Sub-Project ID-158

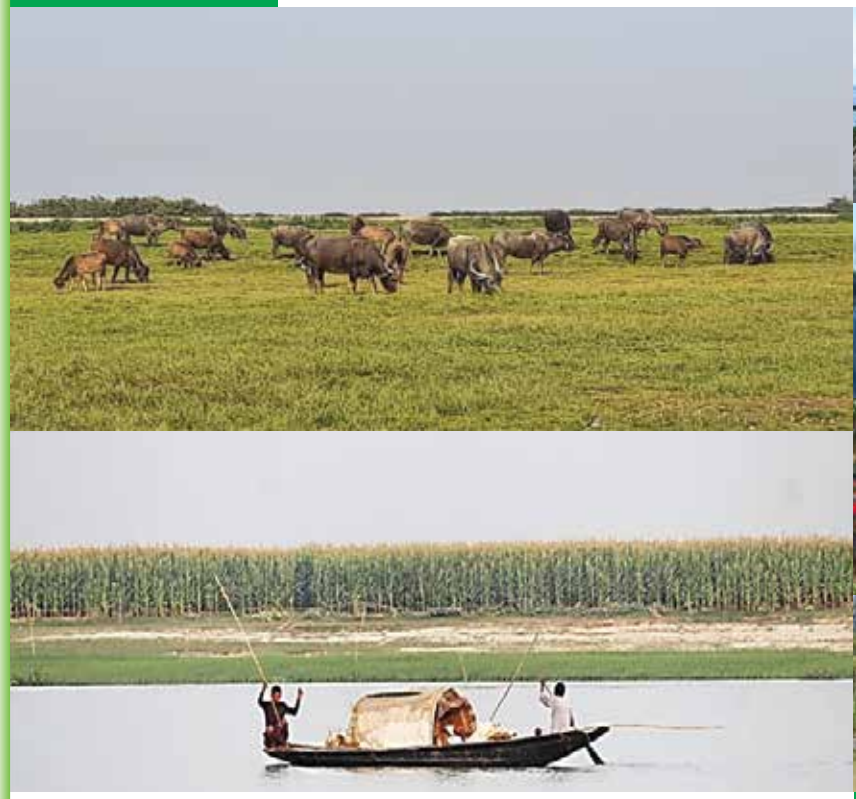
Program Based Research Grant (PBRG)

Sub-project Completion Report

on

Analysis of Agricultural Policy on Food System and Rural Development in Bangladesh: Case of Haor Area (Wetland) Management Practice

Sub-project Duration
15 October 2019 to 15 May 2022



Coordinating Organization

Agricultural Economics & Rural Sociology Division
Bangladesh Agricultural Research Council

Project Implementation Unit
National Agricultural Technology Program-Phase II Project
Bangladesh Agricultural Research Council

Farmgate, Dhaka-1215
April 2022

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Analysis of Agricultural Policy on Food System and Rural Development in Bangladesh: Case of Haor Area (Wetland) Management Practice

Implementing Organization

Department of Agricultural Economics
Bangladesh Agricultural University
Mymensingh-2202

and

Department of Agricultural Economics and Policy
Sylhet Agricultural University
Sylhet-3100

Project Implementation Unit
National Agricultural Technology Program-Phase IIProject
Bangladesh Agricultural Research Council

Farmgate, Dhaka-1215

April 2022

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Abbreviation and Acronyms

ADB	=	Asian Development Bank
AE	=	Agricultural Economics
AEP	=	Agricultural Economics and Policy
AERS	=	Agricultural Economics & Rural Sociology
AIC	=	Akaike Information Criterion
B.baria	=	Brahmanbaria
BARC	=	Bangladesh Agricultural Research Council
BAU	=	Bangladesh Agricultural University
BBS	=	Bangladesh Bureau of Statistics
BCR	=	Benefit Cost Ratio
BDT	=	Taka of Bangladesh
BIDS	=	Bangladesh Institute of Development Studies
BWDB	=	Bangladesh Water Development Board
CIP	=	Country Investment Plan
Co-PI	=	Co-Principal Investigator
DAE	=	Department of Agricultural Extension
DCI	=	Direct Calorie Intake
DER	=	Disaster and Emergency Response
DFID	=	Department for International Development
DID	=	Difference in Difference
DSI	=	Dry Season Income
EC	=	European Commission
EGE	=	Ecological Geographical Environment
FAO	=	Food and Agriculture Organization
FGD	=	Focus Group Discussion
FEI	=	Food Energy-Intake
FSSAP	=	Female Secondary School Assistance Project
et al.	=	et alia (L.) and Other
etc.	=	et cetera (Other and so forth)
GDP	=	Gross Domestic Product
GM	=	Gross Margin
GOB	=	Government of Bangladesh
GR	=	Gratuitous Relief
GRP	=	Gross Regional Production
ha	=	Hectare
HCR	=	Head Count Ratio
HDI	=	Human Development Index
HDR	=	Human Development Report
HHs	=	Households
HIES	=	Household Income Expenditure Survey
HPNSDP	=	Health, Population and Nutrition Sector Development Programme
ICM	=	Integrated Crop Management
i.e.,	=	id est (that is)
IFA	=	Income Flow Approach

IPM	=	Integrated Pest Management
IUCN	=	The International Union for Conservation of Nature
kcal	=	Kilocalorie
kg	=	Kilogram
KII	=	Key Informant Interview
LVC	=	Local Village Club
MDGMH	=	Millennium Development Goal Migrant Households
MFDM	=	Ministry of Food and Disaster Management
MLGRDC	=	Ministry of Local Government Rural Development and Cooperatives
MoK	=	Merging of Knowledge
MoE	=	Ministry of Education
MPME	=	Ministry of Primary and Mass Education
MSW	=	Ministry of Social Welfares
MWCA	=	Ministry of Women and Children Affair
NAES	=	National Agriculture Extension System
NAP	=	National Agriculture Policy
NFP	=	National Food Policy
NGO	=	Non-Governmental Organization
NSDS	=	National Sustainable Development Strategy
No.	=	Number
NR	=	Net Return
NSSS	=	National Social Security Strategy
PCI	=	Problem Confrontation Index
PCR	=	Project Completion Report
PoA	=	Plan of Action
PI	=	Principal Investigator
SAU	=	Sylhet Agricultural University
Tk.	=	Taka
US$	=	Dollar of the United States
viz.	=	videre licet (that is to say)
%	=	Percentage

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Executive Summary

The government of Bangladesh has approved the National Agriculture Policy 2018 with a view to achieving sustainable food and nutrition security through efficient utilization of natural resources. The agriculture policy has given emphasis on investment in wide number of activities such as quality seed production, fertilizer and irrigation, biotechnology, farm mechanization, agriculture cooperative and marketing, safe and nutritious food production, women empowerment, natural resource management,regional special agriculture, involvement of the youth force, agriculture rehabilitation, agriculture afforestation, use of information and communication technology in pursuit of sustainable food production.The agricultural strategy emphasizes on transformation of agriculture to commercial agriculture through capacity building of various actors, development and adoption of high yielding technologies, diversification of high-value commodities, and sustainable use of natural resources leading to poverty reduction as SDGs targets.

The study was conducted in haor areas combing seven districts, in the Grater Sylhet and Mymensingh region where development intervention has been introduced at a massive-scale aiming at achieving food security and poverty alleviation among the rural poor. The studywas initiated to investigate the impact of policy interventions on the capacity of smallholders in the case of the household. The main goal of the study was how the policy interventions were dominated by top-down approaches reflecting in rural development processes in the wetland.

Data were collected using both quantitative and qualitative methods including direct interviews, focus group discussions (FGD) and a new method of participatory policy evaluation technique merging of knowledge (MoK). A mixed methodology of research is applied to analyze the panel data collected through field surveys. The haor and rural development actors are crop producers, fishers, cattle rearers (cow, buffalo, sheep and goat), migratory farmers, duck keepers, sand and mining explorers and tourist boat operators. A total of 3500 farm households were surveyed for the present study. In addition seventy-five FGD and thirty-sixMoKwere conducted analyzing agricultural policy on the food system and rural development of the sample households. A case study was also undertaken over three distinct communities covering decades-long mapped and recorded farming patterns and processes in selected haor areas.

The results demonstrated that the incidence of agricultural policy interventions on household poverty reduces significantly11.54 percent. The estimated effects of the intervention on household income were found by 78,445 BDT per year. While the employment contributions increase 9 units and the labor productivity increases 59 BDT per year by successive agricultural intervention. The selected household income is highly influenced by public investment in rural infrastructure. The rural development dynamics reveal that the exposure of resource pauperization to poverty has increased overtime in the haor area. The flood control, roads and communications, mechanizations in agriculture, tourism, and sandstone exploring reduced seasonal unemployment. Still, policy weaknesses are among the most important causes of backwardness in the haor area. But agricultural policy interventions by subsidies of agricultural inputs like, fertilizer, seed, irrigation water, and mechanization substantially improve rural farm income. The farmer's support policy by government rice procurement was found a common policy directed to the farm household.

Both policy regime and protection interventions are statistically significant. The average policy regime effects in haorarea are higher primary level which contributesreducing poverty vulnerability households. The average sample household wellbeing with respect to policy regime was found about -11.87, implying that successive policy inventions (wellbeing increased by 12 units) isvery conducive towards changes in average wellbeing.

The impact of these policy approaches substantially affects the capacity of smallholders on poverty alleviation and the food system of the study areas. To formulate appropriate policy interventions aimed at generating steady sources of income for the households need revitalizing haoragriculture. The sample households of the area need more non-farm sectors for working opportunities

(handicrafts, transportation, communication, storage services, etc.). Public investment in infrastructure facilities should make sustainable. The theoretical and empirical findings of this research would provide inputs for policymakers to create a long-term framework for poverty reduction and sustainable livelihood development for the poor households in the haor areas of Bangladesh.

Keywords: Food system, rural development, poverty, policy intervention, merging of knowledge and wetland.

PBRG Sub-project Completion Report (PCR)

A. Sub-project Description

1. **Title of the PBRG sub-project:** Analysis of Agricultural Policy on Food System and Rural Development in Bangladesh: Case of *Haor* Area (Wetland) Management Practice
2. **Implementing organization (s): Name of the applying institution/organization with full address:**
   a) **Coordination Component:** Agricultural Economics & Rural Sociology (AERS) Division, BARC, Farmgate, Dhaka-1215
   b) **Component-1:** Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh.
   c) **Component-2:** Department of Agricultural Economics and Policy, Sylhet Agricultural University, Sylhet.
3. **Name and full address with phone, cell and E-mail of Coordinator, Associate Coordinator and PI/Co-PI (s):**

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Bibi Marium, Assistant Professor, Department of Agricultural Economics and Policy, Sylhet Agricultural University (SAU), Sylhet-3100, Bangladesh. Cell: +8801771151205; E-mail:mariumpanna08@gmail.com

4. **Sub-project budget (Tk.):**
   4.1 Total (in Tk. as approved): 147,00000 BDT
   4.2 Latest Revised (if any): 147,00000 BDT
5. **Duration of the sub-project:**
   5.1 Start date (based on LoA signed): 15 October 2019
   5.2 End date: 15 May 2022
6. **Background of the sub-project:**

Agricultural policy, food system and rural development:

Agriculture forms the mainstay of the economy in most *haor* areas of Bangladesh. In 2020 it contributed on average 10 percent of the Gross Regional Production (GRP). Agriculture provides the main livelihood, generating income and employment for the vast majority of people in these *haor* districts. It also provides vital raw materials for national or ecological services for fisheries, livestock, ducks and tourist amenities.

In Bangladesh Agricultural production increased significantly over the last three agricultural policy regimes. Major progress in yields of cereals and other crops, increase in livestock and aquaculture contributed to a 9 percent increase in national food outputs since 2010.

The country's overall food supply has increased faster than population growth. A successful result has largely been achieved through improved agricultural technologies. Moreover, adoption of high-yielding varieties has had a significant impact on farm income. Irrigation and use of fertilizers together with better resource management and a more appropriate agricultural policy have also been major contributors.

Some key developments regionally and in *haor* areas have been:

- The output of cereals per inhabitant increased 11 percent per year from 2010 to 2020 (305 to 342 kg);
- Annual increases of yield per hectare for paddy/rice, wheat and maize was also fairly high during the 2010s, 2015 s and 2018s, but dropped in the 2020s;
- Farmers of *haor* areas have not been able to increase productivity during the last few years compared to other regions.

Although, the rural picture of agricultural development shows significant progress and potential, it has and will probably be unevenly distributed for a foreseeable future. A far greater proportion of the world today is diverse food insecure. The benefits of the successive policy have, however, not reached farmers in all regions. The development progress has been much slower in resource-poor environments, even if new varieties of rice have also been widely adopted. Despite success stories, the prospects in *haor* areas are therefore much grimmer.

There are many reasons why areas are not experiencing growth in yields of major crops. A significant and recognized yield gap exists between proven technologies in experimental plots and farmers' fields. Traditional single-crop systems in the *haor* area typically yield only about 2.5 tonnes per hectare of rice.

This showed that not only does access to inputs ehance yields, but also improvement in management skills. A major challenge is to find mechanisms that allow farmers to narrow yield gaps.

An increase in food production has come from sustained investment in the agriculture sector in the 2010s and onward. Although accurate figures are not always available, FAO data indicate that total net on-farm investment stood at US$26 billion per year between 2011 and 2018.

Most of this improvement has come through public investment. To this policy implementation there must be added public funding for more research and extension estimated at US$10 billion per year according to World Bank's suggestions. The investment in primary agriculture and public support in *haor* areas has, however, been fairly modest in comparison.

7. **Sub-project general objective (s):** To review of interventions that is focusing on creating or expanding modern amenities in *haor* areas for production of agricultural commodities by using scarce resources.
8. **Sub-project specific objectives (component-wise):** The common specific objectives of each component of the subproject are:

    i) To get insight into the connection between agricultural policy (policy regime/specific interventions) and wetland food system development;

    ii) To evaluate the structure of external change like rural development, resource conservation and poverty patterns in line with successive policies for wetlands; and

    iii) To identify the basic constraints which are hinder resource utilization/crop production in *haor* areas (based on necessary amendments in the respective policies).

9. **Implementing location (s):**

Seven districts: Brahmanbaria, Habiganj, Kishoreganj Moulvibazar, Netrokona Sunamganj and Sylhet.

10. Methodology in brief (with appropriate pictures):

10.1 Data Source and Collection Methods

10.1.1 Primary data

The study used primary data of 3500 households by the intensive survey. By using a structurequestionnaire household information relating to income, employment, labour productivity was collected over successive agricultural policy regimes. Moreover, household-level food availability, diversity and access level were recoded for analysis. The information on rural quality of life specifically indirect employment generation, opinion of physical facilities, activities, services, and perceived value of the physical environment were gathered for the study.

Picture 1: .Data collection from the farmers by Enumerator in Gowainghat, Sylhet

10.1.2 Secondary data

The study used published and unpublished data of agricultural policy status, national food security statistics, and poverty level information of Bangladesh. The common source of these secondary data was BBS and DAE. Moreover, the contemporary booklets and bulletin were used for focusing on a development plan.

10.1.3 Farm survey for quantitative data

A total of 3500 farm households were selected for data collection; a survey team was formed in combination with the scientists and trained enumerators of each component organization for collecting primary data with the help of DAE personnel. The coordinator and all respective PIs of the component organization of this project monitored the data collection activities on a routine basis.

10.1.4 Sampling design and survey method

Field survey method was followed involving respective producers of different actors involved with *haor* livelihoods. The *haor* and rural development actors are crop producers, fishers, cattle rearers (cow, buffalo, sheep & goat), migratory farmers, duck keepers, sand and mining explorers and tourist boat operators. A total of 3500 farm households (2500 for BAU component and 1000 for SAU component) were surveyed for the present research as described in Table1.

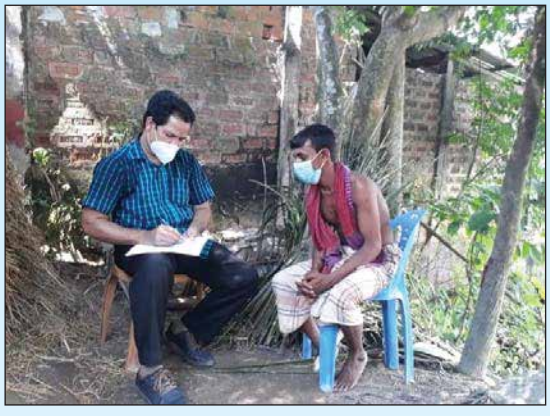
Table 1: Description of sampling structure (in different study locations)

District	No. of study locations	Samples per locations	Total sample		
			BAU	SAU	Total
Brahmanbaria	6	50	100	200	300
Habiganj	10	50	300	200	500
Moulvibazar	10	50	350	150	500
Sunamganj	10	50	300	200	500
Sylhet	10	50	250	250	500
Kishoreganj	10	60	600	-	600
Netrokona	10	60	600	-	600
All	66		2500	1000	3500

Stratified random sampling technique was followed to select the sample respondents and households; guided by a survey team formed in combination with the Coordinator, PIs and Consultant. The coordinator and all respective PIs of the component organizations of the project were monitoring the data collection activities on a routine basis.

10.1.5 Preparation of the questionnaire and data collection

Questionnaires were developed in accordance with the objectives of the research and before finalizing the questionnaire, draft one was pre-tested. Data were collected by the enumerator(s) with constant guidance of coordinator, PI and Co-PI. Supplementary information having relevance with this research was collected from different handouts, reports, published and unpublished documents of the Government of Bangladesh (GoB) and its different organizations and agencies working in the study areas.



Picture 2: Data collection from the farmers by PI in Baniachang, Habiganj

10.1.6 Background of the study area

The study area is located in the northeastern *haor* basin of Bangladesh and geomorphologically under the "major floodplain basin" which hints at the vulnerability of its inhabitants. This is one of the most poverty-stricken areas in Bangladesh where people depend on income generated mainly from dry season agricultural activities as during the 5-6 months wet season the study area looks like an inland sea. This is called the annual monsoonal deluge. Its remoteness, physical and climatic vulnerabilities together constrain the pace of sustainable livelihood, make it challenging and limit the search for income-generating opportunities by its inhabitants for both dry season agriculture and wet season work. Thus, the dynamics of poverty and the mechanisms of sustainable livelihood in these 8 ecologically vulnerable and sensitive areas constitute the focal areas of this research for which some contextual information is needed.The study covers, *haor* region that is an ecological area thatprovides resources to sustain the people living in the ecosystem. The seven-district represent wetlands namely, Brahmanbaria, Habiganj, Kishoreganj, Moulvibazar, Netrokona, Sunamganj and Sylhet.

Picture 3: Research team with local farmers inBarlekha, Maulvibazar

Under the sub-project activities, the BAU component covered 7 districts under Dhaka, Chattrogram, Mymensingh and Sylhet divisions. On the other hand, SAU covers 5 districts under Sylhet and Chattrogram division. Therefore, the BAU and SAU cover the major *haor* areas under these four divisions (Table 2).

Table 2: Area coverage of BAU and SAU component

Component	Division coverage	District coverage
BAU	Dhaka	Kishorganj
	Mymensingh	Netrokona
	Chattogram	Brahmanbaria
	Sylhet	Habiganj, Moulvibazar, Sunamganj and Sylhet
SAU	Sylhet	Habiganj, Moulvibazar, Sunamganj and Sylhet
	Chattogram	Brahmanbaria

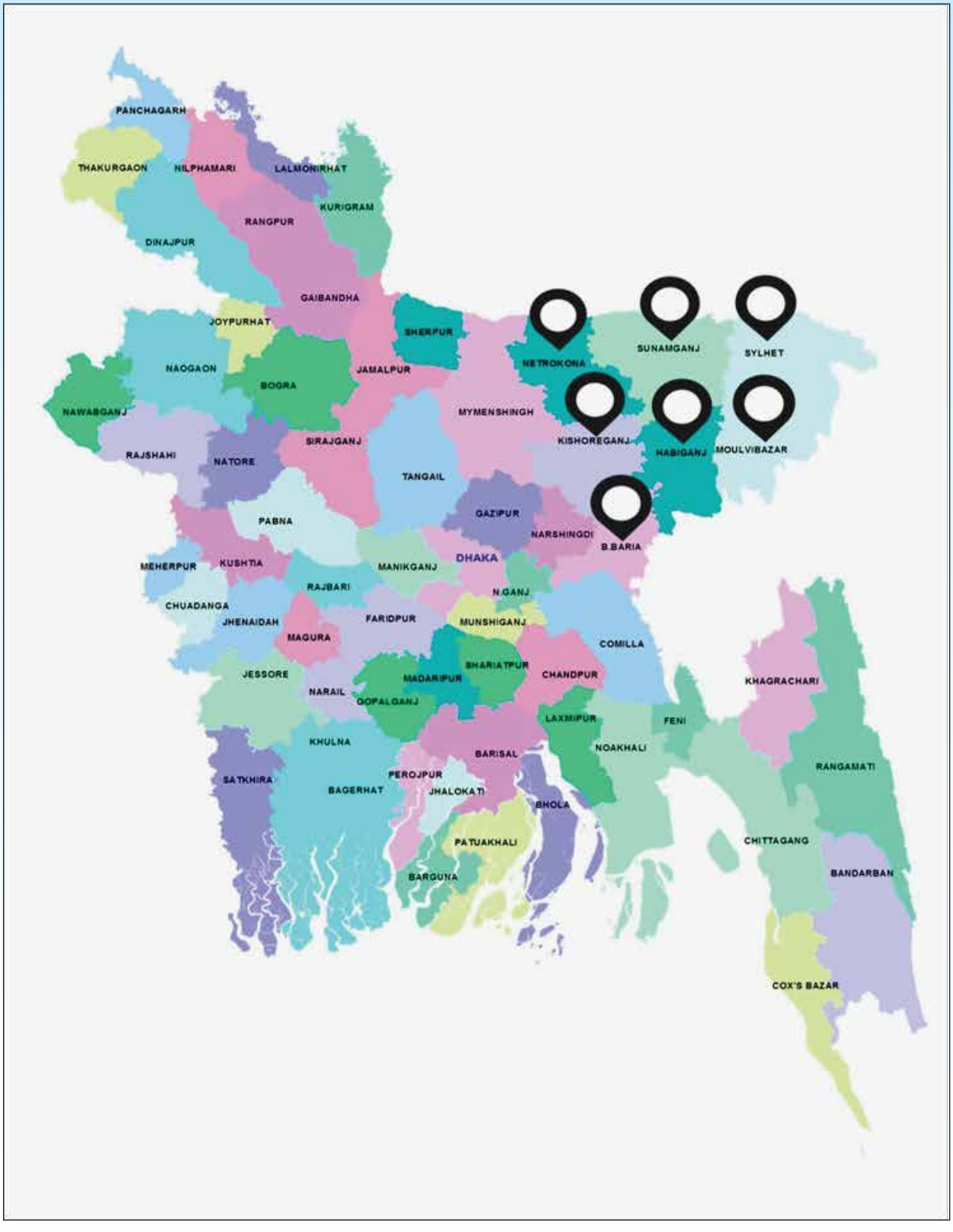


Figure 1: Map of Study location of the project

10.1.7 Area coverage by BAU Component

Haor is a wetland ecosystem in the North-Eastern part of Bangladesh which physically is a bowl or saucer-shaped shallow depression, also known as a back swamp. Occasional high winds during the rainy season (July to September) generate large waves in the *haor*, which may cause considerable damage to homesteads. However, they all dry up in the post-monsoon period. During winter, these *haors* are vast stretches of green land. BAU component covers these seven districts of the *haor* basin known as internationally important wetland ecosystem. The selected districts are Sunamganj, Habiganj, Moulvibazar, Sylhet, Brahmanbaria, Kishoreganj and Netrokona which cover intensive *haor* areas. It is a mosaic of wetland habitats, including rivers, streams and irrigation canals, large areas of seasonally flooded cultivated plains, and hundreds of *haors* and beels. This zone contains about 400 *haors* and beels, varying in size of a few hectares to several thousand hectares.

10.1.8 Area coverage of SAU component

The total area of *haor*-type wetland ecosystem in Bangladesh is 80,000 km^2. This component covered the Sylhet basin estimated to spread over an area between 4,450 km^2 and 25,000 km^2. The *haor* basin is surrounded by the hill ranges of India-Meghalaya on the North, Tripura and Mizoram on the South, and Assam and Manipur on the East. The basin extends north to the foot of the Garo and Khasia Hills, and East along the upper Surma Valley to the Indian border. The Tippera surface lies directly to the South of the *Haor* Basin, and is partly low and deltaic and partly higher ground with a piedmont fringe to the East. It includes about 47 major *haors* and 6,300 beels of varying size, of which about 3,500 are permanent and 2,800 are seasonal. SAU component covered five districts namely Sunamganj, Habiganj, Moulvibazar, Sylhet and Brahmanbaria districts.

10.2 Interactive policy evaluation method for qualitative data gathering

10.2.1 Merging of Knowledge (MoK)

A participatory research method for evaluating agricultural policy intervention, known as merging of knowledge (MoK) where the opinions of grassroots people are gathered by recording of their active dialogue; this was used in the study.

Picture 4: MoKsession in Derai, Sunamganj

The peer group comprised of farmers, fishers, agricultural labor and other people living in the ecology of *haor* areas. The MoK module was conducted with nine to ten participants and 2 facilitators, led by a moderator.

The session is half a day long (more than five hours) involving discussion, dialogue and story writing of peer group with a set of illustrative pictures and issue of agricultural policy intervention strategies.

Picture 5: Two PIs discussed with local farmers in Barlekha, Moulvibazar

10.2.2 Game of brainstorming discussion by relative illustrative pictures

In the first part of the session, the participants of the MoK are asked about some pictures that mainly illustrate the state of farmers, rural development, food system and a poverty level of the people in *haor* areas. Each member of the peer group chooses a picture and he/she describes the picture according to his understanding of the picture or what the picture motivates him. This also involves how does the picture relates to life.

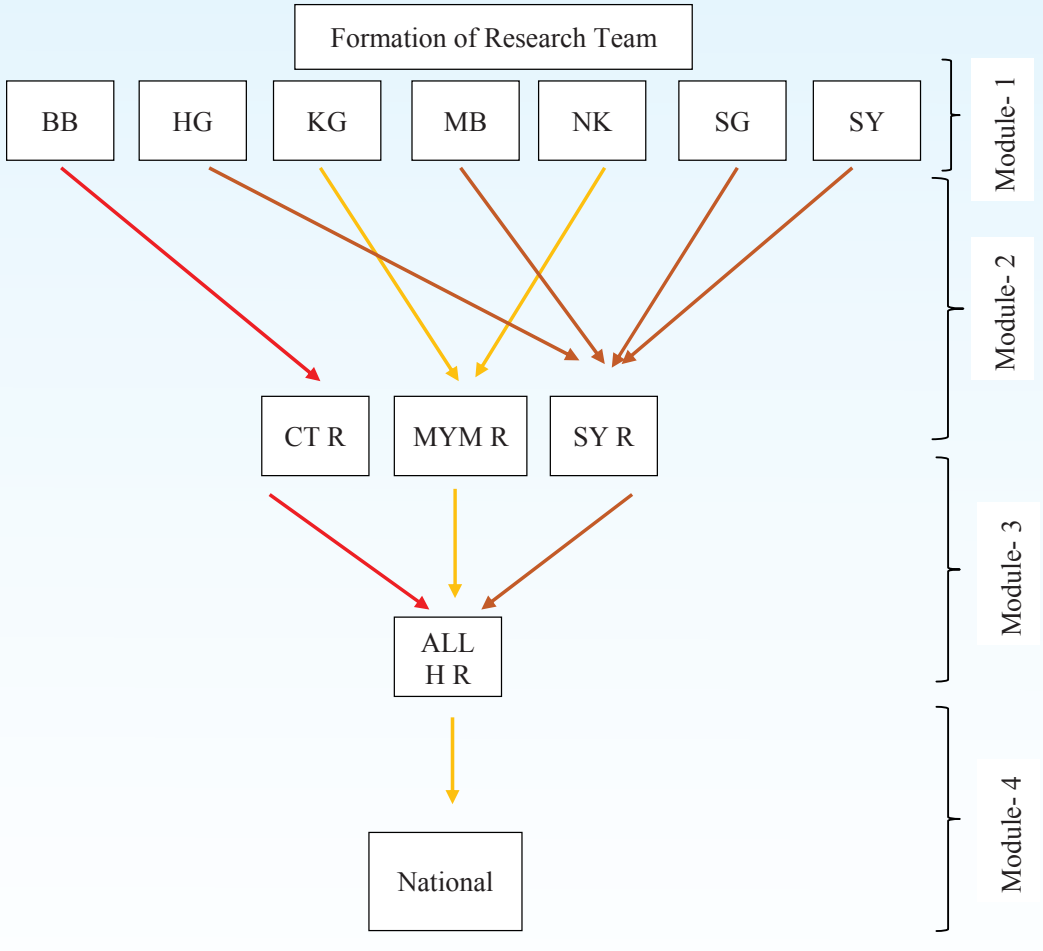
10.2.3 Key words of relevant intervention expressed by the participants in a peer group and their explanations:

The second part of the MoK session mainly asked spontaneous responses about the development issue of the region that mostly appears in a community in the region. Each member of the group is to say one keyword that he/she feel worthwhile for explaining agricultural policy intervention/rural development/state of poverty in *haor* areas. Then next person is to say another keyword of the same themes and the process continued up to the most common ideas finished to the group. The participants would write all keywords on the cue cards and would be asked for sorting the words by order of most significant to less significant. Finally, each member explains their relevant words what exactly mean.

10.2.4 Sub-group wise development story formulation and expression (State of rural development, achievements of agricultural policy interventions and future expectation from government):

In this session, the whole peer group is divided into sub-group of three members with one facilitator for writing a story of development. The sub-groups are separate, tell a story within their group what they have seen in last 12 years, what are the visible achievements by successive agriculture policy and what are their expectation from the agricultural policy.

In the final stage, each sub-group present their story of development, achievements and expectations in the whole peer group. Table 3 described the status of MoK conducted by the study.



Notes: B.B =B.Baria, HG=Habiganj, KG= Kishorganj, MB= Moulvibazar, NK= Netrokona, SG= Sunamganj, SY= Sylhet, CTR= Chittagong Region, MYM R= Mymensingh Region, SY R= Sylhet Region, ALL HR= All *Haor* Region.

Figure 2: Illustration of MoK procedure

Table 3: Total qualitative data assembled by MoK approach

Districts	Number of MoK session			
	Component		Regional /National	Total
	BAU	SAU		
Brahmanbaria	2	2	-	4
Habiganj	2	2	-	4
Moulvibazar	2	3	2	7
Sunamganj	2	2	1	5
Sylhet	2	3	1	6
Kishoreganj	4	0	1	5
Netrokona	4	0	1	5
All	18	12	6	36

10.3 Focus Group Discussion (FGD)

The FGDs were conducted to analyze agricultural policy on the food system and rural development of the selected study in *haor* areas. A total of eight to ten participants were in each group consisting of male and female. Their ages would range between twenty-five to fifty years. Four facilitators were involved to guide with a checklist and take notes of FGD. Table 4 describes the status of FGD conducted by the study.

Picture 6: Focus Group Discussion with farmers in Derai, Sunamganj

Table 4: Number of FGD conducted by two components

District	No. of FGD completed		
	BAU	SAU	Total FGD
Brahmanbaria	5	5	10
Habiganj	5	5	10
Moulvibazar	5	5	10
Sunamganj	5	5	10
Sylhet	5	10	15
Kishoreganj	10	0	10
Netrokona	10	0	10
All	45	30	75

10.4 Case Study

The study used a case study covering decades-long mapped and recorded farming patterns and processes in selected *haor* areas. An integrated methodology from socio-economic and ethnography was employed in the case study to record the changing dynamics of farming systems and livelihood to discover the long-term impacts of Bangladesh's agricultural policies on rural farming systems. Agricultural policy in Bangladesh's

rural wetland is driving profound changes to traditional farming systems. Positive and negative impacts of agricultural policies on village farming systems were mapped, inventoried and evaluated. The driving forces behind these farming changes were recorded from their participation. The integrated findings summaries according to 4 professional categories focusing policies aiming at modernization of farming systems in *haor* areas. The goal of these individual case studies was the development of agriculture under the guise of modernization of local food security with healthy land for hundreds of years.

10.5 Analytical technique

Collected data were edited and scrutinized for analysis. Most appropriate, available and necessary descriptive methods, tools and techniques were used for data analysis. Tabular and diagrammatic analyses were also carried out. In addition, inferential statistics were applied to find out the desired effects of policy.

Methods to analyze these policy analysis processes served to document and evaluate the process of cooperative decision-making on a scientific basis. The popular methods to be employed are qualitative and empirical social research. It includes the techniques like face-to-face interviews, participatory observation and document analysis.

For 1st objective, the study identified the target variable to be the magnitudes of rural household food availability and income poverty. The main explanatory variables are the real wages which again depend on the magnitudes of external shocks, support policy and capital mobility between urban and rural sectors. The methodology involved an account of the effects of economic transition on the level of the rural sector in Bangladesh by successive agricultural policy,especially in *haor* areas. The area covered 20,022 square kilometers that have been included in the master plan of development initiated in 2012. The final intention of the study is to relate development policy in the rural/agriculture sectors to the general poverty picture.

The empirical econometric model would take the following form for finding a connection between agricultural policy and wetland food system development;

$$W_{jt} = \alpha_1 + \beta_T T_{kt} + \mu_{1t} \dots\dots \quad (1)$$

And,

$$P_{jt} = \alpha_2 + \beta_R R_{jt} + \beta_M W_{jt} + T_{it} + \mu_{2t} \dots\dots \quad (2)$$

W=Real wage of labour /rice equivalent, R=Direct protection policies by government T= Policy regime in the kth sector in Jth district t = time in years. P=level of poverty (HCR).

For objective 2 a vertical approach of policy assessment was used to evaluate the structure of external change like rural development, resource utilization and poverty indicators by successive policy for wetlands.

The research team opted for a vertical approach, in which the various measures of welfare would be assessed by real wage analyzed for their (partial) contribution to the overall Programme effects regarding a number of specific core themes/objectives such as income, employment, etc. using DiD (difference-in-differences) method.

The study used DiD model as follows:

Y=β_0+β_1*Group+β_2 Treatment+β_3 Group*Treatment+μ_t…………(3)

The possible effects are classified into three thematic components. Within these, 14 relevant themes were distinguished for evaluation as follows:

Where Y is the outcome variable like income, income consumption gap, employment, labor productivity, quality within agriculture, food system, soil, water, flora & fauna, landscape, physical facilities, activities & services, the perceived value of the physical environment and rural quality of life.

For objective 3 the basic constraints that are hindering resource utilization/crop production in *haor* would be identified (based on necessary amendments in the respective policy). The Agricultural development programmes may be developed nationally but they are always implemented locally and must be understood locally if the promise of agricultural development is to be achieved (Bills and Gross, 2004), Aarts and Woerkum (1995) emphasized the importance of communication for the acceptance of governmental policies. If the acceptance of programmes by farmers is based on political objectives, contents and implementation of development programmes must meet the preferences and needs of clients and users. Consequently, these preferences and needs must not only be known to policy makers but must be channeled into the programme development process. Thus, a permanent flow of information, as well as practical communication support instruments, are needed.

11. Results and discussion:

11.1 Agricultural Policy (Policy regime/Specific Interventions) and Wetland Food System Development

Rural development and food system in developing countries are directly affected by structures within the agriculture sector and the pertinent agricultural policy. Many developing countries have considerable potential for agricultural production and are in a position to open up new sales markets by agricultural commercialization. At the same time, these countries are increasingly importing the food they need from neighboring countries or the global market. Debates surrounding good agricultural policy often focus on the issue of how the country should shape their agriculture and trade policies so that the regions are able to compete on fair terms and have access to markets and thus opportunities to grow. An equally important factor, however, is the way that agricultural policy is formulated in the developing countries themselves. With this in mind, this section examines the possibilities open for the *haor* areas to utilize agricultural policy strategies and instruments to achieve development policy objectives.

The Government of Bangladesh (GoB) adopted a long-term development strategy (Vision 2021), which aims at transforming Bangladesh into a middle-income country by 2021. The implementation of Vision 2021 is being achieved through the National Perspective Plan (2010-2021). In both documents, the GoB has prioritized the attainment of self-sufficiency in food grain production and the achievement of nutritional requirements by 2021. Vision 2021 is being implemented through medium-term plans of 5 years.

The plan aimed at raising agricultural productivity, fostering diversification and boosting rural infrastructure. It has been superseded by the Seventh Five Year Plan (7FYP 2016-20), which has been approved by the end of 2015 and focuses on developing the crop sub-sector to raise rural income and generate employment opportunities for poor rural people.

The development vision for agriculture under the 7 FYP aims at ensuring food and nutritional security, sustainable intensification, and diversification of climate-resilient agricultural production. It priorities commercialization and livelihood improvement through technological innovations and use, and linksthe farming community with markets, both national and international.

The GoB also adopted the National Sustainable Development Strategy (NSDS 2010-21), which identifies strategic priority areas (sustained economic growth, development of priority sectors, social security and protection, environment, natural resources and disaster management) along with cross-cutting areas (disaster risk reduction and climate, good governance and gender) with a view to achieving the strategic vision and addressing long-term sustainability of productive resources. Besides the 7FYP, the key guiding document for the development of the agriculture sector is the National Agriculture Policy (FAO, 2016) (NAP 2013), which aims to improve food and nutrition security for all and the quality of life for rural people through increased productivity and agricultural diversification. The National Food Policy (NFP 2006) mainly targeting women and children, aims to enhance purchasing power to increase access to food and to ensure adequate nutrition for all.10 NFP strongly acknowledges that adequate food availability, though admittedly necessary, is not a sufficient condition for ensuring food security and that ensuring food security requires a major effort aimed at enhancing access to food and subsequent utilization of food for nutrition by the poor and distressed households.

In order to implement the NFP, the GoB adopted a Plan of Action (NFP-PoA, 2008-2015) which provides programmatic guidance for the implementation of the NFP; identifies 26 strategic areas of interventions and more than 300 action agendas; identifies responsible actors (government and non-government) and suggests a set of priority targets and indicators for monitoring progress. Subsequently, the GoB adopted the Country Investment Plan for Agriculture, Food Security and Nutrition (CIP, 2011-2015), which plans and identifies 12 investment programmes to ensure implementation of the NFP PoA; mobilizes additional funds, including from external sources such as the Aquila Food Security Initiative; monitors, evaluates investments in agriculture, food security and nutrition. The GoB has also drafted the National Agricultural Extension Policy (2015) for providing integrated agricultural extension services of Department of Agriculture Extension, Department of Fisheries, Department of Livestock and Department of Forestry under one umbrella through "National Agriculture Extension System (NAES)".

Besides that, the e-agriculture extension service promotes to assist farmers in provisioning valuable information, integrated pest management control and provided active discouragement of damaging and hazardous agriculture practiced by the farmers.

With regard to social protection and nutrition, the government's main strategy is formulated in the Strategic Plan for Health, Population and Nutrition Sector Development Programme (HPNSDP 2011-2016).

In 2015, the GoB adopted the Nutrition Policy (2015), which envisions food security and food safety and optimal nutrition throughout the lifecycle of all citizens, especially for vulnerable populations living *haor* areas. It aims at enhancing dietary diversity and optimum quality and quantity of diet for all.

Furthermore, in 2015, the GoB approved the National Social Security Strategy (NSSS), which encompasses existing safety nets, employment policies and social insurance. The all-policy interventions around agriculture and rural development were assessed in the study. However, the transformation of national agricultural policy in terms of addition of different prioritizing issues and strategy over successive policy period have been portrayed inTable 5.

Table 5: Transformation of National Agricultural Policy over successive policy period

Policy / Topics	NATIONAL AGRICULTURE POLICY (1999)	NATIONAL AGRICULTURE POLICY (2013)	NATIONAL AGRICULTURE POLICY (2018)
Transformation of National Agricultural Policy over successive period	NAP has identified 18 Programme areas where actions or policies might be undertaken for achieving these goals: crop production, seeds, fertilizer, minor irrigation, pest-management, agricultural mechanization, agricultural research, agricultural marketing, land use, agricultural education and training, agricultural credit, government support for production and contingency plan, food-based nutrition, environmental protection, women in agriculture, coordination among government agencies, NGOs and the private sector and reliable database.	There are some key strategies which have been introduced in this policy. These are: 1. Governance of Research Institutions 2. Research Planning and Funding 3. Research Focus Areas 4. Technology Transfer 5. Equity in Service Delivery 6. Informatics 7. Development of Participatory Cooperation 8. Intellectual Property Rights	Some new issues have been incorporated in the new policy including: 1. Research on agriculture development, technology 2. Transfer and agriculture extension 3. Mechanization, specialized agriculture, andICT 4. Marketing of agricultural products 5. Women empowerment and 6. Nano-technology 7. Besides, sensor-technology will be used to examine the quality of land

11.1.1 Characteristics of *haor* agricultural production system and major occupation:

The *haor* is agriculture-covered flooded land of 0.33 million ha. The average estimated risk of BDT 3,486 million (3% of the national contribution to the GDP) worth of agriculture is destroyed each year. Poverty mostly prevails in remote rural areas such as the *haor* area of Bangladesh (Rahman, R.I, 2002) where people survive in a subsistence economy and livelihoods are challenged by its ecological vulnerabilities. Agriculture is the dominant occupation in the region with most practicing mono-agriculture, which means farmers produce only one type of crop usually rice.

Raising livestock is another activity that presents its potentialities in the region. The rearing system mainly depends on free grazing on vast grazing land. The Gas Mohals special ecological source of animal feeding that could be rented from public land authority. The common cattle and buffalos are main for free grazing under commercial operations. But it suffers the challenges of land space to herd livestock in rainy seasons. Most raising systems of livestock rearing in their backyard; or sold before flooding. However, due to lack of adequate space, it is often congested for the animal.

There is a revolution of free-grazing ducks using *haor* ecology. Commercial duck farming with supplementary feeds is a popular and profitable enterprise. Thousands of bird flocks under the enterprise a new dimension of *haor* livelihood.

The fishery is another means of livelihood for the residents of the *haor* regions. The local ecology and fish diversity have dwindled. Artisanal fishing is a significant occupation of the people in *haor* areas depending on natural fish.

An attempt was also made to study the engagement of respondents in different activities in terms of days they spent in a year. Eight activities were found in the alter under study which is shown in Table 6. It is clear from the Table that crop cultivation is the most important activity in terms of days spent in the areas under study. Among the regions, respondents have spent a maximum of 133 days for cultivating their crops in Sylhet and they did the same with a minimum of 105 days in Brahmanbaria, Kishoreganj, and Moulvibazar. Fishing is the second most important activity in Moulvibazar and Brahmonbaria regions. One thing is work mentioning that tourist boating is the second most activity in Sylhet region and it's also in other regions.

Tourist boating is relatively a new innovation activity that has opened a new avenue of livelihood in the Sylhet region. Moreover, Sylhet enjoys a more diversity of activities (6 activities). With more diversity and new activity tourist boating, the position of Sylhet is better than other regions under study.

Table 6: Different activities performed by the sample farmers in the study areas

Activities	Average number of days in a year						
	Brahmanbaria	Habiganj	Kishoreganj	Moulvibazar	Netrokona	Sunamganj	Sylhet
Crop cultivation	105	107	105	105	123	107	133
Fishing	80	70	80	80	115	70	115
Animal grazing	40	0	40	40	104	0	104
Duck rearing	0	0	162	0	220	224	95
Jolmohol operation	55	30	55	55	52	30	52
Sand mining	0	0	0	0	0	90	90
Forest product exploring	0	0	0	0	0	0	0
Boating for tourist	0	0	100	0	127	224	127

Source: Field Survey, 2020-2021

11.1.2 Socio-economic Profile of the Respondents:

Development strategies and policy initiatives largely depend on the socio-economic conditions of the people residing in a community. The socioeconomic information of respondents under the areas of invagination is presented in Table 7. The Table reveals that the maximum of the respondents was of active age group (15-64 years) having experience and sound thought of development of their own and their community. The respondents were found to adopt different types of occupations for their sustenance. Among them, farmers ranked the highest position inspective of regions under study. Almost all the respondents (98.6 percent) undertook farming as their means of livelihood in Habiganj followed by Sylhet (88.0 percent), Kishoreganj (85.0 percent), Sunamganj (84.0 percent), Netrokona (82.0 percent), Brahmanbaria (80.0 percent) and Moulvibazar (79.0 percent). Besides farming, other occupations practiced by the respondents were agricultural laboring, fishing, duck rearing, boating, animal keeping, but their occupations were practiced in piece meal nature and also, those were not adopted in all the areas under study. The occupational scenarios clear the dominancy of farming as means of livelihood of has people in Bangladesh.

Maximum of the respondents were mixed and some of them were found to be still single. Also, a few of the respondents were widowsor widowers experiencing a pathetic phase of life cycles. There found no divorce or repeated respondents under study which depicts the people's family life of the people in the study area.

The Table depicts that illiteracy covers a major portion of the respondents of Kishoreganj (26.0 percent) while secondary education did the same in Habiganj (13.0 percent), Moulvibazar (13.0 percent), Sunamganj (13.0 percent) and Sylhet (13.0 percent). In terms of primary education, Netrokona ranked the light (50.0 percent) and Habiganj (1.0 percent), Kishoreganj (1.0 percent), Moulvibazar (1.0 percent) and Sunamganj (1.0 percent) did the same in higher secondary education. However, graduate level education was found about 1.0 percent for all regions except Netrokona (13.0 percent).

Table 7: profile of the sample farmers in deferent study areas

Categories		Brahmanbaria		Habiganj		Kishoreganj		Moulvibazar		Netrokona		Sunamganj		Sylhet	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Age	Below 15	0	0	0	0	0	0	0	0	0	0	5	1	5	1
	15-64	255	85	410	82	456	76	460	92	468	78	475	95	475	95
	Above 64	45	15	90	18	144	24	40	8	132	22	20	4	20	4
Occupations	Farming	240	80	493	98.6	510	85	395	79	492	82	420	84	440	88
	Agricultural labourer	6	2	0	0	18	3	0	0	0	0	5	1	10	2
	Fisherman	15	5	0	0	6	1	75	15	78	13	10	2	25	5
	Duck rearing	3	1	0	0	6	1	0	0	0	0	5	1	5	1
	Boatman	3	1	0	0	12	2	0	0	0	0	15	3	5	1
	Animal keeper	15	5	0	0	18	3	25	5	24	4	5	1	5	1
	Others	18	6	7	1.4	30	5	5	1	6	1	40	8	10	2
Household size	1-4	93	31	165	33	198	33	90	18	180	30	220	44	220	44
	5-8	204	68	305	61	360	60	400	80	360	60	250	50	255	51
	Above 8	3	1	30	6	42	7	10	2	60	10	30	6	25	5
Educational status	Illiterate	30	10	125	25	156	26	120	24	120	20	125	25	110	22
	Primary	231	77	300	60	354	59	305	61	300	50	300	60	305	61
	Secondary	15	5	65	13	72	12	65	13	65	11	65	13	65	13
	Higher-secondary	6	2	5	1	6	1	5	1	25	4	5	1	10	2
	Graduate	3	1	5	1	6	1	5	1	80	13	5	1	5	1
	Other	15	5	0	0	6	1	0	0	10	2	0	0	5	1

Source: Field Survey, 2020-21

The dwelling status of households largely depends on the financial condition of the households. It is a combination of age, clothing, earning member and some other characters of the household. Table 8 reveals that the respondents lie in the age of 37-55 years which is their most productive phase of life cycle average spending on clothing and footwear per year was the highest BDT 8507 in Sylhet while the second highest (BDT 7196) was found in Moulvibazar. Households spent more or less the same in Habiganj and Sunamganj and the lowest spending was found in Brahmanbaria (BDT 3703). Family with single earning members dominated households of Moulvibazar (88.0 percent) and Habiganj (85.0 percent) while multiple earning members did the same in other regions of the study. The Table also presents a general point relationship between the number of earning members and expenditure on clothing at the footwear of the households in the study area.

Table 8: Dwelling status of the sample households in different districts

Categories		Brahmanbaria	Habiganj	Kishoregonj	Moulvibazar	Netrokona	Sunamganj	Sylhet
Average age of the respondent (year)		42	50	55	35	45	37	42
Average clothing and footwear (BDT/year)		3703	5203	6000	7196	25000	5695	8507
Family earning member	Single earning member	240	425	450	440	462	400	390
	(No.)/%	80	85	75	88	77	80	78
	Multiple earning member (2	60	75	150	60	138	100	110
	or more) (No.)/%	20	15	25	12	23	20	22

Source: Field Survey, 2020-21

11.1.3 Comparative food security and dietary adequacy in sample households

Food is the main basic need of people and so a food-insecure household is a vulnerable household. Food security is the most important component of livelihood. The food security and vulnerability conditions of the studied households were present in terms of different indicators which are presented in Table 9. Usually, 3 meals are received for an individual per day and so 6 meals every 2 days are a general requirement for individual sustenance. But only respondents of Habiganj, Kishoreganj and Netrokona have this ability and the rest lot lower than it (5 meals each). Both Tables produce a net of household commodity and requirements, and household supply of staples was found to be the highest in Netrokona which indicates the better position of the respondent's region.

Table 9: Fooding structure and dietary adequacy in sample households

Categories Sub-categories	Brahmanbaria	Habiganj	Kishoreganj	Moulvibazar	Netrokona	Sunamganj	Sylhet
Average number of meal (in 2 days)	5	6	6	5	6	5	5
Marketable surplus of agricultural crops (Kg)	245	1707	1917	553	1817	824	1245
Staple meet up by individual household (Kg)	281	1764	1894	1012	1984	824	1212

Categories Sub-categories		Brahmanbaria	Habiganj	Kishoreganj	Moulvibazar	Netrokona	Sunamganj	Sylhet
Serving frequency of luxury goods (No/%)	High	6	30	90	40	120	10	25
		2	6	15	8	20	2	5
	Moderate	174	340	450	360	390	75	100
		58	68	75	72	65	15	20
	Low	120	130	60	150	90	415	375
		40	26	10	30	15	83	75
Average monthly hunger episode (days)		0	1	1	1	1	0	1
Average yearly hunger episode (days)		0	4	4	2	5	1	5

Source: Field Survey, 2019-2020

When food situation of the people/inhabitants becomes insecure, they usually consume inferior goods to reduce their vulnerability. It was found in the study that a maximum of the respondents of all the regions try this practice moderately to cope with their vulnerability. Among them, Netrokona ranked the highest 75.0 percent and Brahmanbaria ranked the lowest 60.0 percent. The frequency of purchase of staples was high in Kishoreganj (20.0 percent) and Netrokona (15.0 percent), while found low in Habiganj (25.0 percent) and Moulvibazar (21.0 percent).Respondents of Brahmanbaria (84.0 percent) did the same moderately. So, it can be said from Table 10 that moderate to low food security is present in the wetlands under study.

Table 10: Food security status and vulnerability condition of the sample household

Categories Sub-categories		Brahmanbaria	Habiganj	Kisorgonj	Moulvibazar	Netrokona	Sunamganj	Sylhet
Serving frequency of inferior goods (No/%)	High	75	140	120	125	60	100	125
		25	28	20	25	10	20	25
	Moderate	180	350	420	350	450	325	350
		60	70	70	70	75	65	70
	Low	45	10	60	25	90	75	25
		15	2	10	5	15	15	5
Purchasing frequency of staple foods (No/%)	High	3	5	120	25	90	50	25
		1	1	20	5	15	10	5
	Moderate	252	370	450	370	450	370	375
		84	74	75	74	75	74	75
	Low	45	125	30	105	60	80	100
		15	25	5	21	10	16	20

Source: Field Survey, 2019-2020

11.1.4 Multivariate regression of wellbeing and poverty determinants of the selected *haor* households:

The relationship of well-being and capabilities to the livelihood concept is well identified in the literature (Sen, 1983, 1987&1993; Chambers, 1995 and 1997; Basu, 2003). According to Sen (1983), the realization of human capabilities enlarges human choice, represents more than human capital, ultimately increasing a person's economic well-being. The measurement of well-being depends on different dimensions of socio-economic characteristics which foster livelihood development. Basu (2003) considers educational attainment, health facilities, infrastructure services and technological progress to explain well-being. This approach to poverty and livelihood analysis may allow people to choose the criteria which may result in a range of sustainable livelihood outcomes (Scoones, 1998; Chambers 1997& 2006).

The average sample household wellbeing and poverty are the explanatory variables being determinants identified through theoretical justification. In the first model, the assessment has been accomplished through observing the fixed effect of successive policy interventions over time on the dependent variable wellbeing while holding constant the effects of others. The model is a fixed effect panel model.

In this study, the regression approaches adopted are based on average sample household wellbeing proxy by rice value equivalent for capturing the food price inflation. The model was tested to increase the strength of the regression by providing consistent variance and fulfilling the central theorem hypothesis (normality assumption). Among these variables, household wellbeing measured sample household income.This income converted into rice equvalant quantity and Direct Calorie Intake (DCI) method of poverty measurement (Kakwani, 2003). Table 11 shows the nutritional food-basket for selected household when the total calorie intake is divided by household size, the per capita household calorie intake is given.

Table 11: Nutritional basket based wellbeing of *haor* areas

Indicators	B. Baria	Habiganj	Kishorgonj	Moulvibazar	Netrokona	Sunamganj	Sylhet	*Haor* areas
Per capita normative requirement (Wood 1997)/day	2112							
Wellbeing measured by rice equivalent earnings (Quantity Kg/year)	786.18	883.82	523.27	887.73	648.3	674.22	1474.4	828.26
Wellbeing Calories/day	7538	8475	5017	8512	6217	6465	14138	7942
Average household size that would support by the earning	3.6	4.012	2.38	4.03	2.9	3.03	6.69	3.76

In the case of the poverty determinants model, the household level poverty score is used as a dependent variable while the other independent variables are wage and intervention dummy over time. It also fixed effect panel model for capturing the real effects of policy interventions (Table 12).

Although the best fit model has statistically been built up, both regression models are applied in the data analysis because the whole sample has been broken into sub-samples with the specific region (e.g., Sylhet, Kishorganj, Netrokona, etc,) to generate a clear picture of the factors influencing the regional differences of wellbeing and poverty level of those specific study households.

Table 12: The identification of variables for wellbeing estimation

Equations	Group of variables	Name of variables	Identifications
Regression-1	Dependent variables		
	Household wellbeing	Wellbeing= W_{jt}	Income (BDT) valued of rice equivalent kg
	Independent variables		
	Policy regime T	Policy period T	Time Policy regime 2018=1, Policy regime =2013= 0
Regression-2	Dependent variables		
	Household poverty	Poverty= P_{jt}	Degree of a household falling below the threshold income %
	Independent variables		
	Policy regime T	Policy period T	Time Policy regime 2018=1, Policy regime =2013= 0
	Protection intervention	Protection intervention dummy =R	Specific protection intervention in ith distrct=1 , otherwise =0
	Household wellbeing	Wellbeing= W_{jt}	Income (BDT) valued of rice equivalent kg

The relationship of well-being and capabilities to the livelihood concept is well identified in the literature (Sen, 1983, 1987 and 1993; Chambers, 1995 &1997; Basu, 2003). According to Sen (1983), the realization of human capabilities enlarges human choice, represents more than human capital, ultimately increasing a person's economic well-being. The measurement of well-being depends on different dimensions of socio-economic characteristics which foster livelihood development. Basu (2003) considers educational attainment, health facilities, infrastructure services and technological progress to explain well-being. This approach to poverty and livelihood analysis may allow people to choose the criteria which may result in a range of sustainable livelihood outcomes (Scoones, 1998; Chambers 1997& 2006). The present study empirically finds out the effect of policy over time on wellbeing. After that how the degree of poverty vulnerability is reduced by the relevant variable like wellbeing, policy regime over time.

11.1.4.1 The empirical results:

The panel data collected from 3500 households through a one-off primary survey are used to estimate the two regression models. To identify the variation in wellbeing over time due to successive policy regimes. The expected relationships between the dependent and independent variables and quantifying those relationships the analysis comprises seven parts:

Table 13: Time varient welbeing at different policy regime

District	Variables	Coef.	P>|z|	[95% Conf.	Interval]
B.Baria	Policy regime	-0.871***	0.000	-1.702	-0.670
	Constant	14.792***	0.000	14.637	14.948
Habiganj	Policy Regime	0.357***	0.000	0.268	0.446
	Constant	13.605***	0.000	13.535	13.675

District	Variables	Coef.	P>|z|	[95% Conf.	Interval]
Kishoreganj	Policy Regine	1.115***	0.000	1.078	1.152
	Constant	15.657***	0.000	15.628	15.686
Moulvibazar	Policy Regime	1.341***	0.000	1.245	1.437
	Constant	16.817***	0.000	16.741	16.893
Netrokona	Policy Regime	223.768***	0.000	201.579	245.957
	Constant	284.342***	0.000	249.886	318.798
Sunamganj	Policy Regime	1.674***	0.000	1.609	1.739
	Constant	12.719***	0.000	12.668	12.770
Sylhet	Policy Regime	1.729***	0.000	1.688	1.770
	Constant	15.238***	0.000	15.205	15.271
Whole areas	Policy Regime	0.988***	0.000	0.948	1.028
	Constant	14.959***	0.000	14.907	15.011

*** indicates significant at 1% probability level.

11.1.4.2 Whole sample model:

The results of the whole sample consisting of 3500 households consisting of 10,500 observations show the explanatory power of regression equation-1 measured by adjusted (hereafter) values which are statistically significant and high.

Table 14 shows that two variables are statistically significant the average policy regime effects in the *haor* area is higher primary level which contributes to the reducing poverty vulnerability households. The large coefficient value indicates that the average sample household wellbeing with respect to policy regime is about -11.87 in the regression, suggesting that successive policy inventions over on average sample household wellbeing increase by about 12 units. Therefore, it can be concluded that policy revision is very responsive to changes in average wellbeing.

Table 14: Results of Empirical estimation on empect of different policy regime on poverty

District	Variables	Coef.	P>|z|	[95% Conf.	Interval]
B.Baria	Wellbeing	-4.557***	0.000	-5.499	-3.616
	Protection intervention	-8.087***	0.000	-12.287	-3.886
	Policy regime	-19.724***	0.000	-23.980	-15.464
	Constant	159.228***	0.000	145.003	173.452
Habiganj	Wellbeing	-6.101***	0.000	-7.397	-4.805
	Protection intervention	-9.743***	0.000	-13.796	-4.805
	Policy Regime	-12.708***	0.000	-16.791	-5.690
	Constant	173.236***	0.000	155.465	-8.626
Kishoreganj	Wellbeing	-4.386***	0.000	-6.553	-2.219
	Protection intervention	-0.731***	0.000	-4.076	2.614
	Policy Regime	-5.899***	0.000	-9.348	-2.451
	Constant	154.921***	0.000	121.100	188.743
Moulvibazar	Wellbeing	-3.544***	0.000	-4.304	-2.784
	Protection intervention	-3.080*	0.057	-6.254	0.094
	Policy Regime	-0.949**	0.040	-4.147	2.249
	Constant	141.722***	0.000	128.789	154.654
Netrokona	Wellbeing	-9.961***	0.000	-11.432	-8.491
	Protection intervention	-6.463***	0.000	-8.620	-4.306
	Policy Regime	-4.893***	0.000	-7.041	-2.745
	Constant	246.364***	0.000	223.273	269.456
Sunamganj	Wellbeing	-11.879***	0.000	-13.508	-10.250
	Protection intervention	-6.330***	0.003	-2.140	-10.536
	Policy Regime	-0.460*	0.089	-3.655	-4.591
	Constant	237.161***	0.000	216.527	257.795
Sylhet	Wellbeing	-9.361***	0.000	-14.289	-4.433
	Protection intervention	-0.994*	0.060	-8.443	6.454
	Policy Regime	-1.705**	0.050	-8.219	4.809
	Constant	217.414***	0.000	143.022	291.806
Whole areas	Wellbeing	-2.327***	0.000	-2.668	-1.987
	Protection intervention	-5.828***	0.000	-7.301	-4.356
	Policy Regime	-8.759***	0.000	-10.225	-7.293
	Constant	120.942***	0.000	115.795	126.089

***, **, and * indicates significant at 1%, 5%, and 10% probability level, respectively.

Region-specific model:

Brahmanbaria:

The regression results in Table 14 are based on the sample of 300 households. The empirical findings suggest that the variables wellbeing and protections are significant at the 1% level and associated with correct signs in regressions as expected. The variable poverty level has a negative relationship with the average sample household wellbeing of sample households. It may mean that wellbeing generates low poverty.

Another important result is shown by the variable protection intervention which is highly significant and implies that public policy intervention contributes much to the average sample household poverty level.

Habiganj:

Table 14 reports the regression results for the sub-sample of households in the Habiganj district. Of the aggregate 3500 households, 500 households are separately fitted for regressions.

The variable wellbeing has a negative sign with a coefficient value (-6.101) which may mean that the most of household's poverty level decreases by rice equivalent wellbeing increases. If they have a sufficiently raises real income, the resulting impact decreases risks to household's poverty.

The regression coefficient of protection intervention dummy was -9.743 indicating that ceteris paribus, as the public investment for infrastructure in *haor* areas, decreases on average, sample household poverty level that is poverty goes down 9.743 unit. The household does not facilitate considerable poverty reduction without development initiatives. The specific intervention project is less in the district compared to the Kishoreganj and Sylhet.

Kishoreganj:

The regression results in Table 14 are based on the sub-sample 600 sub-sample households of the Kishoreganj district. The empirical findings suggest by random-effect panel model that the variables are significant at 1% level and associated with correct signs in regression as expected. The average effects on the poverty level are found negative and significant in the regression equation. The reason may be that the household is mostly under intensive policy intervention area and the prevailing wellbeing rural sector is adequately alleviated poverty in *haor* households.

The value -0.731 is the regression co-efficient of direct intervention dummy for protection indicates that ceteris paribus, as the public investment for infrastructure in *haor* areas significantly help to reduce sample household poverty level by its synergic effects.

The value -4.386 is the regression coefficient of wellbeing measured by rice equivalent income-earning indicates that ceteris paribus, the real wage rate in *haor* areas, decreases on average, sample household poverty level.

Moulvibazar:

In the case of Moulvibazar, the regression results are based on the sub-sample 500 sub-sample households of the district. The empirical findings from Table 14 suggest by random-effect panel model that the variables are significant at the 1% level and associated with correct signs in regression as expected. The average effects on the poverty level are found negative and significant in the regression equation. The reason may be that the household is mostly under moderate policy intervention area and the prevailing wellbeing rural sector alleviated poverty in haorhouseholds.

The value -3.080 is the regression co-efficient of protection intervention dummy indicating that ceteris paribus, as the public investment for infrastructure in *haor* areas significantly help to reduce sample household poverty level.

The value -3.544 is the regression coefficient of wellbeing measured by rice equivalent income-earning indicates that ceteris paribus, the real wage rate in haorareas, decreases on average, sample household poverty level.

Sunamganj:

In the case of Sunamganj, the regression results are based on the sub-sample 500 sub-sample households of the district. The empirical findings from Table 14 suggest by random-effect panel model that the variables are significant at the 1% level and associated with correct signs in regression as expected. The average effects on the poverty level are found also negative and significant in the regression equation. The reason may be that the household is mostly under moderate policy intervention area and the prevailing wellbeing rural sector alleviated poverty in haorhouseholds.

The value -6.330 is the regression co-efficient of protection intervention dummy indicating that ceteris paribus, as the public investment for infrastructure in *haor* areas significantly help to reduce sample household poverty level.

The value -11.879 is the regression coefficient of wellbeing measured by rice equivalent income-earning indicates that, ceteris paribus, the real wage rate in haorareas, decreases on average, sample household poverty level.

Sylhet:

In the case of Sunamganj, the regression results are based on the sub-sample 500 sub-sample households of the district. The empirical findings from Table 14 suggest by random-effect panel model that the variables are significant at the 1% level and associated with correct signs in regression as expected. The average effects on the poverty level are found also negative and significant in the regression equation. The reason may be that the household is mostly under intensive policy intervention area and the prevailing wellbeing rural sector alleviated poverty in haorhouseholds.

The value -0.994 is the regression co-efficient of protection intervention dummy indicating that ceteris paribus, as the public investment for infrastructure in *haor* areas significantly help to reduce sample household poverty level.

The value -9.361 is the regression coefficient of wellbeing measured by rice equivalent income-earning indicates that ceteris paribus, the real wage rate in haorareas, decreases on average, sample household poverty level.

11.2 Structure of External Change due to Successive Agricultural Policies in *haor* areas

There is the paramount importance of agriculture and rural sectors in Bangladesh to meet its diverse development challenges. There is a direct link between the agriculture sector and the rural sector. The rural sector is very important because most of the people of the country are living in the rural areas and have a direct link between the rural development and the development of our national economy as well as rural sectors contribute about two-thirds of the GDP. On the other hand, the agriculture sector is the major contributor to sustained food, nutrition and livelihood security of the large population of Bangladesh to achieve self-sufficiency in food production, reduce rural poverty and foster sustainable economic development. Wetland agriculture is important for poverty reduction and food security in many developing countries (Frenken and Mharapara 2002). However, there is little recognition of its current extent, its value to poor communities, or its future potential. A major constraint is the lack of knowledge by government planners, managers of natural resources and local communities of the diverse benefits they provide and how they can be utilized for agriculture in a sustainable manner (McCartney et al. 2005). Frequently, the successive agricultural policies on wetlands always emphasized agriculture and the rural sector's development which is directly linked with national development.

This part of the study synthesizes research into the wetland-agricultural policy-structural change by rural development nexus. Table 15 focused on wetland-specific investment allocation in Bangladesh.

Table 15: Government Allocation over country investment plan (as of 30 June 18) of different financed projects prioritizing *haor* districts

Projects	Allocation in Lakh BDT	Cumulative delivery
Increasing Cropping Intensity at Sylhet Region	4,427	2,766
Project for Using Fallow Land and Increasing Cropping Intensity of Sylhet Region	405	347
Increasing grain plumpness in Sylhet Region	286	129
Sylhet Division Minor Irrigation Development Project	10,174	6,194

Projects	Allocation in Lakh BDT	Cumulative delivery
Mymensingh division and Tangail and Kishoregong district minor irrigation development project	9,800	379
Fallow land utilization and crop intensification project in Sylhet region	1,229	-
Haor Infrastructure and livelihood improvement project	42,364	10,748
Rural infrastructure development project: Greater Dhaka, Tangail and Kishorganj District	30,222	22,558
Development of Sylhet Division Rural Infrastructure	12,225	10,961
Rural Infrastructure development in Aatpara and Mohangonj in Netrokona district	4,734	1,600
Rural Infrastructure development in South Sunamganj, Jagannathpur Upazila of Sunamganj	4,569	1,212
Rural Infrastructure Development of Kuliarchar and Bhairab Upazilla in Kishoreganj District	2,417	1,900
Important Rural Infrastructure Development of Kishoregonj Sadar and Hoshenpur Upazilla in Kishoreganj District	2,115	2,021
Development of important rural infrastructure of Kishoreganj district	34,724	15,996
Development of Sylhet division rural access roads	28,704	548
Establishment of fisheries diploma institute in Gopalgonj, Kishoreganj	1,514	1,133

Source: Monitoring Report of Bangladesh Second Country Investment Plan, 2019

11.2.1 Different amenities and establishment status by successive policy development

Modern amenities and establishments are means of moderate development. The existence and enhancement of their facilities always favor the improvement of the livelihood of people in any community. Respondents were asked about the existence of amenities and establish facilities in their area and then 6 major facilities were identified which are arranged in Table 16. Among the 6 facilities, interviewees gave a favorable response about 3 facilities such as roads, communications and electricity's while unfavorable responses came about the other 3 fourth government office, civic life and drainage. Moreover, Habiganj and Brahmanbaria hold a better position compared to other regions in terms of favorable facilities. In the case of unfavorable mentioned ones, drainage holds the worst position followed by a government office and civic life.

The existence of government offices are essential for different policy and other supports, whilea drainage system be needed for solving the water losing problem and sanitation and civic facilities all the sign of improved livelihood. So, although the wetlands under study enjoy some modern amenities and establishment facilities, they are still lagging behind in enjoying some basic facilities which are essential for their livelihood improvement.

11.2.2 Evaluation of wetland policy by respondents:

Wetland policy is a government endeavor that is designed to ensure the wise use of Jalmohal (water bodies)

so that different associated parties can be benefited without creating harmful effects in the food. So, all the stakeholders need to be well awarded about the wetland policy of the related bodies properly. Table 17 shows different aspects of wetland policy that as important for the farms in the study area. The Table depicts that farms' knowledge about the latest Jolmohal policy 2009 is much better than that of any other aspect of the wetland policy. All the respondents (about 100 percent) of Habiganj were aware of this policy and roughly 90 percent of respondents of other regions have the same idea.

Real fishers have an exclusive right of fishing in the water bodies. Except for Brahmanbaria, more than 90 percent of the respondents of other regions knew this matter.

Some water bodies are managed under the ministry of fisheries between concerned and other ministries. A maximum of 98 percent of respondents of Habiganj and Sylhet were informed about it.

Water bodies are usually leased out to the fishes societies through consensus. But except for Kishoreganj (95 percent) and Netrokona (90 percent), others are not well aware of this matter. Leasing is not only a harvesting contract in water bodies it is also a management tool for wise use of aquatic resources. In this case, Netrokona (92 percent) and Kishoreganj (91 percent) regions is in a better position compared to other regions of study. So, Table 17 clears that although overall awareness of the respondents about the latest Jalmohal policy 2009 is more or less satisfied they are not will aware of other aspects of the wetland policy.

Table 16: Status of Different amenities and establishment in the selected *haor* areas of bangladesh

amenities/establishment	Response	% farmers opined													
		Brahmanbaria		Habiganj		Kishoregonj		Moulvibazar		Netrokona		Sunamganj		Sylhet	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Roads	Exits	300	100.0	500	100.0	527	87.8	474	94.8	527	87.8	415	83.0	408	81.6
	Not-exist	0	0.0	0	0.0	73	12.2	26	5.2	73	12.2	85	17.0	92	18.4
Communications	Exist	297	99.0	500	100.0	600	100.0	454	90.8	600	100.0	420	84.0	400	80.0
	Not-exist	3	1.0	0	0.0	0	0.0	46	9.2	0	0.0	80	16.0	100	20.0
Government office	Exist	22	7.4	2	0.4	450	75.0	154	30.8	450	75.0	178	35.6	104	20.8
	Not-exist	278	92.6	498	99.6	150	25.0	346	69.2	150	25.0	322	64.4	396	79.2
Civic life	Exist	22	7.4	250	50.0	400	66.7	67	13.4	400	66.7	97	19.4	70	14.0
	Not-exist	278	92.6	250	50.0	200	33.3	433	86.6	200	33.3	403	80.6	430	86.0
Electricity	Exist	299	99.7	500	100.0	600	100.0	450	90.0	600	100.0	460	92.0	488	97.6
	Not-exist	1	0.3	0	0.0	0	0.0	150	10.0	0	0.0	40	8.0	12	2.4
Drainage	Exist	3	1.0	0	0.0	0	0.0	77	15.4	0	0.0	180	36.0	194	38.8
	Not-exist	297	99.0	500	100.0	600	100.0	423	84.6	600	100.0	320	64.0	306	61.2

Source: Field Survey, 2020-21

Table 17: Scenario of Farmers' awareness about the latest wetland policy discourse

Statement	Response	Brahmanbaria		Habiganj		Kishoreganj		Moulvibazar		Netrokona		Sunamganj		Sylhet	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
(i) Latest jolmohol policy-2009	Yes	282	94	490	98	534	89	450	90	540	90	445	89	490	98
	No	18	5	10	2	66	11	50	10	60	10	55	11	10	2
(ii) Degree of access to the jolmohol exclusively by the "real fishers"	Yes	210	70	475	95	576	96	475	95	576	96	475	95	455	91
	No	90	30	25	5	24	4	25	5	24	4	25	5	45	9
(iii) Jolmohol under MoU with other ministries	Yes	225	75	490	98	480	80	475	95	510	85	475	95	490	98
	No	75	25	10	2	120	20	25	5	90	15	25	5	10	2
(iv) Leasing of jolmohol to fisher societies through consensus	Yes	180	60	10	2	570	95	50	10	540	90	10	2	25	5
	No	120	40	490	98	30	5	450	90	60	10	490	98	475	95
(v) Leasing system as a management tool	Yes	195	65	35	7	546	91	40	8	552	92	75	15	35	7
	No	105	35	465	93	54	9	460	92	48	8	425	85	465	93

Source: Field Survey, 2020-21

Market-based valuation of agricultural or any other output is essential because it always gives a hint about the financial strength of the producer. Among the regions under study, rice stood the highest in producing market value except forthe Sylhet region (Table 18).

Table 18: Market-based valuation of agricultural products and related components in the wetland areas

Districts	Components	Unit	Amount	Price (Tk./unit)	Value (Tk.)
Brahmanbaria	Rice	Maunds/hectare	92	700	64,400
	Vegetables	Kg./hectare	-	-	-
	Fishing	Kg./day	1	150	150
	Animal grazing	Days.	95	400	38,000
	Duck-rearing	Days	-	-	-
	Boating for tourist	Days/year	-	-	-
Habiganj	Rice	Maunds/hectare	45	626	28,170
	Vegetables	Kg./hectare	-	-	-
	Fishing	Kg./day	2	218	436
	Animal grazing	Days/year	-	-	-
	Duck-rearing	Days/year	-	-	-
	Boating for tourist	Days/year	-	-	-
Kishoregonj	Rice	Maunds/hectare	95	100	95,000
	Vegetables	Kg./hectare	-	-	-
	Fishing	Kg./day	1	150	150
	Animal grazing	Days.	95	400	38,000
	Duck-rearing	Days	-	-	-
	Boating for tourist	Days/year	-	-	-
Moulvibazar	Rice	Maunds/hectare	90	700	63,000
	Vegetables	Kg./hectare	-	-	-
	Fishing	Kg./day	1.5	150	225
	Animal grazing	Days/year	-	-	-
	Duck-rearing	Days/year	-	-	-
	Boating for tourist	Days/year	-	-	-
Netrokona	Rice	Maunds/hectare	95	800	76,000
	Vegetables	Kg./hectare	-	-	-
	Fishing	Kg./day	1	150	150
	Animal grazing	Days.	95	400	38,000
	Duck-rearing	Days	-	-	-
	Boating for tourist	Days/year	-	-	-
Sunamganj	Rice	Maunds/hectare	85	675	57,375
	Vegetables	Kg./hectare	-	-	-
	Fishing	Kg./day	2	100	200
	Animal grazing	Days/year	90	300	27,000
	Duck-rearing	Days/year	75	300	22,500
	Boating for tourist	Days/year	-	-	-
Sylhet	Rice	Maunds/hectare	96	657	63,072
	Vegetables	Kg./hectare	13519	24	3,24,456
	Fishing	Kg./day	2	137	274
	Animal grazing	Days/year	107	450	48,150
	Duck-rearing	Days/year	95	225	21,275
	Boating for tourist	Days/year	126	423	53,298

Source: Field Survey, 2020-2021

The highest value component in Sylhet was the vegetables. Rice became the second in terms of market value in Sylhet while it was the fishing in Habiganj and Moulvibazar and animal grazing in Sunamganj al Brahmanbaria regions. Table 18 reveals that Sylhet has the light diversity having 6 agricultural-related components and it was followed by Sunamganj (4 components), Brahmanbaria (3 components) and Habiganj and Moulvibazar (2 components). More diversity of the components exhibits the advantage of more high income which is essential for enhancing the production system.

11.2.3 Intervention impact evaluations:

The difference-in-differences (DiD) is a quasi-experimental design that makes use of longitudinal data from treatment and control groups to obtain an appropriate counterfactual to estimate a causal effect. DiD is typically used to estimate the effect of a specific intervention or treatment such as the enactment of policy, or large-scale program implementation by comparing the changes in outcomes over time between a population that is enrolled in a program (the intervention group) and a population that is not (the control group) (Table 19).

Table 19: The identification of variables DiD estimation

Equations	Group of variables	Name of variables	Identifications
Regression-3	Dependent variables		
	Income	Income=Y	Sample household income (BDT)
	Independent variables		
	Group	Group	Household under policy intervention (=1) and houses without intervention (=0)
	Treatment	Posttreatment	Household still not under interventions (=0) household after intervention (=1)

11.2.3.1 Empirical results of DiD:

The study used DID method to evaluate the impact of policy on rural development, resource conservation and poverty patterns. Income, employment, labour productivity and rural quality of life are considered as outcomes of the agricultural policy after launching it in 2013. The impact was evaluated up to the data of 2019 after the second revision of policy 2018.

11.2.3.1.1 Analysis of structural change in rural household's income by a successive agricultural policy of selected *haor* areas

The coefficient β0 (the constant) is significant and different from zero. Households in the control group have an average income of 90059 BDTin time =1. The co-efficient β1 (Treatment group) is also significant and different from zero, implying that at time = 1, households in the treatment and control group had a different average income. Specifically, a household in the intervention's income was 39583 BDT more than a household in the control group. The coefficient β2 (post-intervention) is significant and different from zero. It would conclude that the income of a household in the control non-intervention increased from time = 0 to time = 1. The average income of a household in the treatment group increases by67278 BDT at time = 1. The average impact of agricultural policy intervention on the income of a household at time = 1 is 78445 BDT (Table 20).

Table 20: Description of estimates of DID on H/H income

Equations	Group of variables	Name of variables	Value (level of significance)
Regression-3	Dependent variables		
	Income	Income=Y	
	Co-efficient		
	Intercept (β)		90059
	Intervention group (β_1)		39583
	Post-treatment (β2)	Post treatment	67278
	Diff in Diff (β_3)	Impact	78445

Source: Author's estimation based on field survey, 2021

Finally, the coefficient β3 (Diff-in-Diff) is significant and different from zero, which means that the agricultural policy intervention changes the income household in *haor* areas. Particularly, the income increases of 78445 BDT more than it would have without the agricultural policy intervention from 2013 to 2019 (Table 20).

Figure-3: Illustration of DID for rural household's income

11.2.3.1.2 Analysis of structural change in employment by a successive agricultural policy of selected *haor* areas

In this section, the study analyzed the formal employment effects of agricultural policy regionally differentiated public investment. Employment increase considering the work duration of selected households of *haor* areas from the change in the policy regime. The key benefit of this approach is that it allows us to assess the overall impact of the intervention on working days that are enrolled in the social security system for the public and private sectors.

Table 21: The identifications of variables employment

Equations	Group of variables	Name of variables	Value (level of significance)
Regression-4	Dependent variables		
	Employment	Work Duration = D	Standard Working Time (Days)
	Independent variables		
	Group	Group	Household under policy intervention (=1) and houses without intervention (=0)
	Treatment	Post-treatment	Household still not under interventions (=0) household after intervention (=1)

The coefficient β0 (the constant) is significant and different from zero. Households in the control group have an average working day of 214 man-days in time = 1. The co-efficient β1 (Treatment group) is also significant and different from zero, implying that at time = 1, households in the treatment and control group had a different average working day basis employment. Specifically, a household in the intervention's employment 8 man-days more than household in the control group. The coefficient β2 (post-intervention) is significant and different from zero. It would conclude that the average employment of households in the control non-intervention increased from time = 0 to time = 1. The average employment of households in the treatment group increases by 10 man-days at time = 1. The average impact of agricultural policy intervention on the income of a household at time = 1 is 9 man-days (Table 22).

Table 22: DID on H/H employment

Equations	Group of variables	Name of variables	Value (level of significance)
Regression-4	Dependent variables		
	Employment	Work Duration = D	
	Co-efficient		
	Intercept (β_0)		214
	Intervention group (β_1)		8
	Post-treatment (β2)	Post-treatment	10
	Diff in Diff (β_3)	Impact	9

Source: Author's estimation based on field survey, 2021

Finally, the coefficient β3 (Diff-in-Diff) is significant and different from zero, which means that the agricultural policy intervention changes the employment of households in *haor* areas. Particularly, the employment days increase by9 man-days more than it would have without the agricultural policy intervention from 2013 to 2019 (Table 22).

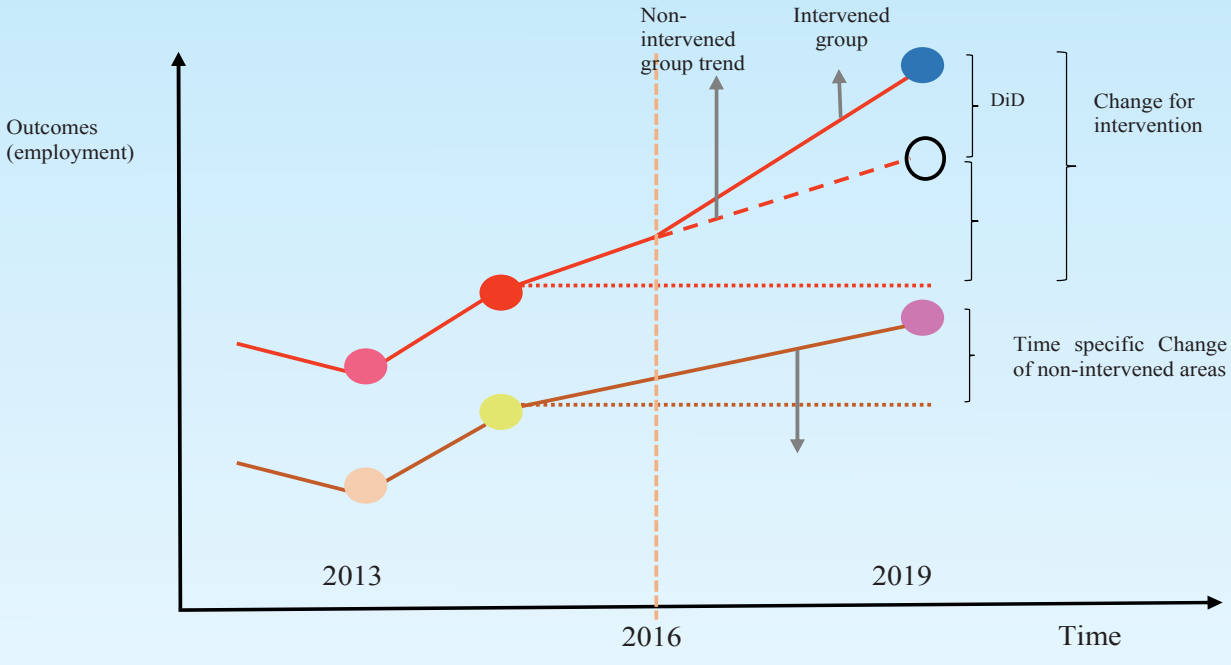


Figure-4: Illustration of DID for rural employment

11.2.3.1.3 Analysis of structural change in labour productivity by a successive agricultural policy in selected *haor* areas

In this section, the study analyzed the formal labor productivity effects of agricultural policy regionally differentiated public investment. Labor productivity increase considering monetary value of per man-day returns the duration of selected households of *haor* areas from the change in the policy regime. The key benefits of this approach are that it allows us to assess the overall impact of the intervention on returns per man-days that are engaged in the economic system for the public and private sectors. Table 23 presents the identifications of different specifications to evaluate the structural change in labour productivity.

Table 23: The identifications of variables for labour productivity

Equations	Group of variables	Name of variables	Value (level of significance)
Regression-5	Dependent variables		
	Labor productivity	Returns per man-day= W	Returns/Man-day in BDT
	Independent variables		
	Group	Group	Household under policy intervention (=1) and houses without intervention (=0)
	Treatment	Post-treatment	Household still not under interventions (=0) household after intervention (=1)

The findings of DiD on labour productivity have been presented in Table 24. The coefficient β0 (the constant) is significant and different from zero. Household in the control group has an average return of 335 per man-days in time = 1. The co-efficient β1 (Treatment group) is also significant and different from zero, implying that at time = 1, households in the treatment and control group had a different average return. Specifically, a household in the intervention's labor productivity was 51 BDT more than a household in the control group. The coefficient β2 (post-intervention) is significant and different from zero. It would conclude that the average productivity of labor in the control non-intervention increased from time = 0 to time = 1. The average productivity of labor in the treatment group increases by 85 at time = 1.

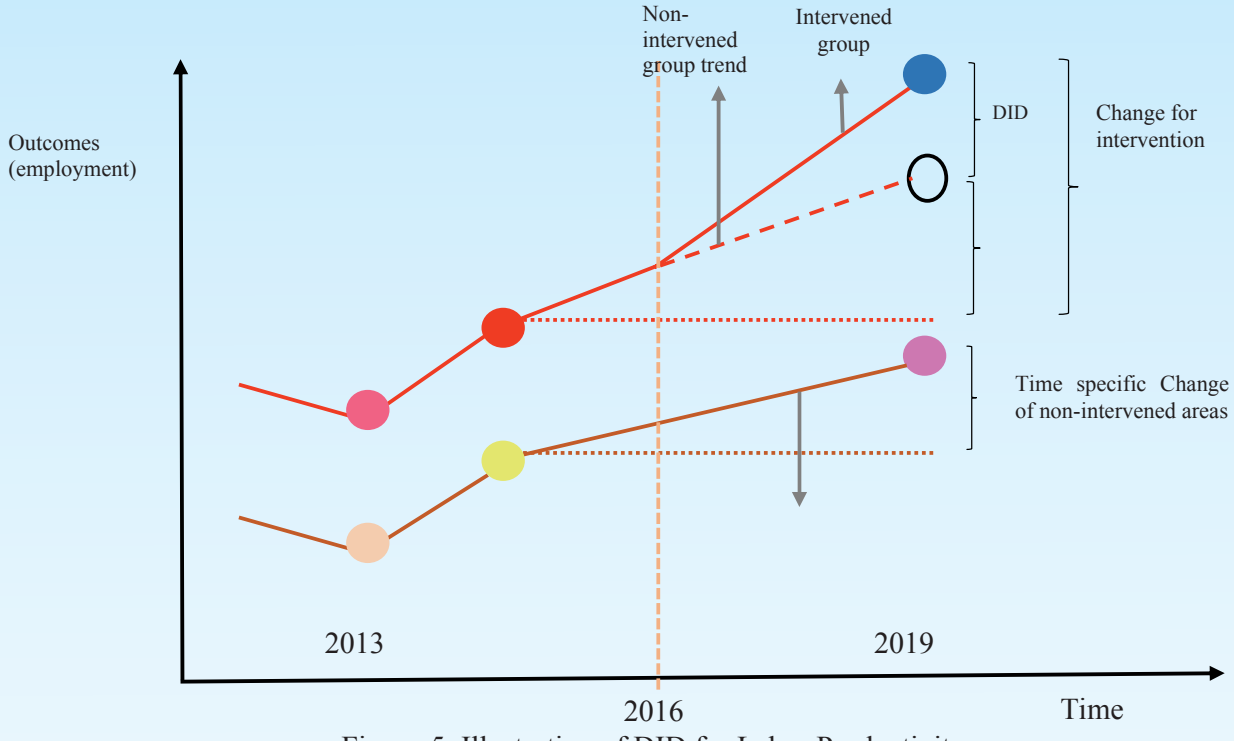


Figure-5: Illustration of DID for Labor Productivity

Table 24: DID on labor productivity

Equations	Group of variables	Name of variables	Value (level of significance)
Regression-5	Dependent variables		
	Labor productivity	Returns per man-day	
	Co-efficient		
	Intercept (β_0)		335
	Intervention group (β_1)		51
	Post-treatment (β2)	Post-treatment	85
	Diff in Diff (β_3)	Impact	59

Source: Author's estimation based on field survey, 2021

The average impact of agricultural policy intervention on the income of a household at time = 1 is 59 BDT per man-days returns. Finally, the coefficient β3 (Diff-in-Diff) is significant and different from zero, which means that the agricultural policy intervention changes the labor productivity in *haor* areas. Particularly, the returns per man-days increase of 59 more than it would have without the agricultural policy intervention from 2013 to 2019 (Table 24).

11.2.3.1.4 Analysis of structural change in the rural quality of life by a successive agricultural policy of *haor* areas

The vitality and potential of many *haor* areas remain closely linked to the presence of competitive and dynamic farming, which employs and provides income for an important number of rural inhabitants and at the same time has positive spill-over effects on many other rural activities (e.g. fishing, livestock keeping, sand mining services, tourism). This picture should, however, be nuanced by recognition of strong regional differences, and by the decreasing weight of agriculture in many rural areas. The importance of agriculture for the well-being of a region does not necessarily depend on the scale of its agricultural activities but reflects broader aspects.

The rural quality of life in study areas was measured by a composite score assigned with weight. The standards of living, availability of decent jobs, access to health facilities, education, and electricity are prime indicators that measured in rural quality of life in study.

Household Access to emergency healthcare, Medicine and Education Facilities:

Easy access to emergency healthcare and modern educational facilities is essential for modern livelihood. In terms of emergency healthcare and medicine, the people of Netrokonaare better compared to other regions. The mostly wetlands are in pathetic condition because about 12-45 percents of respondents mentioned these facilities are non-accessible to them (Table 25). It is also the same for educational facilities where three fourth of the respondents mentioned deprived of educational facilities (except Sylhet). A maximum of 88 percent of respondents opined about accessible healthcare facilities of Netrokona and it was the Sylhet region where 88 percent opined the same about desired schooling facilities. So, it can be said that emergency healthcare and educational facilities are not satisfactory in for all the regions under study.

Table 25: Household access to emergency healthcare, medicine and education facilities

District	Access to emergency healthcare and medicine facilities with distance				Access to desired schooling facilities with distance			
	Accessible		Not-accessible		Accessible		Not-accessible	
	Number of responses	%	Number of responses	%	Number of responses	%	Number of responses	%
Brahmanbaria	165	55	135	45	222	74	78	26
Habiganj	335	65	175	35	390	78	110	22
Kishoreganj	420	70	180	30	450	75	150	25
Moulvibazar	400	80	100	20	350	70	150	30
Netrokona	528	88	72	12	408	68	192	32
Sunamganj	375	75	125	25	325	65	175	35
Sylhet	350	70	150	30	440	88	60	12

Source: Field Survey, 2020-2021

Respondents' opinion on the quality of rural life:

Quality living is an undivided opinion of human society which depends on some direct and indirect facilities and activities. It was found that indirect employment and some other rural activities and services have increased inspection of regions which are beneficed for increasing quality of rural livelihood. On average, about in the study area. If all the regions are considered together, physical facilities remained the same while the perception of environment value decreased severely.

Rural quality of life was adjudged in terms of indirect employment opportunities, physical facilities (e.g., school, government and non-government office, etc.), activities and services (e.g., mobile banking, internet, etc.), and perceived value of the physical environment indicators. According to the opinion of the households, indirect employment (above 65% for all the selected *haor* areas) had increased. In addition to these, activities and services had also increased (above 70% for all the selected *haor* areas) (Table 26). However, there existed mixed opinions about the physical facilities and perceived value of the environment.

Table 26: Farmers' perception on the changes in rural livelihood in *haor* areas

Indicators	Response	Unit	Brahmanbaria	Habiganj	Kishoregonj	Moulvibazar	Netrokona	Sunamganj	Sylhet
Indirect employment	Increase	No.	210	350	450	375	480	325	325
		%	70	70	75	75	80	65	65
	Decrease	No.	60	100	120	75	60	100	150
		%	20	20	20	15	10	20	30
	Constant	No.	30	50	90	50	60	75	25
		%	10	10	15	10	10	15	5
Physical facilities	Increase	No.	195	325	480	325	450	325	325
		%	65	65	80	65	75	65	65
	Decrease	No.	15	75	60	75	120	150	75
		%	5	15	10	15	20	30	15
	Constant	No.	90	100	60	100	90	25	100
		%	30	20	10	20	15	5	20
Activities and services	Increase	No.	210	350	450	350	480	350	350
		%	70	70	75	70	80	70	70
	Decrease	No.	45	100	120	100	60	100	100
		%	15	20	20	20	10	20	20
	Constant	No.	45	50	90	50	60	50	50
		%	15	10	15	10	10	10	10
Perceived value of the physical environment	Increase	No.	210	375	450	375	480	375	325
		%	70	75	75	75	80	75	65
	Decrease	No.	60	50	120	50	60	50	150
		%	20	10	20	10	10	10	30
	Constant	No.	30	75	90	75	60	75	25
		%	10	15	15	15	10	15	5

Source: Field Survey, 2020-21

So according to the respondent opinion, rural life is lagging behind some indicates which are essential for its quality position in the wetland region.

Table 27: The identifications of variables for rural quality of life

Equations	Group of variables	Name of variables	Value (level of significance)
Regression-6	Dependent variables		
	Rural quality of life	Rural quality of life = RQ	Score out of 10 scale
	Independent variables		
	Group	Group	Household under policy intervention (=1) and houses without intervention (=0)
	Treatment	Post-treatment	Household still not under interventions (=0) household after intervention (=1)

Table 28: DiD on rural quality of life

Equations	Group of variables	Name of variables	Value (level of significance)
Regression-6	Dependent variables		
	Rural quality of life	Rural quality of life = RQ	
	Co-efficient		
	Intercept (β_0)		9
	Intervention group (β_1)		7
	Post-treatment (β2)	Post-treatment	8
	Diff in Diff (β_3)	Impact	3

Source: Author's estimation based on field survey, 2021

In this section, the study analyzed the formal labor productivity effects of agricultural policy regionally differentiated public investment. Labor productivity increase considering monetary value of per man-day returns duration of selected households of *haor* areas from the change in the policy regime. The key benefits of this approach is that it allows us to assess the overall impact of the intervention on returns per man-days that are engaged in the economic system for the public and private sector.

The findings of DiD on rural quality of life has been presented in Table 28. The coefficient β0 (the constant) is significant and different from zero. Household in the control group have a rural quality of life indicator 9 in time = 1. The co- efficient β1 (Treatment group) is also significant and different from zero, implied that at time = 1, households in the treatment and control group had a different average rural quality of life. Specifically, household in the intervention's more than household in the control group. The coefficient β2 (post-intervention) is significant and different from zero. It would conclude that the average productivity of labor in the control non-intervention increased from time = 0 to time = 1. The quality of life in the treatment group increases of 7 at time = 1. The average impact of agricultural policy intervention on income of household at time = 1 is 7out of 10 (Table 28).

Finally, the coefficient β3 (Diff-in-Diff) is significant and different from zero, which means that the agricultural policy intervention changes the labor productivity in *haor* areas. Particularly, increases of 3more than it would have without the agricultural policy intervention from 2013 to 2019 (Table 28 and figure 6).

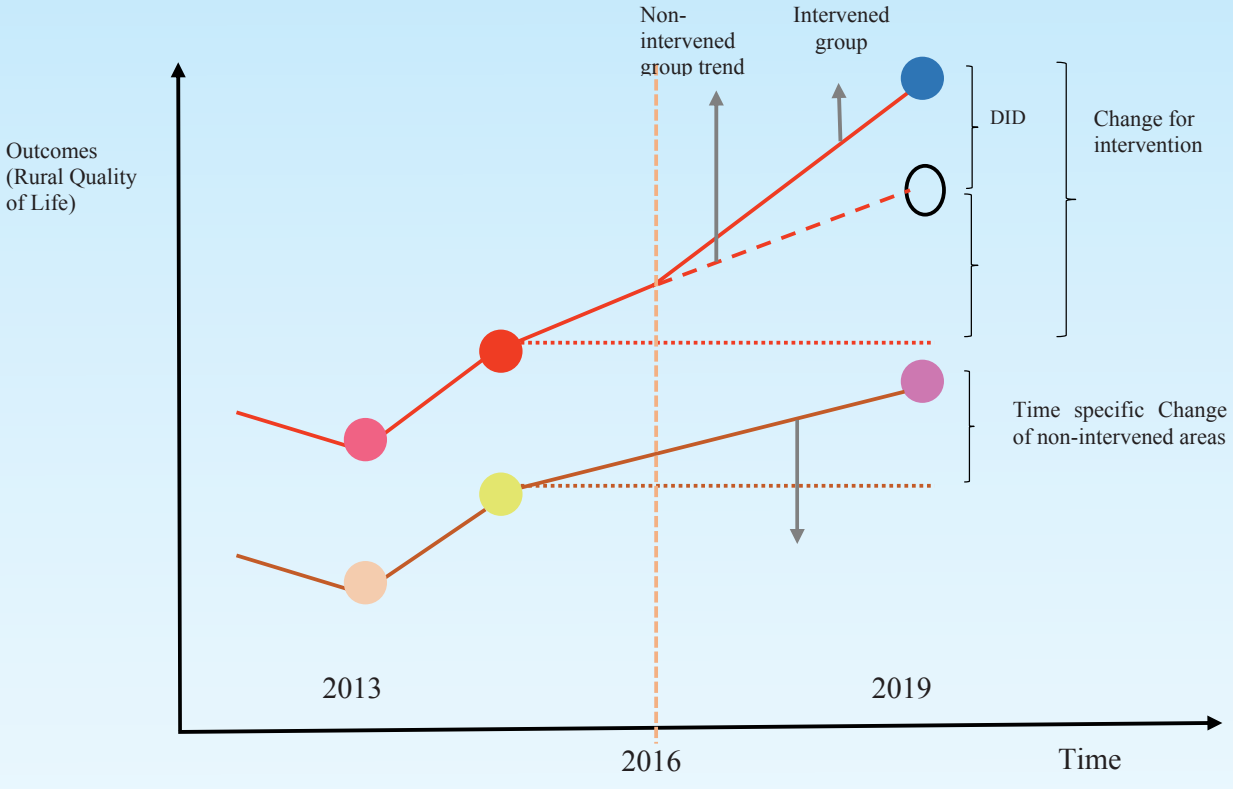


Figure 6: Illustration of DID for Rural Quality of Life

11.2.3.1.5 Scenario of existing and probable cropping patterns of major rice crop by a successive agricultural policy in the selected *haor* areas

Table 29: Possible cropping patterns in the *haor* areas

Major existing cropping patterns	% Area under the pattern	Latest cropping patterns	Exploitable area under pattern
Sunamganj: Boro-Fallow—Fallow Fallow-Fallow-T.Aman Boro-Fallow-T.Aman Fallow-Aus-T.Aman	 80 3 8 6	 Rabi crop-Fallow-T.Aman Vegetable-Aus-T.Aman	 90 10
Sylhet: Boro-Fallow—Fallow Fallow-Fallow-T.Aman Boro-Fallow-T.Aman Fallow-Fallow-B.Aman	 60 10 21 5	 Rabicrops-Fallow-T.Aman Rabi crops-B.Aman	 80 20
Habiganj: Boro-Fallow-Fallow Boro-Fallow-T.Aman B.Aman-Fallow-Fallow	 68 30 12	 Boro-B.Aman-Fallow	 8
Netrokona: Boro-Fallow-Fallow Boro-Fallow-T.Aman Mustard-Fallow-Fallow	 82 20 6	 Mustard-Boro-Fallow Boro-Fallow-.T.Aman	 20

Major existing cropping patterns	% Area under the pattern	Latest cropping patterns	Exploitable area under pattern
Kishoreganj: Boro-Fallow-Fallow Wheat-Fallow-Fallow Wheat-B.Aman-Fallow	 82 3 2	 Ground nut-Fallow-Fallow Ground nut- B.Aman-Fallow	 2 40
Moulvibazar: Boro-Fallow-Fallow Boro-Fallow-T.Aman Fallow-B.Aman-Fallow Rabi crops-B.Aman-Fallow Fallow-Aus-T.Aman Rabi crops-Aus-T.Aman	 64 20 18 45 7	Boro-Fallow-Aman	26
B.Baria: Boro-Fallow-Fallow Boro-Fallow-T.Aman Fallow-B.Aman-Fallow Rabi crops-B.Aman-Fallow Boro-Fallow-.T.Aman	72	Boro-B.Aman-Fallow	18

Source: Based on field survey, 2020-21

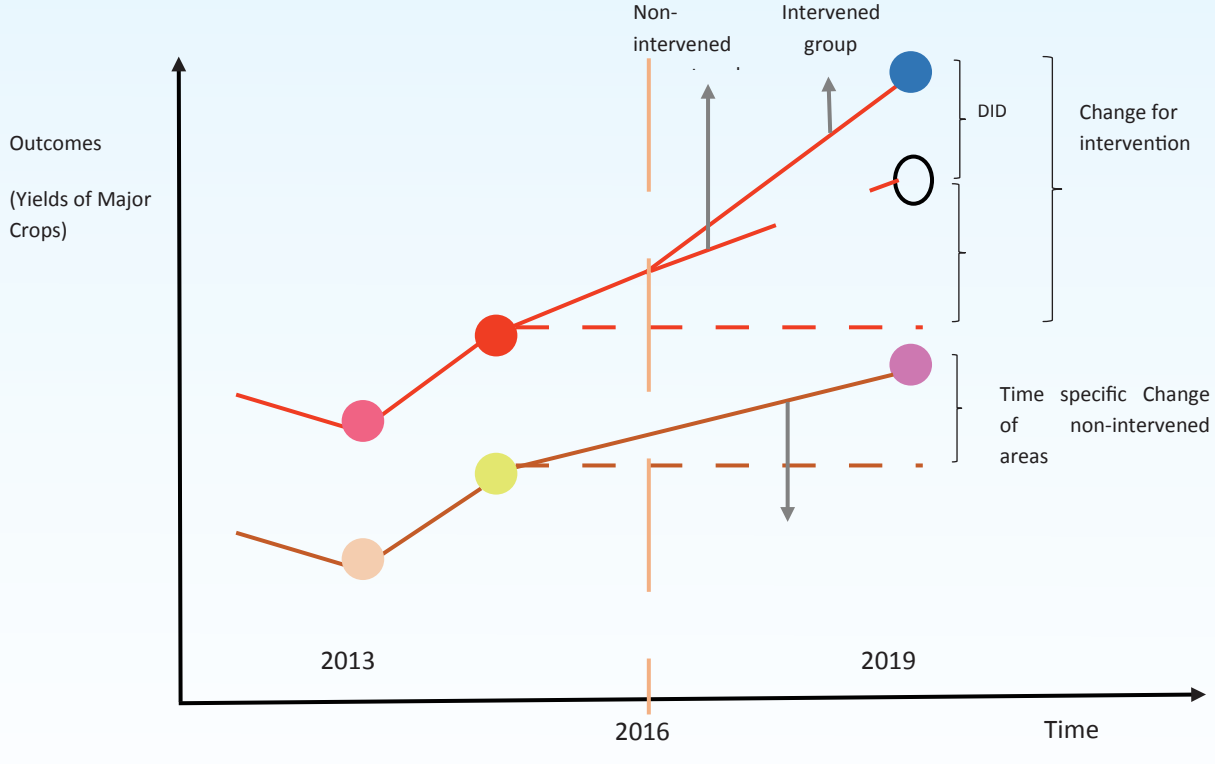


Figure 7: Illustration of DID for yields of major crop rice

Table 30: The identifications of variables of yield change

Equations	Group of variables	Name of variables	Value (level of significance)
Regression-7	Dependent variables		
	Yield	Yield = Y	Per acre production = Maunds
	Independent variables		
	Group	Group	Household under policy intervention (=1) and houses without intervention (=0)
	Treatment	Post-treatment	Household still not under interventions (=0) household after intervention (=1)

The findings of DiD on major crop (Boro rice) yield have been presented in Table 31. The coefficient β_0 (the constant) is significant and different from zero. Household in the control group have a yield indicator 62.1 in time = 1. The co- efficient β_1 (Treatment group) is also significant and different from zero, implied that at time = 1, households in the treatment and control group had a different yield. Specifically, household in the intervention's more than household in the control group. The coefficient β_2 (post-intervention) is significant and different from zero. It would conclude that the average yield in the control non-intervention increased from time = 0 to time = 1. The yield in the treatment group increases of 42.1 at time = 1. The average impact of agricultural policy intervention on yield of household at time = 1 is 48.4 (Table 31).

Finally, the coefficient β3 (Diff-in-Diff) is significant and different from zero, which means that the agricultural policy intervention changes the crop yield in *haor* areas. Particularly, increases of 42.1 more than it would have without the agricultural policy intervention from 2013 to 2019 (Table 31 and figure 7).

Table 31: DiD on major crop (Boro rice) yield

Equations	Group of variables	Name of variables	Value (level of significance)
Regression-7	Dependent variables		
	Yield	Yield =Y	
	Co-efficient		
	Intercept (β_0)		62.1
	Intervention group (β_1)		13.8
	Post-treatment (β2)	Post-treatment	42.1
	Diff in Diff (β_3)	Impact	48.4

Source: Author's estimation based on field survey, 2021

Rural-urban income gaps have widened and rural poverty has increased. New policy approaches are needed to enhance rural economic performance. The country's investment plan and policy have had a visible positive impact on all aspects of rural life, but the strong focus on agricultural policies is not enough to further enhance convergence. The design and implementation of the rural policy should therefore be based on an integrated territorial rather than sectoral approach. This will help ensure a better balance between farm and non-farm development program. The present system favours farmers at the expense of other sectors. However, farmers are rarely the main agents of rural economic development. Rural development policy should also be embedded within a clear regional strategy. Rural development program should not be developed in isolation but integrated into Cohesion and Regional Policy. Diversified rural employment and the development of rural labour markets should be central in rural regional development policies. Agriculture is still an important employer in most of the rural *haor*, but it is not always the major source of income for rural families. To foster the development of the wider rural economy, devolved regional programming and implementation are needed. This generates a more flexible framework, stimulating

creative input from local actors. Regional programming requires the involvement of both local stakeholders (bottom-up) and regional authorities (top-down) to develop and implement projects. Local entrepreneurs should be closely involved. Development plans should not rely purely on the public sector. An understanding of, and an ability to comply with, the rules on co-financing are critical for the successful implementation of policy measures.

A large number of subsistence and semi-subsistence farms is characteristic of *haor* agriculture and requires special attention and policies. These farms are hardly comparable to any sections of the Bangladesh farming sector and currently, the agricultural policy is not really meeting the needs of these farms. Many resources have a significant potential for agricultural production; however, this potential is still underutilized. With regard to the subsistence and semi-subsistence farms, it might therefore be recommended that farm exits be promoted. In this case, however, social policies should be offered to small-holders whose only security is often their subsistence income and their farm. Otherwise, the safety net provided by the farm is undermined.

Small farms are also important suppliers of environmental (and cultural) goods. This means that, for those who decide to stay in the business, policies should place more emphasis on their role in the provision of public goods, and provide them with equal access to measures of the policy. Regional rural development and successfully accessing public funds and implementing worthwhile projects require strong capacity building. This is true for farm-related support and even more so for the territorial and bottom-up approaches. Capacity building involves knowledge, effective relations, the capability to mobilize resources and actors, and the ability to implement and monitor activities. Good intentions will flounder without these four factors. Capacity building is also a key for using the opportunities of the rural non-farm economy. Rural policies depend on experienced, honest, motivated and open-minded officials in the public administration. Some cases require the creation of new administrative structures and institutions capable of attracting, managing and monitoring public funds. For a successful implementation of a well-functioning, motivated administration is essential; the creation of an 'institutional memory' is critical.

11.3 Identification of basic constraints that are hindering resource utilization in *haor* areas amend a respective policy

The principal objective of this section is to evaluate agricultural policy qualitatively. The levels of poverty, rural development and food security were qualitatively assessed for identifying the constraints. The determinants of resource utilizations and respective policy of agricultural production were found out at the grassroot level stakeholders in the *haor* regions which are highly vulnerable and need amendments for better options. The three thematic areas of agricultural policy were discussed in this part. Namely, the food system, rural development and poverty. There are about 75 FGDs, 36 MoK and 10 case studies were done for evaluating the effect of agricultural policy on the poverty, food system and rural development. In addition to these, respondents opinion on various phenomena were evaluated accordingly.

11.3.1 Respondents' opinion on the environment nature and the landscape of the wetland

Opinion of the respondents was sought about the existing condition of environment; nature and landscape of the studied regions and the response are summarized in Table 32. Among the 4 important indicators, the larges point of the respondents informed water consumption, flood and draught incidence has been increased from their previous levels. The same response was received in the greenhouse gas. These results indicate that the overall environment of the wetlands under study is deteriorating and it needs immediate actions for preventing the deterioration. Moreover, Brahmanbaria is the most vulnerable region followed by Kishoreganj and Netrokona in terms of environment, nature and landscape.

Table 32: Respondents opinion on the environment, nature and the landscape of the wetland

Indicators	Response	% farmers responded						
		Brahmanbaria	Habiganj	Kishoreganj	Moulvibazar	Netrokona	Sunamganj	Sylhet
Greenhouse gases (no./%)	Increase	110	38	150	125	120	38	100
		36.7	7.6	25.0	25	20.0	7.6	20.0
	Decrease	87	102	300	25	360	102	50
		29.0	20.4	50.0	5	60.0	20.4	10.0
	Constant	103	360	150	350	120	360	350
		34.3	72.0	25.0	70	20.0	72.0	70.0
Water consumption (no/%)	Increase	240	50	120	50	120	50	50
		80.0	10.0	20.0	10	20.0	10.0	10.0
	Decrease	30	50	360	50	360	50	50
		10.0	10.0	60.0	10	60.0	10.0	10.0
	Constant	30	400	120	400	120	400	400
		10.0	80.0	20.0	80	20.0	80.0	80.0
Flood (no./%)	Increase	110	38	150	38	150	38	100
		36.7	7.6	25.0	7.6	25.0	7.6	20.0
	Decrease	87	102	300	102	300	102	50
		29.0	20.4	50.0	20.4	50.0	20.4	10.0
	Constant	103	360	150	360	150	360	350
		34.3	72.0	25.0	72	25.0	72.0	70.0
Drought (no./%)	Increase	240	50	120	100	120	50	50
		80.0	10.0	20.0	20	20.0	10.0	10.0
	Decrease	30	50	360	50	360	50	50
		10.0	10.0	60.0	10	60.0	10.0	10.0
	Constant	30	400	120	350	120	400	400
		10.0	80.0	20.0	70	20.0	80.0	80.0

Source: Author's estimation based on field survey, 2021

11.3.2 Respondents' opinion about constraints and policy gap (5-point Likert scale)

Policies and programs are undertaken for achieving predetermined objectives regarding the smooth development of any sector. Different constraints in the sector and gaps in the policy of ways frustrate smooth implementation of the policy. So, they need to be addressed properly for effective policy formulation. The respondents were asked with statements following the Likert 5-point scale in this and the results are summarized Table 33 among the 5 statements, a higher number of the respondents agreed and strongly agreed with and statements irrespective of regions under study.

It is evident from Table 33 that provision of subsidy and reducing the cost of agriculture for enhancing income are the most important issues as a greater number of respondents of a maximum of 4 regions expressed such opinions. The next issue was excessive agricultural dependence, the insufficient market price of crops, farmers in dependency in deciding crop prices and banning dangerous pesticides where a large portion of 3 regions respondents gave their strong opinion. Some respondents were also found to give different opinions from others but strong opinions hurting them severely were the largest. So, all the increases under Likert scale analysis should be taken into consideration and need addressing often their rational prioritization which are discussed in Table 34.

Table 33: Respondents opinion about constraints and policy gap (5-point Likert scale)

Statement	Rating scale	Brahmanbaria		Habiganj		Kishoregonj		Moulvibazar		Netrokona		Sunamganj		Sylhet	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Commercialization of agriculture by mechanization	Strongly disagree (1)	62	20.7	38	7.6	45	7.5	4	0.8	38	6.3	95	19	12	2.4
	Disagree (2)	9	3.0	10	2.0	12	2.0	63	12.6	10	1.7	55	11	24	4.8
	Undecided (3)	1	0.3	452	90.4	543	90.5	0	0.0	552	92.0	5	1	8	1.6
	Agree (4)	27	9.0	0	0.0	0	0.0	433	86.6	0	0.0	125	25	212	42.4
	Strongly agree (5)	201	67.0	0	0.0	0	0.0	0	0.0	0	0.0	220	44	244	48.8
Marketing process of crops is difficult and complex	Strongly disagree (1)	12	4.0	13	2.6	15	2.5	4	0.8	12	2.0	18	3.6	14	2.8
	Disagree (2)	89	29.7	30	6.0	36	6.0	20	4.0	30	5.0	182	36.4	106	21.2
	Undecided (3)	54	18.0	10	2.0	12	2.0	13	2.6	10	1.7	153	30.6	74	14.8
	Agree (4)	94	31.3	217	43.4	261	43.5	160	32.0	218	36.3	95	19.0	188	37.6
	Strongly agree (5)	51	17.0	230	46.0	276	46.0	303	60.6	330	55.0	52	10.4	118	23.6
Market prices of crops are remunerative	Strongly disagree (1)	113	37.7	380	76.0	456	76.0	357	71.4	480	80.0	158	31.6	96	19.2
	Disagree (2)	84	28.0	80	16.0	96	16.0	70	14.0	80	13.3	100	20.0	138	27.6
	Undecided (3)	18	6.0	8	1.6	9	1.5	30	6.0	7	1.2	70	14.0	74	14.8
	Agree (4)	43	14.3	32	6.4	39	6.5	30	6.0	33	5.5	97	19.4	160	32.0
	Strongly agree (5)	42	14.0	0	0.0	0	0.0	13	2.6	0	0.0	75	15.0	32	6.4

Statement	Rating scale	Brahmanbaria		Habiganj		Kishoregonj		Moulvibazar		Netrokona		Sunamganj		Sylhet	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Should farmers independent to decide the market value of their crops	Strongly disagree (1)	20	6.7	13	2.6	15	2.5	17	3.4	13	2.2	85	17	34	6.8
	Disagree (2)	61	20.3	0	0.0	0	0.0	16	3.2	0	0.0	100	20	68	13.6
	Undecided (3)	26	8.7	7	1.4	9	1.5	21	4.2	7	1.2	113	22.6	80	16.0
	Agree (4)	81	27.0	70	14.0	84	14.0	210	42.0	70	11.7	137	27.4	254	50.8
	Strongly agree (5)	112	37.3	410	82.0	492	82.0	236	47.2	510	85.0	65	13.0	64	12.8
Subsidy provided for farmers are sufficient	Strongly disagree (1)	41	13.7	10	2	12	2.0	17	3.4	10	1.7	85	17.0	14	2.8
	Disagree (2)	22	7.3	0	0	0	0.0	26	5.2	0	0.0	53	10.6	52	10.4
	Undecided (3)	8	2.7	10	2	12	2.0	20	4.0	10	1.7	30	6.0	46	9.2
	Agree (4)	69	23.0	43	8.6	51	8.5	44	8.8	43	7.2	182	36.4	184	36.8
	Strongly agree (5)	160	53.3	437	87.4	525	87.5	393	78.6	537	89.5	150	30.0	204	40.8

Source: Author's estimation based on field survey, 2021

Table 34: Respondents opinion about solutions of constraints for addressing policy gap 5-point Likert scale)

Statement	Rating scale	Brahmanbaria		Habiganj		Kishoregonj		Moulvibazar		Netrokona		Sunamganj		Sylhet	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Crime control cells to stop duplicity in agriculture products	Strongly disagree (1)	15	5.0	5	1.0	30	5.0	37	7.4	53	8.8	28	5.6	44	8.8
	Disagree (2)	47	15.7	3	0.6	93	15.5	23	4.6	52	8.7	107	21.4	44	8.8
	Undecided(3)	45	15.0	287	57.4	90	15.0	183	36.6	125	20.8	83	16.6	104	20.8
	Agree (4)	127	42.3	170	34.0	255	42.5	166	33.2	180	30.0	185	37.0	150	30
	Strongly agree (5)	66	22.0	35	7.0	132	22.0	90	18	190	31.7	97	19.4	158	31.6
Dangerous pesticides should be banned	Strongly disagree (1)	47	15.7	10	2.0	93	15.5	7	1.4	15	2.5	90	18.0	12	2.4
	Disagree (2)	13	4.3	5	1.0	27	4.5	16	3.2	24	4.0	48	9.6	20	4.0
	Undecided (3)	21	7.0	20	4.0	42	7.0	34	6.8	72	12.0	87	17.4	60	12.0
	Agree (4)	102	34.0	63	12.6	204	34.0	100	20	278	46.3	170	34.0	232	46.4
	Strongly agree (5)	117	39.0	402	80.4	234	39.0	343	68.6	211	35.2	105	21.0	176	35.2

Statement	Rating scale	Brahmanbaria		Habiganj		Kishoregonj		Moulvibazar		Netrokona		Sunamganj		Sylhet	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
To reduce the costs of agriculture that are more than income	Strongly disagree (1)	39	13.0	5	1.0	78	13.0	14	2.8	10	1.7	100	20.0	8	1.6
	Disagree (2)	12	4.0	0	0.0	24	4.0	3	0.6	26	4.3	53	10.6	22	4.4
	Undecided (3)	39	13.0	15	3.0	78	13.0	27	5.4	62	10.3	95	19.0	52	10.4
	Agree (4)	98	32.7	150	30.0	195	32.5	96	19.2	268	44.7	110	22.0	224	44.8
	Strongly agree (5)	112	37.3	330	66.0	225	37.5	360	72.0	234	39.0	142	28.4	194	38.8
Decreasing level of groundwater is a serious problem	Strongly disagree (1)	42	14.0	10	2.0	84	14.0	14	2.8	63	10.5	65	13.0	52	10.4
	Disagree (2)	18	6.0	5	1.0	36	6.0	36	7.2	84	14.0	88	17.6	70	14.0
	Undecided (3)	80	26.7	58	11.6	159	26.5	163	32.6	89	14.8	140	28.0	74	14.8
	Agree (4)	87	29.0	85	17.0	174	29.0	96	19.2	268	44.7	145	29.0	224	44.8
	Strongly agree (5)	73	24.3	342	68.4	147	24.5	191	38.2	96	16.0	62	12.4	80	16.0
Commercial crops should be preferred	Strongly disagree (1)	39	13.0	5	1.0	78	13.0	7	1.4	12	2.0	68	13.6	10	2.0
	Disagree (2)	32	10.7	0	0.0	63	10.5	33	6.6	77	12.8	57	11.4	64	12.8
	Undecided (3)	37	12.3	183	36.6	75	12.5	84	16.8	111	18.5	120	24.0	92	18.4
	Agree (4)	93	31.0	235	47.0	186	31.0	320	64.0	304	50.7	138	27.6	254	50.8
	Strongly agree (5)	99	33.0	77	15.4	198	33.0	56	11.2	96	16.0	117	23.4	80	16.0

Source: Author's estimation based on field survey, 2021

11.3.3 Respondents' perception about wetland environment, ecology and resources

It was efforted to explore the perception of the respondents about their surrounding environment and thus the results are summonsed in Table 35. Except Brahmanbaria and Habiganj, a large portion of the respondents informed that the supply of mountain food was high in their regions. Same response was received from the respondents in the case of rainfall while almost all the respondents opined in favor of moderate temperature. So, it can be said that high mountain flood, high rainfall and moderate temperature are positively correlated in the regions under study.

Table 35: Respondents perception about wetland environment, ecology and resources

Districts	Mountain flood						Rain fall						Temperature					
	High		Moderate		Low		High		Moderate		Low		High		Moderate		Low	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Brahmanbari	75	25	210	70	15	5	90	30	180	60	30	10	75	25	210	70	15	5
Habiganj	100	20	100	20	200	40	100	20	100	20	200	40	300	60	100	20	100	20
Kishoregonj	150	25	150	25	300	50	150	25	150	25	300	50	330	55	60	10	210	35
Moulvibazar	300	60	100	20	100	20	100	20	100	20	200	40	300	60	100	20	100	20
Netrokona	330	55	60	10	210	35	150	25	150	25	300	50	330	55	60	10	210	35
Sunamganj	250	50	125	25	125	25	250	50	125	25	125	25	250	50	125	25	125	25
Sylhet	300	60	100	20	100	20	50	10	50	10	400	80	300	60	100	20	100	20

Source: Field Survey, 2020-2021

11.3.4 Respondents' awareness on the main area of wetland management

Some areas of wetland management need to be handled consciously and wetland people should be aware of these areas. Table 36 depicts, that among the 8 areas of awareness maximum of the respondents were found aware about the marketing of their agricultural products and control of livestock grazing land along the wetland. The same but opposite impression was given by the respondents in the core of sand and store mining regulation. Except for Moulvibazar, respondents showed their favorable conscious ore about agro-chemical use while except for Sunamganj the response is just opposite. The response about coping risk and uncertainty with insurance was mixed while 2 regions responded favorable overall Habiganj respondents are aware compare to another region. So wetland people need to be more aware of wetland management for this healthy and sustainable livelihood. Again, Table 37 indicates that respondents of almost all the wetlands disagree and strongly disagree about excessive use of pesticides and fertilizers and their verification. However, they agree and strongly agree about the harmfulness of pesticides and chemicals on the water resources and human life. Furthermore, respondents of all the regions agree and strongly agree about the subsidy of pesticides and quality seeds.

Table 36: Respondents awareness on the main area of wetland management

Statement	Response	Brahmanbaria		Habiganj		Kishoregonj		Moulvibazar		Netrokona		Sunamganj		Sylhet	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Agro-chemical use	Y	289	96.3	500	100.0	570	95.0	26	5.2	570	95.0	244	48.8	448	89.6
	N	11	3.7	0	0.0	30	5.0	474	94.8	30	5.0	256	51.2	52	10.4
Marketing of agricultural products	Y	290	96.7	500	100.0	600	100.0	440	88.0	570	95.0	348	69.6	356	71.2
	N	10	3.3	0	0.0	0	0.0	60	12.0	30	5.0	152	30.4	144	28.8
Risk & uncertainty management by insurance	Y	231	77.0	150	30.0	180	30.0	66	13.2	150	25.0	260	52.0	256	51.2
	N	69	23.0	350	70.0	420	70.0	434	86.8	450	75.0	240	48.0	244	48.8
Control of livestock grazing along the wetland	Y	234	78.0	487	97.0	585	97.5	290	58.0	585	97.5	244	48.8	302	60.4
	N	66	22.0	13	3.0	15	2.5	210	42.0	15	2.5	256	51.2	198	39.6
Control of arable farming along the wetland	Y	252	84.0	500	100.0	600	100.0	280	56.0	600	100.0	260	52.0	216	43.2
	N	48	16.0	0	0.0	0	0.0	220	44.0	0	0.0	240	48.0	284	56.8
Regulations of sand & stone mining along the wetland	Y	39	13.0	10	2.0	30	5.0	123	24.6	12	2.0	218	43.6	192	38.4
	N	261	87.0	490	98.0	570	95.0	377	75.4	588	98.0	282	56.4	308	61.6
Deforestation of wetland vegetation	Y	12	4.0	5	1.0	20	3.3	70	14.0	30	5.0	232	46.4	214	42.8
	N	288	96.0	495	99.0	580	95.0	430	86.0	570	95.0	268	53.6	286	57.2

Source: Field Survey, 2020-2021

Table 37: Farmers' perceptions about constraints and policy gap of agro-chemical use (5-point Likert scale)

Statement	Rating scale	Brahmanbaria		Habiganj		Kishoregonj		Moulvibazar		Netrokona		Sunamganj		Sylhet	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Pesticides and fertilizers are used more than the need	Strongly disagree (1)	69	23.0	153	30.6	183	30.5	120	24.0	29	4.8	85	17.0	24	4.8
	Disagree (2)	93	31.0	243	48.6	291	48.5	144	28.8	158	26.3	100	20.0	132	26.4
	Undecided (3)	69	23.0	37	7.4	45	7.5	47	9.4	137	22.8	113	22.6	114	22.8
	Agree (4)	53	17.7	40	8.0	48	8.0	146	29.2	196	32.7	137	27.4	164	32.8
	Strongly agree (5)	16	5.3	27	5.4	33	5.5	43	8.6	80	13.3	65	13.0	66	13.2
Pesticides, insecticides are verified	Strongly disagree (1)	50	16.7	215	43.0	258	43.0	304	60.8	127	21.2	93	18.6	106	21.2
	Disagree (2)	114	38.0	235	47.0	282	47.0	103	20.6	226	37.7	122	24.4	188	37.6
	Undecided (3)	80	26.7	18	3.6	21	3.5	20	4.0	108	18.0	125	25.0	90	18.0
	Agree (4)	34	11.3	27	5.4	33	5.5	40	8.0	98	16.3	135	27.0	82	16.4
	Strongly agree (5)	22	7.3	5	1.0	6	1.0	33	6.6	41	6.8	25	5.0	34	6.8
Pesticides and insecticides are polluting soil and water resources	Strongly disagree (1)	12	4.0	8	1.6	9	1.5	7	1.4	10	1.7	23	4.6	8	1.6
	Disagree (2)	47	15.7	10	2.0	12	2.0	14	2.8	58	9.7	105	21.0	48	9.6
	Undecided (3)	40	13.3	10	2.0	12	2.0	36	7.2	117	19.5	107	21.4	98	19.6

Statement	Rating scale	Brahmanbaria		Habiganj		Kishoregonj		Moulvibazar		Netrokona		Sunamganj		Sylhet	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
	Agree (4)	90	30.0	205	41.0	246	41.0	256	51.2	269	44.8	162	32.4	224	44.8
	Strongly agree (5)	111	37.0	267	53.4	321	53.5	187	37.4	146	24.3	103	20.6	122	24.4
Chemicals are affecting human and animal life	Strongly disagree (1)	15	5.0	5	1.0	6	1.0	7	1.4	22	3.7	33	6.6	18	3.6
	Disagree (2)	39	13.0	0	0.0	0	0.0	10	2.0	41	6.8	90	18.0	34	6.8
	Undecided (3)	51	17.0	18	3.6	21	3.5	37	7.4	103	17.2	125	25.0	86	17.2
	Agree (4)	104	34.7	177	35.4	213	35.5	250	50.0	300	50.0	190	38.0	250	50.0
	Strongly agree (5)	91	30.3	300	60.0	360	60.0	196	39.2	134	22.3	62	12.4	112	22.4
Commodities like pesticides, quality seeds are also be provided on subsidy	Strongly disagree (1)	12	4.0	15	3.0	18	3.0	27	5.4	34	5.7	35	7.0	28	5.6
	Disagree (2)	83	27.7	40	8.0	48	8.0	16	3.2	60	10.0	85	17.0	50	10.0
	Undecided (3)	78	26.0	138	27.6	165	27.5	86	17.2	125	20.8	183	36.6	104	20.8
	Agree (4)	87	29.0	260	52.0	312	52.0	177	35.4	208	34.7	110	22.0	174	34.8
	Strongly agree (5)	40	13.3	47	9.4	57	9.5	194	38.8	173	28.8	87	17.4	144	28.8

Source: Author's estimation based on field survey, 2021

11.3.5 FGD Report

11.3.5.1 Thematic Analysis

This section of the study presents findings from the focus group interviews in the form of a summary of what respondents said in response to specific questions. The information in this section represents the researchers' interpretation based upon: (1) notes made during the focus group meetings, (2) a review of the audio and video recordings, and (3) a content analysis of the typed transcripts from the three meetings.

The FGD was conducted to analyze the adaptability of agricultural policy on the food system and rural development in Bangladesh especially in *haor* areas. The study areas are Sylhet, Sunamganj, Kishorganj, Habiganj, Moulvibazar, Netrokona and Brahmanbaria districts. A total of eight to ten participants was in each group consisting of male and female. Their ages range between twenty-five to fifty years who took part in the discussion. Four facilitators took the responsibility with a checklist and they took notes of FGD.

Table 38: Description of FGD groups

Location	No. of Household	Voters
Julurmukh, Cholitabari, Shalutikur, Goyanghat, Sylhet (Farmer)	114	3000
Julurmukh, Cholitabari, Shalutikur, Goyanghat, Sylhet (Fisherman)	114	3000
Balipara, Jaintapur, Sylhet (Farmer)	450	2100
Uchitpur,Modon, Netrokona, (Farmer)	25	300
Uchitpur, Modon , Netrokona (Fisherman)	25	300
Uchitpur,Modon,Netrokona (Boatman)	25	300
Uchitpur,Modon,Netrokona (Female)	25	300
Nurpur Boali, Khaliajhuri, Netrokona (Fisherman)	550	2200
Kodomshrie, Gobindroshire Modon,Netrokona (Farmer)	1200	5000
Borohati,Gobindroshire,Modon Netrokona. (Fisherman)	1000	4500
Chatirchor,Nikli,Kishoreganj (Fisherman)	2500	8000
Chatirchor,Nikli,Kishoreganj (Farmer)	2500	8000
Kolahani, Mithamain, Kishoreganj (Fisherman)	127	600
Kolaani, Mithamoin, Kishoreganj (Farmer)	127	600
Gupdighi, Mithamoin, Kishoreganj (Farmer)	5000	14000
Mojhlishpur Bazer, Nikli,Kishoreganj	800	3000
Noyabari , Maddhagram, Itna Kishorganj	100	400
Hamidpalli,Mithamain, Kishoreganj (Farmer)	150	750
Hamidpalli,Mithamain, Kishoreganj (Fisherman	150	750
Belagaon, Juri, Moulvibazar (Farmer)	1200	4000
Belagaon, Juri, Moulvibazar (Fisherman)	1200	4000
Bokshimul, Kulaura, Moulvibazar (Farmer)	1200	4000
Halla, Borolikha , Moulvibazar	300	1500
Pirijpur, Ajmiriganj, Habiganj (Farmer)	1800	5000
Pirijpur, Ajmiriganj, Habiganj (Fisherman)	1800	5000
Pirijpur, Ajmiriganj, Habiganj (Female)	1800	5000
Sujongram ,Lakhai, Habiganj (Farmer)	240	750
Sujongram ,Lakhai, Habiganj (Fisherman)	240	750
Bilaimara, Nasirnagar, Brahmanbaria (Farmer)	100	400
Bilaimara, Nasirnagar, Brahmanbaria Fisherman)	100	400
Nasirnagor, Brahmanbaria	600	2500
Bilaimara, Nasirnagar, Brahmanbaria	100	400
Shahpur,Jamalgonj Sunamganj (Farmer)	90	400
Shahpur, Shreepur Jamalganj,Sunamganj (Fisherman)	90	400
Noyabondo , Shreepur, Tahirpur, Sunamganj (Farmer)	150	450
Kadipur, Dhormopasha Sunamganj (Farmer)	70	200

11.3.5.2 Perceptions of Agricultural Policy

The stakeholders of focus group discussion members reported that there perception of the existing agricultural policy in a particular career focus influences their choice of crop grown. Some mentioned going into a *haor* community, desired specialty as a way to succeed by public policy and support a fair price for them. Others mentioned that rural life substantially has great opportunities if plentiful and available inputs are ensured for them. The public policy regarding agriculture must have a regional focus and priorities. Specifically, more non-farm jobs creation would prime focus that mobilized resources.

Picture 7: FGD session in Netrokona

They think, undoubtedly, the wetland arable farming area is increasing due to higher siltation. Productivity of rice was also increasing but very steady-state conditions. Subsidy makes regularly use of fertilizers like Urea, TSP, and MOP available in the local area. Recently govt. reduced the price of DAP fertilizer and fixed it to 16 BDT. per kilo. It reduced the farming cost they are happy to have this reduction. They were enjoyed free fertilizer and seeds from govt. in 2017. Availability of quality hybrid seeds contributes to a higher yield of crops they think. The farmers got officials' support to control pest attacks in a rice field in 20291. Maximum farmers have 'Krishi card' but they do not get the direct benefit for having it. Due to the development of communication commercial vegetables is popular in the area mostly in Rabi-season but there is an acute shortage of vegetable in the rainy season. Pulse and oil seeds crop was grown significantly in this area.

Picture 8: FGD session in Austrogram-Kishoreganj

Famers of *haor* area are aware of govt. rice support policy. But they criticized the present process of the rice procurement system. Because small and marginal farmers have no access to the process. They claimed that only local leaders can sell directly to the government officials. The lottery system does not ensure everyone accesses the procurement system. They don't have the chance to be a direct supplier of rice under this support program. Besides, getting access tothe procurement system they were rejected as their rice could not fill up the desired moisture percentage (14%) determined by govt. As a result, they lost their interest in govt. rice support system. The current declared procurement price is satisfactory but lack of good governance at field level creates a problem to get in the benefits of govt. support.

The policy of favoring rice harvesting by combining harvesters from govt. agricultural office reduces harvesting costsby almost half.The timely operation and available machine ensure a good harvest. This support system is high, cost-effective and reduces post-harvest loss as well as minimizes the risk of a sudden flood. They want it to continue. The farmer doesn't get an agricultural loan with 8% interest due to bureaucratic procedures.

11.3.5.3 Food System of *Haor* Areas

Almost every farmer is capable of producing surplus rice. Farmer store paddy for home consumption in over the year.Rice production is sufficient to meet regional demand in *haor* area. The surplus amount is sold during the harvesting season. Food security in *haor* area depends on nature, especially on mountain floods and rainfall events. Vegetables' production is abundant in hoar area but seasonal. People face dietary diversity problems in the rainy season. February and March they sufferings from less income due to no working opportunity available.

People consume food 3 times a day. Rice fish pulse and vegetables are the main con food items. They consumed their own produced rice. According to their opinion egg consumption increased over time but vegetable consumption is very seasonal. Poultry meat consumption increased over time and only available animal protein after fish. Almost every people catchesfish for their consumption. People effort to eat luxury food two or three times a month. They have to buy vegetables in the summer and rainy seasons. Vegetables available in the local market over the years but are price high in the rainy season. In the Rabi season farmer produce chili, tomato, potato on small scale for their consumption. Women rear a duck in homestead areas for egg and meat purposes.

Households preserve paddy for year-round consumption. After boiling the rice they dry it and then husk it in the machine. Consuming dried fish is common in the winter season.Women process fry fish and shrimp as dried fish for consumption in the winter season. Fish consumption is high in the rainy season. Vegetable consumption is low in the rainy season.

They *haor* community is conscious about the nutritional value of food. Potato, gourd, okra, bitter gourd, sponge gourd, water amaranth, etc. are popular vegetables in the *haor* area. The majority portion of the population depends on homestead growing fruits for consumption. Fresh fish is available in *haor* area only in winter. The significant cultured fish supplied from out of *haor*. The broiler is the main source of meat but they are coming from out of wetland areas. In the case of egg consumption increases but milk both production-consumption decreases due to *haor* farming system is not availing their tradition of keeping milking cow. People consume poultry meat 3 or 4 times a month but lamb and beef are rarely found in the local market.

11.3.5.4 Poverty and Quality of Rural Life

Most of the participants argued that a little change happened in economic activities of *haor* area over the decades. Like previous years people are now engaging in Agriculture, fishing, livestock grazing, boating, duck rearing,etc activities. At present, due to increasing mechanization in the agricultural sector, many agricultural laborers have been losing their jobs. But still, now there is a scarcity of agricultural labor in the rice harvesting season.During the time of roads construction, many people work as day laborers. With the frequent infrastructure project of roads construction, many local people worked as contraction laborers. But, they doubt this job sustainability after project completion.

Picture 9: Flood based river erosion and rural infrastructure

Over the years the fisheries resources in haorare decreasing, as a result, many people seasonally migrated to urban areas for searching works. There is a notable change in the free grazing of cattle. Abundant grazing land in the dry season opens new avenues for marginal farmers. Due to the absence of permanent working opportunities people frequently migrate their professions such as fisherman to farmer and farmer to the fisherman. They are grazing their cattle (Buffalo, cow ship, goat) free of cost. The free-grazing system is seasonal started from December to April. Embankment protects rice fields from sudden floods in the initial stage. The opportunity of exploring natural fish is decreasing in *haor*. Local wild species are in danger but higher demand and price of local species substantially increase the income of fishers.

Duck rearing is an ancient activity in *haor* area but in following days many people are engaged in commercial duck rearing as a permanent profession. Over the years the farmer didn't get benefits in rice cultivation due to unfair prices and farmers keep their land as fallow. The current year's price is satisfactory. But always rice farming is a risky enterprise. There are no favors from the existing policy for stabilizing the price. They want an amicable solution for the next policy in this regard.

Although all the policies above can contribute towards sustainable livelihoods in the region, some specific issues are noted below: - the prevailing anti-poverty policies of the government minimally meet the needs of the poor villagers as the qualitative data indicate that the political leaders do not keep their promises when these policies working against their vested interests. As the poor villagers are knowledgeable of the means to reduce risk and increase income, their views must be given value by the policymakers in designing effective poverty mitigating policies. Policy makers must possess knowledge about the livelihood systems and processes in the *Haor* ecosystem to complement their theoretical knowledge of the economic dimensions of poverty to identify and diagnose the causes, livelihood situations and required policy interventions (Mukherjee et al., 2002). – the fishermen and the poor should be provided licenses to fish; regulation must be imposed on the allowable mesh size of fishing gears; a seasonal ban should be imposed for fish breeding and during that time, food stamps should be given to the license holders; only specific beels can be leased out along with strict controls on their duration and boundaries.

11.3.5.5 Agricultural Policy Interventions and Rural Development in Bangladesh

The respondents mentioned that major economic activities in the *haor* areas are crop production, open water fishing, livestock rearing, small-scale vegetable farming, auto-rickshaw driving, and shop keeping which was previously confined to rice production only. Additionally, boating for tourists is a newly emerging profession due to the development of some tourist spots in some *haor* regions. The respondents agreed that productivity has greatly changed due to agricultural policy intervention.The crop production has increased 2 times than previous decade due to quality agricultural seed, fertilizer,

insecticides, etc. Disgracing the nutritional aspect, the increased productivity has ensured the household's access to food. However, the availability of fish is low in *haor* due to the indiscriminate catching of fish fry during hatching season and the use of banned fishing nets. But, nutritional security is not achieved in the *haor* region due to the scarcity of fish, milk, vegetables, etc. In an interactive discussion, the participants revealed that they are aware of some government intervention in terms of flood and drought.

11.3.5.6 Conclusions and recommendations

The findings of this study demonstrate the genuine interactive participation of people living atthe grass-root level.A majority of the participants involved in the study of Bangladesh *haor* areas noted that in part because of the FGD, MoK and case study methodology, everyone’s experience and opinion were valued and considered in equal measure. Participants also noted that the methodology enabled them to understand new aspects of policy evaluation that had not occurred to them before engaging with people from such decent backgrounds.

The study work summarizes several major findings, providing a clear account of the poverty, rural development and food system in Bangladesh hoar areas. Further, many of the factors associated with agricultural policy revision are interdependent. Beyond the more familiar attributes related to the food system, rural quality of life. Many of which are rarely considered in descriptions of agricultural policy or captured formulations. One consideration concerns the way people are treated by government support in input subsidies and public procurement procedures from farmers are not reaching the target groups. Another relates to the physical structure people living in *haor* experienced due to permanent solutions of remoteness. It is about their daily struggle to survive and the continued natural calamities.

Findings on the evaluation are lessons for formulating policies both in Bangladesh and more generally across developing countries. Research outcomes can also be used to explore ways poverty reduction, rural development, the food system in wetland management. Development agencies and government can be made more effective interventions. On the other hand, various economic policies aimed at addressing development policy benefits in all its forms may not ultimately be successful if a multiple-dimensional framework is overlooked, leading to questions about their overall participation.

Future work on these newly identified constraints of resource utilization in Bangladesh will require government policymakers and regulators to conduct a thorough analysis of the pros and cons associated with the research outcomes. In this connection, research outcomes should be shared more widely with

different government bodies and institutions. However, it cannot be said that existing policy failures are merely the consequence of inaccurate results or errors in data on efforts over the decades. Encouraging the inclusion of people living in *haor* and their participation in various policies and programs, including in the design and decision-making process has yet to be fully carried out by those working in the development sector. Without identifying and addressing these concerns, achieving socioeconomic well-being in many *haor* areas will remain an elusive goal.

11.3.6 Agricultural Policy Evaluation Using Interactive Approach MoK

A participatory research method name MoK was used for evaluating agricultural policy intervention. This method is known as merging of knowledge where the opinions of grassroots people are obtained by recording of their active dialogue. The peer group comprises farmers, fishers, agricultural labor and people living by the ecology of *haor* areas. This merging of knowledge module was conducted with nine participants and 2 facilitators, led by a moderator. The session is a half-day long (more than five hours) discussion, dialogue and story writing of peer group with a set of illustrative pictures and set issue of agricultural policy intervention dialogue.

The uniqueness of this part of the study is that it used a new interactive approach, known as "Merging of Knowledge (MoK)" and was introduced by ATD Fourth World. Merging of Knowledge is a technique that facilitates the dialogue between people facing extreme poverty, social exclusion and policy makers, business leaders, social workers, teachers, or researchers. The goal is to overcome the communication and understanding difficulties due to differences in speaking and thinking, in life experience and perspective.

The approach based on constructive discussions can occur. Merging of Knowledge bridges, gaps between people from different backgrounds by creating an environment of mutual respect and patience.

To identify the national agricultural policy benefits in *haor* areas Bangladesh three modules were completed out of four with participants from areas. In order to capture the wide picture of agricultural policy interventions' impact on rural development, poverty and food system Module-1, Module-2 were performed.

Module-4 will be run with peer groups of whole representing groups and policymakersata national level.

Module-1: The main objective of Module-1 was to form the Research Team (RT) in Bangladesh. Therefore, PI arranged several meetings with academics from different institutions. NGO activists and people with *haor* areas. Subsequently, the RT of Bangladesh ended up being composed of fifteen (15) members including seven (7) *haor* inhabitants (3) development activists/practitioners, two (2) Professors from BAU & SAU and two (2) research assistants.

In this module, a 3-day MoK training session has been organized, seeking to demonstrate to participants how the MoK approach can work with people from very different backgrounds. In addition, RT members practiced all the steps of the methodology as described below.

By defining their own set of dimensions of policy intervention, they prepared themselves to facilitate the work with the outreach peer groups in module-1.

For Module-2, the RT focused on participants from *haor* areas. The RT members observed several meetings, contacts with other NGOs and field visits to set up twenty (29) outreach peer groups of people of different *haor* areas of Bangladesh (for details please see the methodology). These groups included farmers, fishers, day laborers, landless people, cattle herders, ethnic minorities, and women entrepreneurs groups.

Module-3:

Module 3: Groups (6) groups of 29 peer groups were selected from 7 *haor* districts by the RT after conducting various MoK atthe grass-root level. Among these six (6) groups, one regional group is a form composed of people with a direct inhabitant of haor, including day laborers, women, seasonal migrants, ethnic minorities, and two (2) practitioners, development organizations, NGOs, journalists and political leaders all working with haor peoples.

Merging of Knowledge (MoK) Procedure: to identify constraints that are hindering resource utilization and crop production in *haor* would be identified (based on necessary amendments in the respective policy).

Three thematic issues were focused to identify resource constraints in each module. First, knowledge about the evaluation of agriculture policy interventions, level of poverty, food system and rural development was generated in each of the independent outreach peer groups described in the methodology.

Each peer group met at least for one day and a half -and most often two days or more- using a range of methods sought to allow the collective identification of characteristics of the policy, Food system, poverty and development, and then to group them into sets of dimensions.

Secondly, the outcomes of Module-2 and Module-3 were analyzed by the RT members. RT members with experience of knowledge merged the sets of community people peer groups in one set. Academic members of RT merged the characteristics, causes and effects of policy intervention. The practitioners of the RT merged the dimensions of the practitioner's peer groups. The merged sets were the reference for their deliberations toward a Merging of Knowledge event.

Thirdly, the Merging of Knowledge 3-days event was organized at the end of Module-3. This module brought together representatives of each outreach peer group. They discussed the RTs synthesis until defining a single list of characteristics of the theme. They also identified some pending questions. The result of this process was not only a final set but also new and enriched insights about the reality of policy intervention that would verify the national level in module-4.

11.3.6.1 Agricultural Policy Interventions: Hoar Perspective of Bangladesh

The observed agricultural policy interventions in the region are subsidies in fertilizer, diesel, and electricity and irrigation water establishment. Due to proper supply of fertilizer and seed is available at a fair price but modern and new varieties' source is limited. Agricultural modernization and mechanizations can be afforded by the rich farmer. The latest agricultural policy of Bangladesh is committed to ensuring safe, profitable agriculture, sustainable food and nutrient securities. After independence, remarkable progress has been achieved in the case of food production; however, about *haor* people still remain unprofitable agricultural system they said.

Picture 10: Haor roads and infrastructure development hotspot in Itna, Kishorganj

The government rice harvester renting is a good indicative step of the policy goal. Agricultural technology transfer in vegetable cultivation started but the absence of fair air price and seasonality great problems. The solution is still not observed in the latest policy interventions.

Government support program encouraging for the higher area under rice production from 2019-2020. But it would not rationalize by production cost. The areas were a surplus season of rice from earlier but now household level surplus is significantly large by only one season. The Aman areas now decreasing.

11.3.6.2 Agricultural Policy on Food System: *Hoar* Perspective of Bangladesh

Almost a common consumption pattern followed in haor community with a few exceptions. The rice, fish, meat, milk, pulse, egg sugar, vegetables and fruits are the main items. According to their opinion compare to other regional food is available in the *haor* area but the price is high compared to other regions. Rice is regarded as the main food item for the *haor* people of Bangladesh. People are taking rice in every meal including breakfast.

Picture 11: Fish landing in Nasirnagar, Brahmanbaria

Their opinion indicated that about 90% of households consumed rice from their own production. The second item fish was found to be consumed by 98% of the people of hoar households by natural source of water bodies only in the months of December to May. Other seasons depend on cultural fish from outside. Whereas pulse consumption is done from the out supply source.

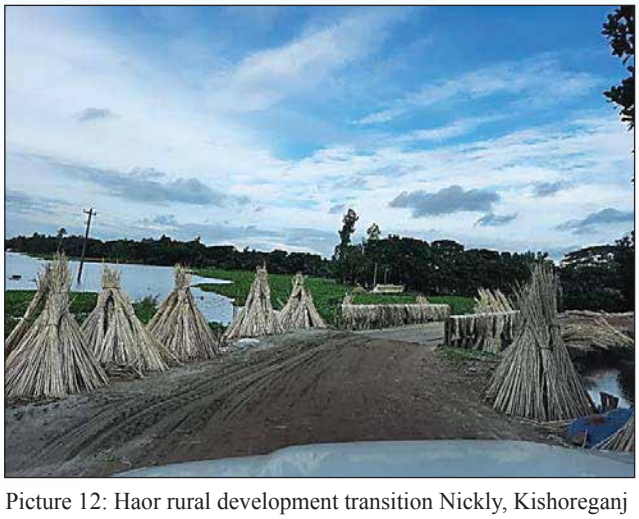
The average amount of fish and pulse consumption increases by successive policy but the areas are not significantly increasing for pulse production due to less profitability.

The high consumption of fish in households is mentioned but not from natural sources instead of having famous for fish.

The overall impact of successive policies capable them for diversifying food consumption. The production, entitlement capacities of purchase, cultural mobility and government campaign on balanced and diverse food successfully intervene for change. Protein and others food sufficiency natural fishing meet up home demand for poor and marginal households but these are seasonal.

1.3.6.3 Agricultural Policy on Rural Development: Hoar Perspective of Bangladesh

The respondent claimed that there is an important link between agriculture policy and rural development in *haor* areas of Bangladesh. To meet its diverse development challenges this link directed a rural area towards development prosperity if the policy favors the target peoples. The link between the agriculture sector and the rural sector. the rural sector is very important because most of the people of the country are living in the rural areas and have a direct link between the rural development and the development of our national economy as well as rural sectors contribute to the Gross Regional Product.



Picture 12: Haor rural development transition Nickly, Kishoreganj

The agriculture policy contributes to sustain food, nutrition and livelihood security of the *haor* region. The successive intervention and infrastructure development programme help the region to achieve self-sufficiency in food production, reduce rural poverty and foster sustainable development. Decade long economic development through agriculture policy crop production technology, livestock rearing, social forestation and plantation boosting income earnings of the community. The commercialization of home stead duck hatcheries and egg production associated with market linkage creates a new revolution in these areas. According to their opinion artisanal fishing opportunities, off-farm wage, sand and stone mining substantially help people to raise income.

The opinion of nature and environment were stated like that the cultivable land increases by siltation. The early water removal naturally helps to expand Rabi crops cultivation and foster cattle rearing periods. Both facts couple with policy favors for raising farm income. But the available rice varieties are not better enough for yield compared to hybrid seed. The policy of recent service like mechanization through combined harvester by govt. support of tremendously solving the century-long problems of harvesting before mountain floods. The policy intervention reduces their 70 % harvesting cost and time.

Despitethe remoteness, the fly-over in the rainy season and sub-merge roads in the dry season improved the communication system. The *haor* developments plan and second country investment plan established rubber, irrigation facilities, flood control measures, massive electrifications,a fish sanctuary for breeding agricultural training opportunities, extension programme of vegetable production significantly increases the employment opportunities.

Floating primary schooling, e-learning, e-commerce, skilled training and education substantially help to increase labour productivity. The wage-earning compared to metro-areas also bring parity of seasonal migration decisions.

The government declared a safety net programme (Social safety net (Suchuna, Lactating mother feeding) and special govt. housing grant contributing to the rural areas.

Basic civic facilities are still under optimum but some of the *hoar* areas under WASH programme for health improvement and household level sanitations. Both time and the cost of emergency healthcare transfer were reduced. The service could avail by the inhabitants of *haor* areas.

Leisure and tourist attractions are created by infrastructure improvement investment. The tourist boating and hospitability services tremendously attract people to see the development amenities around *haor.* They are claiming that in the rainy season tourist boating and hospitability increase their off-season income. Media, communications, television all are affordable by the community they claim. The successive agricultural and development policy in *haor* areas are the greater milestone for creating “my village my city” campaign of rural development.

11.3.7 Case Study (An episode of *haor)*

11.3.7.1 The ‘Ziriati’ (Seasonal Migratory Farm Community) village

It was about dusk in the haor at Muksedpur, Dharmopasha, the cool and heavy breeze was blowing, people were gossiping in a tea stall, and curiously looking at the team. A villager asked, “Are you the people of WDB (water development board)". Where WDB was constructing a huge embankment

Picture 13: The `Ziriati Gram' (Seasonal Migratory Farm Community) village

There were mats of green grasses around the temporary village, women were busy preparing the dinner, Jainta Rani, a student of class iv, smashing the boiled cauliflower, a woman was frying small indigenous species fish, one was smashing red chili. The small indigenous fishes were caught from the adjacent waterbody. Children were playing and their noise was giving life to the village. Saplings of vegetables getting support to grow up. The inhabitants have no sufficient water supply to meet up their demand, and they set a tube well for drinking water. There was a solar panel on the rooftop of each hut which was the sole source of energy for charging the cell phone.

The houses were found to be very neat and clean, which cost Tk. 5-7 thousand to build. In the spacious yard of the village, some 6 were testing a water-pump engine. Mr. Horolal Roy said, "This place was our permanent address, and the consecutive flood was the main reason for leaving this place in the early 60s, and then we anchored in the highland of Mohishkhola, Tahirpur". Some of them bought land in the new place and began farming there. The newly built embankment mitigates the flood situation. "Last year only 25 families came here but this year we are 35, this is due to the reasonable price of paddy that we got last year" added Mr. Horolal. The inhabitants remain almost jobless during the rest of the year and most of them are dependent on the crop production. Call to action "Inhabitants of the temporary village having the NID card that bearing the address of their permanent residence, and they are not voters of this area. So, local public representatives are not concerned about their misery, and are not paying proper attention to the development of this place," said Mr. Amjad, a local union Parishad member.

Picture 14: Homestead duck egg hatching in Chaptir *Haor*, Derai, Sunamganj-2020

There was only one latrine for more than thirty families. However, it was not a sanitary latrine. "Couple of years before there was a severe outbreak of Diarrhea," said Mr. Razkumar Mollick, the inhabitant of this village. He added, "We have no alternative but to struggle for getting modern treatment facilities from Kolmakanda and Moddhyanagar."

Drop out from formal education is a common scenario in this village due to the long study break up for 5 months each year. Some of the self-motivated families left their school-going children in their permanent residence to prosecute their studies.

One of the major sources of problems found every where in the haor area is the management system of natural water bodies. Almost all of the water bodies are awarded as leases to influential persons for fishing. The men of the lessee grab the adjacent water bodies. Local people have no access to those resources, and their irrigation facilities have been squeezed.

11.3.7.2 The Solitary Herdsmen and Ghas Mohal

Picture 15: Buffalo herd under Haor grazing ecology in Musithpure, Sunamganj

Mr. Abdul Matin, 32 years, of Balipara, Trishal, Mymensingh, driving the buffaloes for the last twenty years to Ali's *haor* Sunamgaj every year. In this vast grazing ground, the solitary herdsmen made their temporary huts to spend the cooler and dry five months from December to April. During the conversation, one of his four colleagues introduced himself as Mr. Idris of 50. He claimed himself as a veteran herdsman who comes here every year. They are in 5 groups having 350 buffaloes, of which he has 14 animals of his own. It is easy to get 6 to 7 liters/day/animal at the early stage of the 7 to 8 months-lactation period, which decreases to 2 to 3 liters/day/animal.

Mr. Matin acknowledged the contribution of a middleman, a cheese-producer and milk-trader from Oshtogram, Mymensingh, who collects milk @ Tk. 1200 md/40 liters. In return, the milk trader makes the payment of 0.3 million takas for the grazing ground (Ghas mohal) and bears the cost of the herdsmen's food. Mr. Matin has recognized that man for his continuous support despite losing the milk market during the last year's lockdown period. However, in reply to a question of our team, Mr. Matin gave a contradictory answer that the group of herdsmen pays the rent for the 'Ghas Mohal.' (Grazing land).

Picture 16: A Solitary Herdsmen grazing buffalo in Ghas Mohal Sunamganj

The buffaloes eat the grass, and no supplementary feed needs to be added; they are habituated with the environment of haor, come to Ali's haor, Jamalganj, Sunamganj at the onset of winter, and go back to Trishal, Mymensingh at the end of April.

A complex psycho-physiological cycle drives the animals to migrate to the same place of haor. Mr. Matin described, "The buffaloes stop to take any type of food at the onset of winter, eagerly waiting to come back to their grazing ground of the haor." It takes a 7-day journey to reach the place. Both Mr. Matin and Mr. Idris were happy to get us in the lonely environment, a desolated area. He is satisfied with the Ghas Mohal leasing system from the government but wantsa floating veterinary hospital for *haor* areas.

Mr. Matin looked helpless when he was describing last year's pandemic situation and the fall of the milk market. He uttered that somebody enlisted his name to give some incentives, but eventually, he could not get anything from the government.

11.3.7.3 Fishing in the *haor*

Picture 17: Artisanal fishing and maize field in Moslishpur, Nickley

Puppies were playing with a 'Gang Magur,' a spiny freshwater catfish discarded from the harvest of the 'jolmohal' at the fish-landing center at Sundorpur, Dharmopasha. The jolmohal was leased for 10 million taka, yielded revenue of 0.2 to 0.5 million taka/day during the first month of fishing; later on, 'katha' fishing started, which was periodic at an interval of one or two weeks which boosts the production.

Fishing in jolmohal is a continuous process and needs specialized fishers to do this job properly. Hence, the lessee hires a group of 50 experienced fishers from Nasirnagar, Brahminbaria, who built their temporary shanties near the fish landing center. The fishermen were awarded a portion of the total revenue, resulting in 15 to 20 thousand takas per month. Some 100 leaseholders manage the wetland. Thousands of bamboo poles are set in the canals and channels of the wetland for making FAD (Fish Attractive Device). Despite their commitment, lessees care little to conserve biodiversity because their prime target is robust revenue earning.

11.3.7.4 Conclusions and policy options

Based on the presents analysis, the following conclusions are drawn:

The major agricultural policy attributes in *haor* areas are the resultant of market, policy and institutional. The prominent policy gap arises from institutional failure in market-based and administrative areas. Therefore, they cannot be solved with just one simple policy measure. They require a complex of coordinated interventions. The research demonstrates that policy favor needs target-oriented and demand lead programes for the aforesaid regions. Therefore, it is the most reliable starting point for the successful socioeconomic development of poor local communities, especially when successfully blended with modern technologies. So, farmers should be trained and fostered to adopt new and more efficient mechanization technologies and they should be provided with feasible alternative sources. In other words, plans integrated land and water resource development should be take into consideration all necessary technical, agricultural, socioeconomic and institutional aspects and inputs, and should include the training of farmers.

Recent policy changes in Bangladesh aimed to encourage more efficient, equitable, and sustainableresource use. To investigate farmers' responses to the new policies, as well as the effects on land use and livelihoods. The present research conducted a mixed study on the *Haor* farming and poverty status, food system and rural development between 2010 and 2019. It considers the potential impacts of recent changes in agricultural policy (e.g. modernizations, mechanizations, prices and institutional support) at the household as well as at the aggregate *haor* regional level. The specific objective of the study is to define relatively homogenous areas of agricultural production, regardless of administrative boundaries, based on appropriate agro-ecologic and socio-economic characteristics of activities. Each regional system is characterized by its

natural conditions, market integration and historic influences leading to differentiation and specialization of production within it. The research comprises observation of secondary data as well as primary ones collected through various field surveys

The Policy changes and technological innovations affect each household typology differently, depending on the relative importance of the different income sources and livelihood strategies of the households. The characterization of regional context allows reviewing the possible aggregated effect of policy change as well as the dependence on major crops, which could be subject to policy adjustments. Various environmental concerns emerge from the study. Each farming system is characterized by its typical environmental issues. The results of the earlier research. The Efforts for upgrading traditional to modern irrigations have been more successful in the area; however, the enforcement is still an issue. Governing policies on the registration of land and the transfer of registered ownership of agrarian reform land require urgent attention. The transition from original reform beneficiaries to the next generation has started. It will rapidly broaden the negative effectsfaced by holders without land ownership titles. To the practical difficulties to obtain credit, part of the farmers informally sought pragmatic solutions, which occasionally involve illegal land sales and distribution of land among several young families. This approach is relatively inefficient and carries with it the risk that particularly smallholders negotiate from a weak position in these circumstances and are consequently forced to accept expensive credit arrangements. In some areas, holding size is too small to be viable and the social implications of holdings that cannot be sold should be considered.

One of the most important concerns for increasing the flexibility of farm management across haor region is the access to seasonal as well as longer-term credit policies. Particularly, where farming systems have been affected by the recent drought and assets have been lost, mechanisms need to be established to give these farmers new access to crop finance.

Marginal producers otherwise face serious difficulties to avoid expensive alternative credit sources. The procedures for guaranteeing credits within the cooperative system include an element of decentralized social control for debt repayment but are not fully functional at present.

Furthermore, land-tenure issues in many areas of not encourage development. Farmers are not willing to invest in land that they do not own or do not have the right to use for a long time. Government policies are often not conducive to the development of such practices.

12. Research highlights (title, background, objectives, methodology, key findings, and keywords):

Analysis of Agricultural Policy on Food System and Rural Development in Bangladesh: Case of *Haor* Area (Wetland) Management Practice

Agricultural production in Bangladesh is characterized by subsistence orientation, low productivity, low level of technology and inputs, lack of infrastructures and market institutions, and extremely vulnerable to farm income variability. It has a rapidly increasing population currently close to 174 million and yet about 24 percent of the population lives in absolute poverty. The government of Bangladesh has formulated policies and strategies to guide overall development with a focus on rural and agricultural development. The government has approved the National Agriculture Police 2018 to achieve sustainable food and nutrition security through the efficient utilization of natural resources. The new agriculture policy has given the emphasis on investment including quality seed production, fertilizer and irrigation management, bio-technology, farm mechanization, agriculture cooperative and marketing, women empowerment in agriculture, natural resource management, specialized agriculture, regional special agriculture, involvement of the youth force, agriculture rehabilitation, agriculture afforestation, safe and nutritious food production, use of information and communication technology. This new agriculture policy has addressed new issues and concerns for sustainable food production.

General objective (s): To review interventions that is focusing on creating or expanding modern amenities in *haor* areas for the production of agricultural commodities by using scarce resources.

Specific objectives: The common specific objectives of each component of the subproject are:

i) To get insight into the connection between agricultural policy (policy regime/specific interventions) and wetland food system development;

ii) ii) To evaluate the structure of external change like rural development, resource conservation and poverty patterns in line with successive policies for wetlands; and

iii) iii) To identify the basic constraints which are hinder resource utilization/crop production in *haor* areas (based on necessary amendments in the respective policies).

This research was conducted in *haor* communities of 7 districts, in the Greater Sylhet and Mymensingh region where development intervention has been introduced at a massive-scale aiming at achieving food security and poverty alleviation among the rural poor. The research has been under taken to investigate the impact of policy interventions on the capacity of smallholders at the case of household level. The main goal of the research was how the policy interventions dominated by top-down approaches reflected in rural development processes in the wetland situations.

Data were collected using both quantitative and qualitative methods including direct interviews, focus group discussions (FGD) and a new method of participatory policy evaluation technique merging of knowledge (MoK).

A mixed methodology of research is applied to analyze the panel data collected through field surveys. The results demonstrate that the incidence of agricultural policy interventions reduces household poverty by 11.54 percent significantly. The estimated effects of the intervention on household income were found 78,445 BDT per year. While the employment contributions increase 9 units and the labor productivity increases 59 BDT per year by successive agricultural intervention. The selected household income is highly influenced by public investment in rural infrastructure. The rural development dynamics reveal that the exposure of the level of resource pauperization to poverty has increased overtime in the Haorarea. The flood control, roads and communications, mechanizations in agriculture, tourism and sandstone exploring reduced seasonal unemployment. Still, policy weaknesses are among the most important causes of backwardness in the *Haor* area. But agriculture policy interventions by subsidies of agricultural inputs like, fertilizer, seed, irrigation water and mechanization substantially improve rural farm income. The farmer's support policy by govt. rice procurement was found common policy directed to the farm household. The impact of these policy approaches substantially affects the capacity of smallholders on poverty alleviation and the food system of the study. The theoretical and empirical findings of this research would provide inputs for policymakers to create a long-term framework for poverty reduction and sustainable livelihood development for the poor households in the *Haor* area of Bangladesh.

The agricultural policies initiated over the last two decades have resulted in major changes that have affected farming systems structures and dimensions in *haor* areas of Bangladesh. The impact is causing further marginalization of resource-poor farmers. They are becoming more dependent on external resources. Good food comes from agriculture, beginning with appropriate choices in production and cropping systems, as well as processing, preservation, and marketing, application of food standards, safe storage and correct food preparation and handling. A good public policy of agriculture could accelerate rural development and help to alleviate poverty.

When food systems are designed with a nutrition orientation, they offer an opportunity for an adequate supply of energy and nutrient-dense foods for a healthy diet. The potential of food systems for improved nutrition needs to be promoted to contribute to the economic efficiency, conservation of nutrients and enhanced quality and diversity of diets. Nutrition education needs to be integrated through the production, processing and consumption linkages in the food system. Linking community development policies to a national program for the alleviation of hunger and malnutrition, with an emphasis on increasing the variety of foods consumed, is probably the best strategy for improving micronutrient malnutrition sustainably.

Therefore, food systems need to be shaped to become more nutrition-sensitive so that they can potentially lead to better diets and improved nutritional outcomes and wellbeing. An understanding of the different

elements of the food system that encompasses essential entry points from primary production to the plate is required. This calls for designing policy, planning and implementing programming options and policy enabling the environment to leverage the food system to produce and demand safe and diversified diets. The development initiative taken by the central unit is more likely to create absolute well-being.

It also experiences many negative impacts such as technology divide, losing age-old social capitals, cultural integrity, sustainable lifestyles practices, and depletion in natural resource base including the destruction of soil fertility and local biodiversity. Integration of subsistence farming systems with domestic and global markets geared by poor governance has led to the making farming systems more vulnerable and riskier. To respond to the market demand, farmers in the haor regions have to change the components (sub-sectors) of the farming systems very frequently. It is often making farming less sustainable and productive. It has deprived employment opportunities for resource-poor farmers and made a vast number of people landless. Some actions that could emanate are designing pro-poor development policies, empowerment of rural communities, particularly women, good participatory governance especially at local level, access to information and knowledge-based farming systems, public-private-NGO-Farmer's partnership, microfinance and farmer market direct linkage as part of the complex development process to achieve national development and international commitments like SDGs.

The key findings of FGD are discussed below:

- Crop production, cattle breeding, small-scale vegetable farming, auto-rickshaw driving, and shopkeeping are the primary economic activities in those marshes.
- Rice farming and fish gathering from the open water are the two most important economic activities in this wetland.
- Because of floods, droughts, and other natural disasters that occur virtually every year in the *haor* region, the income of the inhabitants of the area is not steady year after year.
- In this wetland, agriculture was the most important economic activity, and the farmers' income was impacted by variable factors such as flash floods and soil degradation.
- The wetlands provide a substantial source of food for the *haor* people.

The key findings of MoK are discussed below:

- Several changes in rural development, food management, and poverty have been observed in those communities during the last few years.
- Compared to the previous decade, infrastructure development has been observed in roads, electricity, and educational institutions.
- While poverty reduction has improved significantly, with 30% fewer people living in poverty than in prior years, the definition of poverty has remained unaltered.
- People are still unaware as a result of a lack of adequate education.
- Infrastructural improvement of the crematorium is necessary.
- The main component of the food item is rice.
- People have to purchase vegetables from outside due to lack of commercial vegetable production in haor region.
- The progress in vegetable farming is glacial.
- Vegetable agriculture is substantially less prevalent in the area.
- Rice cultivation is constrained by human resources, machinery, and seed.
- Nowadays, people understand poverty as a lack of communication facilities, educational institutions, agricultural mechanization, etc., instead of access to food.
- The reason behind lower poverty is employment generation in *haor* region by government, non-government and other private organizations.
- Despite this, 95 percent of the population is now out of poverty.

Keywords: Food system, rural development, poverty, policy intervention, merging of knowledge and wetland.

B. Implementation Status

1. Procurement (Component wise)

BARC Component

Description of equipment and capital items	PP Target		Achievement		Remarks
	Physical (No.)	Financial (Tk.)	Physical (No.)	Financial (Tk.)	
(a) Office equipment	100%	500000	100%	496800	
(b) Lab &field equipment					
(c) Other capital items					

BAU Component

Description of equipment and capital items	PP Target		Achievement		Remarks
	Physical (No.)	Financial (Tk.)	Physical (No.)	Financial (Tk.)	
(a) Office equipment	Laptop computer-1 Desktop computer & accessories-2 Digital camera-1 Lesser printer-1 Voice Recorder-1 UPS-2 Scanner-1 Hard Disk-2 Book self-1	60,000 120,000 25,000 20,000 8,900 20,000 10,000 10,000 2,73,900 15,000	Laptop computer-1 Desktop computer & accessories-2 Digital camera-1 Lesser printer-1 Voice Recorder-1 UPS-2 Scanner-1 Hard Disk-2 Book self-1	60,000 120,000 25,000 20,000 8,900 20,000 10,000 10,000 2,73,900 15,000	
(b) Lab &field equipment					
(c) Other capital items					

2. Establishment/renovation facilities: Not Applicable

Description of facilities	Newly established		Upgraded/refurbished		Remarks
	PP Target	Achievement	PP Target	Achievement	

3. Training/study tour/ seminar/workshop/conference organized:

Description	Number of participants			Duration (Days/weeks/ months)	Remarks
	Male	Female	Total		
(a) Training					
(b) Workshop i. Inception workshop 23 Feb 20	68	9	77	1 day	
(c) Others (if any)					

C. Financial and physical progress (Combined & Component wise)

Combined

Fig in Tk

Items of expenditure/activities	Total approved budget	Fund received	Actual expenditure	Balance/ unspent	Physical progress (%)	Reasons for deviation
a. Contractual staff salary	4133228	3791805	3725684	66121	90	
b. Field research/lab expenses and supplies	7107000	6937100	6856000	81100	96	
c. Operating expenses	845912	772144	756145	15999	89	
d. Vehicle hire and fuel, oil & maintenance	754944	741000	744167	-3167	99	
e. Training/workshop/seminar etc.	287100	287100	147100	140000	51	
f. Publications and printing	265000	76792	15000	61792	6	
g. Miscellaneous	521116	448813	439273	9540	84	
h. Capital expenses	785700	785700	785050	650	100	
Total	14700000	13840454	13468419	372035	92	

BARC Component

Fig in Tk

Line Item *	Total approved budget	Fund received	Actual expenditure	Balance/ unspent	Physical progress (%)	Reasons for deviation
A. Contractual Staff Salary	2287604	2086725	2006670	80055	88	
B. Field Research / Lab expenses and supplies	0	0	0	0	0	
C. Operating Expenses	193853	182000	172375	9625	89	
D. Vehicle Hire and Fuel, Oil & Maintenance	144944	131000	134167	-3167	93	
E.Training/Workshop/ Seminar etc.	287100	287100	147100	140000	51	
F. Publications and printing	250000	61792	0	61792	0	
G. Miscellaneous	229216	215700	202215	13485	88	
H. Capital Expenses	496800	496800	496800	0	100	
Grand Total	3889517	3461117	3159327	301790	81	

BAU Component

Fig in Tk

Items of expenditure/activities	Total approved budget	Fund received	Actual expenditure	Balance/ unspent	Physical progress (%)	Reasons for deviation
a. Contractual staff salary	960530	866000	960530	0	100%	
b. Field research/lab expenses and supplies	5012000	4822100	5012000	0	100%	
c. Operating expenses	402000	344085	343933	152	100%	left-over
d. Vehicle hire and fuel, oil & maintenance	450000	450000	450000	0	100%	
e. Training/workshop/seminar etc.	0	0	0	0	-	-
f. Publications and printing	15,000	15,000	15,000	0	100%	
g. Miscellaneous	200000	150000	200000	0	100%	
h. Capital expenses	288900	288900	288250	650	100%	left-over
Total	73,28,430	69,36085	68,64080	464,350	100%	N/A

SAU Component

Line Item *	Total approved budget	Fund received	Actual expenditure	Balance/ unspent	Physical progress (%)	Reasons for deviation
A. Contractual Staff Salary (max. 30%)	885094	875231	849080	9863	95.93	-
B. Field Research / Lab expenses and supplies (min. 30%)	2095000	2071655	2095000	23345	100.00	-
C. Operating Expenses (max. 12%)	250059	247273	245457	2786	98.16	-
D. Vehicle Hire and Fuel, Oil & Maintenance (max. 13%)	160000	158217	160000	1783	100.00	-
E.Training/Workshop/ Seminar etc. (max. 5%)	0	0	0	0	0	-
F. Publications and printing (max. 5%)	0	0	0	0	0	-
G. Miscellaneous (max. 7%)	91900	90876	91900	1024	100.00	-
H. Capital Expenses (max. 30%)	0	0	0	0		-
Grand Total	3482053	3443252	3441437	38801	98.83	-

D. Achievement of Sub-project by objectives (Tangible form): Technology generated/developed

General/specific objectives of the sub-project	Major technical activities performed in respect of the set objectives	Output(i.e. product obtained, visible, measurable)	Outcome(short term effect of the research)
i) To get insight into the connection between agricultural policy (policy regime/specific interventions) and wetland food system development;	1. Area selection 2. Questionnaire preparation 3. Contract Enumerators 4. Pre-testing 5. Training of Enumerators 6. Data collection 7. Data management 8. Data analysis 9. Report writings	MS thesis	Final report, published journal articles
ii) To evaluate the structure of external change like rural development, resource conservation and poverty patterns in line with successive policies for wetlands; and			
iii) To identify the basic constraints which are hinder resource utilization/crop production in *haor* areas (based on necessary amendments in the respective policies).			

E: Information/knowledge generated/policy generated

General/specific objectives of the sub-project	Major technical activities performed in respect of the set objectives	Output	Outcome (short term effect of the research)
i) To get insight into the connection between agricultural policy (policy regime/specific interventions) and wetland food system development;	1. Area selection 2. Questionnaire preparation 3. Contract Enumerators 4. Pre-testing 5. Training of Enumerators 6. Data collection 7. Data management 8. Data analysis 9. Report writings	1. Policy elements that would provide information on how does science and political vision transform into development? 2. The interactive decision-making style will present future policy-relevant insight. 3. Generate how the modern amenities could be ensured in rural areas without hampering ecology. 4. The way of making rational lobby for policy change according to the local needs and bottom level demand. 5. Policy makers can use this data for formulating appropriate policies for optimum and efficient resource	(i) The basic plans for dissemination, policy formulation and implementation from the research would be a good idea of quantitative and qualitative policy assessment for wetland management practice for future rural development. (ii) It will provide useful information for the crop producers, extension personnel and researchers for proper utilization of resources. (iii) Policy makers can use this data for formulating appropriate policies for optimum and efficient resource allocation within agriculture and between agriculture of Bangladesh
ii) To evaluate the structure of external change like rural development, resource conservation and poverty patterns in line with successive policies for wetlands; and			
iii) To identify the basic constraints which are hinder resource utilization/crop production in *haor* areas (based on necessary amendments in the respective policies).			

F. Materials Development/Publication made under the Sub-project:

Publication	Number of publications		Remarks (e.g. paper title, name of the journal, conference name, etc.)
	Under preparation	Completed and published	
Technology bulletin/ booklet/leaflet/flyer etc.			
Journal publication		1. Economics of Free Grazing Duck Farming in *Haor* Areas of Bangladesh 2. Analysis of Food System in *haor* Areas (Wetland) in Bangladesh: Implications for Policies	M S Thesis
Video clip/TV program		TV 7 Bangla (22 August 2020)	
News Paper/Popular Article			
Other publications, if any			

G. Description of generated Technology/knowledge/policy:

i. Technology Fact Sheet (title, introduction, description, suitable location/ecosystem, benefits, name and contact address of author): N/A

ii. Effectiveness in Policy Support (if applicable): N/A

H. Technology/Knowledge generation/Policy Support (as applied):

i. Immediate impact on generated technology (commodity & non-commodity):

A policy paper for findings gaps

ii. Generation of new knowledge that helps in developing more technology in future: N/A

iii. Technology transferred that help increased agricultural productivity and farmers' income: N/A

iv. Policy Support:

The seasonal unemployment and limited opportunity of decent work are the main indicators of poverty in Hoar areas.

The seasonality hampered consumption diversity because of limited production diversity of crops in rainy season.

The occupational diversity has been changed & they are not only depending on crop culture but also artisanal fishing, boating for tourists, duck rearing, petty shopkeepers, auto rickshaw drivers.

I. Information regarding Desk and Field Monitoring

i. Desk Monitoring [description & output of consultation meeting, monitoring workshops/seminars etc.):

Items/topics	**No. of participants**			**Venue & Date**
	Male	Female	Total	
Inception Workshop	68	9	77	BARC Auditorium 23 February, 2020

ii. Field Monitoring (date & no. of visit, name and addresses of team visit and output):

Field Monitoring Members:

Date	No. of Visit	Name with position	Organization
22.02.2020 05.06.2021	5	Dr. Md. Mosharraf Uddin Molla, Member Director (AERS),	Bangladesh Agricultural Research Council (BARC)
	3	Prof. Dr. Sheik Abdus Sabur	Consultant Concern sub-project
	2	Dr. Md. Harunur Rashid	Director, PIU-BARC, NATP-2
	2	Dr. Nowsher AIi Sarder	Monitoring and Evaluation Specialist, PIU-BARC, NATP-2
	1	Mr. Mohammad Shahidul lslam	Procurement Specialist, PIU-BARC, NATP-2

Field monitoring report-1 output

Objectives	Activities in relation to objectives	Status (Use appropriate unit)		Deviation (if any)	Performance (Good/ average/ below/ average/poor
		Planned	Actual		
1. To get insight into the connection between agricultural policy (policy regime/specific interventions) and wetland food system development; 2. To evaluate the structure of external change like rural development, resource conservation and poverty patterns in line with successive policies for wetlands 3. To identify the basic constraints which are hinder resource utilization/crop production in *haor* areas (based on necessary amendments in the respective policies)	Review of findings of relevant studies	Not specified	Not specified	N/A	Good
	Data collection and conducting FGDs, MoK& Case Study	Survey: 2500 FGD: 36 MoK: 16 Case Study: 10	Survey: 2300 FGD: 36 MoK: 16 (1+) Case Study: 10		Good
	Data management (Data coding, data cleaning, processing and entry	Survey: 2500 FGD: 36 MoK: 16 Case Study: 10	Survey: 2300 FGD: 36 MoK: 16 (1+) Case Study: 10		Good
	Analysis of both agricultural policy & field survey data	Draft results	Draft results		Average
	Validation of the findings through MoK at the national level	Regional MoK-1	Regional MoK-1		Good

iii. Weather data, flood/salinity/drought level (if applicable) and natural calamities: N/A

J. Sub-project auditing (covers all types of audits performed)

Types of audit	Major observation/ issues/ objections raised; if any	Amount of Audit (Tk.)	Status at the sub-project end	Remarks
Govt. (by FAPAD)	No objection raised	2 times	Year 1 (2019-20) Year 2 (2020-21)	

SAU component

Types of audits	Major observation/ issues/ objections raised; if any	Amount of Audit (Tk.)	Status at the sub-project end	Remarks
FAPAD	Satisfactory	931146.00		09.12/2020
FAPAD	Satisfactory	1880886.00		31.10.2021

K. Lessons Learned:

There are already sufficient evidences to believe that agricultural policy favor might have little effects in improving the livelihood conditions of the people of un-favourable ecosystems and their farming systems as it was happened during green revolution period. Input subsides and procurement policy of the Government has been bypassing the poor farmers, unlike Green-revolution, making their farming systems more vulnerable and less competitive. Farming systems of poor farmers are moving towards crop biased production systems from highly diversified farming systems of pre-green revolution period. Food and livelihoods have improved keeping these farming systems at subsistence level. Policy reforms could not be able to solve the problems of subsistence farming in terms of its productivity and income. On the other hand, it is policy reforms responsible for making their farming systems costly but moderate productive and further improve marginalization. Age old land based agricultural production systems has been gradually transferring to capital intensive agriculture where land does not play much role and poor farmers could not effort it at all.

i) The importance of steady economic growth has been well recognized in remote areas like *Haor*. Nevertheless, it must be recognized that region has not reduced its incidence and prevalence of development intervention to the levels meeting the Sustainable Development Goals (SDGs). There is wide disparity in the regional distribution of the incidence of intervention and investment in rural Bangladesh requiring a review and re-thinking of the policies and interventions to mitigate it.

ii) Successive agricultural policy translates the strong political commitment into the effective implementation in *Haor* areas.

iii) A more inclusive interventions with monitoring needs in a context of worsening inequalities

L. Challenges (if any):

The findings of the study would be useful for agricultural policy formulation in Bangladesh. The findings based on memory and opinion based that would be a challenge for direct replication for other developing countries case.

It is therefore paramount that its capacities continue to be developed. Any gap in intervention may case a problem of sustainability.

M. Suggestions for future planning (if any):

The research considers panel data to understand the impact of policy intervention on rural development, food system and poverty. There is diverse economic activities in *haor* areas, present study consider five

issue under considerations which may not be appropriate for whole assessment output. Availability of panel data of all kind of economic activities would be invaluable in providing a more insightful perspective when consider panel analysis of whole economic activities around *haor*.

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Signature of the Coordinator

Date .....

Seal Dr. Md. Mosharraf Uddin Molla
Project Coordinator (PCO)
"CRASC in Bangladesh (ID:021)"
PBRG, AERS Division (BARC)
PIU-BARC, NATP-2 Project

Counter signature of the Head of the organization/authorized representative

Date .....

Seal Dr. Shaikh Mohammad Bokhtiar
Executive Chairman
Bangladesh Agricultural Research Council
Farmgate, Dhaka-1215

APPENDICES

a. Pictorial view of the sub project activities









Analysis of Agricultural Policy on Food System and Rural Development in Bangladesh
Case of Haor Areas (Wetland) Management Practice
বাংলাদেশে খাদ্য ও পল্লী উন্নয়নে কৃষিনীতির প্রভাব বিশ্লেষণ: হাওড় অঞ্চল (জলাশয়) ব্যবস্থাপনা বিশেষ প্রেক্ষিত
মডিউল
হাওরবাসী (হাকালুদ্দি হাওর)
বাস্তবায়নকারী প্রতিষ্ঠান: বাংলাদেশ কৃষি বিশ্ববিদ্যালয়, ময়মনসিংহ
















Agricultural Policy on Food System and Rural Development in Bangladesh:
Management Practice

Agricultural Policy on
and Rural Development in Bangladesh:
Management Practice (PIRRG Sub-project, ID: 158)
Sharing of Knowledge (MoK)


Merging of Knowledge (MoK


Analysis of Agricultural Policy on
Food System and Rural Development in Bangladesh
Case of Haor Area (Wetland) Management Practice
Focus Group Discussion (FGD)


Merging of Knowledge (MoK)


Analysis of Agricultural Policy on
Food System and Rural Development in Bangladesh
Merging of Knowledge (MoK)















b. Relationship between well-being and policy regime

b.1 Brahmanbaria district

```
                                                          (R)
                                     Statistics/Data  Analysis

                         (R)
                         15.0   Copyright  1985-2017  StataCorp  LLC
  Statistics/Data  Analysis     StataCorp
                                4905  Lakeway  Drive
                                College  Station,  Texas  77845  USA
                                800-STATA-PC          http://www.stata.com
                                979-696-4600          stata@stata.com
                                979-696-4601  (fax)

Single-user  Stata  perpetual  license:
       Serial  number: 301506215585
         Licensed  to:     www.Downloadly.ir
                           Iran Will  Defeat  US

Notes:
      1.   Unicode  is  supported;  see  help  unicode_advice.

1 .  import  excel  "C:\Users\User\OneDrive\Desktop\10  Dec  2021\Brahmanbaria  (300)

2 .  xtset  HouseholdID  Year
         panel  variable:    HouseholdID  (unbalanced)
          time  variable:    Year,  2013  to  2018,  but  with  gaps
                 delta:    1  unit

3 .  xtreg  Wellbeing  PolicyRegime

Random-effects  GLS  regression                  Number  of  obs      =        900
Group  variable:  HouseholdID                    Number  of  groups   =        300

R-sq:                                            Obs  per  group:
     within   =  0.0000                                        min  =          3
     between  =  0.0000                                        avg  =        3.0
     overall  =  0.0745                                        max  =          3

                                                 Wald  chi2(1)        =      72.31
corr(u_i,  X)     =  0  (assumed)                Prob  >  chi2         =     0.0000

------------------------------------------------------------------------------
   Wellbeing |      Coef.   Std.  Err.      z    P>|z|     [95%  Conf.  Interval]
-------------+----------------------------------------------------------------
PolicyRegime |   -.871694   .1025092    -8.50   0.000    -1.072608   -.6707797
       _cons |   14.79292   .0792561   186.65   0.000     14.63758    14.94826
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  1.8391455
         rho |          0   (fraction  of  variance  due  to  u_i)
------------------------------------------------------------------------------
```

b.2 Habiganj district

```
4 .  import  excel  "C:\Users\User\OneDrive\Desktop\10  Dec  2021\Habiganj  (500)

5 .  xtset  HouseholdID  Year
         panel  variable:    HouseholdID  (strongly  balanced)
          time  variable:    Year,  2013  to  2018,  but  with  gaps
                 delta:    1  unit

6 .  xtreg  Wellbeing  PolicyRegime

Random-effects  GLS  regression                  Number  of  obs      =      1,500
Group  variable:  HouseholdID                    Number  of  groups   =        500

R-sq:                                            Obs  per  group:
     within   =  0.0000                                        min  =          3
     between  =  0.0000                                        avg  =        3.0
     overall  =  0.0396                                        max  =          3

                                                 Wald  chi2(1)        =      61.71
corr(u_i,  X)     =  0  (assumed)                Prob  >  chi2         =     0.0000

------------------------------------------------------------------------------
   Wellbeing |      Coef.   Std.  Err.      z    P>|z|     [95%  Conf.  Interval]
-------------+----------------------------------------------------------------
PolicyRegime |   .3572163    .045473     7.86   0.000     .2680909    .4463417
       _cons |   13.60579   .0356124   382.05   0.000     13.53599    13.6755
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  1.0485997
         rho |          0   (fraction  of  variance  due  to  u_i)
------------------------------------------------------------------------------
```

b.3 Kishoreganj district

```
7 . import excel "C:\Users\User\OneDrive\Desktop\10 Dec 2021\Kishoreganj (600)

8 . xtset HouseholdID Year
        panel variable:  HouseholdID (strongly balanced)
         time variable:  Year, 2013 to 2018, but with gaps
                 delta:  1 unit

9 . xtreg Wellbeing PolicyRegime

Random-effects GLS regression                   Number of obs     =      1,800
Group variable: HouseholdID                     Number of groups  =        600

R-sq:                                           Obs per group:
     within  = 0.0000                                         min =          3
     between = 0.0000                                         avg =        3.0
     overall = 0.6621                                         max =          3

                                                Wald chi2(1)      =    3522.80
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000
```

Wellbeing	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
PolicyRegime	1.115617	.0187962	59.35	0.000	1.078777	1.152457
_cons	15.6578	.0148927	1051.37	0.000	15.62861	15.68698
sigma_u	0					
sigma_e	.44501173					
rho	0	(fraction of variance due to u_i)				

b.4 Moulvibazar district

```
10 . import excel "C:\Users\User\OneDrive\Desktop\10 Dec 2021\Moulvibazar (500)

11 . xtset HouseholdID Year
        panel variable:  HouseholdID (unbalanced)
         time variable:  Year, 2013 to 2018, but with gaps
                 delta:  1 unit

12 . xtreg Wellbeing PolicyRegime

Random-effects GLS regression                   Number of obs     =      1,500
Group variable: HouseholdID                     Number of groups  =        500

R-sq:                                           Obs per group:
     within  = 0.0000                                         min =          3
     between = 0.0000                                         avg =        3.0
     overall = 0.3331                                         max =          3

                                                Wald chi2(1)      =     748.34
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000
```

Wellbeing	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
PolicyRegime	1.341598	.0490426	27.36	0.000	1.245476	1.43772
_cons	16.81773	.0388645	432.73	0.000	16.74156	16.89391
sigma_u	0					
sigma_e	1.1091102					
rho	0	(fraction of variance due to u_i)				

b.5 Netrokona district

```
13 . import excel "C:\Users\User\OneDrive\Desktop\10 Dec 2021\Netrokona (600)

14 . xtset HouseholdID Year
        panel variable:  HouseholdID (strongly balanced)
         time variable:  Year, 2013 to 2018, but with gaps
                 delta:  1 unit

15 . xtreg Wellbeing PolicyRegime

Random-effects GLS regression                   Number of obs     =      1,800
Group variable: HouseholdID                     Number of groups  =        600

R-sq:                                           Obs per group:
     within  = 0.2447                                         min =          3
     between = 0.0033                                         avg =        3.0
     overall = 0.0580                                         max =          3

                                                Wald chi2(1)      =     390.67
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000

------------------------------------------------------------------------------
   Wellbeing |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
PolicyRegime |   223.7685   11.32119    19.77   0.000     201.5793    245.9576
       _cons |   284.3425   17.57977    16.17   0.000     249.8868    318.7983
-------------+----------------------------------------------------------------
     sigma_u |  371.07144
     sigma_e |  226.73964
         rho |   .7281357   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

b.6 Sunamganj district

```
16 . import excel "C:\Users\User\OneDrive\Desktop\10 Dec 2021\Sunamganj (500)

17 . xtset HouseholdID Year
        panel variable:  HouseholdID (strongly balanced)
         time variable:  Year, 2013 to 2018, but with gaps
                 delta:  1 unit

18 . xtreg Wellbeing PolicyRegime

Random-effects GLS regression                   Number of obs     =      1,500
Group variable: HouseholdID                     Number of groups  =        500

R-sq:                                           Obs per group:
     within  = 0.0000                                         min =          3
     between = 0.0000                                         avg =        3.0
     overall = 0.6313                                         max =          3

                                                Wald chi2(1)      =    2564.87
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000

------------------------------------------------------------------------------
   Wellbeing |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
PolicyRegime |   1.674482   .0330634    50.64   0.000     1.609678    1.739285
       _cons |   12.71949    .026118   487.00   0.000      12.6683    12.77068
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |   .720896
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

b.7 Sylhet district

```
19 . import excel "C:\Users\User\OneDrive\Desktop\ 10 Dec 2021\Sylhet (500)

20 . xtset HouseholdID Year
        panel variable:  HouseholdID (strongly balanced)
         time variable:  Year, 2013 to 2018, but with gaps
                 delta:  1 unit

21 . xtreg Wellbeing PolicyRegime

Random-effects GLS regression                   Number of obs     =       1,500
Group variable: HouseholdID                     Number of groups  =         500

R-sq:                                           Obs per group:
     within  = 0.0000                                         min =           3
     between = 0.0000                                         avg =         3.0
     overall = 0.8177                                         max =           3

                                                Wald chi2(1)      =     6719.31
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000

------------------------------------------------------------------------------
   Wellbeing |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
PolicyRegime |   1.729397   .0210976    81.97   0.000     1.688047    1.770747
       _cons |   15.23845   .0166212   916.81   0.000     15.20587    15.27103
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .41027748
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

b.8 Whole areas

```
22 . import excel "C:\Users\User\OneDrive\Desktop\ 10 Dec 2021\Whole_areas (3500)

23 . xtset HouseholdID Year
        panel variable:  HouseholdID (strongly balanced)
         time variable:  Year, 2013 to 2018, but with gaps
                 delta:  1 unit

24 . xtreg Wellbeing PolicyRegime

Random-effects GLS regression                   Number of obs     =      10,500
Group variable: HouseholdID                     Number of groups  =       3,500

R-sq:                                           Obs per group:
     within  = 0.2493                                         min =           3
     between = 0.0022                                         avg =         3.0
     overall = 0.0793                                         max =           3

                                                Wald chi2(1)      =     2325.65
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000

------------------------------------------------------------------------------
   Wellbeing |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
PolicyRegime |   .9885411   .0204985    48.22   0.000     .9483647    1.028717
       _cons |   14.95904   .0265218   564.03   0.000     14.90706    15.01103
-------------+----------------------------------------------------------------
     sigma_u |  1.2502142
     sigma_e |  .99295066
         rho |  .61319882   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

c. Relationship between poverty score and wellbeing, protection intervention and policy regime

c.1 Brahmanbaria

```
                                  (R)
     Statistics/Data Analysis        15.0    Copyright 1985-2017 StataCorp LLC
                                             StataCorp
                                             4905 Lakeway Drive
                                             College Station, Texas 77845 USA
                                             800-STATA-PC        http://www.stata.com
                                             979-696-4600        stata@stata.com
                                             979-696-4601 (fax)

   Single-user Stata perpetual license:
          Serial number:  301506215585
            Licensed to:  www.Downloadly.ir
                          Iran Will Defeat US

   Notes:
         1.  Unicode is supported; see help unicode_advice.

1 . import excel "C:\Users\User\OneDrive\Desktop\10 Dec 2021\Brahmanbaria (300)

2 . xtset HouseholdID Year
       panel variable:  HouseholdID (unbalanced)
        time variable:  Year, 2013 to 2018, but with gaps
                delta:  1 unit

3 . xtreg PovertyLevel Wellbeing ProtectionIntervention PolicyRegime

Random-effects GLS regression                   Number of obs     =        900
Group variable: HouseholdID                     Number of groups  =        300

R-sq:                                           Obs per group:
     within  = 0.3369                                         min =          3
     between = 0.0080                                         avg =        3.0
     overall = 0.2036                                         max =          3

                                                Wald chi2(3)      =     302.46
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000

------------------------------------------------------------------------------------
      PovertyLevel |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------+----------------------------------------------------------------
         Wellbeing |  -4.557748    .4802576    -9.49   0.000    -5.499036    -3.61646
ProtectionInterve~ |  -8.087454    2.143163    -3.77   0.000    -12.28798   -3.886932
      PolicyRegime |  -19.72244    2.172393    -9.08   0.000    -23.98025   -15.46463
             _cons |    159.228    7.257394    21.94   0.000     145.0038    173.4523
-------------------+----------------------------------------------------------------
           sigma_u |  12.208807
           sigma_e |  21.626686
               rho |  .24167084   (fraction of variance due to u_i)
------------------------------------------------------------------------------------
```

c.2 Habiganj

```
4 . import excel "C:\Users\User\OneDrive\Desktop\10 Dec 2021\Habiganj (500)

5 . xtset HouseholdID Year
       panel variable:  HouseholdID (strongly balanced)
        time variable:  Year, 2013 to 2018, but with gaps
                delta:  1 unit

6 . xtreg PovertyLevel Wellbeing ProtectionIntervention PolicyRegime

Random-effects GLS regression                   Number of obs     =      1,500
Group variable: HouseholdID                     Number of groups  =        500

R-sq:                                           Obs per group:
     within  = 0.3292                                         min =          3
     between = 0.0001                                         avg =        3.0
     overall = 0.1652                                         max =          3

                                                Wald chi2(3)      =     482.57
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000

------------------------------------------------------------------------------------
      PovertyLevel |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------------+----------------------------------------------------------------
         Wellbeing |  -6.101095    .6612161    -9.23   0.000    -7.397054   -4.805135
ProtectionInterve~ |  -9.743601    2.067903    -4.71   0.000    -13.79662   -5.690585
      PolicyRegime |  -12.70878    2.082938    -6.10   0.000    -16.79127   -8.626299
              cons |    173.236    9.066655    19.11   0.000     155.4657    191.0063
-------------------+----------------------------------------------------------------
           sigma_u |  16.886776
           sigma_e |  21.892313
               rho |   .3730371   (fraction of variance due to u_i)
------------------------------------------------------------------------------------
```

c.3 Kishoreganj

```
7 . import excel "C:\Users\User\OneDrive\Desktop\10 Dec 2021\Kishoreganj  (600)

8 . xtset HouseholdID Year
        panel variable:  HouseholdID (strongly balanced)
         time variable:  Year, 2013 to 2018, but with  gaps
                 delta:  1 unit

9 . xtreg PovertyLevel Wellbeing ProtectionIntervention  PolicyRegime

Random-effects GLS regression                   Number of obs      =       1,800
Group variable: HouseholdID                     Number of groups   =         600

R-sq:                                           Obs per group:
     within  = 0.1560                                         Min =           3
     between = 0.0018                                         Avg =         3.0
     overall = 0.0858                                         Max =           3

                                                Wald chi2(3)       =      222.53
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =      0.0000
```

PovertyLevel	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Wellbeing	-4.386457	1.105622	-3.97	0.000	-6.553437	-2.219477
ProtectionIntervention	-.7310467	1.707133	-0.43	0.668	-4.076965	2.614872
PolicyRegime	-5.899994	1.75925	-3.35	0.001	-9.348062	-2.451927
_cons	154.9219	17.25615	8.98	0.000	121.1005	188.7434
sigma_u	9.3871237					
sigma_e	16.423455					
rho	.24624449	(fraction of variance due to u_i)				

c.4 Moulvibazar

```
10 . import excel "C:\Users\User\OneDrive\Desktop\10 Dec 2021\Moulvibazar  (500)

11 . xtset HouseholdID Year
        panel variable:  HouseholdID (unbalanced)
         time variable:  Year, 2013 to 2018, but with  gaps
                 delta:  1 unit

12 . xtreg PovertyLevel Wellbeing ProtectionIntervention  PolicyRegime

Random-effects GLS regression                   Number of obs      =       1,500
Group variable: HouseholdID                     Number of groups   =         500

R-sq:                                           Obs per group:
     within  = 0.1908                                         min =           3
     between = 0.0025                                         avg =         3.0
     overall = 0.0361                                         max =           3

                                                Wald chi2(3)       =      234.24
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =      0.0000
```

PovertyLevel	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Wellbeing	-3.544839	.3877674	-9.14	0.000	-4.304849	-2.784828
ProtectionIntervention	-3.080068	1.61971	-1.90	0.057	-6.254641	.094505
PolicyRegime	-.9490171	1.631722	-0.58	0.561	-4.147132	2.249098
_cons	141.722	6.598195	21.48	0.000	128.7898	154.6542
sigma_u	23.470657					
sigma_e	13.440513					
rho	.75305172	(fraction of variance due to u_i)				

c.5 Netrokona

```
13 . import excel "C:\Users\User\OneDrive\Desktop\ 10 Dec 2021\Netrokona  (600)

14 . xtset HouseholdID Year
       panel variable:  HouseholdID (strongly balanced)
        time variable:  Year, 2013 to 2018, but with gaps
                delta:  1 unit

15 . xtreg PovertyLevel Wellbeing ProtectionIntervention  PolicyRegime

Random-effects GLS regression                   Number of obs      =     1,800
Group variable: HouseholdID                     Number of groups   =       600

R-sq:                                           Obs per group:
     within  = 0.5464                                         min =         3
     between = 0.0031                                         avg =       3.0
     overall = 0.1928                                         max =         3

                                                Wald chi2(3)       =   1444.87
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

PovertyLevel	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Wellbeing	-9.961989	.7503283	-13.28	0.000	-11.43261	-8.491372
ProtectionIntervention	-6.463412	1.100563	-5.87	0.000	-8.620476	-4.306348
PolicyRegime	-4.893402	1.095923	-4.47	0.000	-7.041371	-2.745433
_cons	246.3649	11.78164	20.91	0.000	223.2733	269.4565
sigma_u	14.763701					
sigma_e	9.5241101					
rho	.70613587	(fraction of variance due to u_i)				

c.6 Sunamganj

```
16 . import excel "C:\Users\User\OneDrive\Desktop\ 10 Dec 2021\Sunamganj  (500)

17 . xtset HouseholdID Year
       panel variable:  HouseholdID (strongly balanced)
        time variable:  Year, 2013 to 2018, but with gaps
                delta:  1 unit

18 . xtreg PovertyLevel Wellbeing ProtectionIntervention  PolicyRegime

Random-effects GLS regression                   Number of obs      =     1,500
Group variable: HouseholdID                     Number of groups   =       500

R-sq:                                           Obs per group:
     within  = 0.3103                                         min =         3
     between = 0.0000                                         avg =       3.0
     overall = 0.1201                                         max =         3

                                                Wald chi2(3)       =    447.69
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

PovertyLevel	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
RiceEquivalent	-11.87919	.8311476	-14.29	0.000	-13.50821	-10.25017
DirectProtection	6.338442	2.141889	2.96	0.003	2.140417	10.53647
Time	.4679524	2.10383	0.22	0.824	-3.655479	4.591384
cons	237.1617	10.52768	22.53	0.000	216.5278	257.7956
sigma_u	19.179326					
sigma_e	17.66824					
rho	.54094027	(fraction of variance due to u_i)				

c.7 Sylhet

```
19 . import excel "C:\Users\User\OneDrive\Desktop\10 Dec 2021\Sylhet (500)

20 . xtset HouseholdID Year
        panel variable:  HouseholdID (strongly balanced)
         time variable:  Year, 2013 to 2018, but with gaps
                 delta:  1 unit

21 . xtreg PovertyLevel Wellbeing ProtectionIntervention PolicyRegime

Random-effects GLS regression                   Number of obs     =      1,500
Group variable: HouseholdID                     Number of groups  =        500

R-sq:                                           Obs per group:
     within  = 0.2212                                         min =          3
     between = 0.0043                                         avg =        3.0
     overall = 0.0686                                         max =          3

                                                Wald chi2(3)      =     282.50
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000

------------------------------------------------------------------------------
PovertyLevel |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   Wellbeing |   -9.36121   2.51427    -3.72   0.000    -14.28909   -4.433332
ProtectionIn~n |  -.9946793   3.800699   -0.26   0.794    -8.443912    6.454554
PolicyRegime |  -1.705266   3.32387    -0.51   0.608    -8.219931    4.809399
       _cons |   217.4144   37.95602     5.73   0.000      143.022    291.8068
-------------+----------------------------------------------------------------
     sigma_u |  28.279079
     sigma_e |  22.773045
         rho |  .60661114   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

c.8 Whole areas

```
25. import excel "C:\Users\User\OneDrive\Desktop\10 Dec 2021\whole_areas (3500)

26. xtset HouseholdID Year
        panel variable:  HouseholdID (strongly balanced)
         time variable:  Year, 2013 to 2018, but with gaps
                 delta:  1 unit

27. xtreg PovertyLevel Wellbeing ProtectionIntervention PolicyRegime

Random-effects GLS regression                   Number of obs     =     10,500
Group variable: HouseholdID                     Number of groups  =      3,500

R-sq:                                           Obs per group:
     within  = 0.2336                                         min =          3
     between = 0.0008                                         avg =        3.0
     overall = 0.0789                                         max =          3

                                                Wald chi2(3)      =    2060.77
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000

------------------------------------------------------------------------------
PovertyLevel |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   Wellbeing |  -2.327844   .1735887   -13.41   0.000    -2.668071   -1.987616
ProtectionIn~n |  -5.82868   .7512612    -7.76   0.000    -7.301125   -4.356235
PolicyRegime |  -8.759539   .7480903   -11.71   0.000    -10.22577   -7.293309
       _cons |   120.9423   2.626231    46.05   0.000      115.795    126.0896
-------------+----------------------------------------------------------------
     sigma_u |  19.263568
     sigma_e |  18.372345
         rho |  .52366686   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

d. Policy Brief
April 2022

Analysis of Agricultural Policy on Food System and Rural Development in Bangladesh: Case of Haor Area (Wetland) Management Practice

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KEY MESSAGES

Rice farming and fish gathering from the open water are the two most important economic activities in this wetland areas of Bangladesh

.....

Infrastructure development is observed in roads, electricity, and educational institutions.

Poverty reduced substantially, with 30% fewer people living in poverty than in prior years.

.....

Recently, people understand poverty as a lack of transport facilities, educational facility, agricultural mechanization, etc., instead of access to food

.....

Since lower poverty is directed by employment generation, more policy focus should be concentrated on employment and infrastructure development

Introduction

In Bangladesh, agricultural production increased significantly over the last three agricultural policy regimes. Adoption of high-yielding varieties,irrigation, fertilizers usage with crop management and rightful agricultural policies have appeared major contributors.

The government formulated policies and strategies to guide overall development with a focus on rural and agricultural development. In line with strategic development polices, the government has also approved the National Agricultural Policy 2018 to achieve sustainable food and nutrition security through efficient utilization of natural resources.

This study has been conducted to investigate the impact of policy interventions on the capacity of smallholders of *haor* communities in seven districts of greater Sylhet and Mymensingh where development intervention has been introduced at a massive-scale targeting food security and lowering poverty. The period of data collection is 2019-2022 usinga mixed methodology such as structured interviews, Focus Group Discussions (FGD) and Merging of Knowledge (MoK).

Descriptive and econometric tools areapplied to get insight into the connection between agricultural policy (policy regime/specific interventions) and wetland food system development;evaluate the structure of external change like rural development, resource conservation and poverty patterns in line with successive policies for wetlands; and identify the basic constraints hindering resource utilization in haor areas (based on necessary amendments in the respective policies).

The impact of policy intervention on livelihood and rural poverty in haors

The incidence of agricultural policy intervention on household poverty reduced to 11.54 percent and income increased to Tk. 78,445 per year. While the employment increased by 9 units and the labor productivity by Tk. 59 per year by successive agricultural interventions. The selected household income is highly impacted by public investment through rural infrastructure. The input subsidies like, fertilizer, seed, irrigation water and mechanization substantially increased rural farm income. The farmer's support policy by government rice procurement was found a common policy benefitting the farm household. The impact of these policy approaches substantially affects the capacity of smallholders on poverty alleviation and the food system of the sample households. The poverty exposure to resource pauperization has increased over time in haor. The flood control, roads and communications, farm mechanizations,tourism and sandstone

exploring reduced seasonal unemployment. Still, policy weaknesses are one of the major causes of backwardness in the haor area. The agricultural policies initiated over the last two decades have resulted in major changes affected farming system structures and dimensions in haor areas of Bangladesh.

The impact is causing further marginalization of resource-poor farmers. They are becoming more dependent on external resourcesfor livelihood. A good public policy of agriculture could accelerate rural development and help to alleviate poverty. The theoretical and empirical findings of this study would provide inputs for policymakers to create a long-term framework for poverty reduction and sustainable livelihood development for the poor households in *haor* areas.

The impact of agriculture policy intervention on food system in haors

A good food comes from agriculture, beginning with appropriate choices in production and cropping systems, as well as processing, preservation, and marketing, application of food standards, safe storage, correct food preparation and handling. When food systems are designed with a nutrition orientation, they offer an opportunity for an adequate supply of energy and nutrient-dense foods for a healthy diet. The potential of food systems for improved nutrition needs to be promoted to contribute to the economic efficiency, conservation of nutrients and enhanced quality and diversity of diets. Nutrition education needs to be integrated through the production, processing and consumption linkages in the food system. Linking community development policies to a national program for the alleviation of hunger and malnutrition, with an emphasis on increasing the variety of foods consumed, is probably the best strategy for improving micronutrient nutrition sustainably.

Therefore, food systems need to be shaped to become more nutrition-sensitive so that they can potentially lead to better diets and improved nutritional outcomes followed by wellbeing. An understanding of the different elements of the food system that encompasses essential entry points from primary production to the plate is required. This calls for designing policy, planning and implementing programming options and policy enabling the environment to leverage the food system to supply and demand for safe and diversified diets. The development initiative taken by the central unit is more likely to create absolute well-being.

Adversative of agricultural policy intervention

It also experiences many negative impacts such as technology divide, losing age-old social capitals, cultural integrity and sustainable lifestyles practices including decline insoil fertility and local biodiversity. Integration of subsistence farming systems with domestic and global markets geared by poor governance has led to the making farming systems more vulnerable and riskier. To respond to the market demand, farmers have to change the components (sub-sectors) of the farming systems very frequently. It is often making farming less sustainable and productive but many have deprived employment opportunities from resource-poor farmers and made a vast number of people landless.

Policy suggestion for future planning

The study considered panel data to understand the impact of policy intervention in rural development, food system and poverty. There are diverse economic activities in haor areas, present study considered five issue under considerations which may not be appropriate for whole assessment output. Availability of panel data of all kind of economic activities would be invaluable in providing a more insightful perspective while considering panel analysis of whole economic activities around *haor*.

Ministry of Agriculture

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