives. Technologies like biogas, solar energy, trichodarma, low cost irrigation etc. have brought the organizations to the lime-light. These are introduced to 39 villages which contributed a lot to increase agricultural production, save domestic fuel cost, encourage mass education and improve general life style as well. In Sadullapur upazila (Gaibandha), for example, a mini market network with the adjacent areas is developed. This is how the CVD cooperative societies play a vital role to act as a 'technology transfer platform' in the rural areas. So it is not mere a rural institution, rather it is a social technology that can address all the issues of the community people.

Lessons from CVDP

- CVDP encompasses all the sector-specific components related to human development, health and sanitation, family planning, education, environmental protection, employment and income generation.
- Nation Building Departments play a supportive role in these areas. This should be strengthened and more collaborative.
- It is entirely community driven and based on self motivation for development. This is the intrinsic value and strength of CVD cooperatives.
- Constitutions tend to be equitable and represent all members, both male and female.
- Creating and managing a pool of community-contributed funds is central to the existence of the society.
- Co-operatives are found to be competent enough to launch and operate the credit programme with their own.
- Decisions are democratically taken at the community level and so a high degree of self regulation and peer pressure exists.
- No need for extensive external monitoring as progress regarding development initiative is already documented and self evident.

- Technology can change the life style of rural people. It should be taken care off with highest priority.
- Training provided members to become sector-specific practitioners in their own right and so exist as a sustainable resource.

Conclusion

Empirical evidences show that many organizations do not last long. After some lapse of time the relatively weak organizations die down. But CVD cooperatives inherently have some especial features like open membership for all, more training, linkage building, strong institutional base, participation and involvement in all activities, gender equality and social networking services which keep them alive and sustain its existence and bring increased benefit for the members. They have ability to demonstrate and uphold the activities before its members and the villagers as a whole.

There are some weaknesses in these village level institutions. Irregular thrift deposits, low attendance in weekly meeting and low rate of membership enrolment are pertinent of those. These can be reduced through intensive monitoring and providing more training from the programme side and policy support from the government. The Nation Building Departments should come forward with all out support and services from their departmental allocation. The cooperators may be given motivation and encouraged to make them self-reliant. All together these can make the CVD cooperatives more effective and sustainable.

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Yield Gap Minimization of Potato and Maize in Level Barind Areas of Bangladesh

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Abstract

The trial was conducted in the farmers' field of Roy Nagar, Shibganj, Bogra, Bangladesh to determine and minimize yield gap of potato and maize in Potato-Maize-T.Aman rice cropping pattern during 2011-12.This research was funded by Krishi Gobesona Foundation (KGF), Dhaka, Bangladesh. The trial was composed of two treatments-recommended management practices (Trial plot) and farmer's practices. All NARS released technologies were followed carefully in trial plot and farmers traditional practices was followed in farmer's plot. In potato, cardinal variety was used and NK-40 was used for maize cultivation. The yield of potato (24.11 t/ha) was found from trial plot where as farmers guided plot was obtained comparatively low yield (18.34 t/ha).The grain yield (7.39 t/ha) from maize was also obtained better from trial plot but the farmer's plot was found lower (6.01 t/ha) than the trial plot. Yield contributing characters and yield were found better in trial plot against farmers practiced plots in both crops. About 23.93% in potato and 22.96% in maize were found more yields from the crops in trial plot compared to farmers practice.

Introduction

The concept of yield gaps in crops originated from different constraint studies carried out by International Rice Research Institute (IRRI) during the seventies. The yield gap comprises at least two components. The first component–yield gap I is the difference between research station yield and the potential farm yield. The second component of yield gap II is the difference between the potential farm yield and the actual average farm yield (Alam, 2006). But, closing the yield gap is not applicable at all levels. At the farm level, the most viable option is to narrow the gap between the potential and actual farm yields or Gap II.

Seed potato is a vital input for successful potato production. It makes up about 50% of the total cost of production for the crop (Hussain,1999).The widespread use of diseased and degenerated farmers seed (94% of seed used) is the major cause for the low national

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average yield of potato in Bangladesh (Siddque et al.,1999). The average per hectare of potato production in Bangladesh is very low in comparison to other potato growing countries of the world. The main reason for poor yield in Bangladesh is the acute shortage of good quality seed tubers (Khan et al., 1999).Higher yield of potato mainly depends on the use of good quality seed tubers and application of proper dose of fertilizers.

In the cropping system, potato and maize is good synchronization in Bangladesh climate. After potato harvest, farmers level their land and then manually plant the maize seed. They do not use PKS fertilizers because they believe that residual PKS from fertilizer applied to potato is sufficient for the maize. They apply nitrogen (N) fertilizer as required. Thus the production cost of *Kharif-I* maize is less than from winter *Rabi* maize. Well resourced farmers and businessmen are anxious to cultivate maize after potato on a large area. Since Potato-Maize is a highly productive and profitable cropping pattern, it seems that the area of *Kharif-I* maize could increase dramatically in coming years, as did winter maize.

The institutes under National Agricultural Research System (NARS) and extension agencies when disseminate the technologies, yield gaps exist in different crops such as rice, wheat, potato, oilseeds, pulses, etc. that may range from 19% to 64% of the potential yield (Matin et al.,1996 & Roy, 1997). Cultivation of low yielder local varieties, lack of recommended management practices with improper fertilizer management are the major causes for poor yield of the crops. To feed the teeming population of the country it is essential to increase production as well as productivity of crops by narrowing the yield gap. The present study was undertaken to determine and minimize yield gap of Potato and Maize using improved management practices.

Materials and Methods

The production program was conducted at the farmers' field of Roynagar, Shibganj and Bogra during 2011-12. The trial was comprised of two treatments-recommended management practices (Trial plot) and farmer's practice with 15 dispersed replications. The unit plot was 1 bigha (1350 m^2). Before conducting the experiment a Focus Group Discussion was arranged with local farmers to find out the reasons of yield gap for the pattern. Yield gap of potato was about 25% and for maize was 20%. All NARS released technologies were followed carefully in trial plot and farmers traditional practices was followed in farmers plot practice based on FGD findings.

The potato, cardinal variety was used in both plots, but foundation seed generated from tissue culture was used in trial plot and farmers collected their seeds from local market. Tubers were planted in first week of December, 2011. The crop was harvested from 27 February-04 March, 2012. At harvest, 10 plants were selected randomly from each plot to

record number and weight of tubers/plant. The yield per plot was recorded and converted into yield per hectare.

The maize, NK-40 variety was used in both plots. The seeds were sown in the plots on 3-5 March, 2012 at the spacing of 70 cm × 20 cm. The fertilizers were 206-50-104-4000 kg N,P,K, cowdung ha^{-1} in Farmers' practice whereas 257-56-139-34-3.6-5000 kg NPKSZn Cowdung ha^{-1} in trial plots. One-third of urea and full amount of other fertilizers were incorporated in the soil during final land preparation. Rest 2/3 of urea was applied in 8-10 leaf stage and 20-22 leaf stage. The crop was harvested during 11-17 June 2012.

Intercultural operations were done as and when necessary. Plant protection measures were taken following IPM technique. Data on yield and yield contributing characters of both crops were recorded carefully. The yield per plot was recorded and converted into yield per hectare. The gross economic return was calculated on the basis of prevailing market price of the commodities.

Results and Discussions

The potato yield and yield contributing characters are presented in Table-1. Maximum plant height (60.97 cm), number & weight of tubers/plant (8.12 & 449g) and tuber yield (24.11 t/ ha) was obtained from trial plot whereas farmers plot was found 7.23 & 412g. Higher gross return (Tk 241100/ha) and gross margin (Tk112990/ha) were recorded from the trial plot. These were 31 percent and 89 percent higher in trial plots compared to farmer's practices, respectively. Gross margin over farmer's practice was 53218 Tk/ha in Table-2.

Table- 1: Yield and Yield Contributing Characters of Potato under Different Management

Treatments	Plant height (cm)	No. of tuber /plant	Wt. of tuber/ plant (g)	Yield (t/ha)	Yield gap (t/ha)	Yield gap (%)
T_1 (Trial plot)	60.97	8.12	449	24.11	5.77	23.93
T_2 (Farmers' practices)	57.07	7.23	412	18.34		
t- value	2.24	4.34	5.71	7.50		
Level of significance	ns	**	**	**		

Table- 2: Economics of Potato under Different Management Practices at Ghagurduar, Roynagar, Shibgonj, Bogra during 2011-12.

Treatment	Gross return (Tk/ha)	Cost of production (Tk/ha)	Gross margin (Tk/ha)	Gross margin over farmers' practice (Tk/ha)
T_1-Trial plot	241100	128110	112990	53218
T_2-Farmers' plot	183400	123628	59772	

The maize yield and yield contributing characters are presented in Table-3. Maximum plant height (182.6 cm), length & breadth of cob (20.03 cm & 13.89 cm), number and & weight of seed per cob (434 & 270.8 g) and 1000 seed weight (392.5 g) was obtained from trial plot but the farmers plot was found less considering all yield contributing characters. Highest grain yield (7.39 t/ha) was also obtained from trial plot which was 22.96% higher compared to farmer's plot. Higher gross return (Tk 110850/ha) and gross margin (Tk 46976/ha) was recorded from trial plot. Gross margin over farmer's practice was 15852 Tk/ha in Table-4.

Table-3: Yield and Yield Contributing Characters of Maize under Different Management Practices at Roynagar, Shibganj, Bogra during 2011-12.

Treatment	Plant height (cm)	Length of cob (cm)	Breadth of cob (cm)	No of seed/ cob	1000 grain wt (g)	Yield (t/ha)	Straw yield (t/ha)	Yield gap (t/ha)	Yield gap (%)
T_1-Trial plot	187.70	23.35	15	463.3	480	7.39	7.59	1.38	22.96
T_2-Farmers' plot	184.66	20.30	13	421.2	350	6.01	6.71		
t-value	8.54	5.84	3.19	17.39	59.22	13.83	2.11		
Level of Significance	**	**	**	**	**	**	NS		

Table-4: Economic Analysis of Maize under Different Management Practices at Raynagar, Shibganj, Bogra during 2011-12.

Treatment	Gross return (Tk/ha)			Cost of production (Tk/ha)	Gross margin (Tk/ha)	Gross margin over farmer's practice (Tk/ha)
	Grain	Straw	Total			
T_1-Trial plot	110850	7590	118440	71464	46976	15852
T_2-Farmers' plot	90150	6710	96860	65736	31124	

From the study it was observed that higher yield was obtained in trial plot against farmers practiced plots. This higher yield was achieved might be due to use of high yielding variety, use of good quality seed, use of balanced fertilizer and proper pest management (especially late blight in potato).

Farmers' Reaction

Farmers were very much impressed to have higher yield with the recommended practice than their own practice. Farmers of the adjacent areas were also impressed to the higher yield and showed keen interest to cultivate the crop with recommended practice in the next year.

Conclusion

Existing cropping pattern was improved through maize intervention and yield gap were minimized. Farmers understood that yield gap can be minimized by proper practicing of NARS technologies and farmers will get rid of loss. So demonstration of good practices of Potato-Maize patten is the key to increasing yield throughout the country.

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Production and Marketing of Safe Vegetables: A Bogra Village Scenario

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Abstract

The study was carried out to assess the existing production and marketing situation of safe vegetables and to determine degree of awareness, problems/constraints in this regard. It was conducted in two Upazilas– Shibganj and Sherpur under Bogra District. Following simple random sampling method, data were collected from 89 respondent farmers who were selected from 300 safe and non-safe vegetables farmers of two Upazilas. The study revealed that farmers had a general idea on safe vegetables as cultivation of vegetables without any insecticide-pesticide and chemical fertilizer. They articulated 14 kinds of idea on cultivation of safe vegetables and it was found to use traditional methods by most of the farmers for making vegetables safe. Among the respondents majority used bio-pesticides (87.6%), followed by Pheromone (41.5%) and insecticides/Pesticides with other methods (16.8%). It is to note that 95.5% farmers used organic manure to increase production of vegetables. Farmers had lack of awareness about health hazards. In case of financial supports for vegetables cultivation, 96.6% farmers used their own capital, 10.11% took financial support from NGOs and a few from Mohajons and others sources. But a few took credit from NGOs, Mohajans and others. In all, 75.3% respondents viewed that producing safe vegetables might be profitable as commercial basis but the rest had confusion for producing safe vegetables to be profitable one. It was found that 73% farmers had not received fair price of safe vegetables, which created frustration among the farmers. They urged for establishing effective network for marketing of safe vegetables with taking measures by diminishing syndication approach in the market, making agro-processing opportunities in the intensive vegetables growing areas and ensuring supply of pure inputs for making vegetables safe, which will ensure fair price for safe vegetables.

Introduction

Background of the Study: The supply of safe and nutritious food to the growing Bangladeshi population is considered as one of the most important issues. Food safety

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is a highly complex issue (Ali, 2010), it must be addressed throughout the food chain from farm-to-table. In Bangladesh, food safety incidents are frequently being reported and they have a serious impact on public health, as well as on trade in food and agriculture products, and on consumer confidence. "Between 25 and 30 percent of total population in the developed world even suffer from at least one episode of food poisoning in a year. Based on the calculation, over 45 million people in Bangladesh suffer from food poisoning or some kinds of food borne diseases round the year (Deon, 2010). General awareness about food safety and food hygiene in Bangladesh is very low, and this is compounded by limited evidence or data on the dimensions of the food safety challenge faced by thecountry. Many of the recent food safety incidents in Bangladesh have been caused by a lack of awareness of food safety hazards among farmers and inappropriate use of pesticides in agricultural production. Food safety must be managed through an integrated approach and along the entire food chain.

Ad Spijkers (2010) told, "Food security could not be achieved without food safety," and urged all stakeholders to come forward and deal with sincerely with the important issue of food safety in Bangladesh. In order to assure food safety, we need to consider some crucial factors in respect of food chain, education and training of farmers and small-scale food production. Furthermore, education of consumers is important and implementation of grassroots advocacy on food safety was considered important for raising consumers' awareness. In Bangladesh, multiple Ministries are involved in food control activities and their roles and responsibilities are not always clearly defined, and gaps and overlaps exist. FAO has long been trying to promote integrated pest management (IPM) as a sustainable and environment friendly solution but little progress has been made so far (Spijkers, 2010). However, it is necessary to take more steps in producing safe food and to know the real situation prevailing throughout the country.

Beside production, fair pricing of safe or other products, especially for the farmers is a great concern to keep the smooth development of the agriculture sector and to keep the producers on the right track. In fact, marketing from rural to urban areas are of many-folds. Farmers generally sell their products to nearer markets, or local buyers and even outside buyers are also purchasing products from farmers' house/farm-yard. Some progressive farmers send their products to distant markets. Local/outside buyers create syndicate in controlling the market price. They assemble purchased products from farmers and send those to the distant markets and also the markets of Dhaka city. As a result, farmers are being deprived of getting fair price of the products. Inadequate market facilities, imperfect market structure, inefficient marketing system and inappropriate market policies hinder the process of modernization/acceleration of agricultural growth. These are fact for all the agricultural products, but especially safe vegetables' production and marketing is a

great challenge. Unsafe vegetables are detrimental for creating health hazards. Vegetables are necessary in our daily life. So, it is essential to know the real situation regarding safe vegetables at the field level. Keeping these points of view, this study was conducted based on the following objectives.

Objectives of the Study

The broad objective for the study was to examine the existing production and marketing situation of safe vegetables in Bogra District.

The Specific objectives were to:

i) Assess and analyse existing production and marketing situation of safe vegetables;
ii) Identify various problems regarding safe vegetables' production and marketing; and
iii) Assess level of awareness among farmers and consumers on safe vegetables.

Justification of the Study

More than 60 types of vegetables of indigenous and exotic origin are grown in Bangladesh. The production of vegetables is higher during winter (60 to 70%) and most districts produce marketable surplus during this season. Especially, Bogra district is a central point of North Bengal and also huge vegetables has been produced in this region. Most of the vegetable producers have been cultivating vegetables with lots of chemicals, insecticides, pesticides, etc. As a result, various diseases are spreading over by using these traditional vegetables. A lot of researches had been conducted regarding production and marketing of traditional vegetables. But a few researches had been conducted regarding safe vegetables production and marketing. So, the present study was conducted on safe vegetables production and marketing; Bogra as a prominent vegetables producing area, was chosen as the sample District.

Methodology

The Study was conducted in two Upazilas, namely Sherpur and Shibganj under Bogra District. At first, a list of 300 farmers from four villages (two villages in each Upazila) who produce both safe and non-safe vegetables was prepared. Then among 300 farmers 89 farmers were chosen as the respondents following simple Random Sampling Method.

Questionnaire and guideline were used to collect data. After collecting primary data, the raw data was coded, edited, tabulated and analyzed in accordance with the objectives of the study.

Beside in-depth survey, FGD was conducted with the farmers and other stakeholders.

Findings and Discussion

Socio-economic characteristics of the selected farmers: Socio-economic characteristics of the farmers were assessed in terms of age, sex, level of education, occupation, household assets including homestead, land under vegetables cultivation and household income level of the vegetable cultivators. This information is helpful to understand the socio-economic status of the farmers. It was found that all farmers were male and 23.6% farmers had no formal education, only they can put their signature and most of them were at the level of primary to SSC. Most of the farmers' main occupation was farming with some subsidiary occupations.

Landholding pattern under safe vegetables cultivation: Landholding pattern of the farmers was analysed based on total cultivable land and coverage under safe vegetables cultivation. Table-1 illustrates landholding pattern in-detail. Out of 89 respondents 55 (61.80%) had less than 0.50 acres and the remaining respondents had 0.50 to 5.00 acres plus of total cultivable land. On the other hand, land coverage under safe vegetables cultivation less than 0.50 acres were covered by 69 (77.53%) farmers and 0.50 to 5.00 acres plus of land by the remaining farmers for the same purpose. Almost all farmers brought land under cultivation of safe vegetables. So, it is quite encouraging picture in extension of safe vegetables cultivation.

Table-1: Landholding Pattern of the Farmers

Land area(acre)	Total cultivable land		Land use under safe vegetable cultivation	
	No. of farmers	%	No. of farmers	%
<.50 acre	55	61.80	69	77.53
0.50-1.00	9	10.11	10	11.24
1.00-1.50	3	3.37	3	3.37
1.50-2.00	8	8.99	4	4.49
2.00-2.50	7	7.87	1	1.12
2.50-5.00	1	1.12	2	2.25
5.00+	6	6.74	0	0.00
Total	89	100.00	89	100.00

Annual income of farmers: All respondents were vegetables growers. They didn't have any fixed income on monthly or daily basis. They usually depend on cultivation of various crops; vegetables got importance among all crops to them as their main earning source. It was found that out of 89 respondents average income of 17 (19.10%) farmers was Tk. 2500 and another same percent of farmers had average income of Tk. 15,000. The remaining farmers had averages ranged from Tk. 15,000 to above Tk. 50,000 (Table-2).

Table-2: Annual Income of the Households

Avg. Annual income (Tk.)	No. of Respondents	Percentage (%)
2500	17	19.10
7500	16	17.98
15000	17	19.10
25000	11	12.36
40000	15	16.85
50000+	13	14.61
Total	**89**	**100.00**

Information on Safe Vegetables Cultivation

Involvement in vegetable cultivation by the farmers: Plenty of vegetables were produced in the study area and most of the farmers were involved in vegetables cultivation. It was found that 44 (49.4%) farmers had involvement in vegetables cultivation with 10 to 20 years of lengths, and the remaining farmers had experience up to 10 years and from 20 plus to 50 plus years of experience (Figure-1).

Farmers' age varied from 18 years to 50 plus. Most of the farmers (67.4%) were 36 to 50 years old. So, the study suggests that medium aged farmers were more involved in farming other than especially young who were not coming forward in farming.

Level of ideas perceived by the farmers about safe vegetables: An attempt was made to determine ideas about safe vegetables perceived by the farmers. They were asked what ideas they have in this regard. Respondent farmers mentioned different ideas of safe vegetables such as, use of no pesticides, use of vermi-compost, harvesting after using insecticide/ pesticide for certain period, non-glittered vegetables, insect free vegetables, fresh vegetables, vegetables using organic manure, and so on. Most of the farmers (49.4%) expressed their understanding as safe vegetables without using pesticide/insecticides while vegetables cultivation and 25.8% had idea as safe vegetables with use of chemical fertilizer (Table-3).

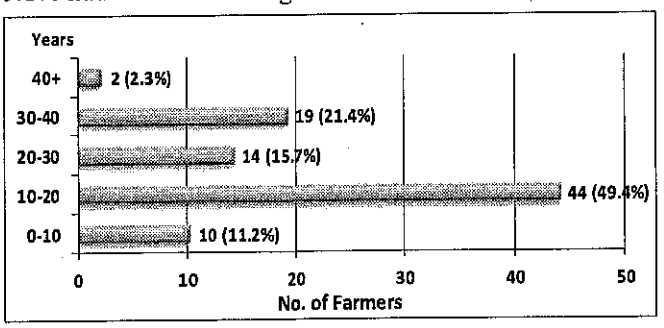

Figure-1: Experience in Vegetables Cultivation

Table-3: Ideas/Concept about Safe Vegetables Perceived by the Farmers

Ideas/concept on Safe Vegetables	No. of respondents*	Percentage (%)
Using no pesticides/insecticide while cultivation	44	49.4
Vegetables with chemical fertilizers are safe	23	25.84
Vegetables what we eat are safe	11	12.36
Vermi-compost use	1	1.12
Harvesting vegetables after certain period of using insecticides/pesticides	3	3.37
Non-glittered vegetables	2	2.25
Fresh vegetables	1	1.12
Vegetables using organic manure	1	1.12
No use of excessive insecticides	2	2.25
Bitter taste	1	1.12
Vegetable using bio-pesticides	7	7.87
Vegetables produced during certain season	1	1.12
Vegetables without use of chemical fertilizers	7	7.87
Vegetables produced by RDA technology	5	5.6
Don't know	2	2.25

* *Multiple answers on safe vegetables*

Methods used for producing safe vegetables: Most of the crops were produced by using traditional methods. An attempt was made to document the methods followed by the farmers in producing safe vegetables. Majority of the farmers followed several methods for making their vegetables safe (Table-4). Data suggest that eight types of methods were followed by the farmers. Out of 89 farmers, 95.5% mostly used organic manure, followed by using bio-pesticides (87.6%) and Pheromone (24.7%). In fact, farmers used mixed method in the field; they were trying to produce safe vegetables by using safe methods and the traditional method as well. No one was found to use only safe methods. In all, 16.8% farmers used insecticides/pesticides as a part of making vegetables safe.

Consumption of safe Vegetables: Regarding using safe vegetables for consumption at the household level, 36% farmers showed positive response to consume safe vegetables for their family. But it's quite questionable because they were using safe and unsafe method both in production process.

Vegetables and impact of using unsafe vegetables: In respect on the impact of unsafe vegetables, 56% farmers told about creating health hazards by unsafe method in cultivation and 33.7% farmers were concerned about their personal health hazards (Table-5) while using spray and other works, but the study revealed that they did not follow the process to

be safe like using mask. Farmers had some consciousness getting ideas from DAE officials, NGOs' staff and other farmers/friends in the village.

Table-4: Methods Used for Safe Vegetables Cultivation

Methods used	No. of respondents	Percentage (%)
Organic manure	85	95.5
Bio-pesticides	78	87.6
Pheromone	22	24.7
Organic manure and Pheromone	15	16.8
Using insecticides/Pesticides with other methods	15	16.8
Set up Bamboo stand	2	2.2
Harvested vegetables after certain period of using insecticides, pesticides	2	2.24
No use of preservatives	12	13.48

** Multiple answers on using different methods of cultivation*

Table-5: Impact of Using Insecticides/Pesticides

Major Reasons	No. of respondents	Percentage (%)
Health hazards created for human being	50	**56.1**
Health hazards created for the farmers themselves	30	**33.7**
Loss original taste of vegetables	20	**22.5**

Marketing of Vegetables

Marketing channels: Four types of marketing channel were followed by the farmers and traders (Table-6). In fact, channels for safe vegetables were almost like traditional vegetables. Generally, safe vegetables produced by the farmers were mixed with other unsafe vegetables in the market. There is no specific channel for safe vegetables. The Number-4 channel is mostly dominant among other channels. A few companies started to work with vegetables farmers in Bogra region and they directly send their product to the outlets of Dhaka city. They have little initiatives but still at initial stage. The respondent farmers were not associated with the companies.

Table-6: Marketing Channel Followed by the Farmers and Traders

Sl No.	Marketing Channels	% of Vegetables
1.	Farmers → Consumers (rural)	2%
2.	Farmers → local Retailers→ Consumers (rural)	3%
3.	Farmers → *Aratdars*/wholesaler (local) → local Retailers → Consumers (rural)	5%
4.	Farmers → *Aratdars*/wholesaler(local) → Distant *Aratdars*/wholesalers → Retailers (Cities/towns) → Consumers (Urban).	90%

Fair pricing of safe vegetables: Fair price of safe vegetables getting by the farmers is very important in continuation of safe vegetables production. In this section, an attempt was undertaken to assess the price-range that the farmers receive for the safe vegetables. Majority of the farmers (73%) showed their negative response on getting fair price of their safe vegetables. The highest ranking problem was syndication created by wholesalers/ aratdars and other middlemen (92.3%), followed by Weak Marketing Management (69.2%) and Unplanned Production by the farmers (32.3%) (Table-7). It is note that safe vegetables growers have an expectation to get high price for their products compared to other vegetables, but for safe vegetables number of customers is few in the market. Besides, customers have lack of awareness about safe vegetables so they have no personal interest to buy safe vegetables paying fair price for safe vegetables.

Table-7: Reasons for Not Getting Fair Prices of Safe Vegetables

Major reason of not getting fair prices	No. of respondents	Percentage
Syndication created by Wholesalers/Aratdars/middlemen	60	92.3
Weak Marketing Management	45	69.2
Unplanned Production by the farmers	21	32.3
Shortage of buyers/customers for safe vegetables	15	23.0
Disturbance by local faria in the market	10	15.4
Decreasing Production due to using safe methods	5	7.7

* *Multiple answers*

Problems in respects of Safe Vegetables Production and Marketing

Problems in vegetables production: Respondents were asked whether they had faced any major problems regarding safe vegetables production or not. An overwhelming majority 87 (97.75%) of the farmers told that they had been facing some problems in cultivation of safe vegetables. Major problems faced by the farmers were high price of inputs (95.5%),

followed by high infection of diseases & insects (80.9%). The other problems were less awareness on the doses of fertilizers, insecticides, pesticides, irrigation problems, impure inputs, etc. (Table-8).

Table-8: Responses of Farmers on Problems in Safe Vegetable Production

Major problems	No. of respondents*	Percentage
High price of inputs-fertilizers, insecticides, pesticides	85	95.5
High infection of diseases & insects	72	80.9
Less awareness on the dose of fertilizers	36	40.4
Excess/less use of insecticides/pesticides	34	38.2
Lack of farmers' knowledge in management of safe vegetables	12	13.5
Irrigation problems	35	39.3
Expensive labor	10	11.2
Impure inputs- insecticides, pesticides, fertilizers	30	33.7
Impure seeds	20	22.5
Expensive irrigation cost	3	3.37

* *Multiple answers*

Limitation in Production

- Some farmers think that It's not possible to produce vegetables without insecticides or pesticides
- Vegetables that need less pesticides & get less attacked by pest are to be produced
- Farmers used to apply pesticide/insecticides when condition becomes worst while producing safe vegetables.
- Still farmers have lack of awareness about production technology.

Problems in Vegetables Marketing

In all, 82 (92.13%) farmers expressed some problems in marketing of safe vegetables. Among all problems, low price of safe vegetables was supported by 92.1% farmers, followed by creation of syndicate hampers fair pricing of vegetables (65%). The other problems were weak marketing management system, shortage of buyers of safe vegetables, etc. (Table-9).

Table-9: Responses of Farmers on Major Problems in Safe Vegetables Marketing

Major problems	No. of respondents*	Percentage
Low price of safe vegetables	82	92.1
Syndicate hampers getting fair price by the farmers	58	65.2
Weak marketing system	41	46.1
Unrealized selling creates quality deterioration daily	38	42.7
Shortage of buyers for safe vegetables	30	33.7
Lack of storage facilities	25	28.0
Farmers cannot sale vegetables at their own choice	20	22.5
Excess production compared to demand in the market	5	5.6

* *Multiple answers*

Conclusion

The study was conducted among the selected farmers to assess and analyze existing production and marketing situation of vegetables and identify various problems regarding safe vegetables' production and marketing. The study suggests that farmers were not more educated and much aware about cultivation method of safe vegetables, but they made remarkable achievement in producing safe vegetables in spite of prevailing lots of problems.

Under safe vegetable cultivation 69 (77.53%) respondents had less than 0.50 acre land, so it's quite encouraging in safe vegetables production. Farmers had long term experience in vegetables cultivation. Land coverage under safe vegetables was quite encouraging. But 97% farmers faced many problems regarding safe vegetables production. The study reveals that farmers at least had some ideas on safe methods of cultivation, but they didn't follow properly. Mostly farmers used bio-pesticides and Pheromone trap for making the vegetables safe. But farmers were found to be less aware about the doses of inputs like fertilizer, insecticides, pesticides, etc. and other safe methods. Even they had no care of their own health risk while using inputs. In all, 96.6% farmers had used their own capital for vegetables cultivations. Only 10.11% respondents took financial support from NGO and a few from Mohajons and others sources. In all, 73% respondents did not get fair prices of their vegetables. The highest ranking problem was syndication created by wholesalers/ *aratdars* and other middlemen (92.3%), followed by weak marketing management (69.2%).

Recommendations

In spite of having lots of problems in producing safe vegetables with uttering problems to ensure fair pricing of produced vegetables, there is a good hope expressed by the farmers.

Of course, profitability is an important factor to get sustainable production of a crop. But farmers did not get fair price of safe vegetables as their expectation, 75% farmers opined that safe vegetables cultivation would be profitable one as commercial basis. In this regard, based on the comments of farmers and researchers" views this section highlights some recommendations to be materialized in favour of commercialisation of safe vegetables.

Recommendation on Vegetables Production

- Production cost is to be reduced through giving subsidize/ special assistance and ensuring supply of quality agricultural inputs, like seed, insecticides, pesticides, diesel, etc.
- Need training for the farmers on safe production technology.
- Search for & cultivate new kind of vegetables that need fewer pesticides & get less attacked by the pest.
- Cost of various accessories related to farming should be reduced.
- Ban import of adulterated insecticides, fertilizers, and other inputs.

Recommendation on Vegetables Marketing

- Awareness among consumers to be habituated with safe vegetables should be created through campaign, print and electronic media and other mass-community gathering.
- Safe vegetables need special identity, like marks on the packaging or attachment of certification.
- Safe vegetables need to export. Need govt. assistance to take farmers in the export marketing channel.
- Encourage people to eat safe vegetables and need to make awareness
- Provision of storing safe vegetables is needed nearby market/growth centres.
- Government should encourage entrepreneurs to initiate production and marketing of safe products.
- New markets should be explored for marketing these products.

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Coping Strategies in Cyclone *Sidr:* Scenario of Coastal Village in Bangladesh

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Abstract

Natural disaster is a common phenomenon of Bangladesh due to geomorphologic and geographical location. Cyclone, tidal surge, flood, river bank erosion are badly affecting livelihood of people of the coastal zone. On 15th November 2007, a devastating Cyclone Sidr struck the southern and central coastal belts of Bangladesh. The strong inundation and wind speed of up to 240 kilometres per hour caused a tidal surge that exceeded 10 meters height in certain areas. This community-based exploratory study was carried out in Chal Rayenda and Lakurtola villages of Rayenda Bazar Union of Shoronkhola Upazila (sub-district) in Bagherhat district during December 2007 through February 2008. Data was collected through in-depth interviews and FGD. The study aimed not only to examine the vulnerability but also identify the post cyclone coping strategies in study villages. Findings showed that female, children and older people were more vulnerable. Though unavailability of transport during disaster created difficulties to move towards cyclone shelters, victims were late in this regard for having excessive devotion to assets and animals during cyclonic period. The study explored unavailability of pure drinking water which caused various types of diseases suffered by the respondents. Lack of alternative skills and improper use of land unprotected the inhabitant of high cyclone risk areas. Study also found that victims were not fully dependent on humanitarian responses and relief initiated by the Government and NGOs. They had their own coping strategies to overcome the life threatening situation. Findings of the study draws an attention to establish linkage among different initiatives and coordinate works of government agencies, NGOs and others in fulfilment of local demand during disaster.

Introduction

Bangladesh is a low lying delta with very gentle slopes at the lowest end of the Ganges, Brahmaputra and Meghna Basin (Roy *et al.*, 2009). Due to this geomorphologic and geographical location natural disaster is a common phenomenon in Bangladesh. Almost every year, Bangladesh has frequently faced different kinds of disasters like flood, tropical cyclones, tornados, tidal surges, droughts, large scale river erosion, etc. (Islam, 2011).

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Cyclone, tidal surge, flood, river bank erosion are some of the worst types of disaster in the coastal zone (Alam, 2005). Those are badly affecting the livelihood of people of the coastal zone (*ibid*).

On 15th November 2007, a devastating Cyclone *Sidr* (category 4) struck the southern and central coastal belts of Bangladesh (Shahrook *et al.*, 2008). The strong inundation and wind speed of up to 240 kilometres per hour caused a tidal surge that exceeded 10 meters height in certain areas (*ibid*). In the span of mere moments, *Sidr* washed away thousands of lives, rice fields and millions of houses (*ibid*).

According to Bangladesh government the consequence of *Sidr* was mainly felt through the destruction of housing and the multiple sources of income (Haque, 1995).

The cyclone affected 30 out of 64 districts (Shahrook *et al.*, 2008). In comparison to the 2004 Tsunami, the Bangladesh cyclone caused fewer deaths and casualties but crucially it affected a larger number of families (*ibid*). The number of deaths caused by the *Sidr* was estimated at 3,406, with 1,001 missing, and over 55,000 people sustained physical injuries (GoB, 2008). International groups pledged US $95 million to repair the damage, which was estimated at $1.7 billion (Rahman, 2007).

The people were vulnerable to the cyclone in terms of their basic needs *i.e.* adequate food and safe drinking water, clothing, safe shelter, education, health and hygiene, nutrition (*ibid*). Besides, a huge number of them were psychologically traumatised, including intrusive flashbacks of the stress event, nightmares, inability to concentrate, and others (*ibid*).

However, they had to solder extra work load in and outside their homes (Smit *et al.*, 2006). Besides, they were brought to seek out possible sources of relief. Many development partners, international organizations and local NGOs worked for assisting vulnerable people (Haque, 1995). Conversely, the people in the study area succeeded to overcome vulnerability after cyclone disasters in the light of past experiences at certain level.

In this study vulnerability and coping strategy are stated as below:

Vulnerability: In 2009, United Nation defines vulnerability as a condition of physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards. Vulnerability is 'insecurity', the reverse of 'security'; it reflects "the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard." It involves a combination of factors that determine the degree to which someone's life and livelihood is put at risk by a discrete and identifiable event in nature or in society (Blaikie *et al.*, 1996:8). According to Hossain and others (1996) vulnerability refers to exposure to contingencies and stress and difficulty in coping with them. It has two components: i) an 'external' side

of risks, shocks and stress to which a structure, individual, household, community or nation is subject; and ii) an 'internal' side of lack of resources to cope without damaging loss. A human condition or process is resulting from physical, social, economic and environmental factors which determine the livelihood and scale of damage from the impact of a given hazard (Islam, 2011).

Coping Strategies: Coping strategies refer to the specific efforts, both behavioural and psychological, that people employ to master, tolerate, reduce, or minimize stressful events. Two general coping strategies have been distinguished: problem-solving strategies are efforts to do something active to alleviate stressful circumstances, whereas emotion-focused coping strategies involve efforts to regulate the emotional consequences of stressful or potentially stressful events (Taylor, 1998). Folkman and Lazarus (1980) suggested that people use both types of strategies to combat most stressful events. So, in the context of cyclone, coping strategy is a behaviour that helps victims to function better in a disaster situation. According to Islam (2011), coping means the trends and techniques where people gain their expected results by using their property. It is very much related to capacity. Strategies can be defined as a set of activities or mechanism by which people try to survive in disasters, recover their situation and develop their conditions after disaster.

This qualitative study was carried out to show how the post *Sidr* situations affect the vulnerable people and their coping strategies in the study area.

Objectives of the study were to:

i) Examine the vulnerability of the people; and
ii) Explore post cyclone coping strategies in the study area.

Methodology

This was a community-based exploratory study in which in-depth interviews and FGD (Focus Group Discussion) were conducted. The study was carried out in Chal Rayenda and Lakurtola villages of Rayenda Bazar Union of Shoronkhola Upazila in Bagherhat district during December 2007 through February 2008. Shoronkhola Upazila was located nearer to the Bay of Bengal and affected severely during the cyclone *Sidr* (GoB, 2008). So, two affected villages from this Upazila were selected, purposively for this study. All respondents having more than 50 years of age were selected, because they could better explain the causes of vulnerability and coping strategies, in view of their multiple cyclone experiences occurred in 1970, 1985, 1991, 1997, 1998 and 2007.

From the study villages, 30 household heads were interviewed (15 households from each village) because of having a good sense of household's vulnerability to threats. Four FGDs was conducted among the male of farming and fishing communities. Each FGD group consisted with five to eight participants.

Collected data were analyzed thematically by content analysis. Inconsistent data were checked and thoroughly scrutinized. One anthropologist and one environmentalist were assigned for the task.

Objective-wise respondents and methods:

Objectives	Respondents	Methods
To examine the vulnerability of the people	30 household heads	In-depth interviews
To explore post cyclone coping strategies in the study area	Farming and Fishermen Community	Four FGDs (each group consisted with five to eight participants.)

Discussion and Findings on Vulnerability and Coping Strategies during Post Cyclone Period

Vulnerability Context:

Vulnerability of the Female, Children, Elderly People and Physically Disable Persons

The study found that women, children and elderly people were more vulnerable during disaster. Respondents mentioned that female's long hair and clothing (e.g *sharee, borka*) which made obstacle to swimming, climbing trees, running in a cyclonic surge. Elderly people or physically disable persons were also more prone to get injured or even death during disaster due to their physical condition. Sometimes, family members left them in extreme cases in their thatched or tin made house to save their own life. During cyclone, physically fit persons can run to a safe place like, cyclone shelter or concrete made school building. Unfortunately elderly and physically disable persons, pregnant women and children who were in unsafe did not get chance to save their life during disaster.

Islam (2011) also suggested that women and children are the most vulnerable group in our society and during disaster this vulnerability increases. The differentiated impact of disasters on men and women is primarily caused by the existing gender inequalities manifested (*ibid*). Study of Newmayer and Plumper (2007) and London School of Economics also found natural disasters and their subsequent impact on average kill more women than men. Moreover, irrespective of sex elderly and disable persons and children were also more prone to vulnerable in disaster.

Tendency to Protect Assets and Domestic Animals

The main occupations of the respondents were agriculture and fishing. Their most important assets were cattle, farming and fishing equipments; so villagers were more devoted to their assets and animals. Therefore, they waited for long time and delayed to respond to warning. It is worth mentioning that there was no cyclone shelter in Chal Rayenda before

Sidr and there was a cyclone shelter in Lakurtola which was insufficient to accommodate all the villagers.

- **Lack of Adequate Transportation**

In the study villages the main transports were *Noshimon* or *Vutvuti* (engine driven tricycle) and rickshaw-van, mostly shared by many passengers. During cyclone, drivers of *Noshimon* and rickshaw-van were busy to save their own life and asset like other villagers, which reasoning unavailability of transport. In this circumstances respondents mentioned about their difficulties to move towards cyclone shelters during emergency. Although the waterways were one of the major means of transportations in the study areas like other coastal areas of the country (Murtaza and Biswas, 2011).

- **Unprotected Settlements in Hazardous Places**

Poor and landless people of the study area had the tendency to build their houses in *Khash* land (government land) of embankment. Embankments were mainly risky area (Ahmed, 2006). In habitants of those areas were being affected most but the study found that even those people who were affected in the previous cyclone or disaster were found to build their house in the same place again.

- **Lack of Alternative Skills other than Fishing and Agriculture**

Respondents depended on shrimp cultivation and collection of forest resources mainly for fuel wood. The loss of the cultivators and the fishermen was enormous while *Sidr* struck (Kamal, 2012). The other livelihood options were also become limited due to destruction of their financial capital. Long-term inundation of homesteads and farmlands hindered their agricultural activities. Thus the cyclone disrupted their ability to earn income by the household members and maintain livelihood as they were not skilled other than fishing and agriculture.

- **Lack of Drinkable Water and Spread of Disease**

As a cyclone prone area, scarcity of drinking water was a serious concern for the community as salt water contaminated nearly all the sources of fresh water. Besides, salinisation of ground water aggravated the water crisis, and therefore people faced a huge water crisis. This study explores that unavailability of pure drinking water caused various types of diseases suffered by the respondent. They were attacked by various diseases and illness like during disaster severe to minor injuries and after disaster; diarrhoea, snake bite, fracture, fever, cholera, skin diseases, etc.

Post Cyclone Coping Strategies of the Villagers

The households of the study villages resorted to different livelihood strategies to cope with the awful situation. Different occupational groups respond in different ways to the cyclone

hazard but some strategies were same for all the inhabitants of cyclone risk areas. Study found that villagers had their own strategies to cope with post cyclonic vulnerability. These strategies played vital role to survive before receiving external help in post cyclone disaster situation. Those were:

- Utilisation of otherwise waste and auxiliary food before receiving external help. One to three days immediate after disaster usually they depend on *chira* (bitten rice), *muri* (puffed rice), *mowa* (one kind of traditional sweet made by bitten or puffed rice), vegetables and unusual herbs collected from nearby area.
- Building special tent type of shed especially for those who have completely lost their houses.
- Usually fishermen go fishing separately, but after cyclone they preferred work in a group and share whatever they caught from the sea or river since most of them are lost their fishing gears.
- It was noticed that a good number of villagers depends on rural quack physicians for their treatment after disaster.

- **Informal Support Mechanisms in the Coping Process**

According to the respondents, informal credit had important implications in rehabilitating the livelihood of cyclone victims. They took loans from the better-off households in the community, neighbours, and kin. Informal credit contributed to the coping process of cyclone-exposed households of respondents. Households who had fewer alternative options depended on various types of informal social mechanisms to recover.

- **Migration as a Coping Strategy**

Respondents mentioned that migration has direct linkages to income generating activities. In the FGD, they emphasized that many households decide to migrate when they fail to cope with the crisis. At the first step they preferred staying with friends and relatives who were living outside of the affected area. In the extreme cases, when they lost everything or all the assets and means of production, then they migrate to the nearby city or even in the capital city. So, they considered migration as an important coping as well as livelihood strategy. Hussein and Nelson (1999) argued that migration forms a central part of rural people's risk mitigation strategies. They further suggest that migration forms a central component of livelihood diversification.

- **Livelihood Diversification as Coping and Recovery Strategy**

Diversification of livelihood strategies is commonly employed to cope with temporary crisis. In the study areas, people attempted to diversify their income portfolios. Instead

of households depending on one or two activities, they spread their working localities and tried to engage all the family members irrespective of age and sex. The occupation of fishing community changes by working in repairing houses in the community and working as day labourers in the different project run by NGOs and Union *Parishad*. Victim-farmers or fishermen started petty-businesses and services to revive their financial solvency.

- **Social Safety-Net in Response to Cyclone *Sidr***

Social safety-net refers to all public and private initiatives that provide income or consumption (cash or kind) transfers to the poor. It protects vulnerable persons or family from livelihood risks and enhances their social status. The study found that different types of social safety-net programmes run by GOs and NGOs played a vital role to ensure a more reliable way to regain the *Sidr* victim people's livelihoods.

- **Meet up the Water Demand**

Study found that villagers started rainwater harvesting and also conserving in the community ponds and reservoirs to meet the safe water demand. In the household level, they collected and preserved water in plastic containers, drums, used plastics bottles (bottles of mineral water, cooking oil, soft drinks etc.) and *matka* (earthen made big jar). Adolescent girls fetched water from long distances which were unusual during normal situation.

Adaptation Strategies

Besides the coping strategies, victims of *Sidr* had some long time adaptation strategies. Those were:

- **Plinth of homestead:** to protect from cyclone surge, they raised plinth of their homestead. The usual average height of earthen plinth (locally called V*ithi)* from crop field is one to two feet but they raised it up to six/seven feet.
- **House building materials:** Instead of tin (corrugated sheet) made roof; they preferred thatched-roof houses. During cyclone the wind speed usually high even up to 240 kilometres per hour, which blow-up earthen and thatched made house, sometimes even semi-brick build houses as well. During cyclonic period, tin was dangerous and deadly for human and animals. Therefore, people try to avoid using tin as roof materials to avoid injuries.
- **Tree Plantation:** The victims of the *Sidr* planted lots of deep rooted trees surrounding of their homestead to protect from wind and cyclone surge. These trees may save their lives, houses and properties as well as.

Conclusion

The current study is about vulnerability and post cyclone coping strategies in the two villages of costal Bangladesh. Vulnerability is greater among people in isolation. The evidence shows that to overcome vulnerability, people' identified the local resources, use of indigenous knowledge and their social capital as a means of coping mechanism. Actually people were not helpless but become very cooperative in disaster through their own safety-net.

Humanitarian responses and relief initiatives plays preliminary role for surviving of cyclone affected people. Therefore, it is necessary to supporting livelihood rather than relief project. Besides, Government in collaboration and partnership with the community actors and stakeholders should play the key role for improving transport networks to facilitate movement of people and goods during disaster events. Awareness generation about the scientific nature of cyclones is required for all the people of cyclonic zone.

Most of relief or support programs are short-term and requires transformation towards long-term planning to deal effectively with climate change risks and vulnerability through building resilience of the communities. Appropriate land use policy should be adopted to settle in cyclone disaster prone areas. Therefore, higher level research to find out appropriate housing structures with low-cost for coastal areas of Bangladesh is needed.

Despite of sufficient and comprehensive policies, strategies and action plans, programmes to deal with climate change adaptation at the grassroots levels is not sufficient. This study draws attention to emergency response systems which needed to be adopted based on local realities. Establishing linkage between government initiatives and local demand is required.

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Homestead Vegetable Cultivation: Seed Source Used and Constrains

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Abstract

A field survey was conducted in six villages of the Kaharole upazila under Dinajpur district and six villages of sadar upazila under Thakurgaon district in 2012 to investigate the seed sources used for homestead vegetable production and its impact on production, income generation and involvement of female members. Data were collected from a sample of randomly selected 120 RDRS (a reputed national NGO) beneficiaries out of a total population of 4637. An Interview schedule was used to collect data during the period from March to June, 2012. The results revealed that about twenty vegetable species were grown in the homestead using locally produced seeds. On the basis of farm category the highest number of farmers were small in category (65%), followed by marginal (18%) while medium (10%) followed by landless (4%). Most of the respondents (90.01 % have no training experience, 55.83% respondents have rare extension contact with lower technical know-how about quality vegetable seed production and vegetable cultivation. About 52% of the farmers were involved only in agriculture and 20% of the farmers were involved both in agriculture and service and the rest of the respondents were involved in both agriculture and business. More than 87% respondents in the study area used locally produced seed of different vegetable species except cucumber. Vegetable like indian spinach, napasak, sponge gourd, baburisak, brinjal, chilli, okra, and swamp cabbage were cultivated cent percent with locally preserved seed. Only few respondents (3.5%) store seed in air tight condition and 49.3% respondents store seed in unsealed polythene bag. Homestead vegetable production mostly depends on female member which was 68% and both men and women perticipation was 32%. Shortage of quality seeds, lack of technical knowledge on vegetable seed production, processing and preservation, lack of training facilities on vegetable and vegetable seed production issues were found as major constrain for homestead vegetable production.

Introduction

As many as 54 different kinds of vegetable were exported from Bangladesh in many country of the world (UNCTAD, 2008). It is an important sector in the total agricultural exports of Bangladesh (Karim, 2008). After independence, vegetable were started to export

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in a very limited scale. Vegetable and fruits are being exported from Bangladesh since 1980s. Bangladesh has achieved a remarkable progress in export of agricultural products Diversification into vegetable, crops and increasing commercialization can support the development of the agricultural sector in several ways. Vegetable and crops sub-sector also share about 11.70% to the agricultural GDP (Bangladesh Economic Review-2008). The vegetable sector, occupying a more or less significant position in our export sector, helps meet our need of foreign currency as well as ensure our economic development. Bangladesh earns Tk. 1456.33 million (US$ 24.70 million) in the year 2003-04 by exporting vegetable, which constitutes 60.08 percent of the earnings from agricultural products (Karim *et al.*, 2005). On the other hand, about 49 vegetable species are grown in the homestead in rural areas of Bangladesh (Anonymous, 1979). Homestead vegetable production is the major source of vegetable consumption in the rural area of Bangladesh. Nearly 150 different crops are grown in Bangladesh of which about 100 are vegetable crops (Rashid, 1999). Here cereals and vegetable are produced at the ratio of 5:1 including roots and tubers. But in many developing countries the ratio is nearly 1:2 (Siddique and Aditya, 1992). Though the trends of vegetable production is increasing in Bangladesh in the recent period but total production is very low resulting low per capita consumption of vegetable (about 32 gm/ day/person) compared to neighbouring countries (Rampal and Gill 1990).

Helen Keller International's (HKI) recent national vitamin A survey in rural Bangladesh showed that children of households without a home garden were at greater risk of vitamin A deficiency than children of households with a home garden. So intensive vegetable production is needed for nutritional security, employment generation, farm income, export potential and minimizing dependency on cereal consumption (Elias and Hussain 1994). It is therefore, necessary to know the reasons between lower productivity of homestead vegetable production in Bangladesh.

One of the main reasons of poor yield of vegetable crops in the country is use of poor quality seed. Quality seed is a vehicle to sustain self-sufficiency or attain self-reliance in food. Introduction of quality seed therefore is very important and urgent. But without understanding the reality about the use of locally produced seed and its effectiveness, promotion of quality seed cannot be attained. Seed limits the yield of a crop and thereby the production of the farmer and as a whole of the country. Seed are the focal points around which strategies to boost-up, the yield of any crop can be build-up (Kelly, 1985) as quality seed is the most crucial input and pre-condition for the satisfactory production of any vegetable (HRDP, 1995). The quality of seed may deteriorate at any stage of management viz. pre-harvest, post-harvest and storage conditions, and may be further degraded during processing/packaging by businessmen for their disloyalty. For poor households, vegetable and fruits are often the only source of micronutrients in the family diet. Homestead production

of fruits and vegetable provides the household with direct access to important nutrients that may not be readily available within their economic reach. Therefore, home gardening would be a good means to improve household food security. Home gardening is especially important in overcoming seasonal availability of foods and promoting household self-sufficiency. Home gardening activities are women centered, can also increase the income of women, which may result in the better use of household resources and improved current practices and empowerment. This empowerment of women also addresses a priority area of poverty alleviation and provides important socio-economic returns through lower health and welfare costs, lower fertility, and lower maternal and infant mortality rates. Thus, the simultaneous impact of home gardening programmes in terms of giving women a voice and promoting their full participation in domestic life can make an important contribution to the overall development of communities as well as national income level. Under such circumstances, this study was undertaken to address the following objectives:

i) to investigate the seed sources used by the respondents in homestead vegetable production,

ii) to assess its impact on income generation of the family throughout the year involving female members of family and

iii) to find out constrains regarding homestead vegetable production.

Materials and Methods

A field survey was conducted in six villages of Kaharole upazila under Dinajpur district and six villages of Sadar upazila under Thakurgaon district to investigate the seed sources used for homestead vegetable production and its impact on production and income generation and involvement of female members. Data were collected from a sample of randomly selected 120 RDRS (A reputed NGO) beneficiaries out of a total population of 4637. In order to collect required information on various aspects of the study, an interview schedule was prepared to attain the objectives of the research. Data were collected from March to June, 2012. Appropriate scales were developed in order to measure the variables. Direct question, focus group discussion, individual face to face interview etc. were used to obtain reliable information. Primary data from the respondent farmer was collected through administering pre-tested questionnaire. Information supplied by the respondents was recorded and checked carefully before leaving the study area in order to minimize errors. In order to process and analyze the data, simple mathematical tools like average, percentage and tables, were used to present the research findings in a meaningful way.

Results and Discussions

Personal information

Information related to respondents' age, education, sex and marital status was collected as personal information. The distribution of respondents according to their above mentioned characteristics is given in table-1.

Table-1: Personal Information of the Respondents

Variables and their categories		Distribution (%)
Age	Young age (up to 35)	40.8
	Middle age(36-50)	52.6
	Old age (above50)	6.6
Education	Can't read and write	5.8
	Can sign name only	40.0
	Primary level	41.7
	Secondary level	9.2
	Higher secondary level	1.7
	Above higher secondary level	1.7
Sex	Male	32.5
	Female	67.5
Marital status	Single	4.2
	Married	95.8

The highest proportion of respondents (52.6 percent) found under middle aged category followed by 40.8 percent under young aged and 6.6 percent belonged to old aged category. The highest proportion of the respondents was under primary level of education (41.7 percent) followed by can sign name only (40 percent), secondary level (9.2 percent), can't read and write (5.8 percent), higher secondary level (1.7 percent) and above higher secondary level (1.7 percent). Among the respondents female and married population (67.5 percent and 95.8 percent) were higher than the male and single person respectively (Table-1).

Knowledge and Training Experience of the Respondents

Knowledge is the cognitive domain of an individual. It accelerates the ability of an individual to perform his/her task more efficiently. On the other hand, training in any aspect is essential for developing skill as well as expanding the horizon of outlook of that aspect. Training experience on quality vegetable seed production enables the respondents to acquire higher technical knowledge on it. Technical knowledge on vegetable cultivation and quality seed production based on training experience (DAE, 1999) is presented in table 2.

Table-2: Distribution of the Respondents According to Training Experience and Technical Knowledge on Vegetable Cultivation and Quality Seed Production

Technical knowledge	Percent respondents				Total percent
	No training experience	Training experience (days)			
		Short(<4)	Medium (4-8)	Long (>8)	
Low (0-6)	60.83	0.83	0	0	61.66
Medium (7-13)	26.67	0.83	0	0	27.5
High (above 13)	2.51	3.34	4.16	0.83	10.81
Total	90.01	5	4.16	0.83	100

Table -2 indicates that most of the respondents (90.01 percent) have no training experience about quality vegetable seed production and vegetable cultivation. This indicates that training on vegetable cultivation and quality seed production is essential for increasing technical knowledge as well as developing skills on those aspects.

Knowledge and Extension Contact

Extension contact is essential to transfer the technical knowledge to the farmers of Bangladesh. As most of the farmers of the country are illiterate to lower level of literacy, non-formal education like extension can important be tool to improve their knowledge level and there by to improve their efficiency. The technical knowledge on vegetable cultivation and quality seed production based on extension contact (DAE, 1999) is presented in table-3.

Table-3: Classification of the Respondents According to their Extension Contact

Technical knowledge	Percentage of respondents			Total
	Extension contact			
	Rare (0-6)	Frequently (7-12)	Regular (above13)	
Low (0-6)	55.83	5	0	60.83
Medium (7-13)	25.83	1.67	0	27.5
High(above 13)	9.17	1.67	0.83	11.67
Total	90.83	8.34	0.83	100

Most of the respondents (55.83 percent) in the study area have rare extension contact with lower technical knowledge about quality vegetable seed production and vegetable cultivation. This indicates that extension contact in the study area needed to be strengthened to increase the technical knowledge of the vegetable growers as well as vegetable seed growers.

Farm Size

According to farm size categories (DAE, 1999) the distribution of the respondents in the study area, majority of the respondents owned small farm (65 percent) while18 percent owned marginal farm followed by medium farm (10 percent) and only a few were (4 percent) landless and large farm owner (3 percent). This information indicates that majority of the respondents belonged to resources poor category.

Homestead Utilization Pattern

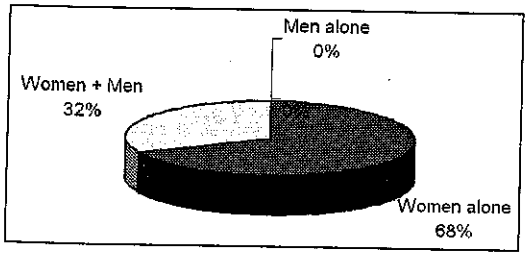
The homestead area of the respondents under different uses of house area, home yard, kitchen garden, trees coverage area, pond, livestock shade based on farm size category was presented in table 4.

Table-4: Homestead Utilization Pattern According to Farm Size Categories

Farm size categories	Area of homestead under different use in hectare						Total
	House	Home yard	Kitchen garden	Tree coverage	Pond	Livestock	
Land less	0.0035	0.0028	0.005	0.0012	0	0.0016	0.0141
Marginal	0.0047	0.005	0.0069	0.0026	0.005	0.0041	0.0283
Small	0.0060	0.0080	0.0093	0.0057	0.005	0.0045	0.0385
Medium	0.015	0.018	0.04	0.015	0.01	0.0096	0.107
Large	0.026	0.036	0. 032	0.01	0.015	0.01	0.129

The kitchen garden area was highest (0.04 hectare) with medium category and the home yard (0.032 hectare) was highest with large category farm. Large category farm possessed higher tree coverage/area than other categories. This indicates that smaller the farm category smaller the tree coverage in homestead implying scarcity of land resources limiting the scope for tree plantation in case of other categories farm.

Women's Participation in Homestead Vegetable Production



In homestead vegetable production women's participation is highest 68%, and both women and man participation is 32% but men participation was zero.

Fig- 1 : Participation in homestead vegetable cultivation activities

Vegetable Species Grown in the Homestead

Sweet gourd (86.7 percent), Bottle gourd (85.8 percent), Wax gourd (70.8 percent), Bean (65.8 percent), Indian spinach (62.5 percent) and Taro (60.5 percent) were popularly cultivated most of the homesteads. Besides other vegetable like Snake gourd (57.5 percent), Ridge gourd (49.2 percent) and Bitter gourd (40 percent) also cultivated in the homestead.

Table-5: Different Vegetable Species Grown in the Homestead of the Study Area According to the Respective Percentage of the Respondents

Vegetable species	percent respondents	Vegetable species	percent respondents
Sweet gourd	86.7	Sponge gourd	18.3
Bottle gourd	85.8	Baburi sak	17.5
Wax gourd	70.8	Cucumber	15.8
Bean	65.8	Brinjal	7.5
Indian spinach	62.5	Chilli	7.5
Taro	60.5	Okra	7.5
Snake gourd	57.5	Pointed gourd	5.8
Ridge gourd	49.2	Cocoyam	4.2
Bitter gourd	40	Tasel gourd	3.3
Red amaranth	37.5	Swamp cabbage	2.5
Amaranth	37.5	Dram stick	2.5
Yard long bean	32.5	Gaint taro	1.7
Bangle spinach	21. 7	Yam	1.7
Napa sak	20.00	Elephant foot	1.7

Popularly cultivated species are climber; needed relatively less space for growing. On the other hand, the vegetable species needed more space were grown in relatively lower scale in the homestead. Some species like Pointed gourd, Cocoyam, Tasel gourd, Giant taro, Swamp cabbage, Yam and Elephant foot were rarely cultivated in the homestead; the homestead containing more spaces as fallow or larger the back yard were frequently cultivated. It is also noted that, those vegetable were propagated vegetatively.

Net Income from Homesteads Vegetable Production of the Respondents

Homestead vegetable production was economically viable. In addition, farmers get nutritious food and buildup relationship with neighbours. In the case of production cost assessment, the price of seeds, seedlings, fertilizers and pesticide were considered. Labour cost was not considered as the garden was maintained mostly by the idle family labours. Gross return, gross margin of different pattern with variable cost are presented in table 6.

Table-6: Average Total Vegetable Production and Utilization Pattern and Net Income of Different Groups of Respondent

Farmers group	Total production (kg)	Vegetable utilization (kg)			Cash income (Tk)	Total income (Tk)	Total cost (Tk)
		Own consumption	Distribution	Sale	470.60	3386.50	315.00
Landless	260.50	180.30	34.00	36.20	2554.50	7026.50	550.00
Marginal	540.50	263.00	81.00	196.50	3328.00	10148.7	860.00
Small	780.67	374.67	150.00	256.00	4810.00	15992.6	1450.00
Large	1230.20	580.20	280.00	370.00	470.60	3386.50	3175.00
Total	2811.87	1398.17	545.00	858.7	2554.50	7026.50	315.00

It was evident that the highest quantity of vegetable was produced by the large farmer (1230.20 kg/year) followed by small (780.67 kg/year) and marginal (540.50 kg/year) and landless (260.50 kg/year) farmer. The result indicates that production, consumption and distribution of vegetable increased from landless towards large farmer while selling increased towards poor farmers. The highest total income (Tk. 15992.60/year) and net income (Tk. 14542.60/year) were obtained from large farmer followed by marginal and landless farmer.

Storage Technique of Vegetable Seed

Different traditional storage structures were used as opined by the respondents, made of indigenous materials readily available in rural areas at low cost. The size and use of this structure vary from area to area. In the study area, the containers for seed storages by the respondents are presented in table 7.

Table-7: Storage Containers of Different Vegetable Seed Used by the Respondents

Storage technique	Percent respondent used	Total
Unsealed polythene bag	49.3	100
Cloths bag	14.7	
Glass jar	13.0	
Earthen pot	10.6	
Metal container	3.4	
Plastic bottle	5.5	
Air tight container/ polythene bag	3.5	

This result indicates that majority of the respondents store their seed in unsealed polythene bag (49.3%) followed by cloths bag (14.7%) and glass jar (13%) where as 10.6% store

seed in earthen pot, 3.4 % in metal container and 5.5% store seed plastic bottle. Only a few respondents (3.5%) stored seed in air tight condition.

Different Vegetable Seed Sources Used by the Respondents

In the study area, some vegetable species are grown by using locally produced seed and some are quality seed. Among the vegetable species about 20 vegetable species were grown are using true seed were mostly grown by locally produced seed as illustrated in the table 8.

Table-8: Different Seed Sources Used for Vegetable Cultivation by the Respondents

Sl. no.	Vegetable species	Percent respondent cultivated	Percent seed sources used				
			Local seed trader	Neighbor & relatives	Own stock	Total percent of local seed	Quality seed from different Organization
1.	Sweet gourd	86.7	5.7	13.8	78.2	97.7	2.3
2.	Bottle gourd	85.8	6.9	15.15	70.96	93.01	6.99
3.	Wax gourd	70.8	2.8	5.64	90.16	98.6	1.4
4.	Bean	65.8	3.2	12.15	80.5	95.4	4.6
5.	Indian spinach	62.5	4.8	19.2	76	100	0
6.	Snake gourd	57.5	8.6	12.17	77.53	98.3	1.7
7.	Ridge gourd	49.2	6.09	10.16	81.72	97.97	2.03
8.	Bitter gourd	40	15	10	65	90	10
9.	Red amaranth	37.5	5.33	2.6	89.47	97.4	2.6
10.	Amaranth	37.5	10.66	5.33	78.68	94.67	5.33
11.	Yard long bean	32.5	12.30	6.15	69.25	87.7	12.30
12.	Bangle spinach	21. 7	9.2	0	86.2	95.4	4.6
13.	Napa sak	20	12.5	2.5	85	100	0
14.	Sponge gourd	18.3	5.6	10.92	83.48	100	0
15.	Baburi sak	17.5	5.6	11.42	82.98	100	0
16.	Cucumber	15.8	6.3	6.3	56.8	74.75	12.65
17.	Brinjal	7.5	86.67	0	13.33	100	0
18.	Chilli	7.5	73.74	13.33	13.33	100	0
19.	Okra	7.5	73.74	0	26.66	100	0
20.	Swamp cabbage	1.7	58.82	0	41.18	100	0

More than 87 percent respondents in the study area used locally produced seed of different vegetable species except cucumber (74.75 percent). Incase of some vegetable like Indian spinach, Napasak, Sponge gourd, Baburisak, Brinjal, Chilli, Okra, and Swamp cabbage were cultivated cent percent with local seed.

Constraints Faced by the Respondents in Homestead Vegetable Cultivation

Different constraints as opined by the respondents were mainly, related to lower yield obtained by using of locally produced seed. The general yield level of vegetables in Bangladesh is very poor because of lack of quality seed, good varieties, inability of the growers to use chemicals and lack of incentives due to improper marketing facilities. Cultivation of vegetables is more expensive than the cost of producing field crops, in terms of labor and inputs. The specific problems are presented in the table 9.

Table- 9: Major Constrains Faced by the Respondents in Homestead Vegetable Cultivation

Constrains	Number of respondents	Percentages
Shortages of quality seeds.	56	46.67
Improper storage conditions of seed	5	4.18
Scarcity of land in homestead	8	6.68
Lower productivity	7	5.8
Lack of technical knowledge on vegetable seed production, processing and preservation.	11	9.17
Lack of training facilities on vegetable and vegetable seed production issues.	15	12.5
Lower germination and yield obtained due to use of locally preserved seed. .	3	2.5
Attack of seed by insect during storage period.	6	5
Lack of awareness about the use of quality seed.	9	7.5
Total	**120**	**100**

Conclusion

Home gardening would be a good means to improve household food security. It is especially important in overcoming seasonal availability of foods and promoting household self-sufficiency. Home gardening activities are women centered and can also increase the income of women, which may result in the better use of household resources and improved caring practices and empowerment. Use of lower quality seed, lack of technical knowledge about seed production practices, improper storage conditions, lack of training on quality seed production are the major constrain in homestead vegetable production in Bangladesh. So training might be provided to the women and farmer as they acquire knowledge about vegetable production as well as seed production, processing and preservation. Finally, home gardening is especially important in overcoming seasonal availability of foods and promotes household self-sufficiency. Women are the main caretakers of the garden, which empowers them, ensures better utilization of the income from the garden for food, and increases family welfare. All these benefits are important contributions towards poverty alleviation.

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Food Security News Coverage in Newspapers of Bangladesh: A Study on Some Selected National Dailies

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Abstract

The United Nations Millennium Development Goals (MDG) are one of the initiatives aimed at achieving food security in the world. In its list of goals, the first Millennium Development Goal states that "the UN is to eradicate extreme hunger and poverty". As the whole world is facing food crisis, a third world nation, Bangladesh is also under the black shadow of the scary crisis. The challenge of food security in Bangladesh is huge. In spite of making considerable socio-economic progresses over the years, Bangladesh still has the third largest number of poor after China and India, a segment of which is chronically malnourished, suffering from silent disaster. So it is very much clear that Food security is now considered as a news item with special treatment in the newspaper of Bangladesh. It is said that newspaper is the mirror of a society. Ever since the formation of society, newspaper has always played a significant role. Concerning the food security issue, as a social crisis, this study focused on the role of newspaper of Bangladesh regarding this issue. Here it has attempted to conduct a comprehensive study on it, which has drawn an overall situation of food security coverage of newspapers of Bangladesh through systematic analysis. On the basis of the findings of the study, It was found that, among the six categories of food security news, the highest coverage was found in food and agriculture related news and that was 40.94 percent of total allocation of food security news coverage area of three selected newspapers namely, The Daily Star, The Prothom Alo and The Daily Ittefak. It was found that, among the three selected newspapers, The Daily Ittefak has published the highest number of food security news followed by The Prothom Alo. On the basis of different categories, it was found that The Daily Prothom Alo has published the highest number of commodity price related food security news while The Daily Ittefak has published the highest number of climate related food security news and surprisingly in The Daily Star no news item was found in commodity price related food security news. So on this issue it can be said that the total amount of food security was not so satisfactory as expected. Considering the gravity of the issue the quantity of news story on this issue should be increased and the newspaper should give more attention on publishing more and more food security coverage.

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Introduction

Food crisis is now affecting many countries across the world. Millions of people in dozens of countries are unable to afford the food they need, and malnutrition is on the rise. From Egypt to Indonesia, Haiti to Thailand, and across many countries in sub-Saharan Africa to Asia, all where around the globe, the scenario of food crisis is same (Lacey, 2008). Worldwide, around 925 million people are chronically hungry due to extreme poverty, while up to 2 billion people lack food security intermittently due to varying degrees of poverty (FAO, 2012).

Access to food is very vital particularly in a country like Bangladesh where about 50% of population live below the poverty line. The income of the poor does not permit them to have sufficient food intake. Ensuring food security for all is one the major challenges that Bangladesh faces today. Despite significant achievement in food grain production and food availability, food security at national, household and individual levels remains a matter of major concern for the Government mainly due to natural calamities (Rahman and Khan, 2005). One of the fundamental rights of the citizens stipulated in the Bangladesh Constitution is food security for all. In view of repeated experience of severe hunger and famine, food security in Bangladesh has long been synonymous with achieving self-sufficiency in rice, the dominant staple food. The Bangladesh economy has made respectable progress in rice, tripping production from 11 million tones in 1971 to 33 million in 2012. The per capita rice production has increased substantially over the level at independence. The growth of production was achieved by fast adoption by farmers of higher yielding crop varieties developed by scientists, supported by rapid expansion of irrigation infrastructure through private investment in tube wells (Hossain, 2013).

In Bangladesh, 70 percent of the people live in rural areas where agriculture is the major occupation. Almost 60 percent of the rural households are engaged in farming. The farming household can access their food from self-production and/or trading the surplus with other foods available in the local market. But the landownership is unequally distributed, and so is the access to food from self-production. Almost 30 percent of the households do not own any land and another 30 percent own only up to half an acre. Such tiny landownership is insufficient to meet the food needs of four to five-member households, whatever advanced technology the farmer use.

The main challenge for achieving and sustaining food security comes from continuing growth of population. The progress in reducing population growth, from 3 percent per year at independence to about 1.3 percent now, is laudable. But the population is still increasing by 1.8 million every year. Rice production has to increase by four lakh tons every year to meet the need for staple food for the growing population. The increase in domestic production at that rate would be difficult due to several supply side factors.

Continuous efforts need to be made in developing and diffusion of improved crop varieties and natural resource management to generate adequate supply of food to meet the needs of the growing population. A more efficient public food grain distribution system can make a significant contribution to the food security of vulnerable households who lack means to access food. Appropriately targeted income transfers, credit programs and insurance mechanisms in times of crisis may generate high payoffs in reducing poverty and improving food security (Hossain, 2013). These interventions should be part of a broader social protection strategy that is both cost-effective and comprehensive in coverage. The news media, particularly, newspaper of Bangladesh can still play a more informative and insightful pro-active role in meet up the challenge of food security. Nothing can bring out the social responsibility role of the media than the challenge of covering mass deprivation and building a public agenda to overcome massive social deficits on the food and nutrition.

Food Security

Food security is a complex sustainable development issue, linked to health through malnutrition, but also to sustainable socio-economic development, environment, and trade (WHO, 2013). The World Food Summit plan of Action Declaration of 1996 defined food security as existing "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life". Commonly, the concept of food security is defined as including both physical and economic access to food that meets people's dietary needs as well as their food preferences. Food security is built on three pillars,1) Food availability: sufficient quantities of food available on a consistent basis; 2) Food access: having sufficient resources to obtain appropriate foods for a nutritious diet and 3) Food use: appropriate use based on knowledge of basic nutrition and care, as well as adequate water and sanitation (FAO, 2012). According to the World Resources Institute, food security refers to the availability of food and one's access to it. A household is considered food-secure when its occupants do not live in hunger or fear of starvation. The World Health Organization (WHO) 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 (WHO, 2013).

Newspaper as Mass Media

The importance of the media today is immense. Never before in mankind's history have the media had such significant impact on peoples' lives and behavior (Fulda Press, 2013). As

an important part of mass media, newspaper has the significant role to aware of the people regarding food security around the world. Newspapers of Bangladesh have been covering many development issues of the country. Health, woman, trafficking, child labor, ethnic group, minority group, arsenic contamination, environment, acid throwing, forestation, climate change, literacy movement, women empowerment, human rights, drug abusing etc. are reflected in the newspapers of Bangladesh. In this connection, food security issue is covering with attention as well. Various articles, editorials, views, news, opinions etc. on food security are being published frequently in the newspapers. The global and local consequences is also highlighted in these reports over the years. As a matter of fact, mass media have a great role to create awareness and construct a social agenda which will help the country to face the food security challenge and to reach the Millennium Development Goals. Considering this reality the mass media specially the print media of Bangladesh have been trying to motivate, aware of the general masses through providing coverage on Food security. This study has attempted to conduct a comprehensive study, which has drawn an overall situation of food security coverage of newspapers of Bangladesh through systematic analysis.

Objectives

The main objective of the study was to analyze critically and appraise the present state of food security coverage in all aspects of mass media especially in newspaper of Bangladesh. As well as to trace out and analyze the quantity and the pattern of food security coverage of selected newspapers of Bangladesh.

Methodology

In this study, content analysis method of communication research has been applied to know the coverage of food security in national dailies of Bangladesh. According to Bernard Berelson, "content analysis is a research technique for the objective, systematic and quantitative description of the manifest content of communication. So Content Analysis is the best suitable method to analyze the newspaper content in accordance with the objectives of the study. In this context, the information have been collected from the selected three newspapers. The information analyzed both qualitatively and qualitatively. In this study, The Prothom Alo and The Daily Ittefak from Bengali category and The Daily Star from English category have been selected by using purposively sampling technique among the top fifteen circulated daily newspapers of the country. The issues of the selected newspapers have been selected from The Prothom Alo (January-February), The Daily Ittefak (March-April) and The Daily Star (May-June), of total first six months of 2010. Total issues of these selected newspapers had been taken for final analysis as sample.

All the issue of food security news are presented in newspaper, it's hard to confine them in one frame. The food security issue is very much extended and multi dimensional issue. the context of food security issue touches more than one category in different ways. That's why conducting the study, food security issues is defined in some different category. Then the presentation of those news are analyzed, those category are mentioned bellow:

Policy

Policy category covers, food security related advices, apprehension, government and specialist opinion news etc.

Market

Market category covers, market condition after production, maintenance and import-export related news.

Food and Agriculture

Production of crops, cultivation, irrigation system, food production, agricultural problems and possibilities related news are covered in food and agriculture category.

Commodity Price

Market price of food, price fluctuation related news are covered in the commodity price category.

Climate

Global climate, weather, natural disaster, flood, drought related news are covered under climate category.

Health

Health, treatment, malnutrition related news are covered in health category.

Food security news are divided in these categories because of, in world Food Summit plan declaration(1996),it is said that, Food Security exist when all people, at all times have physical and economical access to sufficient, safe and nutrition's food to meet their food preference for an active and healthy life style.

Findings of the Study

The study had identified the coverage provider newspaper in terms of the number of news story and total coverage by column inches. It was found that, total 470 food security news stories published in the selected newspapers. Considering the total coverage in column inches, 10.720 column inches space was given in the selected three newspapers. In average, 0.25 number of news published and 88.60 column inches space allocated regarding food security news coverage daily.

Total printed area of the three selected news paper was 7,65,916 column inches, in which 10.720 column inches spaces was for food security news(policy, market, food and agriculture, commodity price, climate, health). In average, 1.39 column inches of printed area was for food security news.

Table -1: Different Category of Food Security News Number and their Average

Category of food security news	Total number	Total food security news in average
Policy	103	21.91
Food and agriculture	193	41.06
Market	85	18.04
Commodity price	18	03.82
Climate	47	10.00
Health	24	05.10
Total	470	100

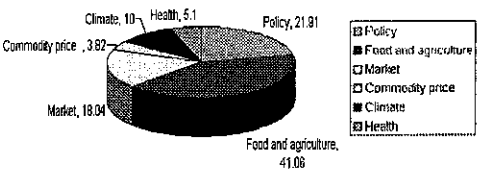

Fig. -1: Different Category of Food Security News Number and their Average

The following table mentioned, in total 470 food security news, policy, market, food and agriculture, commodity price, climate, health, these six categories are included. According to the number of news stories, height number of news, total 193, was food and agriculture related food security news which was 41.06 in average. Then chronologically, 103 policy news coverage (21.91 in average), 85 market news coverage (18.04in average), 18 commodity price news coverage (03.82 in average), 47 news coverage climate(10.00 in average) and 24 health news coverage (05.10 in average).

Table -2: Allocation of Food Security News in Column in Different Newspaper

Category of food security news	Printed area allocation (column inches)	Total allocation of food security area in average (column inches)
Policy	2540	23.69
Food and agriculture	4388.85	40.94
Market	1781.11	16.61
Commodity price	301.96	02.81
Climate	1134.45	10.58
Health	573.7	05.35
Total	10720	100

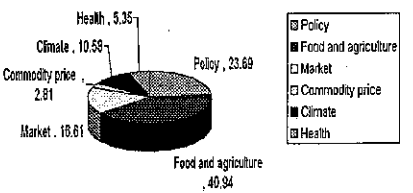

Fig. -2 : Allocation of Food Security News in Column in Different Newspaper

In terms of space allocation of printed area, height space was for food and agricultural food security news. Total 4388.85 column inches printed area was allocated which is 40.98 in average of total allocation. Then the second position found 2540 column inches (in average 23.69) for policy news coverage, and chronologically, 1781 column inches (in average 16.61) allocation for market news coverage, 1134.45 column inches (in average 10.58) allocation for climate news coverage, 573.7 column inches (in average 05.35) allocation for health news coverage and 301.96 column inches (in average 02.81) for commodity price news coverage was found in the selected newspapers.

Table-3: Number of the Stories of Coverage Provider Newspaper

Name of the newspaper	Total Number of news	Total food security news coverage in average
The Daily Star	53	11.27
The Daily Prothom Alo	72	15.31
The Daily Ittefaq	345	73.40
Total	470	100

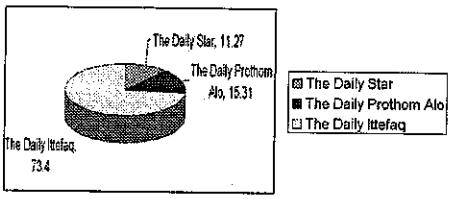

Fig. -3 : Number of the Stories of Coverage Provider Newspaper

The following table mentioned, the coverage provider newspaper in terms of the number of stories published. The hightest coverage provider newspaper found The Daily Ittefaq, total 345 number (73.40 in average)of news, then The Daily Prothom Alo, total 72 number (in average 15.31) of news and The Daily star, 53 number (in average 11.27) of news published in this three newspapers.

Table-4: Space Allocation of News Coverage in Different Newspaper

Name of the newspaper	News coverage (column inches)	Total allocation of food security news coverage in average
The Daily Star	1608.75	15.00
The Daily Prothom Alo	1377.5	12.84
The Daily Ittefaq	7734.5	72.15
Total	10720	100

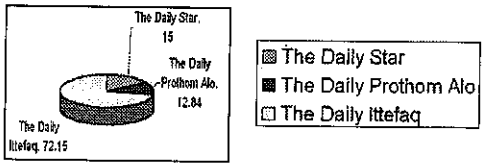

Fig. -4 : Space Allocation of News Coverage in Different Newspaper

This table shows, Space allocation of coverage provider newspaper and their average. Here, the highest space allocation found for The Daily Ittefaq, 7734.5 column inches (in average 72.15). Then, The Daily Star, 1608.75 column inches (in average 15.00) and The Daily Prothom Alo, 1377.5 column inches (in average 12.84).

Table -5: Number of Food Security News Coverage in Different Newspaper

Name of the newspaper	Policy		Food and agriculture		Market		Commodity Price		Climate		Health	
	N	Average	N	Average	N	Average	N	Average	N	Average	N	Average
The Daily Star	15	14.56	17	8.80	3	3.52	0	0	7	14.89	11	45.83
The Daily Prothom Alo	19	18.44	22	11.39	19	22.35	10	55.55	0	0	2	8.33
The Daily Ittefaq	69	66.99	154	79.79	63	74.11	8	45.45	40	85.10	11	45.83
Total	103	100	193	100	85	100	18	100	47	100	24	100

Total: 470

The following table mentioned number of different category of food security news in coverage provider newspaper and their average. The table shows, in total 103 numbers of policy news, 69 number (in average 66.99) of news found in The Daily Ittefaq, 19 number (in average 18.44) of news in The Daily Prothom Alo, and 15 number (in average 14.56) of news published.

In the same way, in total 193 numbers of food and agriculture news, 154 number (in average 79.79) of news found in The Daily Ittefaq, 22 number (in average 11.39) of news in The Daily Prothom Alo, and 19 number (in average 8.80) of news published.

Then, among total 85 numbers of market news, 63 number (in average 70.11) of news found in The Daily Ittefaq, 19 number (in average 22.35) of news in The Daily Prothom Alo, and 03 number (in average 03.52) of news published.

After that, among total 18 numbers of commodity price news, 10 number (in average 55.55) of news found in The Daily Ittefaq, 08 number (in average 44.44) of news in The Daily Prothom Alo published, and there was no news published regarding this category in The Daily Star.

Among total 47 numbers of climate news, 40 number (in average 85.10) of news found in The Daily Ittefaq, 07 number (in average 10.89) of news in The Daily Prothom Alo published, and there was no news published regarding this category also in The Daily Star.

Lastly, in total 24 numbers of health news, the same quantity, 11 number (in average 45.83) of news found in both The Daily Ittefaq and The Daily Star. Only 02 number (in average 8.33) of news published in The Daily Prothom Alo.

Table -6: Printed Area Allocation for Food Security News in Different Categories

Category of news	The Daily Star		The Daily Prothom Alo		The Daily Ittefaq	
	Y	Average	Y	Average	Y	Average
Policy	469.5	29.19	406	29.69	1661.5	21.48
Food and agriculture	471	29.28	472.25	34.28	3445.6	44.55
Market	126.5	7.86	323.75	23.50	1330.86	17.21
Commodity price	0	0	145.5	10.56	156.46	2.2
Climate	236.25	14.69	0	0	898.2	11.61
Health	305.5	18.99	27	1.96	241.2	3.12
Total	1608.75	100	1377.5	100	7734.5	100

The following table mentioned, Printed area allocation of different category of food security news in coverage provider newspaper and their average. In the Daily Star, 469.5 column inches (29.19 in average) space was allocated for policy news, 471 column inches (29.28 in average) space was for food and agriculture news, 126.5 column inches (07.86 in average) space was allocated for market news, 236.25 column inches (14.69 in average) space was allocated for climate news and 305.5 column inches (18.99 in average) space was allocated for health news.

In Daily Prothom Alo, 406 column inches (29.69 in average) space was allocated for policy news, 472.25 column inches (34.28 in average) space was for food and agriculture news, 323.75 column inches (23.50 in average) space was allocated for market news, 145.5 column inches (10.56 in average) space was allocated for commodity price news and 27 column inches (01.96 in average) space was allocated for health news.

In Daily Ittefaq, 1661 column inches (21.48 in average) space was allocated for policy news, 3445.6 column inches (44.55 in average) space was for food and agriculture news, 1330.86 column inches (17.21 in average) space was allocated for market news, 156.46 column inches (02.2 in average) space was allocated for commodity price news, 898.2 column inches (11.61 in average) space was allocated for climate news and 241.2 column inches (03.12 in average) space was allocated for health news.

Conclusion and Recommendation

During the last few decades, the world has been facing a serious crisis of food. That's why, food Security is being considered as a serious socio-economical problem in the present world. Newspaper is considered to be this type of tool that can build up awareness and change the behavior in positive by giving and disseminating more and enormous amount of coverage. From the study, It was found that the total amount of coverage was not so satisfactory on this issue. It was found from the study that the quantity was not so

satisfactory as well. The trend of the coverage of The Daily Prothom Alo, The Daily Ittefaq, and The Daily Star indicated only to focus the issues Food Security. The variation among the newspapers was found in a linear manner in covering Food Security. The newspapers had also shown some similarities according to some specific aspects of reporting the issue. On the basis of the findings of the study, some recommendations were made. These are, the quantity of news story on food security should be increased. Depth news rather than surface news on food security would be published. Especially the interpretative reporting should be given emphasized more. The placement of food security news story should be more in the front and back page as well as in the upper fold.

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In Vitro Propagation of Grape (*Vitis vinifera*) Using Tissue Culture Technique via Axillary Shoot Proliferation

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Abstract

Surface sterilized grape (Vitis vinifera) nodal segments of 0.5 to 1.0 cm long were cultured on Murashige and Skoog (MS) basal medium supplemented with 5, 8, 15 and 20 μM BA. Best total shoot production obtained with 8 μM BA rather than higher BA levels which caused unexpanded shoots and exhibited high mortalities. MS medium supplemented with IBA enhanced rooting by increasing rooting percentage and number per plantlet. Shoots previously proliferated on medium with 5 μM BA, rooted significantly better than those multiplied on 8 μM BA. Shoot vigor during rooting was greater in shoots proliferated on 5 vs. 8 μM BA. Root development was not significantly affected by liquid vs. agar-solidified medium or shoot length.

Chemical used: Tween-20, Sodium hypochlorite, 6-Benzyle adenine (BA), 1H-indole-3-butyric acid (IBA).

Introduction

Single node culture is the method of choice to eliminate pathogens (bacteria, fungus) from many plant species. This method has the advantage of regenerating a single plant from a single minuscule (approximately 0.5 cm) shoot. The technique also avoids the production of plants from callus which can lead to regeneration of an off-type plant. The combination of low hormone levels combined with a minimum time in culture reduces the chance of mutation as well as regeneration of an off-type plant. At the same time, many pathogens are eliminated by this technique. It is thought that this is because the node containing meristem is growing faster than it can be infected by pathogens that may be present in the older plant tissues.

Micropropagation may be an alternative means to clonally propagate grape species; however, studies of grape *in vitro* propagation have dealt predominately with V. vinifera and include culture from shoot apices (Barlass et al.1978, Chee et al. 1982, Fanizza et al. 1984, Goussard et al. 1981, Harris et al. 1982, Li et al. 1984, Monette, P.L.1983, Morini et al. 1985) and auxillary buds (Jona et al. 1978, Pool et al. 1975). Unlike muscadine grapes, most of the cultivars of V. vinifera root readily by dormant hardwood cuttings: Of interest is whether muscadines will be as amenable to culture as vinifera types or exhibit recalcitrance

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in vitro similar to that exhibited with conventional propagation methods. Reports of V. rotundifolia propagation by tissue culture are rare (Rajasekaran et al. 1981). Rajasekaran and Mullins induced adventitious buds and roots from seedling internode-derived callus. However, plantlet establishment outside culture was unsuccessful. In a study evaluating *in vitro* shoot production from apices of several *Vitis* species and cultivars. Gray and Fisher (Gray et al. 1985) obtained shoots from three cultivars; however, factors affecting shoot production and rooting were not studied.

Vegetative propagation of grape is difficult especially in Bangladeshi environment. Rooting of node cuttings was not induced by naphthaleneacetic acid (NAA), indoleacetic acid (IAA), phenylacetic acid (PAA), or IBA at various concentrations (Cowart et al. 1944, Harmon, F.N. 1943). In rooting studies with dormant cuttings (Goode et al. 1982) obtained only 0% to 10% rooting (ethephon), precallousing, sucrose, and type-of cutting treatments. Sharpe (Sharpe,R.H.1953) successfully rooted cuttings under constant mist; however, with this method, succulent, immature tip cuttings are required and percentage loss can be high (Bessis,R.1986). Commercial propagation of muscadine grapes currently requires layering or the use of leafy cuttings under mist (Hartmann et al. 1983). Both methods have a low rate of success.

Previous studies on *in vitro* rooting in grape have been with V. vinifera and have produced varying results that may reflect differences in cultivar response. Barlass and Skene (Barlass et al. 1978) obtained rapid root formation 7 days after shoots were cultured on medium lacking growth regulators. In contrast, Jona and Webb (Jona et al. 1978) reported slow initiation of roots on shoots transferred to medium with no growth regulators or 10 μM BA. Harris and Stevenson (Harris et al. 1979) obtained inconsistent rooting on growth regulator-free medium. Growth regulator treatments found to enhance rooting include NAA (Chee et al. 1972, 1988), IBA (Jona et al. 1980, Morini et al. 1985) and NAA/ IBA in combination (Novak et al. 1982/83).

Jona and Vallenia (Jona et al. 1980) observed rapid root initiation with IBA, but with lack of further development. In this study, rooting percentage of *V. vinifera* responded to IBA treatment; both root initiation and development were enhanced.

Objectives

The objective of this study was to develop methods for *in vitro* shoot proliferation and rooting of *V. vinifera* in culture. Factors considered were the effects of BA level on shoot multiplication and the influence of shoot multiplication treatment, shoot length, agar and growth regulators on subsequent rooting of shoots. The specific objectives of this study were to:

i) Establish a suitable protocol for *in vitro* propagation of grape (*Vitis vinifera*) and

ii) Observe the effects of different phyto hormones on *in vitro* shoot proliferation and rooting of grape plantlets.

Materials and Methods

Shoot establishment and multiplication: Single nodal segments containing the apical second or third nodes were removed from vigorously growing plants *(Vitis vinifera)*. Segments were washed in running water for 50 minutes, surface-sterilized in 2% sodium hypochlorite with 2 drops Tween-20 for 6-8 minutes, rinsed four times in sterile distilled water and then trimmed on both ends to 0.5 to 1.0 cm in length.

To determine the effects of BA concentration on shoot proliferation, nodes were cultured in 1 ml of semi-solid medium containing Murashige and Skoog (MS) inorganic and organic nutrients (Murashige et al. 1962), solidified with 0.7% agar and BA at 5, 8, 15 and 20 μM. The pH was adjusted to 5.5-5.7 before autoclaving. For each BA concentration, 40 segments were placed in culture. Cultures were maintained at 24 ± 2C under cool-white fluorescent lamps and a 16-hr photoperiod.

Three weeks later, cultures were transferred into fresh culture vessels containing the same medium. Shoot development and survival were observed at this time (4 weeks from initiation) and monthly thereafter, at which time subcultures were made by division of shoots into 1- to 2cm clumps, for an additional 12 weeks (16 weeks from initiation).

Rooting: Shoots obtained from cultures multiplied on 5 or 8 μM BA were used for rooting studies. Shoots were excised from actively multiplying cultures and categorized into one of three size groupings: long ($x > 3$ cm), intermediate ($2 \text{ cm} < x < 3$ cm) and short ($1 \text{ cm} < x < 2$ cm) with number of shoots per treatment as indicated in Table- 2. Shoots were transferred onto various rooting media. The media and culture conditions were the same as for multiplication, except that growth regulators were either: 1) omitted, 2) IBA at 1 μM, 3) IBA at 5 μM and 4) IBA at 8 μM. Root number per shoot and percentage of shoots that rooted were rated at 10-day intervals for 30 days.

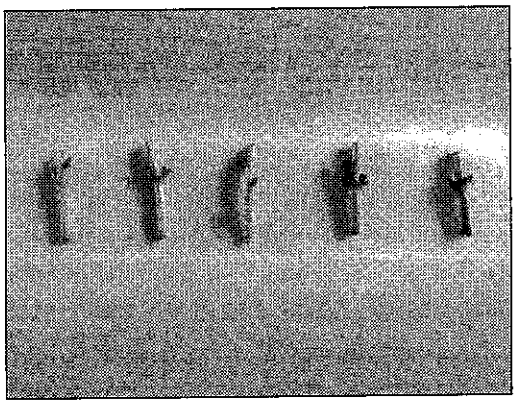

Fig.-1: Nodal segment of grape ready for *in vitro* culture establishment

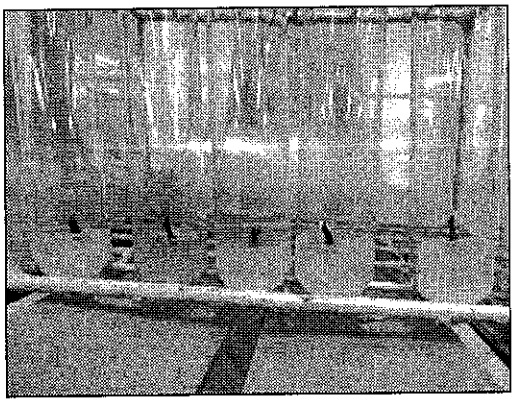

Fig.-2: Explants on modified MS media

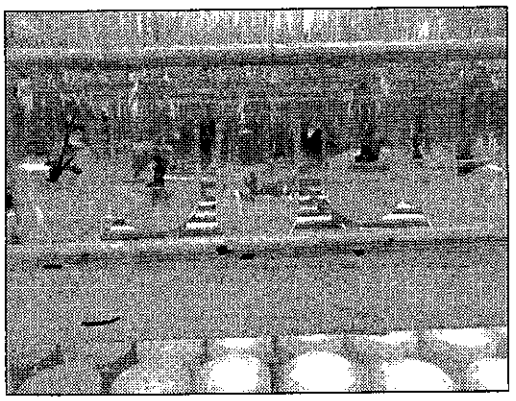

Fig.-3: Shoots proliferation on culture media

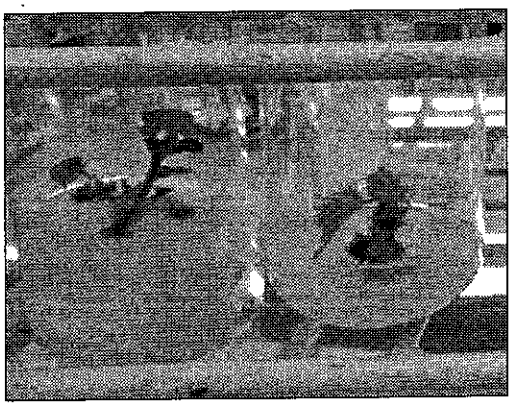

Fig.-4: Elongated shoots on rooting media

Results and Discussions

Shoot development: The rate of shoot proliferation was slow during culture establishment for the first 2-3 weeks for all BA levels but increased rapidly thereafter. Shoots <1 cm long were numerous and increased rapidly after 4 weeks with trends similar to overall shoot proliferation. Relatively rapid increase of shoots 1 to 3 cm long was obtained on 5 and 8 μM BA treatments after 6 weeks, reflecting elongation of small shoots. Higher BA levels strongly inhibited shoot elongation with few or no larger shoots obtained. The proportion of small (<1cm) shoots increased as BA level increased and after 8 weeks, made up 45%, 66%, 86% and 95% of the shoots produced with 5, 8, 15 and 20 μM BA respectively. Likewise, shoots >3 cm long increased as BA levels decreased. Cultures at the two higher BA concentrations had dense, unexpanded shoots and high mortality. Shoot mortality increased with higher BA concentrations; mortality was 23%, 24%, 65% and 71% for 5, 8, 15 and 20 μM BA levels respectively (**Table- 1**). After 16 weeks, the greatest number of total shoots was obtained with 8 μM BA.

Table-1: Effect of Different Concentrations of BA on Multiple Shoot Induction from Nodal Explants of Grape

Growth regulators conc. (μM l^{-1})	% of explants showing shoot proliferation	Days to shoot formation	No. of shoots/ explants (mean ± SD)	Average length of shoot (cm)	Shoot mortality rate (%)
05	45	20-24	6.2±0.44	1.1	23
08	66	20-22	6.5±0.15	1.5	24
15	86	20-22	5.8±0.80	1.4	65
20	95	20-22	6.0±0.23	1.3	71

Rooting: Shoots-multiplied on 5 and 8 μMBA were used in subsequent rooting studies. These shoots were numerous, long enough for manipulations and lacked the high mortalities observed with higher BA levels. We found liquid vs. solid medium have no significant effect on rooting percentage or root number in *V. vinifera.* Data were thus pooled in subsequent evaluations. Liquid vs. agar-solidified media influence in vitro rooting in some systems. Rooting was promoted with no or lower agar concentration in sweetgum (Lee et al. 1986), Norway spruce (Von Arnold et al. 1984), apple (29) and grape (Harris et al. 1979).

BA concentration during shoot multiplication had a pronounced effect on subsequent rooting. Rooting frequency of shoots previously proliferated on 5 μM BA was consistently greater than with shoots previously proliferated on 8 μM BA. In addition, the number of roots per plantlet was higher in shoots previously proliferated on medium with 5 than with 8 μM BA (Table-2).

Table-2: Rooting Percentage of Grape Plantlets as Affected by IBA Level, Previous Proliferation Medium and Shoot Length after 30 Days on Rooting Medium

		IBA conc. (µM)			
		0	1	5	8
Shoot length	**Shoots per treatment**	**Rooting (%)**			
Shoots from 5 µM BA					
Long	26	58	82	100	100
Intermediate	26	36	80	84	85
Short	28	35	80	89	97
Mean		43	81	91	93
Shoots from 8 µM BA					
Long	12	23	65	60	83
Intermediate	40	11	59	59	58
Short	24	08	61	73	80
Mean		14	62	64	74

Percentage of rooting was greater on all IBA treatments than with BA or no hormones. Rooting was <5% or 0 for the BA-treated shoots previously proliferated on 5 or 8 µM BA respectively. Rooting percentage generally increased with higher concentrations of IBA in the rooting medium (Table-2). Most roots were induced by 20 days in both groups, rates slowed considerably beyond this period. There was a pronounced effect of IBA level on root number per shoot, particularly for those previously proliferated on medium with 5 µM BA.

Shoots proliferated on 5 µM BA produced longer and more highly branched roots than shoots proliferated on 8 µM BA. Increasing IBA levels within a proliferation medium likewise induced shorter, branched roots. When on the rooting medium, shoots previously proliferated on 5 µM BA medium grew more vigorously than those multiplied on 8 µM BA.

Conclusion

The results presented in this paper provided evidence that higher BA level inhibited shoot elongation and show high mortality. We found liquid vs. solid medium have no significant effect on rooting percentage or root number in V. vinifera. There was a pronounced effect of IBA level on root number per shoot. Rooting percentage generally increased with higher concentrations of IBA in the rooting medium.

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Institutionalization of *Zakat*: A Divine Way for Ensuring Human Development

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Abstract

Human Development means enlargement of human choices. In principle, these choices can be infinite and change over time. But at all levels of development, the three essential ones are to lead a long and healthy life, to acquire knowledge and to have access to resources needed for a decent standard of living. For enlarging these human choices there are lots of policy recommendations to the Government as well as to the NGOs from various corners. This paper examines how the institutionalization of Zakat can be used as an effective tool for ensuring Human Development. Zakat as a divine system has its conceptual linkage with Human Development. In order to see the linkage and the practicability of Institutionalization of Zakat for Human Development, a field study has been conducted in three areas and it was found that, this linkage is more visible and very much applicable to the real world. As it is one of the five pillars of Islam, Muslim countries can use it to improve the Human Development conditions in their countries.

Introduction

People are the real wealth of a nation. The basic objective of development is to create an enabling environment for people to enjoy a long, healthy and creative life. This may appear to be a simple truth. But it is often forgotten in the immediate concern with the accumulation of commodities and financial wealth (Jahan, 2010, p. 11). We often forget that development is all about people as we have been preoccupied with creation of wealth and material opulence. In our preoccupation with economic growth, we systematically pushed people more and more from the center to the periphery of development debates and dialogues (Ibid).

The publication of the first Human Development Report (HDR) by United Nations Development Program (UNDP) in 1990 was a modest attempt to reverse the trend. It questioned the relevance of the unique preoccupation with equating Gross National Product (GNP) with development and thus shifted the development paradigm. It put

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back people where they belong-at the center of the development debate and dialogue. With the introduction of the concept of Human Development (HD), construction of a composite measure for it and a discussion of the relevant policy implications, the HDR simply changed the way to look at development and to deal with it (Ibid).

HD is simply defined as a process of enlarging choices. Everyday human beings make a series of choices-some economic, some social and some cultural. The ultimate objective of development is not to create more wealth or to achieve a higher growth, but to enhance this range of choices for every human being (UNDP, 1990, p. 10). But all levels of discussion, the three essential ones are for people, to lead a long and healthy life, to acquire knowledge and to have access to resources needed for a decent standard of living. If these essential choices are not available, many other opportunities remain inaccessible (Ibid).

For attaining these above choices there are lots of policy recommendations to the government. It is said that public policy regarding enlargement of these various choices is the key to achieving these. For attaining better standard of living, it is said that there should be an automatic link between expanding income and human choices. Such a link depends on the quality and distribution of economic growth, not only quantity of such growth. A link between growth and human lives has to be created consciously through deliberate public policy (Ibid, p. 18).

For achieving a long and healthy life, it is mentioned that, there should be universal access to health services, particularly basic health services for all of the citizens of a country (Jahan, 2010, p. 44). For attaining knowledge dimension of HD concept, it is said that, education is a major means to knowledge creation and enhancement. It may vary from basic education which provides people with fundamental skill to higher education to vocational training for skill formation. In that context, literacy is a basic ingredient for capacity building. There should be universal access to primary education, secondary and tertiary (Ibid, p. 74). For attaining above mention choices, the government actions and policies have been given most priority (Haque, 1995, p. 23).

An Islamic economic system ideally insures a decent standard of living for everyone, defined as enabling each to satisfy their basic needs for sustenance including food, water, clothing, housing and supplies for work and marriage expenses (Emara, 2003). One of the basic components of Islamic economic system for achieving the above mentioned choices of HD is *Zakat*[3]. It is a religious instrument that assists individuals in society to help the needy and poor people those are not able to help themselves (Chapra, 2000).

Zakat in the contemporary world, especially after the collapse of the Islamic Caliphate, has a little impact on people's lives because of the weakness of the Islamic state in regulating

[3] This is one of the five pillars of Islam.

and managing it. However, due to the growth of Islamic financial and economic institutions, attention to *Zakat* as part of Islamic financial institution is increasing now (Nurzaman, 2011).

Following the concept of welfare of socialist states, the Government of Bangladesh (GoB) has included certain yearly expenditure items which include both in cash and in kind expenditures, aimed at the same kind of categories of *Zakat* recipients as those covered by *Zakat. Zakat* funds can replace government budgetary expenditure in amounts ranging from 21 percent of Annual development Plan (ADP) in 1983/1984 to 43 percent of ADP in 2004/2005. This amount to money is about TK. 30683 million in 1983/1984 to TK.2,20,000 million in 2004/2005 (Hassan & Khan, 2007, p.15). While GoB is working for ensuring the HD for its every citizen, it has never looked at the institutionalization of *Zakat* as a national strategy for HD.

The dimensions of development issues in Muslim countries are requiring comprehensive and scalable tool efforts to address the problem of HD. They cannot rely solely on government policy and also need to be supported by a credible sub-programs and strategies. This supported program is expected can improve the welfare of the poor in the Islamic teaching is in the form of *Zakat* institution (Nurzaman, 2011).

Meaning and Philosophy of Zakat

In *Shari'ah* the word '*Zakah*' refers to the determined share of wealth prescribed by Allah to be distributed among deserving categories (Qardawi, 1997, p. 40). The Arabic word *'Zakah'* means 'purity' and 'cleanliness', since giving away a part of one's wealth to the poor purifies his wealth as well as his heart (Sadeq, 2002). The institution of *Zakat* purifies one's heart from the love of material wealth and prepares it to make sacrifices for the cause of Allah (Shad cited in Sadeq, 2002). The Quran says: "Take from their wealth so that you might purify and sanctify them" (Al Quran 9:103).

Another literal meaning of *Zakah* is growth. The growth has two dimensions (Zaman & Shad cited in Sadeq, 2002). First is spiritual development by pleasing Allah. Second, *Zakat* redistributes income, leading to 'an urge for greater enjoyment and in turn to greater production'. On the one hand, accumulation and hoarding affects production and, on the other hand, distribution and circulation stimulates production and growth.

Chapra (2000) in his study '*The Future of Economics: An Islamic Perspective*' says that *Zakat* is a religious instrument that assists individuals in society to help the needy and poor people those are not able to help themselves. Although this instrument is very potential to encourage poverty reduction, it does not eliminate the obligation of governments to create prosperity. *Zakat* is also not replacing the components of government expenditure for welfare and the government budget for disaster management. The *Zakat* charity, however,

is expected to partly fulfill the necessities of life that can be shifted to the more capable community, especially to close relatives and neighbors of the individuals associated.

According to Islamic *Shari'ah*, the whole community is divided into two categories. One is the payer of *Zakat* and the other is the recipient of *Zakat*. It is important to note that a *Zakat* payer can never be a beneficiary to it. This feature is absent in the traditional tax system where the rich and the poor pay taxes and both of them have equal or differential rights to benefit directly or indirectly from the tax revenue. In a *Zakat* based economy, poor are never taxed. Rather, there is continues inflow of money or wealth to them in the forms of *Zakat* until they reached to the position of a *Zakat* payer. A permanent outflow in the form of *Zakat* from the surplus community and a permanent inflow of the same amount to the deficit community undoubtedly bridge the gap between the poor and the rich and reduces the inequality (Hassan and Khan, 2007).

Zakat plays a fundamental role in the economic system, ensuring the proper distribution and circulation of wealth and *Zakat* purifies the wealth of the individual, but it also keeps the social, economic and political body or structure of the Umma from deterioration (Dean & Khan, 1997).

Zakat is obligatory (Fard) on all Muslims men and women who are Sahib-e-Nisab i.e. possess a specified limit of wealth, to pay each year a prescribed portion from capital or savings like farm produce, cattle, business activities, paper currency and precious metals such as gold and silver (Abdullah & Suhaib, 2011).

There are various forms of *Zakat*, *Zakat* on money, on trade, on merchandise etc. A Muslim is responsible for paying *Zakat al-mal* (or alms on money) equivalent to 2.5 percent of his net worth if, after meeting his needs, he reaches *Nisab* (possesses the equivalent of 85 grams of gold or 600 grams of silver) for a period of one year (Ismail cited in Atia, 2011). There is a specific *Nisab* for each type of *Zakat* but generally Muslims calculate *Zakat* as two and a half percent of their net income, which must be paid on money, merchandise, profit derived from harvest, livestock, stocks and shares, bonds and securities (El Daly cited in Atia, 2011).

Zakat levied on a broad base and include a variety of economic activities. *Zakat* levied on agricultural products, pets, gold and silver deposits, commercial activities, commercial and mining goods taken from the earth. Contemporary *Fiqh* of *Zakat* is even also taken of all revenues generated from the physical and financial assets and expertise of workers (Chapra cited in Nurzaman, 2011).

Significance of Zakat

The word *'Al Zakah'* occurs in the Qur'an thirty times. In twenty-seven of them it is associated with prayers in the same verse. In one place it is mentioned with prayers in the same sequence of verses, this is, 'Those who humble themselves in their prayers" and "who are active indeed in *Zakah'* (Al-Quran, 23:2 and 4). It is a duty from Allah similar to the duty of *'Salat'*. Allah commands in the Holy Quran. "So establish Salat and give *Zakat*, and hold fast to Allah" (Al-Quran, 22:78). *Zakat* is one of the five pillars of Islam. The Prophet Muhammad (SAW) said:

> Islam was built upon five pillars: to witness that there is no God but Allah and that Muhammad (SAW) is His servant and messenger, performing prayer, giving *Zakat*, performing pilgrimage and fasting the month of Ramadhan[4].

The social importance of *Zakat* is its role in helping in the treatment of poverty (Emara, 2003). Al-Quran mentions the needy and the poor is the first two groups from eight groups within recipient list *Zakat (Mustahiq)*. They are given priority by Al-Quran to receive *Zakat*. This shows that addressing the problem of poverty is the main aim of *Zakat* (Qardawi, 1997). It is seen as a tool for acquiring a more equitable distribution of wealth, for achieving social stability and solidarity, discouraging hoarding, and encouraging the circulation of capital in the economy (Emara, 2003).

Disbursement of Zakat

The Holy Quran has mentioned in detail the people who are eligible to receive *Zakat*. The use or allocation of *Zakat* has been determined precisely in the *Shari 'ah* where *Zakat* is only given for eight classes;

> The offerings given for the sake of God are [meant] only for (1)the poor and the (2) needy, and (3) those who are in charge thereof, and (4) those whose hearts are to be won over, and for the (5) freeing of human beings from bondage, and [for] (6) those who are overburdened with debts, and [for every struggle] in (7) God's cause, and [for] (8) the wayfarer: [this is] an ordinance from God – and God is all-knowing, wise (Al-Quran, 9:60).

The list of eight recipients is widely interpreted as: the poor, the needy/impoverished, and the administrators over *Zakat* funds. This also incorporates the recent or potential converts, the freeing of slaves or those in bondage, overburdened debtors, in the cause of God and travelers who need to return to their homes. The seventh category is the most open to interpretation and discussion because *fi sabil-Allah* literally means following the cause of Allah, or in the way of God. Traditionally, this has been interpreted as supporting *jihad*

[4] www.realish.com cited in Abdullah & Suhaib, 2011.

(fighting in the name of/for the protection of Islam) and funding the travel of those who cannot afford to perform the *hajj*, or pilgrimage to Mecca (Atia, 2011).

Sustainability of Zakat

Zakat is a spiritual tax paid by every Muslim under any circumstances. Therefore, the acceptance of *Zakat* fund is relatively stable. This will ensure the sustainability of poverty alleviation programs which typically require a relatively long period of time. Because of these characteristics, the presence of *Zakat* in the socio-economic framework of Islam will become a strong basis for sustainable poverty alleviation programs. As an instrument of HD, *Zakat* will be superior compared to fiscal instruments that currently exist.

Institutionalization of Zakat

It is duty of the Islamic state to collect *Zakat* from all of those who meet the criterion[5]. The eight kinds of recipients of *Zakat* as mentioned earlier indicate that the collection and distribution of *Zakat* requires a proper system coordinated by the state. The collections will be paid through *Zakat* fund (Abdullah & Suhaib, 2011).

Almighty Allah has asked his beloved Prophet (SAW), "Take alms of their wealth" (Al-Quran 9:103).The holy Quran mentions as the duty of the Islamic state to collect *Zakat*. The Quran says:

> Those who; if we give them power in the land, establish worship and pay the poor-due (*Zakat*) and enjoin kindness and forbid inequity (Al-Quran 22:41).

The Prophet (SAW) and the four righteous caliphs after him managed the institution of *Zakat*, collected and distributed *'Sadaqat'* throughout their caliphate. (Abdullah & Suhaib, 2011). *Zakat* is not just a charity for beggars and low class people, rather a form of social security which can only be materialized if it is established as an institution (Abdullah & Suhaib, 2011).

But because of the weakness of the Islamic state, *Zakat* is now a private matter in the sense that it is not collected by the state or any central agency; individuals are left to decide if and to whom to designate their *Zakat*. Many people give it secretly to their relatives or neighbors. A desire not to humiliate the poor underlies the practice of giving in secrecy and many believe that "special religious merit is gained by giving alms in secret" (Benthall, 1999).

Ali observes that *Zakat* is not simply an obligatory charity. It is a state institution or where there is no Muslim state, a national institution. The individual is not, therefore, at liberty to

[5] www.realish.com cited in Abdullah & Suhaib, 2011.

calculate and spend his *Zakat* as he likes. It must be collected by the state or on a national basis and spent by the state or community. Ali submits:

Where the Holy Qur'an describes the main heads of expenditure of *Zakat*, it mentions an item of expenditure on officials appointed to collect and distribute the same, which shows clearly that, it contemplated either a department of the state or at least a public fund managed entirely by a public body. The donor is not required to give a certain portion of his savings to deserving person, but to contribute the same to a fund which must be used for the upliftment of the community (Ali cited in Akanni, 2006).

Thus, the payer of the Islamic tax of *Zakat* is not expected to give it to individuals who to him deserve it. Rather, he should pay it to the common purse of the Muslims. It was in this sense that the Prophet Muhammad (SAW) understood and practiced it as the head of the Muslim empire. Abu Bakar who succeeded him also understood and practiced it in this manner. That was why he used the state law enforcement agencies to compel those who rescinded in its payment to pay it to the purse of the Muslim empire after the demise of the Prophet Muhammad (Balogun, 1996, p. 126).

Human Development

HD is a process of enlarging people's choices. These choices can be infinite and change over time. Three essential choices are to lead a long and healthy life, to acquire knowledge and to have access to resources needed for a decent standard of living. If these essential choices are not available, many other opportunities remain inaccessible (UNDP, 1990, p. 10).

The term HD here denotes both the process of widening people's choices and the level of their achieved wellbeing. It also helps to distinguish clearly between two sides of human development. One is the formation of human capabilities such as improved health, knowledge and skills - and the use people make of their acquired capabilities - for leisure, productive purposes or being active in cultural, social and political affairs. A society needs to build up human capabilities as well as ensure equitable access to human opportunities. If the scales of HD not finely balance the two sides, considerable human frustration may result (Haque, 1995, pp. 18-19).

Sen's Capability Approach

The Capability Approach sees human life as a set of 'doing and being', it may call 'functioning' and it relates the evaluation of the quality of life to the assessment of the capability to function. This valuational exercise cannot be done by focusing simply on communities or income that help those doings and beings, as in commodity based

accounting of the quality of life. The functionings themselves have to be examined and the capability of the person to achieve them has to be appropriately valued (Sen, 1997, p. 4).

The constituent elements of life are seen as a combination of various different functionings. This amounts to seeing a person in as it were an 'active' rather than a 'passive' form. The included items may vary from such elementary functionings as escaping morbidity and mortality, being adequately nourished, undertaking usual movement etc., to many complex functionings such as achieving self respect, taking part in the life of the community and appearing in public without shame. The claim is that the functionings are constitutive of a person's being, and an evaluation of a person's well being has to take form of an assessment of these constituent elements (Ibid, p. 5).

The primitive notion in the approach is that of functionings have been seen as constitutive elements of living. A functioning is an achievement of a person: what he or she manages to do or to be, any such functioning reflects, as it were, a part of the state of that person. The capability of a person is a derived notion. It reflects the various combinations of functionings (doings and beings) he or she can achieve. It takes a certain view of living as a combination of various 'doings and beings'. Capability reflects a person's freedom to choose between different ways of living. The underlying motivation of focusing on freedom is well captured by Marx's claim that what we need is "replacing the domination of circumstances and chance over individuals by the domination of individuals over chance and circumstances" (Ibid).

Objective of the Research

The overall objective of this research is to conceptualize the institutionalization of *Zakat* as a tool of HD as well as to examine its role in improving HD of *Zakat* recipients of the Center for Zakat Management (CZM). Capability Approach is used as theoretical lens to analyze the improvement of HD of *Zakat* recipients after having the institutional *Zakat* fund from CZM.

Research Question (s)

Main Question

How the institutionalization of *Zakat* can be a tool for ensuring HD and what are its roles for improving HD of *Zakat* recipient from the CZM?

Sub Questions

- What are the roles of institutionalized *Zakat* in income and health condition of *Zakat* recipients?

- What are the impacts of institutionalized *Zakat* for increasing knowledge of *Zakat* recipients?
- How institutionalized *Zakat* fund can be the great source for national HD program of Bangladesh?

Field Work and Research Methods

This research is mainly qualitative in nature. It is based on the data from primary source. The method of non probability purposive sampling has been used for data collection. Details are described below:

Research Area

Three areas have been selected for this research. First one is the *Jibika* Project[6] of the CZM which is under implementation in *Mohora* Union under the Upazila of Chandgaon in Chittagong district, second one is Dhaka University (DU) and third one is Faridpur. First one is selected for collecting data on the impacts of institutionalized *Zakat* in income and health condition, second and third one is to see the impacts of institutionalized *Zakat* on promoting knowledge and skills of the *Zakat* recipients.

Sampling Strategy

The method of non probability purposive sampling has been used for this research. It requires this method because the institutionalized *Zakat* system is new in Bangladesh and is not fully developed as yet. So the role of this system for improving HD is not easy to judge due to lack of data.

Researchers have purposively selected 15 respondents in the research area. Among them 10 respondents were selected for collecting data on income generation and 5 respondents for health purpose. Respondents were interviewed through semi-structured questionnaire. Additionally, one case study has been taken from the respondent of income generation activities. Case study method has also been used for collecting data on promoting knowledge through institutionalized *Zakat* fund. The *Zakat* recipients were those who had become *mustahiq (Zakat* recipient*)* for at least one year, and received the fund in the form of income generating scheme, education and health purpose (or beneficiaries of health services). The impact of the income generating scheme on the income, education and health of the Zakat recipients was examined in through this study. Furthermore, 1 year is assumed as a criterion that is considered minimally adequate to see the results of different program on the *Zakat* recipients. Due to

[6] *Jeebika* (*Zakat*-based livelihood and human development program) is a project which aims to follow family based approach to ensure sustainable community development with the help of *Zakat* fund and active community participation. The program facilitates and coordinates to provide a package of services as per the requirements of the targeted hard-core groups to upgrade their living standard.

the issue of *"ethics"*, anonymous names of the respondents were provided here instead of using real identity of them. The recipients of *Zakat* for income generation purposes are women. Among them 7 respondents are Muslim and 3 respondents are Hindu[7]. There is a health center in that Union from which the basic treatment is provided by the CZM. The respondents who were selected for health purpose were the beneficiaries of the service from health center as well as they have been given specific amount of *Zakat* fund for their major health problem during last one year. For the education purpose, four students who are studying in different department at DU have been selected. They are the recipients of Genius Scholarship program of the CZM for the University level students. We have selected one respondent who have completed the receiving of the scholarship, two students whose scholarship is going to be completed very soon and one student who is the new recipient of the scholarship. Among them two students are male (one of them is blind) and two students are female. One recipient was selected for skill development purpose. This respondent has been given with training on solar energy.

Semi-structured questionnaire were used to collect primary data.

Link and Framework between HD-ZAKAT

If the term HD means enlargement of human choices then institutionalization of *Zakat* is an effective tool for ensuring it for the people who are not capable by themselves to enlarge his or her choices. How this Institutionalization of *Zakat* can enlarge the human choices?

From the following diagram, it will be found that the individual *Zakat* is collected by the *Zakat* institution and ultimately it forms the basis for the institutionalization of *Zakat*. After institutionalization of *Zakat* by the central body of the *Zakat* institution, it is distributed to the three main sectors. There are income generation activities for the poor, for education and skill development of needy and deprived people and for health services for the poor and general masses. The disbursement of *Zakat* on income generating activities for the poor will ensure the self sufficiency in income for them for a sustainable basis. Then the poor people will be self sufficient in income. After achieving the self sufficiency in income, these poor people will have the *agency* over their resources as they have been given the full authority over the *Zakat* fund by the Islamic Shari'ah. The poor people will have the capability to spend their income for consuming the better nutrition, spend for child education and also for the better health services. These spending together will ensure the better standard of living.

This better standard of living will ensure their well being. These poor people also will use their income for the further generation of income by their own means which will also

[7] Hindu was selected to get a new perspective on institutionalization of *Zakat*.

ensure their agency over their resources. After completing the amount of income which is necessary for their survival these previously poor people will be the possible sources of *Zakat* collection by the *Zakat* institution which will ultimately ensure the sustainability of the fund for the institutionalization of *Zakat*.

The fund of *Zakat* can finance the education and skill development of needy and deprived people. In this case a special exemption is given to students for whom employment may deviate them from their basic role of gaining knowledge. Training and skill development are important through *Zakat* for improving participants' capability, competency and potentiality. *Zakat* fund, in this case, could be used to cover the expenditure of the educational expense for the poor students and training and courses provided to the needy and deprived people. By having better knowledge and enough skills, the people can engage themselves with the job which is suited for them as well as being *Zakat* recipients they could use the distributed fund effectively. The students who has received *Zakat* for their educational expense and the people who has received training will have gained better access to the community participation and as well as in better employment. These two communities will have the access to higher income and can lead a life with dignity which ultimately will lead to better standard of living as well as ensure well being for the *Zakat* recipients.

The institutional *Zakat* funds have the other sector to finance that is the basic health services for the poor and general masses. The poor people often do not have access to the health services due to their resource constraint and suffer from the ill health. *Zakat* could be used for ensuring the basic health services for the poor people. After taking the basic health services the poor people will be better in health. Then they will be able to participate in the production process. With their better health they will be able to earn the higher income for them which will ensure their better standard of living as well as well being for them.

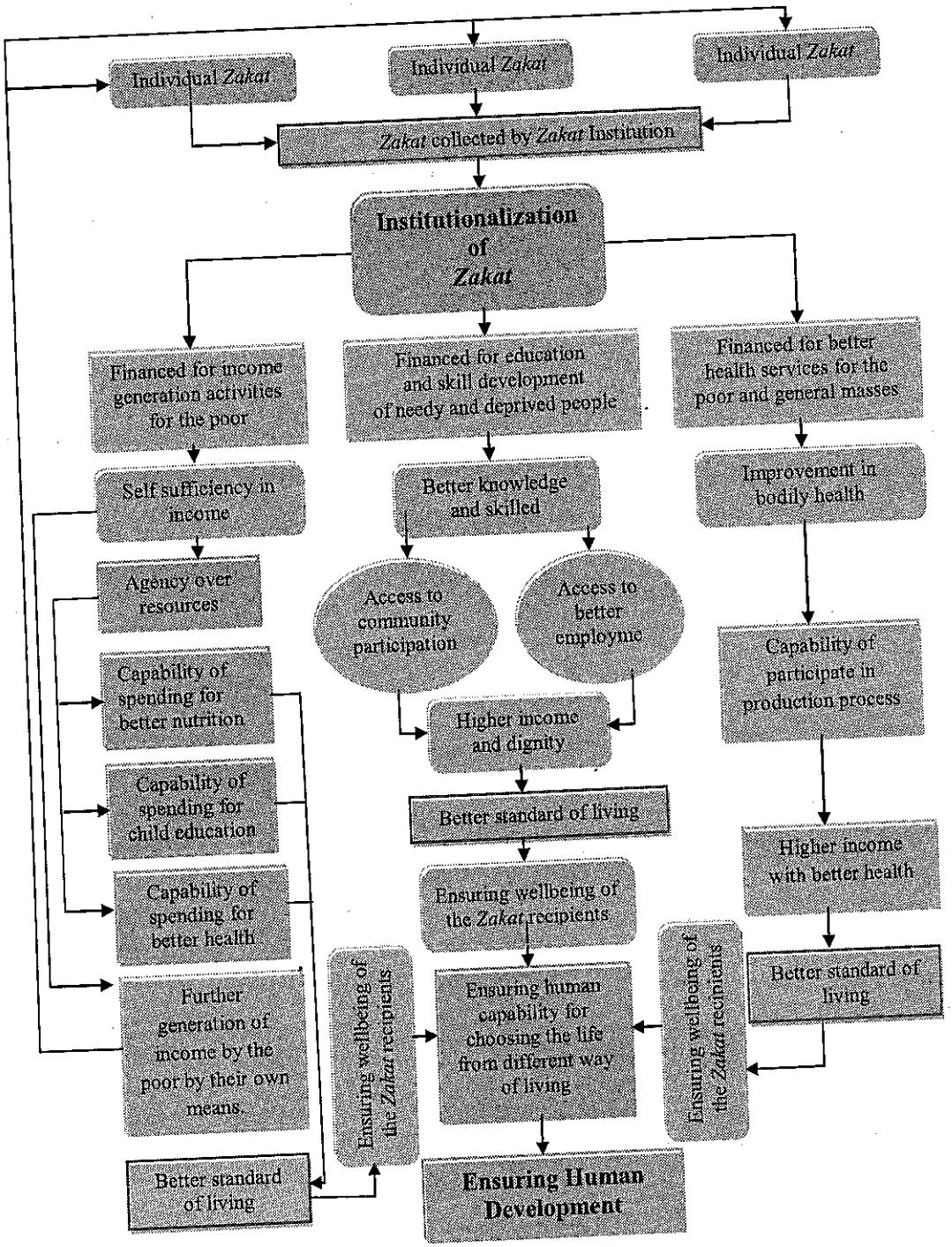

Fig.- 1: Ensuring HD through Institutionalization of Zakat: A Conceptual Root

So from the above diagram it is seen that financing every sector by the institutionalized *Zakat* fund will ultimately lead to the better standard of living as well as well being for the poor people. When these poor people are able to earn income above their basic needs then they eventually will fall into the category of the *Zakat* payers which ensures the sustainability of the fund for the institutionalization of *Zakat*.

The financing by the *Zakat* fund make the people capable to choose their life from different way of living which is insight message of the Capability Approach of Amartya Sen. People can do and act by their own will and also they can command the resources for their better standard of living. They have the full agency over their way of living. These capabilities will enlarge the choices as well as ensure well being for them. These capabilities and well being will ultimately ensure the human development for the *Zakat* recipients.

Findings of the Field Study

The summary of the major findings of the field study has been presented under the following broad categories:

Increased Social Harmony

Social harmony and religious coexistence is a necessary condition for ensuring the happy life and wellbeing for a specific area or country. We know the people of Bangladesh are living their life with social harmony and religious coexistence since its emergence. Institutionalization of *Zakat* as tool of human development can also keep this religious harmony in balance. The study found that *Zakat* fund is being given to both Muslim and Hindu. This is the symbol of the social harmony and religious coexistence of the two major religious people in Bangladesh. This *Zakat* fund is not only ensuring the well being of the poor people but also it is promoting the social harmony and religious coexistence.

Increased Income Generation

The respondents who were seleted to see the impact of income generation activities have been given with specific amount of *Zakat* for fixed basis within a group consisting of specific number of people. The number of group member may vary from 20 to 30. Among the 10 respondents almost all of them are engaged with bamboo fencing, majority of them have a stock business (Bamboo fencing) additional to it. One third respondent work as a teacher in preprimary and adult literacy school run by the CZM. Almost half of the respondents have business of their own respectively wood business, vegetable business, tea stall and a grocery shop. Among these respondents, one responded work as part time home servant. One fifth respondents make handicrafts and sold it to the market[8].

[8] Author's interview with recipients of *Zakat*, 8th November 2012, Mohora, Chandgaon, Chittagong

The amount of fund taken by the recipients of *Zakat* is different for the respondents. As we mention there is a group fund for the specific number of recipients, they have the opportunity to withdraw money as their need basis. The initial amount of money taken by the every household is 15000 Taka. After the successful income generating initiatives they have the opportunities to withdraw a large amount of money from the group fund. Among the 10 respondents, all have withdraw money at least for second time during last one year from the group fund. For example, if they borrow fund of Tk. 15000, they are allowed to borrow another large amount after paying the initial amount without any interest. The average amount of money taken by the 10 respondent is around 46,000.00 taka during last one year. The lowest amount is Tk. 20,000.00 and the highest amount is Tk. 1,20,000.00 respectively.

After having the *Zakat* fund of their own, the recipients of *Zakat* were guided to use these funds for their income generating activities. They are using these funds for their improvement. As we said they are engaged with different work as well as many works by one family, they are committed to bring a higher income by these amounts of money because they have the ownership of their receiving fund. The recipients of *Zakat* have been said that they are the real owners of these funds and they have the full authority over it. They are responsible for the proper use of these funds for their well being. After one year their average monthly net income is about 12000 taka. The lowest amount of net income was Tk. 6,000.00 and the highest amount of net income was Tk. 22,000.00 per month.

Many people have their own stories of life but sometime these stories remain unheard. In this study, we have heard these unheard stories of life. Rajea Sultana, a 21 year's old unmarried girl is maintaining her family where she has a 5 little brothers and sisters. She experiences the great changes in her life after receiving the *Zakat* from the CZM. She told her story of life. According to her:

> Before, I faced poverty, soreness and lots of difficulties in my life. My father died in 2001 and my mother maintained our family. After 5 years of my father died, my mother broke the relation with us. She is not dead but she is not with us because of my family problem. At that time I was the elder person in my family with 5 of my brothers and sisters. After 2005, my family was fully depended on me. I was at a loss how I would manage my family as I was a girl and had no opportunity to do work outside. I managed the family by making bamboo fence for other. Somehow I managed that situation. After the great difficulties, I found CZM. I became the teacher of its pre primary education project. I have been with CZM for last 23 month. Before, I was unable to fulfill the demand of my brothers and sisters but now I am able to fulfill their basic demand from me.

> Eating rice with full belly was a dream for us. As the days of fasting has gone. It is the biggest issue for us. I have a dream. I want to set up a handicraft industry. If I find a big loan from CZM, then I will be able to hire some workers and make the work hard so that I can earn more money as well as they can. I have a dream about my brothers and sisters. My two brothers are studying in *Madrasa* and my younger sister is studying in school. I did not continue my study due to poverty, I want my brothers and sister will make themselves educated. They will be established in their life. They will fulfill my dreams[9].

This story is the example of how *Zakat* can be a blessing for someone and how this fund can ensure the wellbeing of the individuals. Institutionalized *Zakat* is quite successful to ensure the wellbeing of its recipients in this regard.

Increased Standard of Living

As this study found that *Zakat* recipients have the higher income, they are able to maintain a basic standard of living for their family. All the respondents said that they spend their money for their family purpose mostly on bearing their living expenses like ensuring the better nutrition for their family Although their expenditure basket is not large but all respondent said that, at present, they are able to maintain a basic standard of livings for their family. Almost all of them have shown their satisfaction over their income. They are well off than the previous time.

Ensuring Better Health

Institutional *Zakat* fund is ensuring the better health for its recipient in two ways. First one is, people are getting the higher income and they are able to spend it for the health purpose. Second one is CZM has set up health center for the poor people and are giving the special support to them for major health problem. These two facts are ensuring the better health for the *Zakat* recipients. In this research, it has been found that, for the health purpose, no one spends any money during last year. But they have taken treatment from the health center set up by the CZM. As there is a MBBS doctor for every week, people who faces health problem, went to the doctor and took treatment. Three respondents have taken special allowance and support from the CZM for their major health problem during last one year.

Promoting Knowledge

Institutional *Zakat* fund is using for the promoting knowledge of the poor and needy students. They are being given the support so that they can continue their studies when they fall in difficulties. In this study, every respondent who received the *Zakat* fund for their education purpose said that they have been benefited by this fund. They got enough time to

[9] Author's interview with Rajea Sultana, 8th November 2012, Mohora, Chandgaon, Chitagong

concentrate in study and did well in their exam. Someone become first and second in their respective departments. They agree with the notion that this support has benefited them to be a knowledgeable people. They wish they could be a successful person in the future and will do their best for the country.

Mr. Momtahi one of the Zakat recipents students is studying Masters in Philosophy at University of Dhaka. Her father lost the power of his eye when he was a student in college. Now he is totally blind. He does not have any job. Her mother is the only wage earner for the family. She has only one brother. In her words:

> I passed S.S.C and H.S.C in 2005 and 2007 from Jamalpur govt. girls' high school and Govt. Ashek Mahmod College respectively. I got admission in Dhaka University in 2008 but I was in great difficulties where I would reside because there was no condition for me to reside in Dhaka by my own expenses. I was in the house my cousin who was affluent enough to bear my expenses but gradually I felt that he did not want me to stay at his house. Then I went to another cousin house who herself was in difficulties. I was able to stay at that house for some days. Then I found a great hearted people who was not kin of mine or whom I did not see before. She is a senior officer of T.S.C. She heard my difficulties and offered me to stay with her until I reside in hall. She gave me food and treated me as like as her daughter. In the mean time I was searching for tuition. But I found it after some month. I went to my department teacher and said to her about my difficulties. Then she managed me a sit in the hall. But my difficulties were not over. I spent many times when I was able to buy the food for single time in a day. But there was no leakage in my patience. At the end of 2nd year I found CZM and received monthly scholarship amont Tk 2,500.00 until my completion of graduation. Then I was able to concentrate more in my study. I used to take two tuition of my own where I had little time to concentrate on my study. After having the scholarship I was engaged with single tuition and was able to concentrate more in my study. I have a dream to help the helpless people from child to old. I hope I will be able to fulfill my dream by the grace of Allah[10].

This is a story of a girl who has the strong determination about study. She is walking towards her goal by her own feet. She is the example of a poor girl who is fighting with her fate and becoming stronger in terms of resilience power.

Promoting Personal Skills

CZM has given its support to make the young people skilled in the specific technical knowledge so that they can become self reliant persons. These young people get jobs or

[10] Author's interview with Momtahi , 22nd November 2012, Dhaka

make themselves individual entrepreneurs after getting the training by the support of CZM. Shohag, a twenty years old unemployed young boy tells his story of life. According to him:

> I have two brothers and two sisters in my family. My sisters have already been married. Now, in my family, we are three members. My father died two years ago. I am the youngest son of my parents. My elder brother is two years senior to me. He is a student. The economic condition of my family was not so good but my parents were able to maintain a basic standard of living for us. As I am a youngest son in my family, I was admitted to a *Qoume Madrasa* in my early age. But I had to stop my study due to some unavoidable circumstances. I went to United Arab Emirates (U.A.E) as an unskilled construction worker. I managed to go U.A.E after selling my agricultural land. But at the time of great recession I came back to Bangladesh in 2008. I was totally unemployed at that time. As I had to sell my land I became a victim of mental torture from my family as well as from the village people. I searched for a job, but no one gave me a job. I went in different places and stayed there for a job. But I was unable to continue my job. As I had no formal education it was impossible for me to get a permanent job. I worked as a day laborer in prawn farm, worked in a shop and worked as a helper of an electrical shop. At this time there was continues pressure and insult upon me but my family member bears all of my sufferings. Few months earlier my brother told me that he managed training for me on solar energy. I showed my interest on this training. I have completed this training few days ago. Now I am working in a company. Previously, sometimes I felt that I have no right to live in the world. I took attempt to commit suicide for several times. Now the people around me have changed their outlook upon me. They treat me as normal person in the society. I think this training opportunity gave me the new life to think about my own future[11].

From the above story, it can be said that institutionalization *Zakat* has made a young boy to think about his life differently. He has gain training on solar energy which is growing sector in Bangladesh. He has gain certain capability by which he will be able to earn his livelihood.

Bridging the Gap

When people have the certain amount of income in regular basis and willing to improve their economic condition then it is very much simple to bridge the gap between the rich and poor in a specific area. As it is found in this study that after receiving the *Zakat* fund the poor people are becoming self sufficient and are able to maintain a basic standard of

[11] Author's interview with Shohag , 4th December 2012, Dhaka.

living for them. This fact is helping to bridge the gap between rich and poor in the rural area. This bridging the gap is not only in monetary term but also the social and community participation among the rich and poor.

Conclusion

Institutionalization of *Zakat* is acting as a tool of ensuring the HD of its recipients. This is a catalyst to accelerate agency, capability and functioning of human being which further brings well being. As found in the study that financing every sector like income generation, health, and education and skill development by the institutional *Zakat* fund is bringing the capability and ensuring the well being for the *Zakat* recipients. The financing by the institutional *Zakat* fund has made the people capable to choose their life from different way of living. People have the ability to function by their own will and also they have agency to command the resources for their better standard of living. These capabilities have enlarged the choices as well as ensured well being for them. These capabilities and well being have ultimately ensured the human development for the *Zakat* recipients.

The findings of the research imply that GoB should concentrate regarding the issue of institutionalization of *Zakat*. GoB can institutionalize *Zakat* through its own channel. As we know in Bangladesh there is a central body which collects *Zakat* from the citizens of Bangladesh. But the smooth performance of it is not ensured by the government. GoB should take some necessary steps for the smooth working of the existing *Zakat* institution of the government.

GoB should give the special support to private initiative on institutionalizing *Zakat* so that they can work properly as well as find right direction. These institutions will act as alternative to the foreign funded NGOs. As we know NGOs receives fund from the foreign sources for their survival as well as for running their project. These *Zakat* institutions can act being independent from the foreign pressure because their fund will be collected from the local sources. The sustainability of these funds is ensured as it is found in the study. These institutions together with will bring change for Bangladesh in the future.

GoB should initiate specific program to attract the *Zakat* payable community for the institutionalizing the *Zakat*. GoB can incorporate the real philosophy and it implication to the society on its national education policy. GoB can take awareness building program about the real philosophy of *Zakat* for avoiding wrong use of traditional *Zakat* disbursement.

There is a great scope to conduct future research on institutionalization of *Zakat* and HD. These researches could be both qualitative and quantitative. Qualitative research could show the changes in the life of *Zakat* recipients more comprehensively. Quantitative research could show the exact time frame for GoB to ensure the HD for its all citizen by

focusing on the poverty rate and the amount of institutionalization of Zakat fund. Authors hope that research institution will come forward to conduct these kinds of research.

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Converting Environment Friendly Waste into Wealth

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Abstract

During the last two decades, the waste haulage and disposal system has undergone considerable importance for maintaining hygienic as well as friendly environment in Bangladesh. Though, this is a regular practice in city areas but in the rural communities of Bangladesh almost overlooked or neglected. The rural communities are less responsive to the needs of waste hauling and disposal system because of high cost involvement and low return with the traditional system of getting composted fertilizer for utilization to their agricultural lands.

The Rural Development Academy (RDA), Bogra has worked to address these issues since its founding. RDA focused not simply on pollution prevention, but rather expressed how communities could enjoy the friendly environment and increase local capacity and stimulate economic development through the efficient use and reuse of local resources. RDA through her action research implementing a community based biogas project that could be implemented at the local level to convert waste into wealth and reduce solid waste management costs. With aesthetically managed waste economies could be created and sustained at the local level, thereby creating markets for collected recyclables, a new source of income for local communities, new enterprises through providing need based training and employment opportunities. There is also lot of economic/ employment opportunities to introduce recycling program for creating friendly and sustainable environment.

First target illustrate the environmental and economic benefits of converting degradable waste into wealth through community based biogas plant on the basis "one village one biogas plant (capacity: 130- 200 m^3)". In Tearband village under Shahjadpur upazila of Sirajgonj district nearby Bangladesh Milk Producers' Co-operative Union Limited (Milk Vita), Baghabarighat station, conducted an action research was conducted and the data found from officials demonstrate that how biogas plant reduces the need for these waste disposal facilities and reduces waste management costs and demonstrated the economic benefits of a "closed-loop" system. Then put theory to practice and helping communities attract end-users through pioneering innovative business structures such as biogas for cooking, safe drinking water supply, electricity connection to households and providing market access with produced

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organic fertilizer to local and national level vendors (ACI Ltd.) and village community (VC), so that commercial growth benefits not just the local, but also to the national level.

In 2012, Tearband community could manage approximately 732 tons of degradable waste that employed 5 regular people and 122 day-laborer had Tk. 1522060 in sales (Table 1 & 4). Our work continues as large vendors continue to pursue status-quo waste management strategies that do little to protect the environment or create meaningful employment.

The Waste to Wealth approach of community biogas project (CBP) works with activists, policymakers and businesses to manage waste and maximize the reuse and recovery these materials and their associated products. It seeks to convert wastes from environmental and economic liabilities to valuable resources that create fit for human habitation jobs and provide community development opportunities. RDA's Waste to Wealth project has strengthened communities across the country create policies and practices that at the same time address habitats' environmental concerns and economic needs.

Introduction

The global livestock sector is characterized by a dichotomy between developing and developed countries. Much of this growth was concentrated in countries that experienced rapid economic growth, particularly in East Asia. This growth is driven by the rapidly increasing demand for livestock products and this demand is mainly driven by population growth, urbanization and increasing incomes in developing countries (Delgado 1999).

On the other hand in developed countries production and consumption of livestock products are now growing only slowly or stagnating, although at high levels. This combination of growing demand in the developing world and stagnant demand in industrialized countries represents a major opportunity for livestock keepers in developing countries where most demand is met by local production and this is likely to continue well into the foreseeable future (Steinfeld *et al.* 2006). At the same time, the expansion of agricultural production needs to take place in a way that allows the less well-off to benefit from increased demand and that moderates its impact on the environment (World Bank, 2009).

The challenge facing the world economy today is to provide sustainable approaches to economic growth through properly managing waste. One drawback of industrial processes is the creation of waste products. These waste products enter a 'sink' which can sometimes 'overflow', harming the environment so that the wider resource base may be depleted (Thornton *et al.* 2010).

It is therefore vitally important for industry and the community to develop methods of limiting the harmful effects of the 'waste sink' and wherever possible of converting 'waste' into productive outputs. "The sustainable development means which meets the needs of the

present without compromising the ability of future generations to meet their own needs" (Rosegrant *et al.* 2002). The waste products are unavoidable and were originally considered to be largely unusable. Finding ways to dispose of the waste with minimal impact on the environment is one of today's greatest challenges. Agricultural by-products mainly were disposed of by methods such as field burning, households cooking etc. which caused increased concerns over public health and environmental problems such as the greenhouse effect and ozone layer depletion. The need for legitimate and organized initiatives in the rural waste management has been regularly articulated in Bangladesh. With the emerging concern on large quantity of the waste being produced both in the form of solid and liquid waste, the concept of waste management becomes one of the key areas of sustainable development principles which is based on policies and practices that are resource-conserving following standards that can be met in the long term and reverence values of equity in human access to resources. The terms solid and liquid waste management (SLWM) is the collection, transport, processing, recycling or disposal of waste materials usually ones produced by human activity in an effort to reduce their effect on human health or local aesthetics or amenity (UNICEF, 2012). Concerning waste management more than a decade ago, Rural Development Academy (RDA), Bogra, Bangladesh conceived and implemented the waste management program in RDA campus especial emphasis given on agricultural farm with the aim of putting the thrash on environmental pollution caused by livestock and poultry wastes. RDA through her one of the action research projects (Community Biogas Project) started in 2009 to address these problems associated with sustainable waste management targeting 112 communities and will discuss the potential of replication to the other regions of Bangladesh.

In addition to improving the local environment quality, the project will also deliver local community benefits related to the creation of new jobs during the construction, operation and maintenance stages of the livestock waste management system and to the utilization of methane gas (CH4) as renewable energy resources. The project activities can also be replicated in other farms around the country which will lead to environmental awareness related to livestock waste management, renewable energy and climate change.

This study attempts to provide current status of community waste management systems in relation to recent trends coupled with a brief assessment of whether these trends are likely to continue at rural areas for sustainable environment. It also indicates where potential remains in relation to livestock waste management and livestock diseases control under community initiatives. This study sketches a number of factors that may modify both the production and the systems of livestock waste management in an efficient manner with a view to converting waste into wealth and to determine of key factors for dissemination of community based biogas plants in Bangladesh. The paper concludes with a summary

outlook on community based waste management systems and utilization towards sustainable environment.

Objective

The main objective of this study was to assess the suitability to set-up and implement a community based biogas plant and its potentials for proper livestock waste management in Bangladesh.

Methodology

The overall procedural approach is paying attention on integration of quantitative and qualitative methods. Along with questionnaire which is the main source of data, a number of qualitative tools have been used for data collection. The findings from the survey and qualitative investigation are made complementary to each other throughout data collection to analysis phases.

The following methodologies were used to fulfill the objective of the study:

- Analyses of secondary data including project documents from Rural Development Academy (RDA), Bogra, Bangladesh.
- Several field visits performed to get an impression on the performance of biogas plant and to collect practical information on community biogas project implemented by RDA in Tearband village, Shahjadpur, Sirajgonj.
- A check-list was prepared for the collection of data during field visits.
- Interviews with key informants and potential stakeholders of community biogas users.

Study Area

The Rural Development Academy (RDA), Bogra, Bangladesh, runs a poverty alleviation project at Tearband village under Shahjadpur upazila of Sirajgonj district in the northern part of Bangladesh. This study was conducted in Tearband to identify the suitability to set-up and implement a community based biogas plant towards proper livestock waste management and to address in the livelihood patterns of people in the community. A participatory approach was used for both qualitative and quantitative data collection during July to October 2013. Respondents interviewed were directly engaged in community biogas plant management and associated income-generating activities such as livestock rearing, beef fattening, poultry rearing, biogas & electricity selling, organic fertilizer packaging and marketing and home gardening. Respondents were selected randomly from the study area covering various categories according to the farm sizes.

Major Sources of Waste Collection and Utilization

The community on traditional basis use crop fields and forest as the major sources of fuel and biomass for cooking. Most of the villagers use their biomass as fuel from the crop residues (maize straw, bottom part of rice straw, husk etc.) followed by dried cow dung cake, leaves and twigs from forest etc. As there is no availability of gridline gas and electricity most of the respondents depend on natural sources of biomass for cooking. Due to insufficiency of natural forests the farmers collect fuel wood from the homestead forestry. The major sources of biogas production feeding materials are from livestock waste (89%), poultry droppings (7%), kitchen waste (3%) and others (1%) etc. (Figure 1).

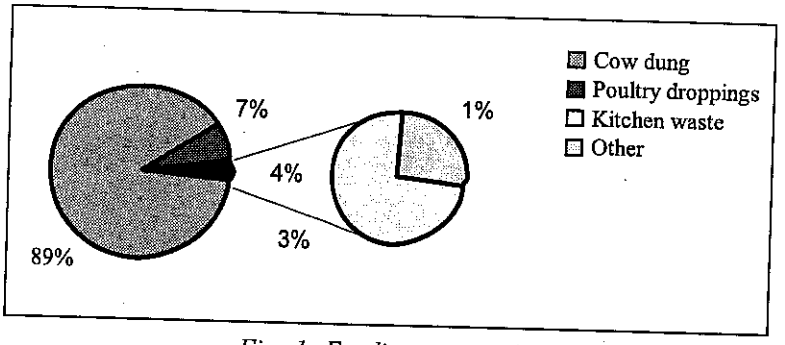

Fig.-1: Feeding materials

Waste from Forest

The estimation of leaves and twigs from forest were based on gathering by the farmers. By field data amount of gathered leaves and twigs per household per day was recorded and calculated the amount on year basis, multiplying the amount by the weightage of the leaves and twigs.

Waste from Livestock

Cow Dung: The total number of cattle in the community was recorded before and after project started 270 and 340 respectively. The quantity of cow dung (dry basis) was calculated by multiplying the cow dung production per head per year and the number of cattle in the community. The cow dung quantity per head per year was found 0.51 ton in the study area which was little-bit higher to the cow dung (dry basis) quantity per head per year was estimated as 0.49 ton for Mymensingh area (Chowdhury *et al.* 2002). The quantity of cow dung was found higher due to increased of cross-bred cattle in the study area.

Goat Faeces: The dry biomass obtained from goat faeces per head in the study area was also estimated by same method used in cattle. The goat faeces quantity per head per year was found 19.22 kg in the study area which was almost similar to the finding (dry matter

basis) per head per year was estimated at 19.25 kg (Shahjalal, *et al.* 1997).

Poultry Droppings: According to Uddin (1991) average per head poultry dropping production was estimated at 10.95 kg on dry matter basis but in the study area it was 12.28 kg per bird per year.

The quantity of poultry droppings was found higher due to increased of hybrid poultry in the study area.

Total dry matter (DM) from livestock used as input for the biogas plant was calculated by the following formula:

$$W_{cd} = \frac{\sum_{i=1}^{n} P_{cr}(i) x f_{cr}(i) + G_{dp}(i) x F_{dp}(i) + P_{dp} x F_{dp}}{\sum_{i=1}^{n} C_{dp} + G_{dp} + P_{dp}}$$

Where, Wcd = Total cow dung used as input of biogas plant by the community, ton

Cdp = Production of dried cow dung of (i) family, ton

Gdp = Production of dried goat faeces of (i) family, ton

Pdp = Production of dried poultry droppings of (i) family, ton

Fdp (i) = Percentage of dry dung used as input by (i) family, ton

n = Number of family of a community.

Total fuel consumption for cooking

Total fuel consumption for cooking was calculated by using the following formula:

$$T_{Fcon} = \sum_{i=1}^{n} W_{fuel}(i) x H_{fuel}(i)$$

Where, T_{Fcon} = Total fuel consumption for cooking, kg/year.

W_{fuel} (i) = Weight of (i) fuel for cooking, kg/year.

H_{fuel} (i) = Heating value of (i) fuel, kJ/kg.

n = Number of fuel type.

Results and Discussion

At present, livestock rearing for milk and meat production is very low profit margin enterprises because of high feed and labor cost compare to other agricultural based income generation activity (IGA). Efficient and economic use of livestock waste need to be developed with the need of soil types, air and sunlight associated with climatic region. There are about 26.83 million cattle in Bangladesh of which about 1.088 million (4%) are cross-bred (BBS, 2012). Community based biogas plant could be a better solution to grip all the wastes produced by livestock and concerned community as well as to capture the potential benefits of managing & converting waste into wealth environmentally friendly. This community supported livestock rearing associated with waste management strategies may increase people's participation with labor and land saving investment with a new avenue of not only income earning but also environment friendly sustainable enterprises. This approach would enhance good sanitary condition both for human & animal ensuing nutrition in soil conservation and water holding capacity. The nutritional cycle doesn't end with the cattle. Nutrients in manure are edifice of soil productivity and better crop production. To get optimum benefit from livestock, waste produced with proper management through community biogas plant can be one of the potential factors to attract the investors in Community Biogas Plant (CBP). The findings showed annual net earning captured by the community of Tearband village stood at Tk. 4,27,101/- (Table 3). Though, the total efficiency of biogas digester (volume: 130 m3) for waste management incurred by the community was near about 66% only. A community refers to the social unit shares common values. There are multi-dimensional scopes of a community based livestock rearing especially for the developing country towards food security to have an environmentally friendly waste management assuring sustainable economic support (viz. renewable energy, electricity, safe water, employment opportunity, emission reduction etc.).

Comparative statement of "Tearband" community & traditional biogas plant operated in Bangladesh stated as follows:

Traditional Biogas Plant	**Community Biogas Plant**
Family based	Community based
Small unit (1.2-4.8 m^3)	Bigger in size (130-200 m^3)
Waste management in household level	Waste management in community level
Individual family use	Common output sharing
Individual family (less participation)	Community (active participation)
Individual contribution with subsidy	Community investment without subsidy
Only Bio-gas plant	Package support for sustainability
Cost Tk. 0.35-0.60 Lakh	Total investment Tk. 14.5 Lakh

Cont,

Traditional Biogas Plant	Community Biogas Plant
One family only	Family coverage: 120-200 families
Waste management capacity 30-60 kg./d	Waste management capacity 2-3 Ton/d
Improper decomposition	Proper decomposition
Daily gas output 1.1-2 m^3	Daily gas output 100-108 m^3
Manure output 6-12 kg/day	Manure output 500-600 kg/day
No water supply system	Safe water supply system
No generator	Biogas generator for electricity (5KVA)
Only biogas line to individual family	Nano-grid pipeline for supply of water & biogas to the community households
High cost	Average cost nominal
Least scope of benefit sharing	Maximum scope of benefit sharing
No slurry drying cum processing floor	Slurry drying cum processing floor
No training facility	Wide range of training facilities

A number of barriers hold back a small size family based biogas plants as commercial entrepreneurship due to lack of active participation for collecting and providing waste as feed materials to the biogas plants to make its' efficiently use. It is also difficult to make biogas plants cost-effective with sale of energy as the only source of income. That is why; planners and decision-makers have to come forward instead of establishing small sized traditional family based biogas technology which is not feasible and cost-effective. Study also reveals that about 50-60% traditional family based small size biogas plants are inactive because of inadequate supply of feeding material, absence of cattle of the plant owners due to immerging of power tiller and in some cases migration to the city.

RDA's Experience on Community Based Waste Management

Rural Development Academy (RDA), Bogra started "Fixed Dome" type biogas plant following community based waste management system since 2002 at RDA campus. The design is based on principle of "Semi Batch-fed Digester". A combination of batch and semi-continuous digestion is known as semi-batch fed Digestion. It also called Fixed Dome Digester. Such a digestion process is used where the dung/droppings from confined farm animals is sufficient to operate a plant and the same time organic waste like crop residues, agricultural wastes, kitchen waste, biomass etc. are available during the season. But RDA's Fixed Dome CBP (Community Biogas Plant) use cow dung as the major feeding material. This plant has an inlet pipe connected to CBP for daily feeding of cow dung directly from animal's shed. The semi-batch fed digester has much longer digestion cycle of much gas production as compared to the batch-fed digester. The batch-fed digester is ideally suitable for traditional family base small and medium farmers having 6-8 cattle's or 20-30 goats to meet the basic cooking requirement and at the end of the cycle it gives enriched organic

manure in the form of digested slurry (Mamun *et al.*, 2009). Actually, RDA developed CBP offers a package system which mainly included e.g. a need based biogas plant (minimum vol. 130 m3) for managing waste; biogas generator to generate electricity, deep tube well to have safe water both for community and running biogas digester smoothly, pipeline both for water & biogas supply to the households level and a drying cum processing floor to manage organic fertilizer etc. with to some extent financial support of training match income generation activities (IGAs) towards sustainability.

Household Energy Use

Household level energy use for a particular household was estimated through different daily activities performed by the family. The activities include using energy for cooking, parboiling of rice, lighting, providing smoke to the cow shed and so on. The average homestead fuel energy requirement was estimated 83.86 GJ/Yr per household. (Rabbani *et al., 2011*).

Utilization of Biogas

Utilization of biogas was observed in Tearband village produced from community biogas digester. The households connected to biogas system to 42 families for cooking and 2 cowsheds for boiling water and broken rice as feed for cattle. As on require basis this biogas is also used for 5KVA biogas generator for production of electricity which connected to 28 households for lighting (Table 4).

Economic Analysis of Community Based Biogas Plant at Tearband Village

The total gas production of Tearband bio-gas plant per day was estimated 72-108 m3 at 210 millibar pressure. The total expenditure, gross return and net return incurred by the community were Taka 10,94,959; 15,22,060 and 4,27,101 respectively during last year. The net return from this biogas plant was found Taka 427101 of which from biogas was Taka 1,18,000 and from bio-fertilizer ranked the highest Taka 2,47,701. Biogas plant produces slurry as byproduct which is used as bio-fertilizer. The return from bio-fertilizer was found much higher than the return from bio-gas. The overall benefit-cost ratio of the bio-gas plant was found 2.56, which was very promising (Table 3). According to villager's opinion, the cost of supply of bio-gas per family per month at Tearband was estimated as Taka 1506.85 whereas the cost of supply of LP gas per family per month was Taka 1723.35. Therefore, the user of Tearband village is benefited by Taka 216.50 per family per month by supplying bio-gas to its households. However, the Tearband community is subsidizing Taka 1106.85 per family per month by collecting Taka 400 from each household per month and allowing each household a benefit of Taka 1323.35 per month (Table 4). This finding is almost similar to Mamun *et al.*, 2009.

Cow Dung as Feeding Material for Biogas Plant

Traditionally cow dung in the forms of dried cakes and with sticks is used to cook food which rather could be used as feed source of biogas digester turn into biogas as renewable energy and organic manure for soil organic matter enrichment, enhanced water holding capacity and which ultimate would lower the need for chemical fertilizer and of course environment friendly.

Price of Inputs

Average price per (kg) of raw materials supplied as input to the biogas plant by waste category at Tearband village, Shahjadpur, Sirajgonj was Taka 0.40 for cow dung; 0.55 for poultry droppings; 1.00 for kitchen waste & 0.50 for others including sorting and carrying cost (Table 2).

Seasonal Variation

As part of qualitative investigations, seasonality mapping was done in the study village. Substantial seasonal variations have been found in terms of availability of raw materials, biogas availability and quantity of bio-fertilizer production. The following figures indicate the seasonal variation for the community based biogas plant (Figure 2).

Item	Month (January – December)											
	1	2	3	4	5	6	7	8	9	10	11	12
Availability of raw materials	*	*	*	⇧	⇧	⇧	⇧	*	*	⇩	*	⇧
Gas availability	⇩	⇩	*	⇧	⇧	⇧	⇧	*	*	⇩	*	⇧
Quantity of slurry produced	⇩	⇩	*	⇧	⇧	⇧	⇧	*	*	⇩	*	⇧

* Normal ⇧ More than normal ⇩ Less than normal

Fig.-2: Seasonal variation of dung based Plants

According to respondents opinion rainy season is the best time (month of April- July) for the availability of cow dung because of confinement of cattle in their shed and availability of natural grasses. The cows produce more dung during the four months of rainy season (Figure 3). As a result biogas production increases as well. Moreover, the higher moisture content in the dung also helps generating more gas. Hence, availability of cow dung is more; bio-fertilizer also produced in more quantity during rainy season. However, the scenario get reverse for the cow dung based plants in winter which is almost similar to the findings of Wim *et al.*, 2005. Availability of cow dung reduces significantly in the month of October in the study area and due to that biogas and slurry production quantity declined as shown in Figure 2 & 3. It is to be noted here that, the fact is from traditional pit system of

producing compost is less available as it is difficult to store and often gets washed away by rain and seasonal flood almost 70-90%. The winter is not suitable for availability of both slurry production and biogas as well.

However, the rainy season is not particularly good for management of bio-slurry. The rain washes away the bio-slurry and the quality of it is affected by rain-water. Thus, although the rainy season is good for performance of the plants in terms of gas production but the slurry management is more complicated. In the last year, 2012 community managed 7,31,460 kg degradable waste and produced about 26,332 m^3 of biogas and utilized that gas for cooking and electricity generation. Through which on monthly charged basis community could able to supply 35 households (Tk. 400/m) & one dairy farm (Tk. 2000/m) for cooking purposes and connected 45 households (Tk. 100/m) with electricity (Table 4).

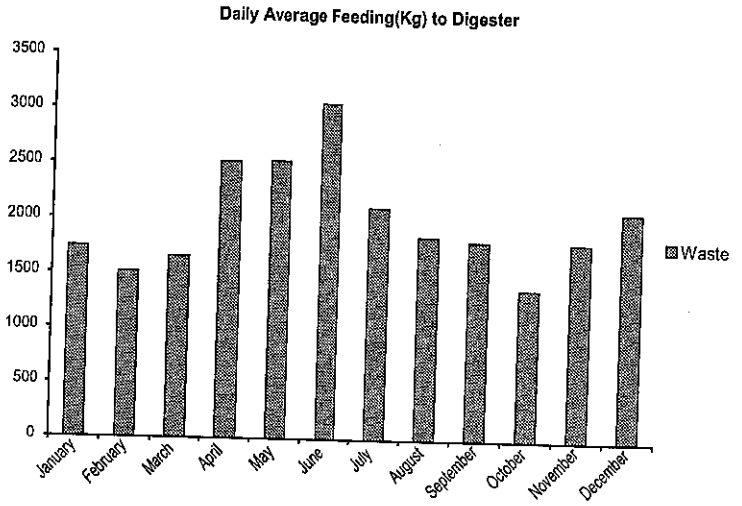

Figure 3: Waste availability in Tearband community

Better Hygienic Conditions

Managing of animal and other degradable wastes through biogas systems obviously improves hygienic conditions for the plant owners, their families and the entire village community. Biogas system eliminates the need for household's waste dumping pits, thereby substantially improved the hygienic conditions in the village concerned. In addition, noxious odors and microbes associated are avoided because of decomposed slurry stored in such pits is odorless.

Reduction of Disease Transmission

Since biogas slurry does not attract flies or other vermin which is the vectors for contagious diseases of human and animal alike are reduced. Furthermore, respiratory problems

attributable to soot and smoke from the burning of dried cow dung and firewood are mitigated.

Particularly, in the rural areas of Bangladesh as long as inadequate sanitary and hygienic conditions prevail. So the health of the rural people will remain threatened. The anaerobic digestion of animal and other organic wastes and effluents extensively detoxifies such material by killing most of the ova and pathogenic bacteria. It is not surprising that the widespread popularization of biogas in Bangladesh has immediate beneficial effects on the sanitary conditions of the areas concerned. As soon as the introduction of community biogas technology fully covered an area, so no more animal or organic wastes were deposited in the open pits. This would help to eliminate some of the main sources of water contamination and infectious diseases e.g. tapeworm, schist soma etc.

Economic Aspect of Disease Reduction

With regards to the smoke reduction in the kitchen for the user of biogas technology, health effects are tangible. The reduction of diseases can only be felt if the numbers of biogas systems in an area reaches a critical threshold. Similarly, for a larger entity like village, district or nation health impacts of biogas systems do not grow as a linear function of the numbers of biogas units installed. Analysis with caution – should be done to estimate the value of health benefits in a comparable region that is targeted for a biogas program.

Social Acceptance and Tradition

The women and children of poor families in rural areas traditionally expected that they collect fuel wood and cow dung for cooking. Through introducing of community biogas plant now they have more free time and are more likely to attend school. Finding also shows that the use of biogas systems gives women more time to engage inthe family affairs as well as caring of their children to boost up nations' development. The use of biogas for lighting can lead to remarkable changes in the cultural and educational sectors. Biogas lighting makes it possible to engage in activities at night such as reading or attending evening schools.

Employment Generation

During construction period of biogas plant creates an opportunity of short-term employment and income due to the need for excavation, metal-work, masonry and plumbing. Again, the subsequent operation and maintenance of the biogas systems can have long-term beneficial effects on regional employment and income. Community plants require a permanent/ seasonal staff for plant management, raw material procurement, plant operation and maintenance, distribution of electricity, water and biogas and for disposal, processing & packaging of organic fertilizer for the marketing.

Conclusion

Community based approach for managing waste is playing an important role for mitigating daily energy needs of rural households at Tearband village. Community based biogas plants may be considered as an efficient technology for managing all sorts of degradable waste to reduce diseases both for human and animal as a means of economic and sustainable environment. This area has a wonderful climate for biogas production. Community approach of managing and utilization of waste through biogas technology proved to be suitable and affordable. They touched the success of producing biogas as a means of renewable energy source for cooking and electricity generation, bio-fertilizer production, sustainable livelihoods and friendly environment through community led waste management approach instead of family based traditional biogas plant. These technology need to be standardized and popularized for dissemination in rural Bangladesh. However, community may need motivational support for owning this technology to maintain all sorts of degradable waste especially for livestock and to have a sustainable environment. The Government along with NGOs and private sector institutions should initiate programs for extension and dissemination of this technology as a strategy of replicating this model by installing community led, "One Village One Biogas Plant". However, the reduction of green house gas (GHG), deforestation and consequent soil erosion is one of the main arguments to allocate funds for the dissemination of biogas technology for national or international planning.

Table- 1: Daily Average Feeding to the Biogas Plant by Waste Category

Month	Amount (kg) of feeding materials used /day				
	Cow dung	Poultry droppings	Kitchen waste	Others	Total
January	1557	130	41	14	1742
February	1312	136	47	17	1512
March	1433	152	53	18	1656
April	2265	162	64	23	2514
May	2335	105	65	22	2527
June	2847	103	74	31	3055
July	1830	204	61	18	2113
August	1557	208	72	17	1854
September	1613	106	78	16	1813
October	1200	102	63	15	1380
November	1610	118	56	18	1802
December	1837	158	58	31	2084
Average	**1783**	**140**	**61**	**20**	**2004**

Table- 2: Raw Materials Supplied to the Biogas Plant By Percentage, Ratio & Price Per (Kg) at Tearband Community, Shahjadpur, Sirajgonj.

Item	Category of raw materials				
	Cow dung	Poultry droppings	Kitchen waste	Other	Comment
Feeding to biogas plant (%)	89	7	3	1	Depends on availability
Feeding to biogas plant (water : material)	1:1	1:2	1:0.5	1:1	Depends on raw materials
Average price Tk. per (kg)	0.40	0.55	1.00	0.50	Including carrying cost

Table- 3: Yearly Income & Expenditure of Tearband Community Biogas Plant

Serial No.	Major items	Expenditure (Tk.)	Income (Tk.)	Net income (Tk.)
1	Organic fertilizer	483759	731460	247701
2	Biogas Supply	62000	180000	118000
3	Biogas Generator	41000	66000	25000
4	Deep tube well	53000	68400	15400
5	Beef fattening	455200	476200	21000
Total		**1094959**	**1522060**	**427101**

Table- 4: Item Wise Yearly Income & Expenditure of Tearband Community Biogas Plant.

Item	Yearly expenditure (Tk.)				Yearly income (Tk.)			
	Input	Labor	Other	Total	House-hold	Farm	Total	Net income
Deep tube well	24000	24000 (1)	5000	53000	44400 (37)	24000 (1)	68400	15400
Biogas generator	12000	24000 (1)	5000	41000	54000 (45)	12000 (1)	66000	25000
Biogas supply	12000	42000 (1)	8000	62000	168000 (35)	12000 (1)	180000	118000
Organic fertilizer	380359	96400 (123)	7000	483759	-	731460	731460	247701
Beef fattening	401840 (16)	48000 (1)	5360	455200	-	476200 (1)	476200	21000
Total	**830199**	**234400**	**30360**	**1094959**	**266400**	**1255660**	**1522060**	**427101**

N.B. Figures in the parenthesis indicate number of users.

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