

3.1 Introduction to RDA Research

3.1.2. Responsibilities of the Research and Evaluation Division

Research and Evaluation Division of the Academy is involved in different processes of research activities that start from the preparation of research proposal to the submission of final report for publication. For this purpose, this division has a permanent section of 15 skilled staff of four categories: Research Supervisors, Tabulators, Evaluation Assistants and Research Investigators. As a service division of the Academy, Research and Evaluation Division provides advice and services to the researchers in preparing research proposal, collecting, processing and tabulating primary data and maintaining appropriate review and edit process of research studies by the internal and external reviewers and editors before submitting the final reports for publication.

The progress of research projects is monitored regularly by the Research Division as well as by the Research Committee, which consists of the learned Faculty Members of different disciplines. Research Committee recommends the research proposal with estimated budget after reviewing by the committee members. According to the recommendation given by the committee, the Director General approves the research proposal with competitive budget. The status of annual research plan is also reviewed in the meetings of the Research Committee chaired by Director (Research and Evaluation). Besides, the Faculty Council of RDA regularly reviews the progress of ongoing research projects in its monthly review session. At the time of the Board of Governors' meeting, the status of the research projects is also reported. The progress of the research projects is also submitted to the Director General. Research Division helps to process and publish the research reports after being reviewed and edited by the internal or external reviewers and editors.

3.1.3. Research activities

Research is one of the main activities of the Academy. The main objectives of the research activities are to improve the quality of life of rural population, identify various problems and possibilities of rural development, assist in the development of sustainable agriculture and environmental friendly technology, and determine the strategies of technical research based on the findings. In addition, the results of the research are also used in the preparation of training materials. Research projects are conducted with the aim of national rural development policies, poverty alleviation strategies, socio-economic development, agricultural development, environmental protection, etc. Through these research activities, not only the rural development but also provide assistance and advice to the policy makers and researchers who are involved in rural development process. Apart from these, the division works on ensuring or developing technical skills of the Faculty Members in their respective fields of specialisation.

3.1.4. Research themes

Sustainable Development Goals (SDGs): Extreme poverty and hunger alleviation, basic education for all, gender equality and empowerment of women, reducing infant mortality, maternal health development and environmental protection etc.

Socio-economic Development: Micro credit, skill development, good governance, e-governance, gender development, institutional development, social empowerment, safe drinking water and sanitation, comprehensive village development, cooperative development, quality education, health and nutrition, population and family planning, development of backward and marginalised

communities, human resource development, rural economy, accounts, demography, public administration, rural sociology, social work including social safety net programmes and so on.

Agricultural Development: Crop diversification, irrigation and water resources management, poultry and dairy management, fisheries development, nursery, home gardening, animal health care, agricultural machinery, hybrid technology, seed technology, food processing and agribusiness, agricultural marketing, soil and land development, conventional agriculture, horticultural crops. Agricultural expansion, ICT based agricultural management, agricultural economy, and so on.

Environmental Protection and Development: Social forestry, safe water, elimination of arsenic problems, disaster risk management, climate change mitigation and adaptation, integrated pest management, enhancement of organic farming and soil fertility, biogas technology, varieties of crocodile crops, salt tolerance and saline cultivation in coastal areas, and so on.

3.1.5. Research area based classification

In addition to the above mentioned themes, the faculty members of RDA conducted a total of 514 research projects on 22 thematic areas from the year 1975 to 2021. Table 2.1 gives year-wise distribution of research projects according to thematic areas conducted by RDA. The table shows that the highest number of researches (142) was impact/ evaluation studies, followed by the studies on social issues (57), agricultural engineering (29) and gender aspects (30), etc.

Table 3.1. Year-wise Area of Research (1975-2021)

Sl. No.	Thematic Areas	1975-85	1986-96	1997-2007	2008-18	2019-20	2020-21	Total
1.	Socio-economic/ social/ economic	20	14	5	12	3	3	57
2.	Fisheries	1	1	4	14	3	4	27
3.	Impact/ evaluation studies	47	26	26	40	3	-	142
4.	Baseline survey	2	4	4	3	-	1	14
5.	Agricultural crop	8	2	16	35	2	4	67
6.	Agricultural engineering	9	4	9	5	-	2	29
7.	Cooperative	4	8	7	4	-	-	23
8.	Feasibility study	3	-	1	9	3	-	16
9.	Ethnographic studies	1	-	-	-	-	-	01
10.	Gender issues	3	6	9	9	3	-	30
11.	Local government	1	6	4	12	1	1	25
12.	Environmental issues	-	8	2	6	-	1	17
13.	Comparative analysis	-	3	1	-	-	-	04
14.	Education	-	2	1	1	1	1	06
15.	Documentation	-	1	1	7	-	-	09
16.	Public health	-	2	9	4	-	-	15
17.	ICT	-	1	-	7	-	-	08
18.	Livestock	-	-	7	6	1	2	16
19.	Food and nutrition	-	-	-	2	-	1	03
20.	Accounting	-	-	-	1	-	-	01
21.	COVID-19						1	1
22.	Others	1	1	-	1	-	-	03
	Grand Total							514

Source: RDA Research Souvenirs (Vol. 1, 2, 3, and 4; Annotated Bibliography of RDA Publication along with Official Record)

3.1.6. Research based on SDG

RDA has been focusing 17 SDG goals in conducting researches since the year 2015 coping with the universal call to end poverty, protect the world and ensure that all people enjoy peace and prosperity. Among other priorities, RDA conducted a good number of researches on SDG in the goals of ending poverty and hunger, good health and wellbeing, quality education, and Gender inequality including new areas such as climate change, economic inequality, innovation, global peace and justice (Table 2.2).

Table 3.2. RDA Research and SDGs (2015-16 to Present)

SDGs	Area	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Total
Goal 01	No poverty	1	5	4	1	3	1	15
Goal 02	Zero hunger	6	-	15	13	5	2	41
Goal 03	Good health and well-being	1	1	1	3	-	-	6
Goal 04	Quality education	2	-	6	-	1	-	9
Goal 05	Gender equality	1	2	-	3	1	1	8
Goal 06	Clean water and sanitation	-	-	1	1	-	-	2
Goal 07	Affordable and clean energy	-	1	-	-	-	-	1
Goal 08	Decent work and economic growth	-	-	3	-	-	-	3
Goal 09	Industry, innovation and infrastructure	-	4	-	1	2	-	7
Goal 10	Reduced inequality	-	2	-	-	-	-	2
Goal 11	Sustainable cities and communities	-	2	-	-	-	1	3
Goal 12	Responsible consumption and production	-	1	-	-	-	-	1
Goal 13	Climate action	1	1	-	-	-	1	3
Goal 14	Life below water	-	-	-	-	-	1	1
Goal 15	Life on land	1	2	3	-	-	-	6
Goal 16	Peace, justice and strong institution	-	2	2	-	1	-	5
Goal 17	Partnership to achieve SDGs	-	1	-	-	-	-	1
Total		13	24	35	22	13	7	114

Source: RDA Research Souvenirs (Vol. 1, 2, 3, and 4; Annotated Bibliography of RDA Publication along with Official Research Record).

During planning in 2021-22, faculty members should conduct research on the issues those are very important in relation to SDG, Election Manifesto of the Govt. and less covered by RDA, Bogura since its inception.

3.1.7. Performance of RDA Research

The Faculty Members involve themselves in different processes of research activities that start from the preparation of research proposal to the submission of final report for publication. Research and Evaluation Division is always helping them in processing at different stages of research. During the last four decades, RDA has earned commendable achievements in conducting research and number of completed research projects reaches to 515. In order to facilitate wider dissemination of the findings of the researches, the Executive Summary of RDA Research Publications- Volume I, II, III and IV containing 245 articles are brought out by the Academy. These volumes will give the glimpses of Research highlights conducted by the Academy and pave the path of rural development and strategic plan of RDA.

The academy deal with 30 research projects in 2020-21 including carried over research projects from the last fiscal years. Among those, 02 reports are in publication stage and one is under review. Among the completed reports some are accepted as Journal Articles. The remaining ongoing research projects are in the form of draft report writing and data collection or experimental stages (Table-3.3).

The major reasons for delaying of research projects were the engagement of the faculties with huge activities of training and action research projects. Apart from the above, other reasons for delaying - (i) in some cases after starting study required more time than mentioning time period in proposal; (ii) sometimes long waiting for getting the reviewers' comments.

The following table shows the present status of RDA research:

Table 3.3. Ongoing Research Projects of RDA

SL.No	Title	Name of the Researcher (s)	Status
1.	Development of Reduction Mechanism of Post-Harvest Losses in Horticultural Crops	Dr. Md. Abdur Rashid Noor Muhammad	Publication Stage
2.	Exploring Some Aspects of the Social Life of Adolescent School Going Girls in Rural areas of Bogura District, Bangladesh	Md. Tanbirul Islam Gopinath Annadurai Andalib Mahejabin	
3.	Precision of Irrigation Water for Upland Crops Under Conservation Tillage and Mulching Management	Dr. Md. Abdul Kader Md. Ferdous Hossain Khan	Review Stage
4.	Adaptability Trial of Orchid, Cactus and Ornamental Succulent Plants at RDA Demonstration Farm	Md. Khalid Aurangozeb Dr. Md. Abdul Majid Rebeka Sultana	
5.	Exploring the Economic Role of Non-Conventional Mechanized Transport in the Development of Rural Bangladesh: A Study on Rajshahi Division	Md. Mohiuddin Md. Nasir Uddin Goni	
6.	Woman Centered Disaster Risk Management and Climate Change Adaptation: Roles of Gender and Culture in Rural Bangladesh	Dr. Shaikh Mehdee Mohammad Shaikh Shahriar Mohammad	Report writing Stage
7.	Women Participation in Drought Risk Management	Dr. Shaikh Mehdee Mohammad Begum Nargis Jahan	
8.	Education System in Creating Rural Livelihood Opportunities in Bangladesh: A Case of Educated Unemployed Rural Youths in Bogura District	Andalib Mahejabin Maupiya Abedin Dr. Shaikh Mehdee Mohammad	
9.	Optimization of Planting Method of Micro Propagation Derived Potato (Solanumtuberosum) Plantlets for Higher Production	Md. Mizanur Rahman Md. Asaduss Zaman Suvagata Bagchi	
10.	কৃষি জমির আইল উঠিয়ে দিয়ে সমবায় ভিত্তিক যান্ত্রিক চাষাবাদ পদ্ধতি শীর্ষক প্রায়োগিক গবেষণা প্রকল্প	Mr. Md. Aminul Islam Md. Abdullah Al Mamun and team	

SL.No	Title	Name of the Researcher (s)	Status
11.	Socio-economic Impacts of Rural-Urban Migration in Bangladesh	Mr. Md. Mazharul Anowar Dr. Shaikh Mehdee Mohammad Dr. Md. Nurul Amin	
12.	Air Quality and Health Risks in Rural Development Academy, Bogura	Dr. Md. Shafiqur Rashid Mr. Kamruzzaman Sarker Bulbul	
13.	Economics of Production of Crossbred (Local x Holstein Frisian) Bulls for Fattening under Different Feeding Conditions (Under RDA, Rangpur Project)	Dr. Muhammod Riazul Islam Dr. Sultana Fizun Nahar Mashrufa Tanzin Dr. Md. Abdul Majid Pramanik Dr. Samir Kumar Sarker	Report writing Stage
14.	Sequestration Trial of Biochar as an Exceptional Bioresource Energy for Enhancing Soil Productivity in Rice	Noor Muhammad	
15.	Production Performance of Indigenous Chicken Under Intensive and Semi-intensive Rearing System	Md. Abdulla Al Mamun Md. Delwar Hossain Dr. Sultana Faizun Nahar Md. Abdus Samad	
16.	Extension and Dissemination of Community Based Indigenous Poultry Farming for Economic Empowerment of Rural Area	Abdullah al Mamun Dr. Muhammad Riazul Islam MasharufaTanzin Sultana FizunNahar	
17.	Impact Evaluation of PGDRD in Employment Generation	Dr. Md. Shafiqur Rashid Md. Tanbirul Islam Suvagata Bagchi	
18.	Social Safety Net Programmes to Fight against Pandemic in Bangladesh: A Study on Some Selected Union Parishad in Bangladesh	Maruf Ahmad Jannatul Fedous	Data Analysis Stage
19.	ইছামতী নদী এবং এর তীরবর্তী জীবন ব্যবস্থা	ড. শেখ মেহদী মোহাম্মদ মাহবুব সিদ্দিকী মোঃ মহিউদ্দীন আলমগীর	
20.	Feasibility Study of the Freshwater Prawn (Macrobrachium Rogenbergii) Culture in Biofloc System	Md. Ashraful Alam Macksood Alam Khan	
21.	Rural Development Reconsidered: A COVID-19 Effect on Workers' Migration in Bangladesh	Dr. Md Shafiqur Rashid	Data Collection Stage
22.	A new Applicable model towards Rural e-Commerce: Rural Women E-commerce School to Expand Rural e-Entrepreneurship based on Rural Traditional Products in the Network Economy	Monirul Islam Shamal Chandra Hawlader Dr. Mohammad Munsur Rahman, Dr. Hasneen Jahan	

SL.No	Title	Name of the Researcher (s)	Status
23.	Existing situation and Future challenges of Micro-Credit Programmes for Poverty Reduction towards Government and Non-government Organizations in the Northern region of Bangladesh: An Comparative Analysis	Md. Mazharul Anwar	Data Collection Stage
24.	Protocol Development for Disease Free Plantlets Production of Local Banana (Musa Spp.) Cultivars Trough Micropropagation	Md. Mizanur Rahman Md. Asaduss Zaman	
25.	Challenges of Biofloc fish culture technology in Bangladesh	Macksood Alam Khan Md. Ashraful Alam Md. Al Mamun	
26.	দারিদ্র্যমুক্ত মডেল গ্রাম শীর্ষক প্রায়োগিক গবেষণা প্রকল্প	খলিল আহমদ আব্দুল্লাহ আল মামুন মোঃ ফেরদৌস হোসেন খান মোঃ মিজানুর রহমান ড. শেখ মেহুদী মোহাম্মদ মাকছুদ আলম খান ড. মোঃ শফিকুর রশিদ ড. মোঃ আব্দুল মজিদ প্রামানিক মাশরুফা তানজীন ড. মোঃ আব্দুল কাদের অসীম কুমার সরকার	Data Collection Stage
27.	Development of Ecofriendly Household Waste Management System and Conversion of Household Waste into Compost Using Trichoderma Spp.	Md. Mizunur Rahman Sarawat Rashid Md. Asaduss Zaman Suvagata Bagchi	
28.	Effect Of Different Water Bodies on Growth of Brood and Fry Production of Koi Carp Fish in RDA Hatchery.	Md. Ashraful Alam Macksood Alam Khan	
29.	Production Performance of Miyazaki Mango Cultivar (Red Mango) in RDA, Bangladesh	Md. Khalid Aurangozeb Rebeka Sultana	
30.	Micropropagation of Date Palm (Phoenix dactylifera L.) through Direct Organogenesis	Md. Mizanur Rahman Md. Asaduss Zaman	Experimental Stage

CHAPTER 4



ANNUAL RESEARCH PLAN 2021-22



4.1. Research Plan for 2021-2022

For the year 2021-22 the Faculty Members have proposed 11 research proposals considering the national priority, SDGs and government priorities. The proposed titles are shown in **Table 4.1**. Moreover, there is also scope for inclusion of new research projects in the plan whenever any new idea generates from the Faculty Members or any request is received from national or international agencies. The details of research proposal are shown in below.

Table 4.1. Proposed Research Projects (2021-2022)

Sl. No.	Title of the proposed research	Researchers
1.	Appropriate soil and water management practices in sandbar cropping system for producing high-value vegetables in riverine areas of Bangladesh.	Dr. Md. Abdul Kader Md. Ferdous Hossain Khan
2.	Upliftment of Livelihood status by fish culture in household pond towards the poverty-free model village.	Md. Ashraful Alam Macksood Alam Khan Dr. Md. Abdul Majid Pramanik
3.	Performance evaluation of RDA-developed water and waste management system in RAJUK, Dhaka.	Md. Ferdous Hossain Khan Dr. Md. Abdul Kader
4.	Design and implementation of cost-effective rural housing using stone materials.	Md. Khalil Ahmed Md. Ferdous Hossain Khan Dr. Md. Abdul Kader
5.	Effect of diet on the production performance of carp fattening in the semi intensive pond at North-western region of Bangladesh	Macksood Alam Khan Md. Ashraful Alam
6.	Market for traditional goods (M4TG) কনসেপ্টের মাধ্যমে নারীর ক্ষমতায়ন ও দারিদ্র বিমোচন	মাকছুদ আলম খান
7.	Research on the key technology of processing soybean isolated protein and quality deterioration during storage	Monirul Islam
8.	Improving a hand on learning preschool curriculum in term of Montessori.	Monirul Islam Shamal Chandra Hawlader Maupiya Abedin Tamanna Mannan
9.	Rural household livelihood improvement through seedlings plantation: implications for poverty free model village.	Noor Muhammad Rebeka Sultana Md. Al Mamun
10.	Impacts of COVID-19 pandemic on the aquaculture supply chains in Bangladesh.	Dr. Md. Nurul Amin
11.	Socio-economic improvement of rural poor women through indigenous chicken rearing	Dr. Sultana Faizun Nahar Md. Delwar Hossain Dr. Shaikh Mehdee Mohammad
12.	Sustainable community based goat farming for livelihood improvement	Mashrufa Tanzin Muhammod Riazul Islam Dr. Samir Kumar Sarker Dr. Md. Abdul Majid Pramanik
13.	Production performance of hydroponic fodder and its benefits at RDA demonstration farm	Mashrufa Tanzin Md. Khalid Aurangojeb Dr. Muhammod Riazul Islam Mohammad Mohi Uddin

Sl. No.	Title of the proposed research	Researchers
14	In COVID-19 pandemic situation the Role of ICT in the education system in Bangladesh:A case study in the northern part in Bangladesh	Sk. Saeem Ferdous Andalib Mahejabin

Proposal-1

Appropriate soil and water management practices in sandbar cropping system for producing high-value vegetables in riverine areas of Bangladesh

Dr. Md. Abdul Kader, Deputy Director

Md. Ferdous Hossain Khan, Director

Introduction

Bangladesh is a deltaic country located within the floodplains of the three major rivers - the Ganges, Brahmaputra, and Meghna. These rivers drain a total catchment area of 1.72 million km², of which only 7% lies within the country, and has an estimated 2,709 km² of newly accreted transitional land, locally known as char land along the basin of these rivers system in the north-western part of the country (Rashid et al., 2018). These char lands in the river systems are largely composed of coarse sands, often aided by silts through annual inundation. The climate-adaptive solution called “sandbar cropping”, helps the poor farmers displaced by recurrent river erosion in producing food crops i.e. pumpkin, squash, and other high-value crops on these transitional riverbeds (Khatun et al. 2017). The sandbar system to assist people whose lands and farms were lost due to recurrent flooding and erosion and hence were forced to live on flood protection embankments without any legal arrangement (Chowdhury, 2021). It aimed to assist these displaced people by offering them improved livelihoods by using transitional common property resources. Statistics showed that, over a decade it has produced 158,000 MT worth \$37.1m of pumpkins and squashes and has reached to over 10-15 million consumers (Chowdhury, 2021). Using the sustainable sandbar cropping model, it is possible to leave a better hunger free world equipped with climate smart solutions of efficient water and energy uses for self-resilience to cope and improve rural livelihood (Chowdhury, 2021). Moreover, transformation of sandbar cropping system with improve irrigation methods may led to enterprise in agricultural sector in northern four districts of Bangladesh (Khatun et al., 2017). Promotion of a community led youth agro-enterprise model of cropping by adopting climate adaptive technologies for the improvement of riverbed farming system and charlands development which reduce poverty and improve agriculture productivity in the north part of Bangladesh (Noman et al., 2014).

A producer driven agribusiness model led by women and to secure sustainable water access and expansion of horticulture farming with more diversified and demand based high value crops and vegetables in remote char lands in northern Bangladesh. Solar power-based irrigation with drip tubers may applied with plastic mulching which could maximize energy use and minimize water use in sandbar cropping system (Kader et al., 2019). Ultimately, agriculture productivity may increase and poverty eradication in rural Bangladesh may significantly impact on sustainable rural development in Bangladesh. This will impact erosion affected extreme poor communities who have the potential to contribute to the food security of millions of poor and the needs of local, national

and international consumers by supplying organic and pesticide free products. These 'lands' are common property resources but until now have not been used hugely for productive purposes. On the other hand, Bangladesh faces 40% irrigation water deficit in the dry season. Irrigation coverage can be increased by 29% through adaptation of simple farm based technologies and water efficiency can be increased 50% by improving water use technology (Chowdhury, 2021). Keeping both these challenges in mind, the innovation has successfully demonstrated that the growing of pumpkins and other high value crops in small compost pits dug into the sandy soil using water saving technologies and portable solar irrigation technology which is both possible and profitable. The study has planned to go to scale through existing producer associations men, women and newly added youths group for agri-enterprise development in northern Bangladesh.

Rationality

Bangladesh is a riverine country and around 270 rivers passes in the whole country. Sandy soil is not good options in riverine area for cultivating vegetables crops where most of the soil are bare land and unable to produce the crops. There is great contribution in national economy in Bangladesh, if the isolated area of the rivers is considered under agriculture productive area. A novel approach using soil pits and plastic mulching may contributes the productive in char areas. Soil mixture with organic matter, fertilizer and trichoderma may provides an artificial pit in sandy soil which may covered by plastic mulching for conserving soil water and controlling soil temperature. In this way, saving irrigation water in sandy soil by plastic mulching and soil pits may give higher productivity of crops. However, the effects of plastic mulching and soil physio-chemical analysis on sandbar cropping system is remain uncertain and need to further deep investigations.

Objectives

The main objective of the study is to evaluate the mulching and soil pits effects on sandbar cropping system which could affects on growing high value crops.

Specific objectives are:

1. the physio-chemical analysis of the artificial soil by analyzing the soil parameters.
2. quantifying the irrigation water by using the plastic mulching.
3. crop growth and yield analysis on the sandbar cropping system.

Material and methods

Two study area will be considered for experimental location. The study site will be riverine area of the Bogura district of the Bangladesh. RDA will be one of the research station which will be compared with sandbar areas. Two treatments (plastic mulching and no-mulch) will be used to grow the high-value crops (water-melon, squash, melon). For plastic mulch, black color film will be used. Using a digital sensors daily soil moisture, temperature, EC, N, P and pH data will be taken from 0-10 cm depth from the each treatment. Optimization of irrigation water by using advance water-saving methods. In addition, small-scale portable water supply system developed using overhead tank and hose pipelines. Digging pits in sandy soil and covered by film mulching to control soil moisture and temperatures. Sensors based irrigation system installation to irrigate the cropland based on weather demand and water availability. Select an innovative poor land less farmers is the study area and recorded their total resources, income and overall lifestyle through a baseline survey. Select farmers land and support around 100 pits (seeds, compost, fertilisers, intercultural inputs). Record the high value crop data relevant to crop production and record the yield data. Finally, the data will be analysis using advance statistical software.

Expected result and impacts

Using water saving (drip irrigation, mulching and rainwater harvesting) methods can reduce pressure on limited water resources in northern Bangladesh. Also, crop productivity in sandy soil by using organic fertilizer may enhance soil organic matter as well as soil health. The result has revolutionary impacts in Bangladesh, particularly char land areas adversely affected by climate change. The adaptation has potential for barren land and water management to ensure food security for now and coming decades. Increased unproductive land operations of riverine area for increased agriculture production to address the needs at regional, national and international level and diversify farming system with multiple crops and vegetables and consumers specific products for multiple choices. Our system will help to disseminate best practices on water management to nearby farmers, not only sandbar farmers, thus ensuring optimum groundwater use. The technology would seem to have a much wider application in other dry areas and could even become an important coping strategy in some areas adversely affected by climate change in Bangladesh and in South-Asian countries.

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Proposal-2

Upliftment of livelihood status by fish culture in household pond towards poverty free model village

Md. Ashraful Alam, Assistant Director
 Macksood Alam Khan, Director (In-charge)
 Dr. Md. Abdul Majid Pramanik, Joint Director

Introduction

Within fisheries management and development policy, the importance of sustainable small-scale fisheries is increasingly recognized (Allison, 2001). In Bangladesh, the fisheries sector has a significant prospective to contribute to national socio-economic development, economic revitalization, and poverty reduction (Salagrama, 2006). As an effective cash crop, Fisheries products can generate cash income comparable to agricultural products (Bene et al., 2007). This cash crop nature of fisheries product acts as a potent market stimulator and wealth generation with multiplier effect which continuously providing broader income and employment opportunity (FAO, 2004). This sector incorporates a diverse range of livelihood activities, 15.0% of total global employment from production and processing to marketing of fish products and ancillary functions (FAO, 2006). The demand for fish, a nutritious food source for around one billion people, is rising globally. The bulk of aquaculture production still originates from small-scale farming systems and practices in developing countries, such as Bangladesh.

Fish consumption and production play an essential role in the lives of people in Bangladesh. It is a rich source of protein and the primary livelihood for nearly 18 million people, of which approximately 1.4 million are women. In recent decades, Bangladesh's farmed fish market has increased by 25 times, and the number of actors involved has increased three-fold.

The fisheries sector plays a significant role in the national economy of Bangladesh, contributing 3.69% of GDP and 23.60% to the agricultural GDP (FRSS, 2019). Additionally, in Bangladesh, more than 17 million (including 1.4 million women) depend on the fisheries sector, and another 11 million people are engaged in other related activities.

Most households in rural areas still rely on home production of fish by maintaining homestead fish ponds as a source of fish for home consumption and market sales of surplus production (Dey et al., 2010). It has been estimated that over four million householders own ponds near their homesteads (Belton and Azad, 2012). A satellite survey estimated the number of homestead ponds to be approximately 1.95 million in Bangladesh (Huda et al., 2010), contributing over 43% of the total recorded production of fish (DoF, 2016). Nevertheless, fish production from homestead ponds does not receive much attention because of the traditional way of production and sub-optimal productivity in ponds (Alam et al., 2004). However, for several reasons, production in homestead ponds is still essential for poorer farming households. First, a homestead pond is ideal for growing a range of small fish species-rich in micronutrients, providing women easy and regular access to this nutritious food source (Thilsted, 2012). Second, through homestead fish culture, women, who are often excluded from aquaculture activities owing to social barriers, get the opportunity to engage themselves in fish culture (Sultana and Thompson, 2008). Third, the income generated from the sale of surplus production contributes to increased household income. But the majority of the pond was kept as a fellow land. Some pond owners stocked fish in their pond without any

feeding and care. Lack of improved fish culture knowledge they culture fish in the traditional way consequences low production in their household pond.

Objectives

1. To explore the livelihood scenario of the fish farmer from selected three village
2. To know the status of the existing fish culture technology of the selected area
3. Input supply to the marginalized fish farmer of the chosen area
4. To transfer the improved fish culture technology through training and farmer field school

Materials and methods

Location of the study

Three villages, namely Char Polisha, Melandhah, Jamalpur; Rotia, Mithapukur, Rangpur and Kalshimati, Sherpur, Bogura, will select for this purpose.

Selection of the target group

The target group will be the marginalized person of the selected mention area who has a household pond.

Data collection procedure

A baseline survey will be conducted in the selected area to know the demography of the villagers and explore the livelihood status of the fish farmer. After completing the baseline survey, a survey will be conducted to see the existing fish culture technology level only on the marginalized fish farmer through a semi-structured questionnaire and Focus Group Discussion (FGD).

Input support

To provide input support to the marginalized fish farmer, a pond will dig in the fallow land in the RDA demonstration farm. The brood carp fishes will start rearing and breed in the fish unit pond. The spawn that gets from breeding will be nursing in the new dig and other ponds until fingerling is considered fish seed. Fish seed and additional logistic support will be provided to the selected fish farmer. Improved fish culture technology will also offer by training and farmer field school to the marginalized fish farmers of the selected area.

Processing and analysis of data

All the collected data will be accumulated, analyzed, and presented in tabular or graphical forms to understand the scenario of the livelihood status of fish farmers, aquaculture conditions, and input impact in the selected areas.

Expected outcome

After finishing the study, the input and logistic support to the poor fish farmer can enhance their household income and include more fish in their diet that leads toward poverty-free model village.

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Proposal-3

Performance evaluation of RDA-developed water and waste management system in RAJUK, Dhaka

Md. Ferdous Hossain Khan, Director
Dr. Mohammad Abdul Kader, Deputy Director

Background

Water scarcity and the limited capacity of conventional sources in urban areas promote rain water harvesting as an easily accessible source. Conjunctive use of groundwater and surface water would be one potential solution to reduce heavy reliance on groundwater. Surface water treatment plants are treating polluted water before delivering it to a supply pipeline. But the level of pollution of surface water has limited the applicability of the treatment process. DWASA supplies 2092.69 million liters of water daily against the current demand for 2815.7 million liters, which indicates that the city is facing a huge shortage of water daily in Dhaka city (Sumon and Kalam, 2014). All the scenarios between water demand and supply prevails the immediate need for adopting alternative solutions to release the pressure on water sources. Surveys on climate projections

provide evidence on critical impacts of climate on natural water sources that eventually affect human societies and ecosystems (Ponce, 2013).

Groundwater recharge is a process where groundwater is supported by several techniques to add or bring back the health of the groundwater for sustainability. It can be upstream or downstream discharge such as areas close to mountain peaks because the precipitation is higher than in the adjacent lowlands. The shallow groundwater discharges directly to the valleys, and too low-lying zones and the deep groundwater discharge directly to the oceans through return flow on irrigation, leakage from runoff, and wastewater collection system (EMTV, 2019).

Rainwater harvesting (RWH) could be the most sustainable solution to be included in the urban water management system. It could mitigate the water crisis problem, reduce the burden on traditional water sources, alleviate nonpoint source pollutant loads, control water logging problems, prevent flooding, help in controlling climate change impacts, contribute to the storm water management, and so forth

Rain water will be harvested from roof top that comes to road immediately and makes flash flood. To reduce the magnitude of flood in the housing area harvested rain water will be arrested in ground reservoir and the overflow water will be injected in aquifer thus ensure artificial recharge. The stored water will be treated and inject to the water supply system.

Proper management of solid waste is critical to the health and well-being of urban residents. In most developing cities, several tons of garbage is left uncollected on the streets each day, acting as a feeding ground for pests that spread disease, clogging drains and creating a myriad of related health and infrastructural problems. The urban poor – often residing in informal settlements with little or no access to solid waste collection and often in areas that are contiguous with open dumps – are particularly vulnerable. While urban residents in developing countries produce less solid waste per-capita than in high-income countries, the capacity of their cities to collect, process, dispose of, or re-use solid waste in a cost-efficient, safe manner is far more limited. Municipal SWM efforts often focus on expensive ‘end-of-pipe’ measures, those involving the collection and disposal of solid waste, yet many of the ‘best practices’ for SWM improvement are far more accessible and cost-effective opportunities involving waste reduction programs and recycling strategies. The challenges to be faced in collecting solid waste will dramatically increase in the next 30 years as a result of both the rapid growth of developing cities and increases in per capita waste production. It was once believed that increases in per capita waste went hand-in-hand with economic growth, but recent trends in developed countries show that aggressive efforts to reduce, recycle and reuse can break this link. Environmentally-sound urban SWM strategies should address unsustainable patterns of consumption and production. A framework for improved urban SWM combines the expansion of safe collection and disposal with measures designed to minimize trash production and promote the recycling, reuse or recovery of resources from solid waste. Fortunately for those involved in urban SWM, there is a great deal of experience represented in the literature on SWM, ranging from appropriate technologies and financing strategies to sanitary landfill development and the importance of community participation.

Solid waste management is extremely important in your community mainly because it will prevent your household from experiencing the hazardous outcomes of solid waste material. Solid waste will be collected from main entrance where source separation will be preliminary ensured at HH

level. In this regards awareness program will be arranged time to time among the HH representatives and home made. Two separated drums will be placed besides the entrance for collecting degradable and non-degradable waste. A group of people will be engaged for collecting both the waste separately by high duty charger vans and finally sorted out before throwing the degradable waste in to Bio-gas digester. Twelve units of Bio-gas digester will be constructed and after decomposition of solid waste, generated gas will be supplied to HH for cooking purpose. Therefore, efficiency of this system need to be checked by analysis in depth studies.

The project will make the RAJUK Uttara project green, environment friendly and zero Carbone emission area. All waste will be converted to value evolving modern technique and ensure integrated management practice. Rainwater will be arrested from rooftop for ensuring the storage of firefighting and the overflow will be subsisted for recharging existing after pretreatment. Toilet waste and gray water will be collected, processed in mechanical STP vessel, biologically processed and the sludge will be considered as an input of Bio-gas digester. Liquid is separated and drain out in nearest stream or artificially recharged after pre-treatment. Every household will be insisted to separated their kitchen waste in two separate buckets (degradable and non-degradable including cans; plastic; glass etc.) and ensure to make available in front gate having two containers according to sorted characteristics. In this regards awareness will be built up by arranging sort of advocacy programs by the leadership of RDA. A group of people will be deployed for carrying the deposited waste near to Bio-gas digester. Second time sorting of degradable waste will be taken place besides the digester and make sure to deposit into Bio-gas digester. Concentrated sludge also is pumped into digester with required amount of gray water, without treatment. Fermentation will be taken place inside the digester in an-aerobic condition.

Development and installation of water supply, sewerage, drainage system and solid waste management system is a critical component of the Purbachal New Town project. Traditionally, water and sewerage projects have been developed by formal and traditional public procurement basis. However, in order to access private sector expertise for efficient water and sanitation services and unlock private financing, RAJUK has taken a decision to implement this project on PPP basis. The PPP modality would also enable RAJUK to enter into a partnership with a private sector partner who would be involved in Installation of water supply, sewerage, drainage system and solid waste management system at affordable rates to the residents of the township. Compact size, clean and odor free operation are the unique features. Simplicity in design and performance with lesser number of rotating parts. Effective and satisfactory performance in unattended / unmanned operations. Lower piping cost and only RCC works require for collection and outlet tank. Biological Treatment ensures 100% digestion of sewage leaving clear water to environment. Extended aeration provides sufficient oxygen to reach endogenous phase, thus small sludge production and high BOD removal. Unique decanter operates with hydraulic principle, controlled by solenoid valve. No moving part, hence easy to maintain.

Background and rationality

RDA-Developed solid waste treatments installed in RAJUK, Dhaka but the system needs to be observed in terms of water quality and economic viability. In this study, we will investigate the water quality parameters and ground water recharging through the building rainwater and analyze how the system works well. Moreover, groundwater recharge is a great challenge in the major mega city like Dhaka due to depleting of groundwater level and over population creates pressure on

limited water resources. Therefore, groundwater recharge through rainwater harvesting a new approach installed in RAJUK project by RDA where no research study has been conducted for their performance of water quality, and quantity. Also, biological water treatment system is more significant component of the RAJUK project which should need to consider in depth analysis for water quality parameters like BOD, COD, DO, and other heavy metals. Therefore, combining the water, energy and environmental aspect in RAJUK project, a brief research study may need to observe to quantify the performance evaluation the RDA-developed system.

Objectives

The main objective of the study is to assess the performance evaluation of RDA-developed waste water management system in terms of water quality recommended by DOE in the Uttara Housing Project of RAJUK.

The specific objectives of the project are as follows:

1. To collect wastewater sample from inlet and outlet points and analysis water quality parameters including COD, BOD, DO, and heavy metals for knowing the performance of waste water management.
2. To make a scope of rainwater treatment as artificial groundwater recharge facility for protecting continuous depletion of groundwater level in Dhaka city.
3. To ascertain the project green and environment friendly in respect of waste management and groundwater recharge.
4. To make a video documentary of the RAJUK wastewater management system to empower the technique nationally.

Materials and methods

The following material and methods will be evaluated in the study. Collected water sample at every 15-days intervals using sensors and data loggers. Collected sample will be analyzed in laboratory for future quantifications. Performance analysis in terms of efficiency and economic aspect will be studied in installed recharge well for artificial aquifer recharge in the study site.

RDA-Implementing Project Overview

To ensure compliance of ECR-97 and facilitated a green and sustainable environment in the residential area and its surroundings RAJUK desires to install STPs for liquid waste management at Uttara Apartment Project (UAP).

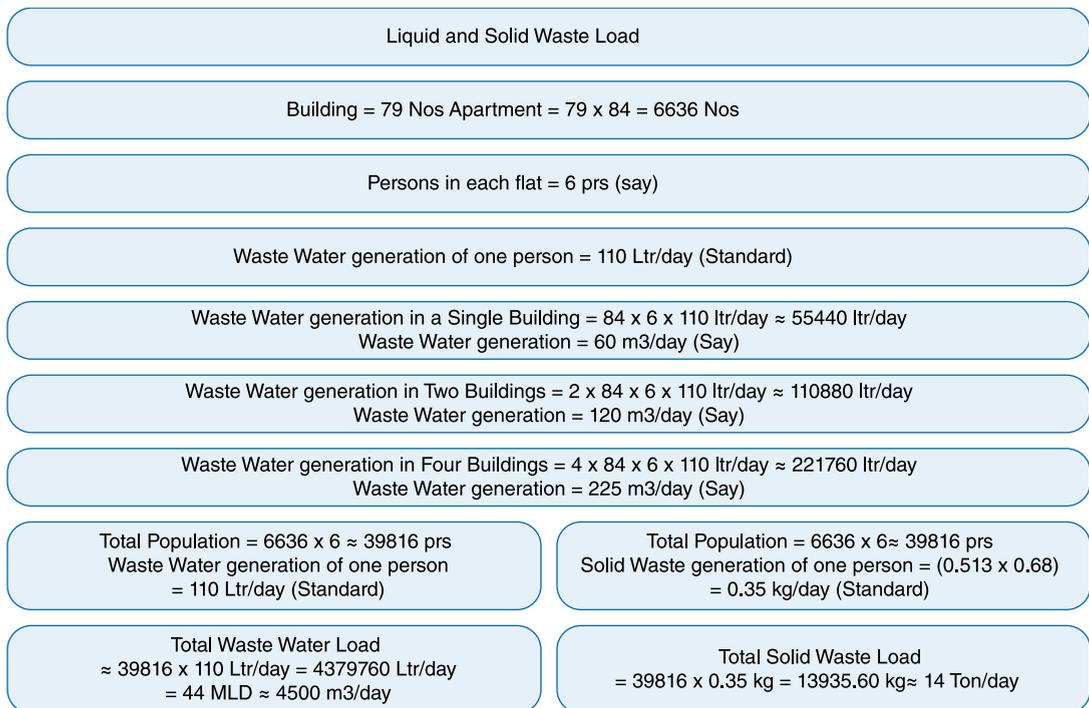


Figure 4.1. Details overview flow chart of RDA-implementing RAJUK project in Dhaka

Scope of works of the project

Design, Engineering, Supply, Installation, Testing and Commissioning with One Year Operation of Sewage Treatment Plants (STP), Solid Waste Management with Bio-digester and Rain Water Harvesting for waste treatment management excluding the civil works.

1. Biological treatment plant for sewage and wastewater
2. Bio-degradable solid waste management with bio-digester and bio-fertilizer
3. Rain water harvesting with ground reserve and underground recharge

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Proposal-4

Design and implementation of cost-effective rural housing using stone materials

Khalil Ahmed, Director General
Md. Ferdous Hossain Khan, Director
Dr. Mohammad Abdul Kader, Deputy Director

Introduction

Bangladesh is a developing country where most of its people live in the urban areas. In the last two decades, rural economy is increased drastically (World Bank, 2020). This increase of economy creates great impact to the rural people's lifestyle as well as their housing. In the rapidly growing economy of Bangladesh, housing should be a significant factor in both maintaining and supporting the economy. The development of decent, affordable rural housing can improve the lives of those with inadequate shelter, while at the same time benefitting the local economy. There are several different methods to improve rural housing conditions. While sectors like infrastructure, industry and connectivity enjoy prioritised attention, we feel that housing as a foundational sector of development deserves a much bigger, thoughtful and creative focus. Housing is a complex social and economic dynamic whose results are the physical patterns of cities and settlements, the qualities of collective living, and the health and well-being of the people. According to various industry studies, Bangladesh is the fourth largest producer and consumer of masonry bricks in Asia after China, India, Pakistan and Vietnam. Although, making process of brick is not environmentally friendly in Bangladesh which release large amount CO₂ and toxic gasses to the atmosphere. Therefore, alternate construction materials need to find considering environment aspects, cost-effectiveness, and easy availability.

Bangladesh is the fourth largest producer and consumer of bricks in Asia after China, India, Pakistan and Vietnam, according to various industry studies. There are more than 6000 traditional brick kilns which cater for 99 per cent of the 17 billion pieces of the country's annual brick requirement. In the process, the kilns emit large quantities of environmental pollutants into the atmosphere causing harmful impact on agricultural yields, climate and health. Therefore, developmental transformation is urgently needed in the brick industry by gradually shifting it towards cleaner processes, efficient technology and better product portfolio. Given this backdrop, non-fired bricks/blocks (often cited as alternative bricks or AB) have the required potential to become the next phenomenon in the brick field industry of Bangladesh. A concrete block is primarily used as a building material in the construction of walls. In use, blocks are stacked one at a time and held together with fresh concrete mortar to form the wall similar to conventional bricks. The blocks materials are economical, better functional efficiency, better durability, ease of construction, better finish, minimum waste, less maintenance cost, less energy intensive, no salt leaching (low maintenance), fire resistant, provide thermal and sound insulation, environment-friendly, indigenous sand used as raw materials, reduction in dead load, reduced air conditioning load, faster construction, assured quality and size, recommended for earthquake resilient buildings.

Objectives of the study

The main objectives of this study are i) to make a cost-effective rural infrastructure to develop a model house for the poor people of Bangladesh, ii) to evaluate of all characteristics of building

wall and compare the performance with traditional bricks wall, and ii) to review the size and shape of existing building blocks and assess the suitability of size and shape for rural housing.

Justification of the study

Bangladesh is a severely land-scarce country with per-capita cultivable land of only 12 decimals. Bangladesh loses one percent agricultural land annually mainly because of unplanned rural settlements and production of clay burn bricks using fertile topsoil. Such high rates of land loss will not only hamper agricultural production but will have adverse impact on food security. Moreover, production of bricks is destroying forests due to the burning of wood as fuel. Annual brick production is over 25 billion against our national demand of around 20 billion, emitting 20 million tonnes of carbon which is about 20 percent of the country's total emission. Studies reveal that 58 percent of total pollution in Dhaka is due to over 1,200 brick kilns operating in and around the city during the months of November to February and 1,250 children die every year in the capital city alone. Benefits of using blocks in construction are immense. Hollow concrete blocks are substitutes for conventional bricks and stones in construction. They are lighter than bricks, easier to place and also cut costs of construction and consumption of cement. They help construct lightweight buildings, give protection from salinity, insulation from heat and sound, and ensure durability. At the same time, the use of such blocks reduces construction costs by 10-15 percent. So, the cost-effective housing may solve the housing problems for the rural farmers.

Methodology

The cost-effective 500 square feet rural housing will be constructed at the RDA campus. In this house, no-brick material will be used and stone materials will be used. Moreover, the building house will be visited in order to measure the current shapes and sizes of the stone. Pre-forma will be prepared based on actual wall and floor size. In this house, all materials will be used as cost-effective purposes. The ease of construction, wastage, maintenance cost, energy intensiveness, functional efficiency, used raw materials and the quality will be compared over the traditional bricks wall building. Samples of building wall will be collected from different places to measure the compressive strength, fire resistance, capacity of thermal and sound insulation, air conditioning load and dead load will be analyzed in the laboratory. Finally, impact on environment and cost benefit analysis of will also be done over the traditional bricks works.

Expected result and impacts

The cost-effective house will be constructed as a pilot basis and it will be extended in the remote rural area for their sustainability. This study will can be an ideal example to make a cost-effective housing in rural area which can be solved the housing problems in the rural Bangladesh. The cost-effective technology would seem to have a much wider application in many other regions of Bangladesh.

Proposal-5

Effect of diet on the production performance of carp fattening in the semi intensive pond at North-western region of Bangladesh

Macksood Alam Khan, Director (In-Charge)

Md. Ashraful Alam, Assistant Director

Introduction

In Bangladesh's national economy, fisheries play an important sector, contributing 3.50% of total GDP and 25.71% agricultural GDP (DOF, 2019). More than 11 percent of the country's total population i.e. about 19 million people, are directly and indirectly dependent on the fisheries sector for their livelihood. Capture fisheries from natural water bodies are declining day by day, and at present, about 57% of the fish production obtains from aquaculture (DOF, 2019). A silent revolution has been taken place in aquaculture for the last few years. Aquaculture is now one of the most promising sectors of the country, and in aquaculture fish production, Bangladesh stands 5th position worldwide (FAO, 2020).

For the Bangladeshi population, especially poor rural communities, fish is the primary source of animal protein. Fish are an essential source of animal protein, accounting for 80 percent of animal protein consumption and 7% of whole protein sources. Fish is the third most popular food in the country in terms of weight. Per capita annual fish consumption in Bangladesh is about 14 kg against a recommended minimum of 18 kg/year. From the last national survey in rural Bangladesh, the mean total protein intake was 48 gm/person/day, of which fish contributed 3 g (Ahmad and Hassan, 1983).

Background and significance

Pond culture represents huge potentiality accounting for 44.43% of the total recorded production and 57.70% of the area under culture, and it has the potentiality to increase further (DoF, 2019). Dominating species for pond aquaculture are Indian major carps and exotic carps (Hasan and Ahmed, 2002). However, the potentiality of carp polyculture is beyond the reach to be sustainable due to climate change, making the fisheries sector of Bangladesh vulnerable to environmental degradation in various magnitudes, such as groundwater sinking and contamination through pollutants (DoF, 2017). This phenomenon is primarily true for the northwest part of Bangladesh, characterized by red or yellow clay soil, limited rainfall, and water sources in the dry season. In these consequences, poor survival and reduced growth of cultured fish species are evident frequently in this area (Hossain, 2011). The appropriate technique is thus felt necessary to increase fish production in the vulnerable area. Fattening is a popular technique to increase biomass in animal rearing. This practice is often followed to produce beef cattle (Sarma et al., 2014) and crab (Ferdoushi, 2013) in Bangladesh. Stocking of overwintered and larger size fish species in carp fattening is considered beneficial to mitigate the fish culture problem of lower water columns under overwintering is a proven technique to obtain the fast growth of fish (Alam et al., 2002; Jobling, 2010) and large size fish stocking under lower density can help to get maximum fish biomass within a shorter period (Grover et al., 2000). However, appropriate selection of species combination, judicious utilization of inputs like feed and fertilizers, and proper application of good aquaculture practices (GAP) should also be considered vital for the sustainability of carp fattening technique.

The people of Bangladesh are increasing geometrically. The fisheries sector plays a prime role in meeting the animal protein requirement and fish farmers cultured fishes with high densities in their pond using artificial fish feed. The use of aquaculture feeds in Bangladesh has grown substantially in the past few years. Now over 1 million tonnes of commercial pelleted feed are being formulated for use by aquaculture farmers (Belton, 2011). Most of the variable cost of fish culture composes of buying fish feed. Fish feed cost to account for 60-70% of the total fish culture cost. To reduce the feed cost, many fish farmers use hand-made fish feed using raw feed ingredients. Raw unformulated feeds-most importantly rice bran and, to a lesser degree, mustard oil cake-are widely used throughout Bangladesh in homestead aquaculture, especially for carp culture, to reduce the feed cost. The main ingredients used for fish feed production are rice bran (20–50 percent inclusion), maize (5–20 percent inclusion), soybean meal (10–30 percent inclusion), mustard oil cake (10–25 percent inclusion), fish meal (5–15 percent inclusion) and meat and bone meal (10–20 percent inclusion) (Belton, 2011).

In addition, large live fishes have a higher price in the market. In Bangladesh, pond aquaculture with high densities has a chance of disease infection and using more feed, making the water pollution. Using different chemicals in the fish pond to control diseases makes the fish unsafe. In the carp fattening technique, the fish stocking density is low and uses fish feed and chemicals only; the recommended dose makes the fish safe, and hence the fish culture cost is low. In addition, Bangladeshi people like live fish more than dead ones in the fish market. Small carp fishes have a low price in the market than the larger ones. So, carp fattening is one of the promising sectors for low-cost aquaculture, growing large live and safe fishes in Bangladesh.

Review of literature

Bangladesh, fortunate in having potential water resources, is one of the world's leading fish-producing countries, with a total production of 43.84 lakh MT in FY 2018-19. Aquaculture accounts for 56.76 percent of the total fish production. Over the last 12 years, with the reasonably steady average fisheries growth of 5.01 percent and consistent average aquaculture growth of around 8.59 percent. It is expected that the country will continue to achieve the projected production target of 45.52 lakh MT of fish by 2020-21 in conformity with the marks of Vision-2021 of the present Government Pond aquaculture (DoF, 2019).

Carp species are the most dominant species in the aquaculture of Bangladesh, contributing 80% of total inland pond aquaculture (DoF, 2019). Rohu, catla, and silver carp are the commonly cultured carp species comprising 25%, 21%, and 19% of the total estimated production from the pond, respectively (World fish, 2020). More than one fish species grow in the same water bodies in a scientific pattern known as polyculture. As fishes are utilized available natural food efficiently that stocked in all the layers of water bodies, polyculture contributes more production than the monoculture in extensive systems (Wahab et al., 2001). Popular poly cultured fish species in Asian countries are rohu (*Labeo rohita*), catla (*Catla catla*), and mrigal (*Cirrhinus cirrhosus*) (Rahman et al., 2008).

In aquaculture, feed accounts for over 50 percent of the production cost. Although considerable variation exists among the fish feed ingredients, cereal grains are the usual carbohydrates sources in most aqua feeds and cannot be economically supplemented with other sources. It was reported that during late 2008, feed prices had increased by over 30 percent on average in many of the countries in Asia, while farm gate prices of aquaculture products had remained

static, literally impinging on the economic viability of several thousands of small-scale producers that form the backbone of the aquaculture sector, particularly in Bangladesh, the epicenter of aquaculture production (Rahman et al., 2008). To reduce the feed cost farmer uses hand-made feed by using raw fish feed materials. Raw ingredients of fish feeds may be derived from on-farm sources but are more frequently purchased in local markets and are usually of domestic (rather than imported) origin. Barman and Karim (2007) calculate that around 80,000 tonnes of raw feeds are used annually in homestead pond grow-out in Bangladesh based on the assumption that 100kg is required to produce one tonne of carps in improved extensive systems (the remainder of fish nutrition being derived from natural feeds produced in situ through pond fertilization). The authors estimate that another 20,000 t of unprocessed supplementary feed is utilized for nursing seed, amounting to 100,000 t. use of supplementary feeds, organic fertilizers such as cow dung and compost and manufactured inorganic fertilizers in homestead pond culture remains rather patchy. The high proportion of operating costs indicates that seed in homestead ponds instead of semi-intensive and intensive systems. Feed represents a significant portion of variable costs (Belton, 2011). In addition, the farmer uses both sinking and floating feed to reduce the feed cost though they stock fish based on the pond layer.

Carp fish fattening is the new concept in Bangladesh. Fattening is the modern technique for any animal rearing for enhancing biomass. In Bangladesh, the fattening process produces beef cattle (Sarma et al., 2014) and crab (Ferdoushi, 2013). Larger over wintered fishes are stocked in the water bodies in polyculture manner at a lower density to get maximum fish production within short periods (Alam et al., 2002; Jobling, 2010). The low amount of feed used in the carp fattening technique results in low feed cost and less chance of disease infection, making the fish safe.

Objectives

The specific objectives of this study will be-

1. To monitor the water quality parameters of the carp fattening ponds;
2. To evaluate fish growth and yield of carp fattening from selected ponds.

Material and methods

Location and duration of the study

The study will be conducted in the RDA demonstration farm and farmer's pond from July 2021 to December 2023.

Pond management

All aquatic weeds in the embankment and inside the pond will remove manually by labor. Unwanted and predatory fishes will remove by using repeatedly netting and rotenone in the pond. Groundwater use in the pond to keep the depth of the pond is a minimum of 6 ft. Lime will be used 2 kg/decimal as a basal dose and 0.5 kg/decimal/fortnight in the entire culture period. Aqua-probiotic, disinfectants, micronils, salts, inorganic manures, mustard oil cake, rice bran, and other medicine will be used in the pond to keep the optimum water quality parameters. Overwintering, carp fishes will stock in the pond as 10 fishes/decimal. Fish feed containing 25% protein will use in the pond at 6% body weight for 3 months and 3% body weight in the rest of the periods.

Research Design

A randomized complete block design (RCBD) will follow in the present experiment with three

different feed treatments (T-1: company made floating feed; T-2: 70% sinking and 30% floating company made feed; T-3: handmade feed) with three replications. The carp species combination will follow surface feeder-40%, column feeder-30% and bottom feeder-30% (Hossain et al. 2020). Two surface feeders, namely catla, *Gibelion catla* and silver carp, *Hypophthalmichthys molitrix*; one column feeder namely rohu, *Labeo rohita*; and two bottom feeders namely mrigal, *Cirrhinus cirrhosus* and calibaas, *Labeo calbasu* will use in the present experiment. Stocking density will be 8 kg fishes per decimal, and the size of the fishes will be 500-600 gm, the same for all treatments.

Water quality parameters

Water quality parameters of the experimental ponds will be recorded throughout the study period. The water temperature (°C), dissolve oxygen (ppm) and hydrogen ion concentration (pH), ammonia (NH₃) and Nitrite (NO₂) will monitor with 15 days interval following standard methods (APHA, 2002). Common water quality parameters should be maintained by using different aqua-chemicals for optimal growth of carp fishes.

Estimation of growth performance

Monthly sampling from each pond will ensure by using ber net and cast net. The weight of the sampled fish will be recorded by using an electric balance (Model: HKD-620AS-LED). After harvesting fish, the final weight will be recorded. The following parameters will be used to evaluate the fishes' growth and production. Following calculations will be used to observe the growth parameter carp fishes.

Data analysis

The recorded data will be entered into the MS Excel 2010 and then summarized adequately before statistical analysis. After entering the data, the descriptive statistical analyses will be done by MS Excel and SPSS software.

Implication and contribution to knowledge

Carp fattening is a popular method of fish culture in the Rajshahi and Natore region. This fish culture method is not popular in the adjacent area in the RDA and Bogura region yet. After completing the research, the technique will be disseminated in the mentioned region if feasible. Besides, this document will also use as a basal document of carp fattening in the Bogura region.

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Proposal-6

গ্রাম বাংলার ঐতিহ্যবাহী পণ্য উৎপাদন ও বাজারজাতকরণের মাধ্যমে গ্রামীণ দরিদ্র নারীদের আয়বৃদ্ধি ও দারিদ্র্য বিমোচন বিষয়ক গবেষণা

মাকছুদ আলম খান, ভারপ্রাপ্ত পরিচালক

মো: মহিউদ্দিন, উপপরিচালক

মৌপিয়া আবেদীন, সহকারী পরিচালক

ভূমিকাঃ

দক্ষিণ এশিয়ার ভৌগোলিকভাবে গুরুত্বপূর্ণ উন্নয়নশীল গ্রাম কেন্দ্রীক সমাজ ব্যবস্থার একটি দেশ হলো বাংলাদেশ। বিশ্বব্যাংক (২০১৯) এর হিসাবে, বাংলাদেশে ৬২.৬ শতাংশ জনগণ গ্রামে বসবাস করে যেখানে শতকরা প্রায় ৩৫ শতাংশ নারী। একটি দেশের অর্থনৈতিক উন্নয়নের গুরুত্বপূর্ণ নিয়ামক হলো-নারী-পুরুষের সমতা, অংশীদারিত্ব এবং শহর ও গ্রামে আয় বৈষম্য কমিয়ে আনা। ওয়ার্ল্ড ইকোনমিক ফোরামের (২০২০) তথ্য মতে, বাংলাদেশ ইতোমধ্যে ২০০৭ সাল থেকে ২০২০ পর্যন্ত ৭২ শতাংশ জেন্ডার গ্যাপ কমিয়ে এনেছে। যার স্বীকৃতি স্বরূপ বাংলাদেশের মাননীয় প্রধানমন্ত্রী শেখ হাসিনা ২০১৯ সালের ৮ মার্চ, বিশ্বনারী দিবসে “লাইফ টাইম কন্ট্রিবিউশন ফর উইমেন এম্পাওয়ারমেন্ট অ্যাওয়ার্ড” এ ভূষিত হয়েছেন।

বাংলাদেশের বহুল প্রচলিত একটি পত্রিকার প্রকাশিত প্রতিবেদন অনুসারে, ৪৩ শতাংশেরও বেশি নারীরা এখনো শুধুমাত্র গৃহস্থালীর কাজই করে থাকে। রিপোর্টটিতে আরও উল্লেখ আছে যে, গৃহস্থালী কাজে দেশের নারীরা বছরে ব্যয় করে ১৬ হাজার ৬৪১ কোটি ঘন্টা, যার আর্থিক মূল্য ২ লক্ষ ৪৯ হাজার ৬১৫ কোটি টাকা, এই কাজকে ন্যাশনাল ইনকাম মেজারিং সিস্টেম এর অন্তর্ভুক্ত করা হলে জিডিপিতে নারীদের ভূমিকা প্রায় ৪৮ শতাংশ হবে, যা বর্তমানে ২০ শতাংশের মতো রয়েছে। নারীদের পারিবারিক কাজ অর্থনৈতিক কাজ হিসেবে গণ্য করা হয় না এবং এক্ষেত্রে বিশ্ব অর্থনীতি থেকে নারীদের এই অবৈতনিক শ্রম অদৃশ্য ও উপেক্ষিত। বর্তমানে, জাতিসংঘ উন্নয়ন কর্মসূচি (ইউএনডিপি) এবং নারী বিষয়ক সংস্থা ইউএন উইমেনের নতুন উপাত্ত বলছে, করোনা ভাইরাসের (কোভিড-১৯) মহামারীর জেরে চরম দারিদ্র্য বাড়বে, যেখানে নারী দরিদ্র হবেন বেশি। কাজের সুযোগ, আয়, স্বাস্থ্য, অবৈতনিক শ্রম এবং সহিংসতা সব দিক দিয়ে নারীর অবস্থান আরও নাজুক ও অসম হবে। সমতা যেটুকু অর্জিত হয়েছে, সেটুকুও ঝুঁকিতে পড়বে। সাম্প্রতিক সময়ে প্রকাশিত বিভিন্ন প্রতিবেদনে দেখা যায় যে, কাজ, নানা চাপ আর অর্থনৈতিক অনিশ্চয়তায় নারীরা মানসিকভাবে বেশি বিপর্যস্ত হচ্ছেন। তাঁরা বিষণ্ণতায় ভুগছেন। লকডাউনে ঘরে নারী নির্যাতনের ঘটনাও বেড়েছে। এছাড়াও বিআইডিএস এক প্রতিবেদনে উল্লেখ করেছে, বাংলাদেশে ৩০০-এর বেশি পোশাক কারখানা বন্ধ হয়ে লাখের ওপর শ্রমিক বেকার হয়েছেন, যেখানে বেশির ভাগই নারী। বেসরকারি কিন্ডারগার্টেন স্কুলগুলোতে অনেক নারী কাজ করতেন। গৃহকর্মী, বিউটি পার্লার, ক্ষুদ্র উদ্যোগের মতো নারী প্রধান খাতগুলোতেও কাজ প্রায় বন্ধ। বৈশ্বিক প্রতিবেদন বলছে, চরম দারিদ্র্য বাড়বে এবং সব ক্ষেত্রেই নারীর সমতা কমবে, বৈষম্য বাড়বে।

অভিজ্ঞতা থেকে দেখা যায় যে, প্রায় প্রত্যেক নারীরই কোন না কোন কাজে দক্ষতা আছে, যেমন- কেউ মুড়ি ভাজতে পারে, কেউবা ছোট বাচ্চাদের জন্য নেপকিন ও কাঁথা এবং পরিবারের জন্য গ্রামবাংলার ঐতিহ্যবাহনকারী কাঁথা সেলাই এ দক্ষ, আবার কারো বাড়িতে

টেকি আছে, সে টেকি ছাটা চাল, আটা ও ছাতু তৈরী, মাষকলাই এর গুড়া ডাল ইত্যাদি কাজ ভালভাবে করতে পারে, আবার কারো বাড়িতে সেলাই মেশিন আছে এবং তিনি সেলাই এর কাজ ভালই পারেন, আবার কেউ বা দক্ষ আঁচার,পাপড়, চিপস, কুমোড়বড়ি ইত্যাদি তৈরির কাজে, আবার কারো কারো যথেষ্ট সুনাম আছে সুতার কাজ ও শোপিছ তৈরিতে (হস্তশিল্প), আবার কেউ কেউ খাতা-খাম বানানো, ঠোংগা তৈরী, শপিং/বাজারের ব্যাগ তৈরির কাজ করে যাচ্ছে নিরবে। এরকম অনেক কাজই গ্রামীণ দরিদ্র পরিবারের নারীরা করে যাচ্ছেন যুগের পর যুগ ধরে। গ্রামীণ নারীদের উৎপাদিত এসমস্ত পণ্য বাজারজাতকরণের কথা জোরালোভাবে ভাবা হয়নি কখনই। অথচ ছোট বাচ্চার জন্মের সময় আমাদের বেশি প্রয়োজন পড়ে বাচ্চাদের জন্য নেপকিন ও কাঁথা, কিন্তু পাওয়া যায়না কোন দোকানেই, আবার যে গ্রামীণ দরিদ্র নারী কাঁথা সেলাই করেন সেও উপযুক্ত পারিশ্রমিক পাননা। আবার, আমাদের প্রায়ই খেতে হচ্ছে করে টেকিছাটা চাল, আটা ছাতু, মাষকলাই এর গুড়া ডাল অথবা কুমোড়বড়ি; কিন্তু ভালোমানের পাওয়া যায় না বেশিরভাগ সময়। ভাল করে লক্ষ্য করলে দেখা যায় যে, গ্রামীণ এ সমস্ত পণ্যের যথেষ্ট চাহিদা থাকা সত্ত্বেও অদ্যাবধি উন্নত বাজারজাতকরণের ব্যবস্থা হয়নি। সরকারিভাবে জয়িতা'র মাধ্যমে এবং বেসরকারীভাবে বেশকিছু এনজিও এর মাধ্যমে শুধুমাত্র হস্তশিল্প ও নকশীকাঁথা বাজারজাতকরণের উদ্যোগ দেখা যায়, কিন্তু গ্রামীণ নারীদের অসামান্য দক্ষতায় উৎপাদিত গ্রামবাংলার ঐতিহ্যবাহিনকারী এসমস্ত পণ্য এখনো বানিজ্যিক গুরুত্ব পায়নি, অর্থাৎ বঞ্চিত হচ্ছেন গ্রামীণ নারীরা। অবশ্য কিছু কিছু ক্ষেত্রে গ্রামীণ নারীদের উৎপাদিত এসমস্ত পণ্যের মান ভালো হয়না- এর প্রধান কারণ হলো এসমস্ত পণ্য তৈরীর দক্ষতা অর্জন করেছেন তার পরিবার থেকেই, কোন প্রশিক্ষণ পেয়ে নয়। এক্ষেত্রে স্বল্পমেয়াদী ও স্বল্পবাজেটের একটি প্রশিক্ষণের মাধ্যমেই পণ্যের মান উন্নত করা যেতে পারে।

গবেষণার যৌক্তিকতাঃ

এ গবেষণার মাধ্যমে গ্রামীণ দরিদ্র পরিবারের নারীদের স্বাভাবিক যে দক্ষতা ও সম্পদ আছে তাকেই পূঁজি করে নারীদের আয়বৃদ্ধির মাধ্যমে দারিদ্র্য বিমোচনের জন্য চেষ্টা করা হবে। গ্রামীণ নারীদের দ্বারা উৎপাদিত গ্রামবাংলার ঐতিহ্যবাহী পণ্য যোগুলি তথাকথিত আধুনিকতার ভীড়ে হারিয়ে যেতে বসেছে (দেশি মুড়ি ভাজা, ছোট বাচ্চাদের জন্য নেপকিন ও কাঁথা এবং পরিবারের জন্য ঐতিহ্যবাহী কাঁথা, টেকিছাটা চাল, আটা ও ছাতু, খাতা-খাম বানানো, ঠোংগা তৈরী, বাজারের ব্যাগ, পাপড়, চিপস, কুমোড়বড়ি, সুতার কাজ, শোপিছ, বাডু, আঁচার, মাষকলাই এর গুড়া ডাল ইত্যাদি), অথচ প্রত্যেক বাঙালিই এসবের প্রয়োজন অনুভব করে, সেসমস্ত পণ্য বাজারজাতকরণের ব্যবস্থা করা হবে এ গবেষণার মাধ্যমে।

গবেষণার মাধ্যমে, গ্রামীণ নারীদের দ্বারা উৎপাদিত গ্রামবাংলার ঐতিহ্যবাহী প্রায় সকল পণ্যই বাজারজাতকরণের ব্যবস্থা করা হবে, এটি বাংলাদেশের প্রেক্ষিতে একটি নতুন ধারণা। এর কাছাকাছি কনসেপ্টে নারীদের দ্বারা উৎপাদিত ২/১ পণ্য (মূলত হস্তশিল্প) বাজারজাতকরণের জন্য কাজ হয়েছে, কিন্তু বিভিন্ন ধরনের এতগুলি পণ্য নিয়ে একত্রে কাজ করা হয়নি। ঐতিহ্যবাহী পণ্য উৎপাদন ও বাজারজাতকরণ করে বাংলাদেশ সরকারের টেকসই উন্নয়ন লক্ষ্যমাত্রা সূচক-১, ২, ৫ ও ৮ অর্জনে গবেষণাটি সহায়ক ভূমিকা পালন করবে।

গবেষণার উদ্দেশ্যঃ

গ্রামীণ জনগোষ্ঠীর নারীদের স্বাভাবিক দক্ষতা এবং সম্পদকে ব্যবহার করে বাংলাদেশের ঐতিহ্যবাহী পণ্য উৎপাদন ও বাজারজাতকরণের ব্যবস্থা করার মাধ্যমে গ্রামীণ দরিদ্র পরিবারের নারীদের আয়বৃদ্ধি এবং দারিদ্র্য বিমোচন করাই হলো এই গবেষণার উদ্দেশ্য।

গবেষণার মূল উদ্দেশ্যঃ

১. গ্রামীণ নারীদের স্বাভাবিক দক্ষতা এবং সম্পদকে ব্যবহার করে বাংলাদেশের ঐতিহ্যবাহী কিছু পণ্য উৎপাদন ও বাজারজাতকরণের ব্যবস্থা করা।
২. গ্রামীণ দরিদ্র পরিবারের নারীদের আয়বৃদ্ধি এবং দারিদ্র্য বিমোচনে সরবরাহকৃত সহায়তার কার্যকারিতা নিরূপন করা।

কর্ম পদ্ধতিঃ

ক) গ্রাম নির্বাচন

গবেষণা এলাকা হিসেবে পল্লী উন্নয়ন একাডেমী, বগুড়ার সন্নিকটে দুটি গ্রাম নির্বাচন করা হবে। গ্রাম নির্বাচনের ক্ষেত্রে একাডেমীর সাথে যোগাযোগ ব্যবস্থা ভালো, নিবিড়ভাবে পর্যবেক্ষণ ও প্রয়োজনীয় মালপত্র সহজেই পরিবহন করা যাবে এবং দরিদ্র পরিবারের সংখ্যা বেশি এই বিষয়গুলোতে গুরুত্ব দেওয়া হবে। একাডেমীর সন্নিকটে ও যোগাযোগ ব্যবস্থা ভালো হবার কারণে কালসিমাটি এবং রামনগর গ্রাম দুটি গবেষণা এলাকা হিসেবে পরিগণিত হতে পারে।

খ) গবেষনার রেসপন্ডেন্ট (Respondent) নির্বাচন

গবেষণা এলাকাতে দুটি ধাপে গবেষনার রেসপন্ডেন্ট (Respondent) নির্বাচন করা হবে। প্রথমত, অংশগ্রহনমূলক গ্রামীণ সমীক্ষার (পিআরএ) মাধ্যমে দুটি গ্রামের জনগনের সহযোগিতায় গ্রামীণ জীবনযাত্রা ও অবস্থান সম্পর্কে জানার চেষ্টা করা হবে।

অংশগ্রহনমূলক গ্রামীণ সমীক্ষার মাধ্যমে দরিদ্র ও হতদরিদ্র পরিবারগুলো চিহ্নিত করা সহজতর হবে। পরবর্তীতে, শুধুমাত্র দরিদ্র ও হতদরিদ্র পরিবারগুলোতেই কেবল MPI পদ্ধতির মাধ্যমে গবেষনার রেসপন্ডেন্ট (Respondent) নির্বাচন করা হবে।

গ) পণ্য নির্বাচন

ফোকাস গ্রুপ ডিসকাসন এবং প্রশ্নপত্রের মাধ্যমে গ্রামীণ নারীদের বিভিন্নরকম কাজের দক্ষতা ও আগ্রহ সম্পর্কে জানার পরে পণ্য নির্বাচন করা হবে। তবে দেশীয় পদ্ধতিতে ভাজা খৈ ও মুড়ি, মুড়ির নাড়ু, নারিকেলের নাড়ু, হাতে বানানো বিভিন্ন ধরনের দেশীয় পিঠা, স্বাস্থ্যসম্মত উপায়ে তৈরী কুমোরবাড়ি, টেঁকিছাটা চাল, আটা এ ছাতু, মাষকালার ডালের গুড়া, পাপড়, চিপস ইত্যাদিতে গ্রামীণ নারীদের উৎসাহিত করা হবে।

গ) দল গঠন

নির্বাচিত গ্রামে MPI পদ্ধতি অনুসরণ করে চিহ্নিত দরিদ্র ও হতদরিদ্র পরিবারের মধ্য হতে নির্বাচিত পণ্য তৈরীতে দক্ষতা অনুযায়ী দুটি গ্রাম হতে মোট ৩০ জনকে বাছাই করে দল গঠন করা হবে। প্রত্যেক দলের জন্য একজন করে দলনেতা নির্বাচন করা হবে। যিনি সকল কাজের তদারকি করবেন এবং দলের সদস্যদের সাথে দলনেতার মাধ্যমেই যোগাযোগ করা হবে। এক্ষেত্রে যার যে কাজে দক্ষতা আছে, যেমন- যারা বাড়িতে মুড়ি-খৈ ভাজতে পারে তাদের মুড়ি-খৈ ভাজার কাজ, যার বাড়িতে টেঁকি আছে তাকে টেঁকিছাটা চাল, আটা ও ছাতু তৈরীর কাজ দেয়া হবে।

ঘ) প্রশিক্ষণ প্রদান

গবেষণার মূল উদ্দেশ্য দরিদ্র নারীদের স্বাভাবিক দক্ষতাকে পুর্জি করে গ্রামবাংলার ঐতিহ্যবাহী পণ্যসামগ্রী উৎপাদন ও বাজারজাতকরণের মাধ্যমে দরিদ্র নারীদের আয়বৃদ্ধি করা। সেই লক্ষ্যে গ্রামীণ নারীদের দ্বারা তৈরীকৃত এ সমস্ত পণ্যের মান একইরকম ও উন্নত করার লক্ষ্যে দলভিত্তিক বিভিন্ন ট্রেডে প্রশিক্ষণের ব্যবস্থা করা হবে।

ঙ) পণ্য উৎপাদন

গবেষণায় দরিদ্র ও হতদরিদ্র পরিবারগুলোর নারীরাই কেবল প্রাধান্য পেয়েছে, সেই কারণে তাদের পণ্য উৎপাদনের জন্য মাথাপিছু প্রয়োজনীয় কাঁচামাল গবেষণা খাত হতেই প্রদান করা হবে। এক্ষেত্রে দুই পর্যায়ে নারীদেরকে সহায়তা করা হবে।

১) পণ্য উৎপাদনের জন্য অবকাঠামো উন্নয়নে সহায়তা হিসেবে,

২) ঋণ হিসেবে।

চ) সংগ্রহ ও প্যাকেটিং

পণ্য বিক্রয়কেন্দ্রে আনার পর পণ্যের মান যাচাই করে প্রযোজ্য ক্ষেত্রে প্যাকেটিং করা হবে। উৎপাদিত সকল পণ্যই ব্রান্ড নেম “পল্লীর ঐতিহ্য” এর আওতায় আনা যেতে পারে। নারীদের প্রয়োজনীয় কাঁচামাল সরবরাহ, তৈরীকৃত পণ্য সংগ্রহ করে বিক্রয়কেন্দ্রে নিয়ে আসা ও পণ্যের হিসাব দলীয় নেতার মাধ্যমেই করা হবে।

ছ) উৎপাদিত পণ্যসামগ্রী বাজারজাতকরণ

পল্লী উন্নয়ন একাডেমী, বগুড়ার সমবায় বিপণির মাধ্যমেই মূলত উৎপাদিত পণ্যসামগ্রী বাজারজাতকরণ করা হবে। এছাড়াও অনলাইনে বিক্রয়েরও ব্যবস্থা করা হবে। গবেষণার জন্য নির্বাচিত সদস্যগণ (Respondent) বিক্রিত পণ্য হতে প্রাপ্ত লভ্যাংশের একটা নির্দিষ্ট অংশ পাবেন।

জ) তথ্য সংগ্রহ পদ্ধতি, বিশ্লেষণ ও প্রতিবেদন প্রস্তুতকরণ

উল্লিখিত কার্যক্রম বাস্তবায়নের এক বছর পরে গবেষণাটির ফলাফল নিরুপনের জন্য আবারও নির্বাচিত সদস্যদের অর্থনৈতিক অবস্থা MPI পদ্ধতির মাধ্যমে গবেষণার আওতাধীন থাকা নারীদের তথ্য সংগ্রহ করা হবে। বেসলাইন সমীক্ষা এবং এক বছর শেষে MPI পদ্ধতির মাধ্যমে প্রাপ্ত তথ্যের তুলনামূলক বিশ্লেষণ করা হবে। এছাড়া গবেষণাকালীন সময়ে প্রতি মাসে একটি করে মাসিক সভা অনুষ্ঠিত হবে, যেখানে ফোকাস গ্রুপ ডিসকাসন (FGD) এর মাধ্যমে তথ্য সংগ্রহ করা হবে। এক্ষেত্রে গবেষকবৃন্দের ব্যক্তিগত পর্যবেক্ষণও গবেষণার ডাটা হিসেবে বিবেচিত হবে। সংগৃহিত তথ্য হতে গুণগত বিশ্লেষণ (Qualitative analysis) এর মাধ্যমে গবেষণা প্রতিবেদন তৈরী করা হবে।

Proposal-7

Research on the Key Technology of Processing Soybean Isolated Protein and Quality Deterioration during Storage

Monirul Islam, Assistant Director

Introduction

Soybean (*Glycine max*) origin to East Asia (especially in China and Japan) belongs to the legume family (Kader, Senge, Mojid, and Nakamura, 2017). It is a good source of proteins, complex carbohydrates, polyunsaturated fatty acids, soluble fibers, and isoflavones. Nowadays, it's widely grown worldwide as an edible bean (Peluso, Romanelli, and Palmery, 2014). Wang et al. (2020) reported sixty varieties soybeans were used for product development by 2018, 398 million tons of soybeans were produced across the world, with 61% for oilseed production. In addition, Salgado and Donado-Pestana (2011) who found 90% of soybean production of the world total is from the United States of America (USA), Brazil, South America, and Northwestern Europe. Jooyandeh (2011) reported soybean oil composition were 15% saturated 61% polyunsaturated, and 24% monounsaturated. Fiala (2008) described increasing the population, industrialization, and urbanization with increase the plant meat demand about 72% by 2030.

Golbitz and Jordan (2006) found that soybeans typically contained 35% to 40% proteins with well-balanced amino acid composition, 30% carbohydrate, 15-20% fat, 10-30% moisture content as well as fiber, calcium (Ca), iron (Fe), zinc (Zn), and vitamins B complex. In addition, soybean contains some minor compounds such as lecithin, iso-flavones, bio-peptides, and others provide protective effects against chronic cancer, cardiovascular diseases, type II diabetes (Dixit, Antony, Sharma, and Tiwari, 2011; G. Singh, 2010; P. Singh, Kumar, Sabapathy, and Bawa, 2008). Soybean protein is suitable for fortifying with the people lacking plant protein consumption for its nutritional value and good health effect on calcium metabolism in addition to lowering cholesterol (Shih, Hwang, and Chou, 2016). Moreover, soy products include soy flour, soy milk/powder, soy protein isolate, soy protein hydrolysates (X. Guo, Sun, Zhang, Wang, and Yan, 2018; He, Guo, and Zhu, 2019; Simmons, Smith, and Vodovotz, 2012), which could be used as food additives and nutraceutical ingredients.

Meat alternatives could be classified as plant based (soy, gluten, pea, etc.), cell-based (vitro or cultured meat) and fermentation based (mycoproteins) (Sha and Xiong, 2020). In recent years, plant based meat is developed for its consumer demands, the market has grown exponentially and sustainability of future food supply (Sha and Xiong, 2020). The expansion of plant based meat market is predictable to boost from \$4.6 billion in 2018 to 56 \$85 billion in 2030, and as a milestone by 2026, would achieve \$30.9 billion (Sha and Xiong, 2020). Among the Several mechanistic techniques for texturization of the plant based meat, extrusion is the most often applied (Dekkers, Boom, and van der Goot, 2018). High moisture extrusion, through over 40% of moisture contents during processing, has the huge advantages of lesser energy input, lower waste discharge, higher efficiency, and greater value of texturized products. Therefore, it is lately considered as better choices for the developing of plant protein-based meat substitutes (Zhang et al., 2019). For texture optimization exogenous polysaccharides are one of the mostly useful additives used in food industries. At the time of the proteins denature of extrusion process, the dormant reactive sites of the interior proteins would become available and the structure proteins

become flexible, which permits the protein-polysaccharide interactions. Polysaccharides could be used as cross-linker to alter the conformation of proteins, interact with them by cross-linking to protein side chains all the way through Maillard reaction and form a protein-complex structure (Caillard, Remondetto, and Subirade, 2010).

Background and significance

Soybeans, first cultivated in the Yellow River Valley in China ~ 5000 years ago and on record from ~ 16 to 11 century BC. Its contain around 34% protein, 20% lipid, and 30% carbohydrate that is comprised of a soluble and an insoluble fraction. The difference variety of soybean such as okara, tofukasu, draff, soy pulp, tofu cake, tofu residue, douzha (Chinese) and bejee (Korean), as well as tempeh gembus (Indonesian) (Jooyandeh, 2011). Soybeans have a high protein content (34%), they, and products derived from them, are seen as animal protein substitutes. In their raw state the concentration of nutrients is high, by comparison with beef 21.0%, eggs 12.3%, and cow milk 3.1%. It has been used as food for a long in many Asian countries. In addition to nutrition, chemical components like isoflavones, lecithin, biopeptides and others have reported to provide protective effect against, chronic cancer, cardiovascular diseases type-2 diabetes and reduced menopausal discomfort in women (Dixit, Antony, Sharma, and Tiwari, 2011; G. Singh, 2010; P. Singh, Kumar, Sabapathy, and Bawa, 2008).

Meat alternatives may be classified as plant-based (soy, pea, gluten, etc.), cell-based (in vitro or cultured meat), and fermentation-based (mycoproteins). Plant-based meat alternatives are developed to address consumer demands and sustainability of future food supply, and the market has grown exponentially in recent years. Although progresses have been made to construct plant protein-based fibers organoleptically comparable to a whole-muscle cut, it remains challenging to reproduce the hierarchical organization of muscle tissue known to contribute to the overall sensory profile. The growth of plant-based meat market is projected to increase from \$4.6 billion in 2018 to 56 \$85 billion in 2030 and, as a milestone by year 2026, reach \$30.9 billion (Sha and Xiong, 2020).

High-moisture extrusion technology for moisture contents higher than 40% has the advantages of lower energy input, no waste discharge, high efficiency, and higher quality of the texturized products, thus it is now considered as one of the best choices for developing vegetable protein-based meat substitutes (Zhang et al., 2019). Exogenous polysaccharides are one of the main additives generally used in food industries for texture optimization. Interactions with polysaccharides will influence the functional properties of food proteins such as protein solubility, water and oil holding capacity emulsifying and foaming properties. During the denaturation of protein in the extrusion process, the buried reactive sites in the protein molecular chains become exposed and the structure of the protein became flexible, which allows configurational adjustments and favors the protein-polysaccharide interactions. Polysaccharides can be used as a cross-linker to alter the conformation of proteins, interact with them by binding to protein side groups through Maillard reaction, and produce a protein network structure (Caillard, Remondetto, and Subirade, 2010). Germinated soybean has become increasingly popular in Asian countries because of its nutritional functionality. Vegetable protein-based meat substitutes with rich fibrous structure by adding the exogenous polysaccharides.

Research aims and purpose

The aim of this study is to investigate the effect of different hydrolysis methods to extract soybean protein and quality deterioration during storage in term of high moisture extrusion technology.

Research Design and Method

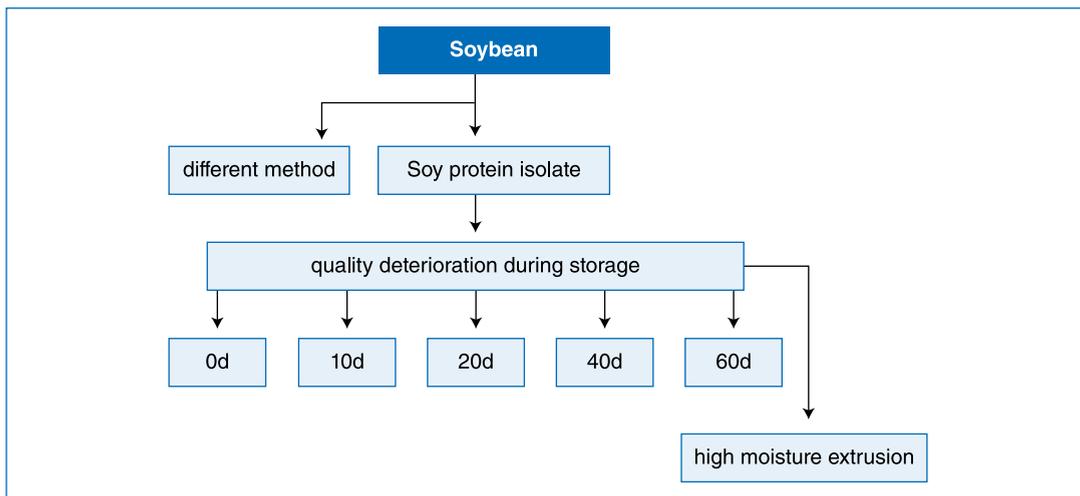


Figure 4.2. Research Design and Method

Protein extraction from soybean

Soybean pretreatment by ultrasonic-assisted

Soybean powder was initially dissolved in distilled water (1:50, w/v) and stirred at 25 °C for 30 min. Then liquid solution was added into the suspension, and the mixture was stirred at 25 °C for 2 h. The ratios of IL/SPI were 0.1 and 1 (by weight).

Protein extraction by enzymatic hydrolysis

Soybean protein extraction by enzymatic hydrolysis according to Fathollahy, Farmani, Kasaa, and Hamishehkar (2021). Enzymatic hydrolysis of 5% (w/v) protein isolate solutions (dissolved in 0.01 M phosphate-buffered saline) was carried out for 4 h at 2% (W/W) enzyme to the substrate ratio using Alcalase (1:1, pH 8.5, 50 °C), Protamex (1:1, pH 8.0, 50 °C). Enzyme inactivation was carried out by heating the reaction mixture in a water bath at 95 °C for 15 min. After centrifugation (10000×g, 10 min) of the final mixture and then supernatant solution was freeze-dried and storage at -20 °C for analysis.

Acid and alkali Hydrolysis

Acid Hydrolysis

10g of powdered sample of soybean powder was taken in 250 mL screw-capped flasks and added 100 mL of 2% sulfuric acid. The flasks were then heated at 90 °C for different time intervals (30, 60, 90, and 120 min). After cooling, the liquid was separated from the solid by using filtration, measured, neutralized (pH was adjusted to 7.0 with equal strength of acid) and used for the analysis.

Alkali Hydrolysis

Ten gram of sample was taken in a conical flask and used for alkali hydrolysis with 100 mL of 2 N NaOH. The flask was kept on an orbital shaker at 150 rpm for different time intervals (30, 60, 90, and 120 min) at room temperature. Then the liquid was separated by filtration, volume was measured, neutralized (pH was adjusted to 7.0 with equal strength of alkali) and used for further analysis.

Proximate chemical composition

The chemical compositions (moisture, protein- N \times 6.25, Ash, fat) of soybean protein hydrolysates will be analyzed determined according to the AOAC method (AOAC, 2005) with minor modifications. The moisture content of soybean protein hydrolysate was analyzed by an oven air drying at 105 °C until a constant weight was obtained. The crude protein was estimated by using a standard micro Kjeldahl method (N% \times 6.25). On the other hand, ash content was analyzed by incineration of the samples at 550 °C in a muffle furnace until a constant weight. The total lipids were determined by using macro Soxhlet apparatus.

Amino acid analysis

Amino acids were determined according to the AOAC method (AOAC, 2005) with some modifications. For tryptophan (total) analysis, 100 mg PH by 8 mL of 5 mol/L NaOH at 120°C for 22 h under nitrogen gas and neutralized by 6.67 mL of 6 M HCl. On the other hand, other amino acids were determined, the same amount of sample was taken and hydrolyzed with 8 mL of 6 mol/L HCl under nitrogen gas and incubated in an oven at the same temperature and time, neutralized by 4.8 mL of 10M NaOH. For the free amino acids evaluation, soybean protein hydrolysates taken 1,000 mg and diluted with 25 mL of 5% TCA then 1–2 h stranded and centrifuged at 10,000 \times g for 10 min. Finally, 1 μ L of solutions were injected into HPLC analytical.

Molecular weight distribution

Molecular weight (MW) profiles of soybean protein hydrolysates were investigated according to a guideline of Islam et al. (2021) with some modifications. Briefly, hundred (100 mg) of soybean protein hydrolysates was taken into 15 mL glass tubes and diluted by 10 mL deionized water, the glass tubes were placed in an ultrasonic bath for 5 min and transferred into centrifuge tubes, centrifuged at 10,000 g for 10 min (SCLOGEX-D3024R, Beijing, China) at 4 °C. Then supernatants were filtered and used for MW profile analysis by gel permeation chromatography using a HPLC system (Waters-1525, USA). The TSK-GEL2000 SWXL (300 \times 7.8 mm) column (Tosoh, Japan, Tokyo) was equilibrated with mobile phase composed of acetonitrile/water/trifluoroacetic acid 45/55/0.1V/V). The column was eluted at a flow rate of 0.5 ml/min and monitored UV220 nm and temperature at 30 °C. Cytochrome C (12,384 Da), bacitracin (1,422 Da), Gly-Gly-Try-Arg (GGYR) (451 Da), and Gly-Gly-Gly (GGG) (189 Da) were used as standards of MW.

SEM

Microstructure of soybean protein hydrolysates will be performed using the method described in previous literatures (Liu and Lanier, 2015; Parés et al., 2018) with minor modifications. Briefly, samples will be cut into cubes (0.2 \times 0.2 \times 0.5 cm) and then freeze-dried for 24 h. The cross sections of the samples will be sputter-coated with gold. The microstructure and element of samples will be measured by scanning electron microscope (SEM) (Quanta 200, Fei Company, Netherlands). At least three representative pictures at each magnification (160 \times) will be taken for per sample.

FTIR

The Fourier transforms infrared (FTIR) spectra for soybean protein hydrolysate will be recorded using 5DXC FTIR apparatus (Nicolet, USA) at room temperature according to method of (Hu, Li, Zhang, Kou, and Zhou, 2018). 2 mg of sample will be ground to get her with 200 mg KBr, and passed in to pellet. FTIR spectrum will be reported in cm^{-1} , and the range of data was recorded with in wave number of 4000–500 cm^{-1} .

Ultraviolet-visible (UV–vis) spectroscopy analysis

The aqueous solutions of deproteinized soybean protein hydrolysate (0.5 mg/mL) will be analyzed using a spectrophotometer (model UV-2100; Unico Scientific, Hong Kong), the UV–vis spectra will be read in wave range of 200–900 nm.

Crystallinity (X-ray diffraction)

Crystallinity of the soybean protein hydrolysate powder will be evaluated using an X-ray diffractometer (D2PHASER, Bruker AXS Co. Ltd., Karlsruhe, Germany) (Li, Wang, Chen, Yu, and Feng, 2018). The scanning region of the diffraction angle (2θ) ranged from 5° to 80° . X-ray diffraction patterns of samples will be analyzed using software (MDI Jade 6) and calculated as relative crystallinity (%) according to equation

Water activity (aw)

Water activity (aw) measurements were performed using a Lab Master-aw (Novasina, Switzerland) with an accuracy of 0.001 at 25°C . After the calibration, the soybean protein hydrolysate powders were placed in a sample chamber and kept until equilibrium was reached. Each sample was carried out at list three times.

Color measurement

Color of soybean protein hydrolysates will be measured using a colorimeter (Hunter Lab Ultra Scan PRO Spectrophotometer, Hunter Associates Laboratory, Inc., Virginia, USA). The instrument will be calibrated to standard white and black tiles before measurement. Approximately 4 g of soybean protein hydrolysate powder was placed in a transparent plastic bag, the color parameters [L^* (light\dark), a^* (red\green) and b^* (yellow\blue)] were determined in randomly three different surfaces of each sample (Waleed et al., 2019).

Functional properties

Protein Solubility

Protein solubility of soybean protein hydrolysate will be determined according to (Santhalakshmy, Bosco, Francis, and Sabeena, 2015). 0.5 g of sample powder will be mixed and transferred into 50 mL of distilled water, stirred using a magnetic stirrer (500 rpm for 30 min) at 25°C , then centrifuged at 5000 rpm for 5min. An aliquot of 25 mL of the supernatant was dried at 105°C . Solubility of the sample then will be calculated using equation:

Emulsifying properties

Emulsifying activity index (EAI) and the emulsion stability index(ESI) will be measured using the methods of (Nalinanon, Benjakul, Kishimura, and Shahidi, 2011) with slight modifications. Soybean protein hydrolysate solution 1% will be mixed with 10 mL of edible corn oil and homogenized at 20,000 rpm for 1 min. After the formation of the emulsion, 50 μL will be taken from the bottom and diluted with 5 mL of 0.1% sodium dodecylsulfate solution. The absorbance of the solutions was measured at 500 nm after 0 and 10 min by using UV 1000 spectrophotometer (Techcomp, China).

Water and oil holding capacity (WHC-OHC)

WHC and OHC was estimated by the centrifuge method according to the study of (Hughes, Cofrades, and Troy, 1997) with some modifications. Each PH (0.5 g) was dissolved into 10 mL dd-water or 10 mL soybean oil in a centrifuge tube and dispersed by vortex mixer (XW-80A, Zhejiang, China) for 60 s. The water and oil dispersion were allowed to stand for 7 h and 20 min, respectively,

at 25 °C and centrifuged (SCLOGEX-D3024R, Beijing, China) at 5000×g for 25 min at 4 °C. To get WHC the supernatant was filtered by using a filter paper (Whatman No. 1) and calculated by different weight, while the free oil was taken to obtain OHC from the weight difference.

Foaming capacity and foam stability

The foaming capacity (FC) and foam stability (FS) were estimated according to a modified method of Islam et al. (2021) with minor modifications. One-gram soybean powder was taken and dissolved in 100 ml distilled water and adjusted to pH 2 to 10 using either 0.1 N NaOH or HCl. The solutions were poured into a 250 mL volumetric cylinder and the foam was prepared by using a homogenizer (MORGE, MBL50, Shanghai, China) at 16,000 rpm for 2 min. The volume of foam was recorded directly after homogenization. On the other hand, FS was examined by measuring the fall in the volume of foam after every 2 min until 10 min. FC and FS were calculated according to the following equation.

Where, V_a is the before whipping Volume (mL) and V_b is the after whipping Volume (mL).

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Proposal-8

Improving a hands on learning preschool curriculum in terms of Montessori

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Background and significance

To raise a child properly is the big responsibility of parents and society. We undertake that the human ecological needs can be divided into five levels, i.e. physical, security, leisure, social interaction, and aesthetic. Our aim is to fully satisfy the needs of each level when designing a growing up curriculum. Research found that children learn best in safe and secure environment with caring and responsible adult. Most important part of a human life is childhood because most of their brain develop in the last trimester of pregnancy and the first two year of life or first 1000 days. Their brain grows 80% at age 3 and reaches 90% adult brain size at age 5. So every experience influences their future.

This research focus on individual needs to give children the best start of life. Montessori philosophy has a positive effect on physical space characteristics according to culture but has a universal characteristic and materials for better learning which is more spiritual and practical, it is more similar with Islamic parenting pattern. The environment of Montessori is follow minimal style like specious, open tidy and pleasing in appearance, simple and real place, where each element exists for a reason in order to help the development of the child. A safe learning/growing environment is not only focused on academic achievement but also fostering positive relationships between parents and children, and encouraging community connection. Montessori curriculum focused on freedom for children, provided with self-directed activity. Sense training, considered her school as the temple and the child as a God, her method was against collective method, stresses individual method of teaching.

She focused on learning through living: Practical exercises are provided to enable the children to learn to learn good habits like cleanliness, order, self-help and dignity of labor. In this study, a common pre-schooling curriculum is provided applying Montessori Education model. Children are natural learner, they learn to walk spontaneously, learn mother language, think control their movement, and learn basic life skills at about the same times in their development. Development of cognitive, emotional, social and physical builds a strong foundation during this year for the rest of the life. Learning is a continuous process which takes throughout life but in early childhood learning is taking place at a speed. In Bangladesh, education is mostly influence by Great Britain as the subcontinent was a British colony and Bangladesh was part of it. Primary education is compulsory until the end of grade eight and free by Government Pre-school are run by mostly by private sector and NGOs like BRAC and others, as well as by mosques, community organizations, and centres attached to elementary school. Now the National Curriculum and Textbook Board has developed a pre-elementary curriculum to homogenize preschool education.

Children enter elementary education at the age of six. According to 2010 education policy one year of preschool should be introduced at the age of five or younger. According to the World Bank, the change and other factors, the pre-elementary GER surged from 11 percent in 2009 to

40 percent in 2017. Core principles of curriculum development are

- Child centeredness
- Children as active learner
- Family involvement
- School as responsive social institute
- Inclusiveness Local culture and heritage
- Relationship
- Immediate environment
- Environment friendliness

Review of Literature

Montessori Method

The child is both a hope and promise for Mankind-Maria Montessori Our brains are sponges and we are born as blank states. Understand that genes aren't solely responsible for structuring our personalities. Every child is self-learner and learn from surroundings and experiences, they have the tools within themselves, to become the person they want to be, if they got the right environment. One of the main principle of Montessori Method is absorbent mind means children like a sponge they take whatever they socking up from surroundings. Absorb knowledge from environment and essentially teaching themselves. It gives an unparalleled success. However, she also discovered that there is adult created obstacle in the way of a child reaching his/her full potential. The Montessori approach is designed to support the natural development of children in a well-prepared environment so that it become very popular around the world with early childhood professionals and parents within a short time. Maria Montessori focused on five basic principles that represent fairly and accurately, that is why Montessori educators implement the method in many kinds of programs give the transformation of education across the globe. The goal of this method is to grow self-confidence and independence. From the Montessori own word, "A child learns to adjust himself and make acquisitions in his sensitive periods. These are like a beam that lights interiorly a battery that furnishes energy. It is this sensibility which enables a child to come into contact with the external world in a particularly intense manner. At such a time everything is easy; all is life and enthusiasm. Every effort marks an increase in power. Only when the goal has been obtained does fatigue and the weight of indifference come on. On the other hand, when the sensitive period has disappeared, intellectual victories are reported through reasoning processes, voluntary efforts, and the toil of research. And from the torpor of indifference is born the weariness of labor "Maria Montessori, *The Secret of Childhood*. One of the most important part in the sensitive period, a child burning finest interest to learn. Sensitive period is the developmental window of opportunities. At the age of six years' sensitive period and the absorbent mind is disappearing, and new way of learning takes it place. Montessori designated the child's beginning years on the basis of the unique capacity of the sensitive periods by the absorbent mind to aid the process. "She must conscientiously prepare an environment, placing educational materials about for some clear purpose and introducing the child with great care to practical work of life."

– Maria Montessori, *The child in the family*. (childhavenmontessori.com, 2002) Montessori observe that children like learning about the real world such as a butterfly emerging from a chrysalis, or the parts of a plant more than listening to fairy tales. Normally fantasy, the product of adult imagination like ghosts, insects are used to terrify children and play are used a means of control but this is

wrong way to raise a child. Background of Montessori was psychiatry, she said living in a fantasy world disconnected from reality as a symptom of illness, losing the creativity or imaginations. Young child is the source of novelty and wonder beyond all others. Montessori observed that toddlers are highly motivated to become independent and try to do things for themselves follow the elders. They eagerly respond to the chance to practice and master life skills. When a toddler wants to do something as an adult, they should be welcome and allow the child with child size equipment.

Child's needs should be on their reach. So the furniture of their belongings should be proportional to children's height and size, and it has low shelves and tables and chairs of their sizes at home. The surroundings encourage the child's independence in the discovering and education process by The Prepared Environment. Independence and self-control make possible that each child finds activities that re-join to their evolutionary needs. Montessori believed that children develop to be a man in changing of stages that has its own characteristics and unique qualities. A Montessori school provides materials, time, and the freedom to explore. It is possible to give child these experiences at home, also.

Principal of Montessori Method

Respect for the Child (freedom of liberty)

Respect the child means treat them as an adult, respect their opinion, their request and practical wish. Respect their play, play is the work of children, without interrupting their concentration. Teachers model respect for all students as well as peaceful conflict resolution, and must learn to observe without judgment. (Devis, February 2019)

The Absorbent Mind (Sense training)

Montessori education is based on the principle of minimal living; children are constantly learning from the world around them. Their brains function differently than any other time of life. (Bowman, 2013) Montessori suggested that when a child is focused on repeating an activity, she is doing the inner work of creating fundamental brain structures that she will use for life. Young children absorb their environment into themselves until they are a fully participating part of it. (Bowman, 2013)

Sensitive Periods (individual Development)

Montessori believes there are certain periods during which children are more ready to learn certain skills. These are known as sensitive periods, and last only as long as is necessary for the child to acquire the skills (Devis, 2019). She identified a number of Sensitive Periods in young children, for such things as: order, language, numbers, small objects, motor skills, spatial relationships, writing, and more (Bowman, 2013).

The Prepared Environment

The learning environment should encourage liberty for children to explore materials of their choice. Teachers should prepare the learning environment by making materials and experiences available to children in an orderly and independent way. (Devis, February 2019)

Auto education (Self education and Auto-education)

Auto education, or self-education, is the concept that children are capable of educating themselves (Devis, February 2019)

Aims and Research questions

Traditional education is followed in kindergarten the Froebel Method by While Froebel is teacher oriented whereas the Montessori is student oriented. Froebel said: "Let us live with our children, play with them, direct them into this manifold life of the universe." Madame Montessori says: "Let the child live, free to develop all his powers; let him create his own world." (ELLEN YALE STEVENS)

Conventional teaching process is hypothetical whereas the Montessori Method is more practical different from conventional approaches to teaching and learning. The student is in charge of their own learning, supported by the adult and the environment. In traditional education, the teacher generally stands in front of the students in a classroom leading them, directing them. Student's desire to learn is not important in the usual teaching method which is also a one-size-fits-all approach. A teacher table and chair and opposite direction some table and benches for a large amount of students. In Montessori method, a typical classroom is known as prepared environment is large and open, with many open selves carefully organized with learning materials. Children free to move around the room, selecting desired material to work and return materials to their proper place when finished. Students can work alone or jointly. They learn happily with playful way. In conventional method lessons are given as per teacher desire whereas in Montessori Method lessons are given when children are developmentally ready for new concepts, a judgment that the teacher must make a careful and continuous observation. Practical material but in child sized brooms and mops—are most common element in Montessori classroom, respect the learning environment and other students is a hallmark of Montessori education. In the conventional learning process this is totally absent. Maria Montessori described the process this way in 1909: There are forty little beings—from three to seven years old, each one intent on his own work. One is going through the exercises for the senses; one is doing an arithmetical exercise; one is handling the letters, one is drawing, one is fastening and unfastening the pieces of cloth on one of our little wooden frames, still another is dusting. Some are seated at tables, some on rugs on the floor. There are muffled sounds of objects lightly moved about, of children tiptoeing. Once in a while comes a cry of joy only partly repressed, "Teacher! Teacher!" and eager call, "Look! See what I've done." But as a rule there is entire absorption in the work in hand. The teacher moves quietly about, goes to any child who calls her, supervising operations in such a way that anyone who needs her finds her at his elbow, and whoever does not need her is not reminded of her existence. The teacher decides that everyone is prepared to learn, for example, the letter on the same day. Montessori education is the learning to lead a life. In her writing, Dr. Montessori reiterates that the objective of Montessori teaching is not to fill a child with facts, but to cultivate their own natural desire to learn. The goal of early childhood education should be to activate the children own natural desire to learn." - Maria Montessori. In Montessori education there is a dynamic relationship between the child, the adult, and the learning environment. The child is in charge of their own learning, supported by the adult and the environment. "An education capable of saving humanity is no small undertaking; it involves the spiritual development of man, the enhancement of his value as an individual, and the preparation of young people to understand the times in which they live."-Dr. Maria Montessori

Figure 7 Tradition education vs. Montessori education. In the diagram of Montessori education above, the arrows are pointing in both directions. The environment and child interact with each other. The environment attracts the child and the child learns from the materials in the environment. The adult and environment are also affecting each other. The adult prepares the environment, observes, and makes adjustments where necessary to meet the child's

needs. And the adult and child have a dynamic relationship, based on mutual respect for each other. The adult will observe the child and step in to give only as much assistance as necessary before stepping out of the way for the child to continue their self-mastery. Montessori principles do not just apply in the classroom—they inform the way we are with our children in the home. It supports our children to make discoveries for themselves, it gives them freedom and limits, and it enable success by setting up our homes so they can take part in our daily lives.

Research Design and Method

To find out a better child-friendly interior space which also ensure safety and security in a house followed by Montessori. It is predictable that children need and perception is different from adults, but apartments are designed for adults by the adults. Parent's participation in this research can bring more benefits and efficient utilization of interior space in home interior space setup. The overall objective of this research is give a direction, guideline and policies to setup a home child friendly. The findings of this paper are based on a questionnaire survey of user parents' and interviewed parents on prerecorded questionnaire. Sub components of the study will form by findings and the generated model, determined by conceptual Analysis of conceptual components influencing physical space, which is defended to be realized in home interior space set up. Based on this awareness, findings, purpose, scope and content of the conducted study has been covered in this section. In total 25 parents are interviewed in RDA Campus. Among them 5 persons are father and rest of them are mother. Only 4% are aged under 30 and their children ages between 0 to 6 years.

Implication and Contribution of Knowledge

This research will find a model for low cost Montessori equipment, that's will help for RDA day care centre as well as Bangladesh will get good practice knowledge of pre-schooling syllabus.

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Proposal-9

Rural household livelihood improvement through seedlings plantation: implications for poverty free model village

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Background of the Study

Bangladesh is an agricultural country where a majority of the population is primarily employed in agriculture (Alam *et al.*, 2009). Among the total lands, 70 percent are dedicated to growing crops. Agriculture is the largest employment sector in Bangladesh, making up 14.2 percent of Bangladesh's GDP in 2017 and employing about 42.7 percent of the workforce. The performance of this sector has an overwhelming impact on major macroeconomic objectives like employment generation, poverty alleviation, human resources development, food security, and other economic and social forces. A total number of 48.4% populations are employed in agriculture. Major crops cultivated include rice, jute, wheat, tea, pulses, oil-seeds, vegetables, and fruits (Hyder, *et al.*, 2014).

Bangladesh has made remarkable progress in poverty reduction, supported by sustained economic growth. It has been among the fastest-growing economies in the world over the past decade. As a result, Bangladesh reached a lower-middle-income status in 2015 and is on track to graduate from the UN's Least Developed Countries (LDC) list in 2026. Poverty declined from 44 percent in 1991 to 15 percent in 2016, based on the international poverty line of \$1.90 a day (using the 2011 Purchasing Power Parity exchange rate) (World Bank, 2019). Moreover, human development outcomes improved along many dimensions. Based on the international poverty line of \$1.90 per person per day, poverty declined from 44.2 percent in 1991 to 13.8 percent in 2016/17 (Rahman and Sakib, 2021). In parallel, life expectancy, literacy rates, and per capita food production have increased significantly. In Bangladesh, the population living below the national poverty line dropped to 20.5% in 2019 from 24.3% in 2016. In connection with the Government poverty reduction strategy, Rural Development Academy (RDA), Bogura also working as a national contributor in poverty reduction. It works for a zero poverty model village in three selected village areas of Bangladesh.

Justification of the Study

Agriculture contributing to a large percentage of Bangladesh's overall economy has remained largely subsistence-based, with uncertain crop yields and inefficient infrastructure limiting the ability of farmers to fully commercialize their products. Besides the crop sector, vegetable cultivation at the household level might be a good option for poverty reduction. Vegetable production provides a promising economic opportunity for reducing rural poverty and unemployment in developing countries and is a key component of farm diversification strategies. Vegetables are mankind's most affordable source of vitamins and minerals needed for good health. On the other hand, tree plantation to fallow land and homestead areas creates an extra opportunity to earn money by the villagers. Trees help in several ways likely reduces erosion and pollution in our waterways and may reduce the effects of flooding. Besides habitat conservation trees provide food, protection, and homes for many birds and mammals. With all kinds of positive effects, trees are finally the largest source of income generation to villagers.

Objectives of the study

1. To determine the extent of livelihood improvement by providing seedlings and saplings to rural villagers
2. To describe the socio economic conditions of the target respondents
3. To explore relationships between seedlings plantation and livelihood improvement.

Review of Literature

Effective tree plantation management may increase farmers' incomes and contribute to poverty alleviation. Widespread plantations of seedlings increase household income from wood and biofuel production (Paquette and Messier, 2010; Schoneveld *et al.*, 2011). However, monocultures with a single objective but polyculture has the potential to fulfill a variety of objectives (Paquette and Messier, 2010), such as increased income, reduced vulnerability to volatile global markets for forestry products (Ahrendset *al.*, 2015), better-regulating services and nature conservation (Zhenget *al.*, 2019).

Polycultures of fruit and vegetable seedlings could be designed to accomplish diverse and context-specific goals. Intercropping with vegetables or legumes, forest farming for mushrooms, medicinal herbs, floral greenery are all being integrated into mixed tree plantation systems (Bishaw, 2013). The shortage of land can hamper long-term income generation for farming communities (Coomes *et al.*, 2011), but appropriate land reallocation and full use of current land resources might be helpful to alleviate poverty (Zhou *et al.*, 2019). Plantations can contribute to economic growth and rural livelihoods (Obidzinski *et al.*, 2012; Phimmavong and Keenan, 2020). However, the plantation of single trees or monocultures often generates environmental problems, including air and water pollution, soil erosion, waterway siltation, flooding, and biodiversity loss (Obidzinski *et al.*, 2012) which indicates us to mixed fruit and vegetable gardening.

Conceptual Framework

To better understand the relationships between rural household livelihood and plantation dependence livelihood approach will be considered as conceptual framework of the research study. Chambers and Conway (1992) proposed a popular definition of livelihoods as “the capability, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and choices, maintain or enhance its capabilities and assets, while not undermining the natural resource base”. Subsequent studies identified five main categories of capital (natural, physical, human, financial and social), which are useful in understanding rural livelihoods (Ellis, 2000). The framework will highlight the role of tree/vegetables plantations, an important form of natural capital interacting with other forms to shape household livelihoods.

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Proposal-10

Impacts of COVID-19 pandemic on the aquaculture supply chains in Bangladesh

Dr. Md. Nurul Amin, Director

Introduction

Bangladesh is blessed with different types of waterbodies including inland, marine and fresh-water resources which are very much suitable for growing fish and other aquatic organisms having economic importance. It is one of the world's leading fish producing countries with a total production of 43.84 lakh MT in FY 2018-19, where aquaculture accounts for 56.76 percent of the total fish production (DoF, 2020). Fish is one of the major sources of animal protein to the people of Bangladesh. Fish is the primary protein source in Bangladeshi diet contributing about 60% of total animal protein. Per capita per day fish consumption in 2017 has been estimated at 22.84 kg and is expected to remain growing in the medium to long term (BBS, 2017). Aquaculture is one of the most vibrant sectors in the Bangladesh economy. Bangladesh has ranked 3rd in the world in inland fish production, 5th in aquaculture production and 11th in marine fish production in 2018 (FAO, 2018).

As the production from open water fisheries has become almost static during the last several years, the necessity of improving the aquaculture production has seriously been felt by the concern. Considering the requirement for boosting up aquaculture production to meet the growing demand for fish, intensification in aquaculture system being taken place. Aquaculture activities in the country have already been expanded in different forms including inputs business, aquaculture production, and processing, marketing, transportation and so on. The entire fisheries sector supports the livelihoods of people more than 18 million in the country directly and indirectly (FRSS, 2017). About 1.4 million women depend on the fisheries sector for their livelihoods through fishing, farming, fish handling and processing (BFTI, 2016).

In the country, lockdown and restriction on movement has been continuing for almost one and half year starting from late March, 2020 due to COVID-19 pandemic worldwide. As a result, all the value chain and supply chain activities in aquaculture sector including inputs business, fish seed production in the hatcheries, fish production in grow out ponds, transportation, processing, marketing etc. has been interrupted. It cannot be expected that this situation would be changed within a very short time. If the situation continues for more long time some value addition activities and some stages of aquaculture supply chains might be destroyed due to which a huge number of people engaged in this sector will be unemployed. Besides, due to marketing problems fish consumption by the people will be reduced. Considering the above facts, the present study has been proposed to conduct a quick survey to find out the exact stages of value chain and supply chain of aquaculture industries which are being affected due to lockdown and movement restriction during COVID-19 situation in the country. The extent of effects and suggested measures for overcoming the problems will also be recorded in the proposed study. The findings will be instrumental to the

government and non-government agencies working in this sector to take proper and immediate measures to address the problems and to keep the aquaculture sector vibrant.

Objective of the study

The main objective of the study is to document the impacts of lockdown and movement restriction during COVID-19 situation on aquaculture sector in Bangladesh. The specific objectives of the study are as follows:

1. To visualize the present aquaculture supply chain.
2. To point out the stages of supply chain of aquaculture industries which are being affected due to lockdown and movement restriction during COVID-19 situation in the country.
3. To measure extend of effects of lockdown and movement restriction.
4. To record the suggested measures of different stakeholders of aquaculture supply chains for overcoming the problems of this sector.

Methodology of the study

Study Area

The proposed study will only cover the inland aquaculture systems due to high infection rate of Corona virus at present in different parts of the country. In Bangladesh major inland aquaculture activities are mostly concentrated in some districts namely, Rajshahi, Natore, Bogura, Kumilla, Mymensingh and Jeshore. For quick completion of the study, data will be collected from Rajshahi, Bogura, Mymensingh and Kumilla areas. In addition, Dhaka city will also be taken in the study as a considerable share of fish comes from aquaculture are transported, marketed and consumed here

Respondents of the Study

All types of stakeholders involved in different functions of aquaculture value addition and supply chains will be the respondents of the study. Selection of respondents from different stakeholders' group will be as follows:

Table 4.2. Respondents of the study.

Sl. No.	Types of stakeholders	Selected no. of respondents from each district	Total no. of respondents
1.	Input dealers/ sellers	05	20
2.	Hatchery owners	05	20
3.	Fish nursery owners	05	20
4.	Market size fish growers	05	20
5.	Whole sellers	05	20
6.	Aratder/ commission agents	05	20
7.	Retailers	05	20
8.	Consumers	05	20
9.	Transporters	05	20
	Total		180

In addition to the above respondents, information will be collected from three whole sale markets in Dhaka city namely Uttara, Mirpur and Jatrabari, three chain shops namely Shopna, Agora and KrishibidBazar and three retail markets.

Data collection method

Data will be collected through physical interview or mobile call to the respondents using non-structured questionnaires. In addition, a guide line will also be used to collect information from some stakeholders.

Proposal-11

Socio-economic improvement of rural poor women through indigenous chicken rearing

Dr. Sultana Faizun Nahar, Assistant Director
Md. Delwar Hossain, Joint Director
Dr. Shaikh Mehdee Mohammad, Director

Introduction

Bangladesh is a densely populated developing country but despite occupying the status of developing country, many people in this country are still living below the poverty line. The problem of poverty and unemployment is evident here. As a developing country, unemployment, inadequate nutrition and poverty, scarcity of arable land are the major problems in Bangladesh. In Bangladesh, the population living below the national poverty line dropped to 20.5% in 2019 (BBS, 2019). In order to improve the backward people of the country, various government and non-government departments and organizations have been undertaking various developmental activities at different times. Besides, most of the backward people are women. As a result, these women are socially and economically deprived in the family and society. In order to overall development of a country, it is necessary for men as well as women to participate in various resource development activities such as vegetable and fish farming, poultry rearing etc. to improve the social and economic condition.

The economy of Bangladesh is mostly depending on agriculture. Poultry is a part of agricultural farming system in Bangladesh. The poultry sector has emerged as a flourishing and promising commercial sector in Bangladesh during the recent years. Even though raising poultry birds is mostly a subsistence practice in Bangladesh. The contribution of poultry production is vital to the national economy in case of generating employment opportunity, additional income for households and improving the nutritional level of the people and generating income. In addition, for good health, each person needs 120 grams of meat per day, which we can successfully meet by raising domestic chickens at home. Smallholder poultry as a tool for poverty alleviation has been developed and widely applied in Bangladesh. About 3.47 percent of GDP came from animal farming during the 2018/19 financial year (DLS 2020). It is recognized as a profitable business by many people and getting popularity day by day as employment opportunity is being created among people. Reviewing the economic progress of the developed countries, it is seen that the transition from an agro-based economy to an industrial and service-dependent economy has significantly increased the annual growth rate of some sub-sectors of the agricultural sector, which is accelerating the overall economic development. Similarly, analyzing the economic progress of Bangladesh, it is seen that the poultry sector is developing as one of the sub-sectors of agriculture, which will contribute significantly to the country's economic growth / progress on the one hand and improve the socio-economic status of women on the other.

According to the data of National Poultry Policy 2008, the ratio of commercial and rural poultry in egg

production in the country is almost equal and the ratio in meat production is 60:40. As poultry industry is less capital dependent and labor intensive, this industry is considered as one of the means of alleviating poverty in the country along with creating employment opportunities. Socially we are having male dominating family system; obviously all income from agro produce is in hands of male farmer. It is observed that there is always shortage of money in the hands of rural farm women. Women are primarily responsible for the care and management of the bird under backyard poultry systems (Deka *et al.*, 2014). May be it is the only resource which is completely owned and controlled by women from the moment of selection of the bird to sales/purchase and control over the income earned from the birds (Ramdas, 2009 and Anthra, 2000). Besides, rural women can raise poultry in the traditional system without any investment. It will be possible to increase the income of the family by keeping domestic chickens in a small scale commercially. However, poultry reared in this manner, especially domestic chickens, cannot produce enough eggs and meat for the growing population. Most of the backward rural women are illiterate and do not have the mental capacity to adopt new technologies considering their social and economic status. There are various problems in rearing indigenous chickens in the traditional way, especially the infant mortality rate is high, the body weight gain is very slow and there is uncertainty and more time in marketing. Poultry production in scavenging system is facing various problems including housing, feeding, diseases, lack of knowledge of rural farmers regarding quality of feed, disease prevention and control techniques (Billah *et al.*, 2013). By providing better management (artificial brooding, balanced granulation, regular vaccination and deworming, it is possible to reduce the mortality rate of chickens (about 50%) as compared to the past and it is possible to bring the average weight of chickens to the desired level and market them in a short time.

In this context, the socio economic status of the indigenous chicken women rearer is very much essential for the policy makers to develop an effective programme. Hence an effort has been made in the present study to collect information regarding socioeconomic status of indigenous chicken rearer and their farming systems and income generation through supplying indigenous chicken with improved management system.

Objectives of the study

1. To explore the previous socio-economic status of rural women rearing domestic chickens in the traditional system in the selected three villages
2. To provide inputs to the rural women of the selected villages for rearing domestic chickens with modern technologies.
3. To improve the socio-economic status of targeted women by rearing indigenous chickens with modern technologies through involving in income generating activities

Materials and methods

Location of the study

Three villages namely Char Polisha, Rotia and Kalshimati of three districts Jamalpur, Rangpur and Bogura respectively will be select for the study purpose.

Selection of the target group and sample size

The target group will be the poor women of the village who are deprived from opportunities and rear indigenous chicken at traditional system. A total 150 women will be selected from three villages each containing 50.

Data collection procedure

A baseline survey will be conducted in the selected area to know the demography of the poor women and explore the livelihood status of the women. After completing the baseline survey, a second survey will be conducted to see the livelihood improvement of the women through a semi-structured questionnaire and Focus Group Discussion (FGD).

Input support

Each targeted women will be provided 30 indigenous chicken of one month old and total 4500 chicks will be provided among 150 women. The day old chick will be collected from RDA poultry hatchery and will rear upto one month of age at RDA poultry farm. From day zero to thirty all the chicks will be reared with improved modern system (Artificial brooding, balanced feeding, regular vaccination – Ranikhet vaccine at day seven and twenty first and Gumboro vaccine at day ten and day eighteen). The chicks will provide adequate amount of feed and drinking water at 24 hours. Improved technology will also offer by training and farmer field school to the targeted women of the selected area.

Processing and analysis of data

All the collected data will be accumulated, analyzed, and presented in tabular or graphical forms to understand the scenario of livelihood status specially socio economic status of the rural women before and after giving input.

Expected outcome

After finishing the study, the input and logistic support to the poor women can enhance their income generating activities also can contribute to the household income and include more meat and egg in their diet including improvement of their socio economic status that leads toward poverty-free model village.

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Proposal-12

Sustainable community based goat farming for livelihood improvement

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Muhammod Riazul Islam, Protocol Officer
Dr. Samir Kumar Sarker, Director
Dr. Md. Abdul Majid Pramanik, Joint Director

Background of the study

Goat is the natural resource of Bangladesh (Chowdhury, 2002) which is economically important for promising animal resources in the developing countries especially in Asia and Africa (Hussain, 1999). The contribution of livestock in the gross domestic product (GDP) of Bangladesh is about 1.43% and to agricultural GDP is 19.90% and the annual growth is 3.04%. The livestock sector directly employs 20% and indirectly employs 50%. It creates year-round employment opportunities for 60-70% of the rural population (DLS, 2020).

For the rural poor and land less specially women (Chowdhury, 2002) it is an important source of income with little capital investment (FAO, 1991) even without specific arrangement of housing. In Bangladesh, goats reared are mostly Black Bengal reputed for its prolificacy, fertility, early sexual maturity, and adaptability to hot-humid environment. There are some Jamunapari and other cross breeds available in the country. Usually, goat graze on barren and road-side land with grass and least homemade supplies such as rice gruel, boiled rice, vegetables peels etc. In addition, goats fed on jackfruit leaves, which often are available in most of the rearing areas.

However, the higher demands for meat and especially for skin in the local as well as foreign markets focused the goat enterprise extremely prominent to the vulnerable group of people and the existing socio-economic condition of the country. Moreover, goat also have important role in generating employment, income, capital storage and improving household nutrition (Devendra, 1992; Hussain, 1999). Considering the possibilities, a participatory approach a small-scale subsistent family enterprise has been promoted by the government and various non-government organizations with the credit and input support since 1980's in this country (Islam et al. 1992; DLS 1998; Fattah, 1999; Das, 2004). It has been anticipated that over the next decade, there will be a massive increase in the demand for food of animal origin (100 million tons of meat and 201 million tons of milk), as a result of global population growth, an extra 2.5 billion people to feed by 2020 (DFID, 2000). The normal requirement of animal protein for a man is about 62.5 per day, while people of our country get only 6.90 meats per day (Jabber, 1985). So, the importance of goat is strongly emphasized for their versatile production profile and valuable contribution like meat, milk, industrial raw product such as skin, fiber and manure.

In developing countries, goat is being reared predominantly by smallholders under traditional husbandry practices including lack of backward linkages such as breeding technique (use of quality buck), feeds and fodder, housing, management, extension support, vaccination, medication. There are also lack of forward linkages in output sector like access to market, marketing facilities (temporary holding, transportation etc.), value addition, access to byproduct and export market. Also, livestock rearing is a high input oriented, labor intensive and long-term program and remains a challenge for developing countries due to lack of resource personnel, supportive infrastructure and institutional arrangements. But, without or minimal involvement of farmers' participation in

the design and implementation of the technical support have been found unsuccessful in most cases under smallholder livestock production (Wurzinger et al., 2011).

The centralized technical support operated by government intuitional farms and research stations have potential contribution for livestock improvement using open or closed nucleus herds/flocks which have potential impacts on station-based performance. However, they don't coup up satisfactorily to the community level due to lack of animal's adaptation ability. The bridging gap between farmer's perception and researcher's interest is one of major hindrance for successful implementation of technical program. It is noteworthy to mention that the top-down manner technical program mostly collapses once withdrawal of financial and technological support or changes in government priorities (Nimbkar et al., 2008; Kristjanson et al., 2009). Within this context, the sustainability of any technical program largely depends on farmer's interest and willingness to do work according to planned objectives. The community-based goat rearing program (CBGRP) will be more viable and sustainable for goat farming improvement of livestock to rural livelihood improvement (Philipsson et al., 2006; Wurzinger et al., 2011).

The concept of community-based technical program is not new, formally used as a tool in agricultural research since 1970 (Omoro et al., 2008). CBGRP are based on bottom-up participatory approaches and typically relate with the farmers of low-input production systems within the certain geographical areas those having a common interest to work together for the improvement of their production performance (ICAR-FAO, 2000; Mueller et al., 2015).

Objective of the study

The overall objective of this study is to establish community-based goat rearing through ensuring technical support and market linkage which will increase livestock production and enhance livelihood improvement that can be replicated to the neighboring or other region of the country.

The specific objectives of this study are:

1. To determine the technological support and market linkage for ensuring community-based goat farming
2. To establish a nuclear herd of goat at RDA demonstration farm to produce best quality kids
3. To analyze strength, weakness, opportunity, and threats of community-based goat farming

Materials and Methods

Experimental Sites

The experiment will be conducted at demonstration farm of RDA, Bogura and Kalsimati village of Sherpur Upazila for a period of two years starting from November 2021.

Data collection tools

To address the various objectives of the study primary data will be collected for technological support and market linkage by the following tools:

Baseline survey: A baseline survey will be conducted with structured questionnaires where a total of fifty poor rural goat rearing farmers will be interviewed and data will be collected using a well-structured and pretested interview schedule by covering all the dimensions of involvement of management and health care *i.e.* housing, feeding, breeding, health care, marketing of goat and income from them.

Focus Group Discussion (FGD): The focus group discussion (FGD) will be conducted among

the farmers, private service provider, middlemen, butchers, traders, and other stakeholders to address the constrain and prospects of community-based goat farming.

Beneficiary Selection

The 20 rural poor farmers will be selected randomly from Kalsimati village of Sherpur Upazila where RDA is implementing Action research on “Poverty free Model Village” and each beneficiary will be provided with two goats (one male and one female).

Study Animals

Eighty goats of local origin will be purchased from local market and 20 purebreds will be purchased from the local importer. Out of 80 goats 40 for the beneficiaries and 40 for the RDA nucleus flock and other 20 goats will be reared for semen production and breed improvement. The animals will be kept under hygienic conditions and uniform management throughout the experimental period. Each animal will be vaccinated against Pestedes-petits-ruminant (PPR) disease and de-wormed with anthelmintics two weeks after purchase.

Animal Housing and diet

The experimental low-cost goat house (100 capacity) will be constructed at RDA demonstration. and Kalsimati village where the beneficiary’s goat will be reared with improve technologies. All the animals will be provided diet on an adlibitum basis.

Methodology

There are 20 poor rural farmers will be selected randomly from Kalsimati village of Sherpur Upazila and each beneficiary will be provided with two goats (one male and one female) of 5-6 months of age for their livelihood improvement. Rural Development Academy (RDA), Bogura will provide training to beneficiaries and field monitor on improve goat rearing, technological support (housing, feeding, hydroponic fodder, silage, vaccination, deworming, treatment etc.) and market linkage.

Even though for supplying of quality male and female kids to the farmers of Poverty free model village of RDA a nucleus flock of goat will be established and maintain for semen production, breed improvement as the selection of superior kid on basis of weight gain and dam milk production. The poor rural people will rear goat through better management for more profit and during selling period their superior characteristics species will be selected for nucleus flock of RDA to maintain superior quality.

A low-cost model goat house for demonstration will be constructed at study village and RDA on station. Here, a field monitor, who maintain liaison between RDA and beneficiaries for providing necessary technological services and market linkage will be benefited after ensuring services to the farmers. The project beneficiaries will rear two kids after getting from RDA up to next 4-5 months, if the female kids become pregnant then they will continue rearing but if not, pregnant they will sale both male and female together to the market. After that they will buy new kids from profit and rest amount will pay for their livelihood improvement. All the data related to management, production, reproduction will be recorded and will be analyzed with STATA V-14.

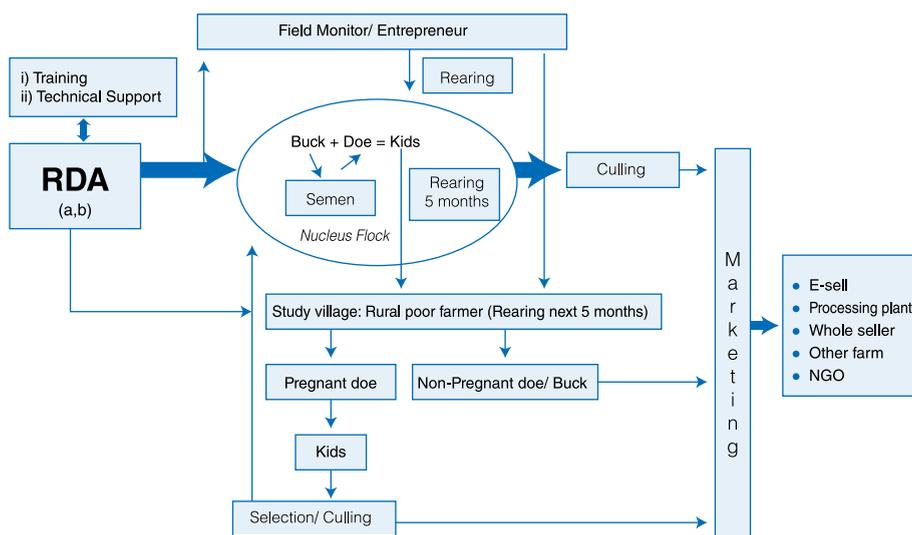


Figure 4.3. Methodological framework of community-based goat farming

Expected outcome

The expected outcomes of the proposed study will be as follows:

- The capacity of the rural poor farmers will develop for goat rearing
- The low-cost model goat house will be constructed both at RDA and study village
- Better management and technological support will reduce mortality, and increase productivity
- Ensure proper vaccination and deworming and reduce disease outbreak
- Community-based goat farming will reduce input cost, save management time and increase market linkage
- Farmers will get more profit and livelihood improvement

Proposal-13

Production performance of hydroponic fodder and its benefits at RDA demonstration farm

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Background and problem statement of the study

In Bangladesh, livestock plays an important role for the nutritional security, particularly of the small and marginal farmers. The livestock population of the country is 412.24 million including 24.3 million (5.89%) cattle, 1.4 million (.33 %) buffaloes, 3.6 million (.87 %) sheep and 26.4million (6.40 %) goats. The increase in the livestock population along with the intensive rearing system has resulted in the increase demands for feeds and fodder in the country. The feed scarcity has been the main limiting factor in improving the livestock productivity (Brithal and Jha, 2005; Khan

et al. 2009; Khandaker et al., 2012). The arable land allocation for cultivation of green fodder is limited to only 5% of the gross cropped area; but by 2050 Bangladesh would require double amount of protein where dairy and livestock can provide the high quality animal protein. This would require triple amount of green grass than currently producing. Since the green grass production is increasing but it is still in the primary stage which would require research on the production of the greenfodder without land.

The productive and reproductive performance of the livestock is adversely affected due to the unavailability of good quality green fodder and limited knowledge on providing the balanced ration. Apart from this, the unavailability of land, higher labour requirement for cultivation (sowing, earthing up, weeding, harvesting etc.), increasing wage rate, more growth time, non-availability of same quality round the year, requirement of manure and fertilizer; the uncertain rain fall, water scarcity and natural calamities due to climate change are the major constraints for green fodder production by the livestock farmers.

Against those constraints, hydroponic fodder production might play pivotal role in meeting the scarcity of the green fodder. Allowing dairy and other livestock species Due to the above constraints of the conventional method of fodder cultivation, hydroponics technology is coming up as an alternative to grow fodder for farm animals (Naik et al., 2011; Naik, 2012; Naik et al., 2013a). Further, hydroponics technology for fodder production will be very effective for rearing small ruminants (sheep and goats) as these animals have lesser dry matter requirement and are being shifted from extensive to intensive rearing system.

Hydroponics technology for fodder production

The word hydroponics has been derived from the Greek word 'water working'. Hydro means 'water' and ponics means 'working' and it is a technology of sprouting grains or growing plants without soil, but only with water or nutrient rich solution. However, hydroponics fodder can be well produced with the use of fresh water only and the use of nutrient rich solution is not obligatory. The added expenses of the nutrient solution also do not justify its use rather than the fresh water, unless there is significant improvement in the feeding value of the hydroponics fodder due to the use of the nutrient solution. The metabolism of the nutrient reserves of the seeds is enough to fuels the growth of the fodder plant for a short duration. The water used for sprouting of grains should be clean and free from chemical agents as the major source of microbial contamination is water. Fodder crops produced by hydroponics technology are also known as hydroponics fodder, sprouted fodder or sprouted grain. Sprouting of the grains is made inside a greenhouse within a short period of approximately seven days. A greenhouse is a framed or inflated structure covered with a transparent or translucent material in which the crops could be grown under the conditions at least partially controlled environment and which is large enough to permit a person to work within it to carry out cultural operations (Chandra and Gupta, 2003).

Earlier, it was perceived that hydroponics fodder can only be grown in hi-tech greenhouse, which is very much costly. but hydroponics is now being used across many countries to take pressure off the land, shortage of water, erratic rainfall and frequent draught grow green feed for livestock, poultry and carp raised for agriculture. Hydroponics fodder cultivation is very easy and simple science of growing fodder crops in less time, water and input cost. The hydroponic green fodder produced from this innovative system has a high nutritional potential and value. These feeds are suitable for use at all types and categories of animals - cows, sheep, goats, pigs, horses, rabbits, fish - and birds [13].

Besides, there is no need of costly soil preparation for fodder production, constant weed removal, fencing etc. Besides, there is no need of fuel for harvesting and post harvesting processes and no damage from insects or roaming animals, etc. leading to low maintenance requirement [14]. Even though the cost of production may vary with the production capacity of the machine and various fixed and variable expenditures incurred in the production of hydroponics fodder, a lot of advantages are also associated with hydroponics green fodder as it is a viable alternative technology for the farmers having no grazing lands, lack of irrigation facilities and water scarcity. In Bangladesh, limited research has been done on production performance of hydroponic fodder at farmer level.

Objective of the study

The overall objective of the project is to evaluate the production process and its affect on increasing nutritional value with economic way. The specific objectives are:

1. To determine the production performance of hydroponic fodder at on-station and on-farm level
2. To estimate the cost and profit of the hydroponic fodder production

Materials and Methods

Materials

Maize seed , Tap water , Hydroponic tray , Water irrigation system, Hydroponics irrigation system, tap water with switch ,timer, ,supply of light, rack, hydroponics tray which having specialized constructed on the bass to production of fodder with two end there is outlet pore through which excess water go out the hydroponics tray size will be 1.5X1 ft .In each tray near about 1 kg of seed should filled .The well mature healthy clean seed select for the cultivation of hydroponics fodder. In this research maize and wheat will be used for fodder production due to the seed availability at local level and biomass more compare to other fodder.

Methods

Hydroponics fodder production have very simple and convenient techniques that will sprouting and developed into seedling and from that hydroponic fodder will be produced We include different methods steps. All material is gathered then first prepare

Hydroponics system with help of rack, hydroponics tray, tank of distilled water, irrigation system with fogger arrangement, timer which allow to start irrigation every two hours. Then we will be select seed which should healthy and undamaged .Seed should sold from the market . Then sorting of healthy seed then it soaked in tap water 24 hours and 12 fours for maize and wheat respectively, then placed in the gunny bags for the sprouting those seed are sprouted that are transferred to hydroponics tray and water irrigation start with proper interval time by fogger the watering should give 7-10 days then our hydroponics fodder will be ready for feeding for livestock. .

Procedure

The steps involved in the hydroponic fodder production are stated as below:

- Setting Hydroponics System
- Selection of Seed
- Soaking Seed
- Sprouting
- Hydroponics fodder production

Expected outcomes

The expected outcomes of the proposed study will be as follows:

- The improved management and production technology will be known
- The use of the hydroponic fodder at on-station and on-farm level along with their usage-level will be known
- The cost of hydroponic fodder production will be known

It is also anticipated to link the output with the on-going PhD research collaboration of the RDA and the Department of Animal Nutrition, Bangladesh Agricultural University.

Proposal-14

In COVID-19 pandemic situation the Role of ICT in the education system in Bangladesh (A case study in the northern part in Bangladesh)

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Andalib Mahejabin, Deputy Director

Bangladesh has a large education system with 38.6 million students: 3.6 million in pre-primary; 18 million in the primary; 13 million in secondary and 4 million in tertiary education³. According to the 2018 Bangladesh Education Statistics, there are 0.17 million primary-to- tertiary educational institutions including 0.13 million primary education institutions. Around 75.2 percent are enrolled in government primary schools among primary level students, and only 48.9 percent of primary schools are government schools. Economic growth in the country is strongly related to ensuring good educational achievement, learning outcomes and skill development.

When Bangladesh identified the first case of COVID-19 on March 08, 2020. In the first week of April 2020, the outbreak began spreading rapidly. Bangladesh has detected 12,425 confirmed cases as of May 07, 2020, and 199 deaths². Several steps have been taken by the government to restrict transmission. The country has been facing a national shutdown (with the exception of emergency services) and restrictions on public transport since 26 March 2020, extended until 15 May 2020.

As the situation remains unpredictable, it is difficult to accurately predict the course of this pandemic in the future. Accepting the fact that there are no alternatives to schools and educational facilities, there should be readily accessible mechanisms and means of coping with crisis circumstances that cause uncertainties around continuous learning and maintaining pupils' health, protection, and hygiene. The situation of COVID-19 has highlighted the fact that the mechanism is inadequately prepared to deal with a crisis such as this one. Some ad hoc initiatives were taken with limited success during the crisis period, either because of the lead time required to implement the plans and because of limited access to resources, making it difficult to achieve the expected goals. COVID 19 reiterates the need for a structured and robust learning plan and for pupils' fitness, safety, and hygiene.

Globally, however, the pandemic COVID-19 led to about 1.6 billion school children and young people in 193 countries leaving school, accounting for over 90 percent of total enrolled learners⁶. There was also an end to education from around 38.6 million Bangladeshi students when a country-wide school closures were announced on March 17, 2020, when the COVID-19 pandemic was launched. It has resulted in the suspension of the exam for the first term in all primary schools in

the region, while the exam for the Grade 12 / Equivalent Terminal exam for the academic year has been postponed. By September 2020, authorities expect to extend the closure of educational institutions. A short, medium and long-term effect on education and the creation of human resources in the country is anticipated for the continuation of school closure and disruption. I realize the importance of planning and resolving the COVID-19 pandemic in Bangladesh education in the report. So, I am interested to do the research “In the COVID-19 pandemic situation the Role of ICT in the education system in Bangladesh” in education sector.

Objectives

1. To enlighten various measures taken by Govt. of Bangladesh for the education sector during this pandemic;
2. To highlight the various positive impact of COVID-19 on education;
3. To enlist some negative impacts of COVID-19 and to put some effective suggestions for continuing education during the pandemic situation.

Methodology

The research methodology of the study focuses on the quantitative and qualitative approaches. Data from this research work will be collected from two main sources; the primary and the secondary sources. Primary data will be first-hand data collected directly three Upazila in Bogura District in the field selected three schools from each Upazila and also through an online survey and have not been used by anyone. Such data will be obtained using the questionnaire, observation, and online interviews. Meanwhile, secondary data are those items that have been originally collected and worked by another research that the present researcher may need for her research work. It is second hand in nature and less reliable. This type of data can be collected using newspapers, textbooks, journals, magazines, and even the internet.