Government of the People's Republic of Bangladesh

Ministry of Housing and Public Works

Urban Development Directorate (UDD)

Preparation of Development Plan for Fourteen Upazilas

Package-04

(Saghata Upazila, District: Gaibandha; Sariakandi Upazila and Sonatala Upazila, District: Bogra)

FINAL SURVEY REPORT

AGRICULTURE SURVEY
Of
Saghata Upazila, Gaibandha

June, 2017

Modern Engineers Planners & Consultants Ltd.

Letter of Transmittal

Ref No.: MEPC/UDD/2017/61 Date: 04.06.2017

To

The Project Director

"Preparation of Development Plan for Fourteen Upazilas" Project

Urban Development Directorate (UDD)

82 Segun Bagicha, Dhaka-1000.

Subject: Submission of the Final Agriculture Survey Report of Saghata Upazila, Gaibandha.

Dear Sir,

I have the pleasure to submit herewith the Final Agriculture Survey Report of Saghata Upazila, Gaibandha District under "**Preparation of Development Plan for Fourteen Upazilas Project**" Package No: 04 (Saghata Upazila, District- Gaibandha; Sonatala Upazila and Sariakandi Upazila, District- Bogra) for your kind information and further action.

Thanking you and assuring you of our best services.

Best Regards

…… ……

(Engr. A. Sobahan) **(Shamim Mahabubul Haque)**

Managing Director of MEPC Team Leader, Package-4

Executive Summary

Saghata is the remotest potential agricultural Upazila under Gaibandha district. The land of this Upazila is intensively used for agricultural purposes. It is reported that natural disasters like prolong drought, flood, decreasing ground water, heavy rain, early rain, erosion, water logging and hail-storm damage crops of this Upazila. The study is to determine the present scenario of agriculture practices and assessment of the potential sustainable future development of the sector. Both the primary and secondary data were reviewed for preparing the survey report. The project entitled "Preparation of Development Plan for Fourteen Upazilas", Package 04 is expected to contribute to achieving the objectives of the National Agriculture Policy.

Saghata is Upazila falls into 02 Agro Ecological Zones: (i) Tista Meander Floodplain (AEZ-3) and (ii) Active Brahmaputra-Jamuna Floodplain (AEZ-7). Most of the areas of this upazila are developed from transformed alluvial deposit by the Tista river system. The landscape is complex and seasonally flooded. Saghata Upazilas consists of 10 Unions and consists of 4 land Zones. These are: (1) Agriculture Zone, (2) Agro-Fisheries Zone (3) Agriculture-Char Land and 4. Mixed Use Zone (Upazila HQ- Char and Agriculture). Most of the people of this Upazila are directly or indirectly dependent on agriculture.

The highest percentage is double cropped area (68%) followed by triple cropped area (25%), single crop area (7%) under Saghata Upazila. The cropping intensity of Saghata Upazila is 221% which is higher than Gaibandha District (215%) and also higher than average National cropping Intensities (190%).

The scenario of present cropping pattern under Saghata Upazila is complex and predominantly Boro (HYV/Hybrid) & T. Aman (HYV/LV) Rice, Jute, potato, Wheat, Maize, Vegetables, Oilseeds, Pulses, Spices, Fruits Garden based. Study finding shows that 14 different cropping pattern are practiced by Saghata Upazila farmers. Saghata Upazila present one main cropping pattern area is

Boro (HYV/Hybrid)→ Fallow→T. Aman (HYV) which is practiced 64.28% of the Net Cultivable Area (NCA). Similarly, Boro (HYV/Hybrid) → Fallow→ Fallow which is practiced 5.58% of the Net Cultivable Area (NCA). Further, Wheat/Maize→ Jute→ T.Aman which is practiced about 4.61% of the Net Cultivable Area (NCA). Mustard→Boro→T. Aman (HYV/LV) is covering about 3.25% of the NCA. Potato & Sweet Potato are the cropping pattern covering about 3% of the NCA.

The present total different cropped area is 34915 ha of which rice cropped area are 29580 ha and the rest 5335 ha is covered by non-rice crops (Jute, Potato, W & S. vegetables, pulses, and oilseeds and fruits etc.). The rice and non-rice cropped area are about 85% and 15% respectively of the total cropped area. HYV/Hybrid rice or others crops gives higher yield in compared to local variety crops. At present, total crop production is 153317.6 metric tons of which rice production is 98113.6 metric tons and non-rice production is 55204 metric tons. Among the rice crops the contributions of T. Aman (LV), T. Aman (HYV), Boro (HYV) and Boro (Hybrid) are about 7%, 38%, 36% and 18% respectively.

Irrigation is considered as a basic input for producing cereals and many other crops. Most of the farmers are dependent on irrigation. A total of 6853 machine were used for irrigation under Unions in Saghata Upazila. A total 60 DTW, 38 STW and 297LLP along with other indigenous irrigation tools are used for lifting water. In many cases small and marginal farmers are involved in operation and maintenance of irrigation equipment. All DTW and 1338 STW has electricity facilities but 5437 STW & 38 LLP has no electricity. Electricity user's farmers reported that failed or disruption of electricity supply during Boro season were acute problems under Saghata Upazila. Framers wanted non-stop electricity supply during Boro season. Majority of the Farmers reported irrigation drainage system DTW is pucca but 90-100% STW drain is kutcha which is major cause of wastage of irrigation water. Farmers wanted pucca drainage system. In Rabi crop season maximum cultivated area (94-95%) are covered by irrigation water under different Unions. This indicates that farmers have access to irrigation water that facilitated ground water and surface water lifting.

Rice production cost of Boro and Aus are Tk.18.65 and Tk.18.64 per kg, and Aman rice production cost is Tk.17.61 per kg which is less than Boro and Aus. Department of Agriculture Marketing estimated production cost for Boro rice Tk. 18.08 per kg, Aman rice Tk. 18.20 per kg and Wheat Tk. 23.50 per kg in the year 2015-16. On this basis Government has declared buying rate of Boro rice Tk. 20.70, Aman rice Tk. 18.50 per kg and Wheat Tk. 27.02 per kg respectively.

The present study was assessed financial profitability of Brinjal, Tomato, Potato and Cabbage/cauliflower vegetables production under Saghata Upazila. Finding shows that Tomato cultivation is more profitable (Tk. 746514.4.per ha) followed by Brinjal (Tk. 589086 per ha), Cabbage/Cauliflower (Tk. 309776.67 and potato (Tk. 231890 per ha) and cucumber vegetables (Tk.200000/-) respectively.

Study finding shows 62% local variety rice was decreased during last ten years. The HYV/Hybrid paddy cultivation area 24% was increased. Remarkable changes in land coverage

of cultivated crops have been noticed over last 10 years in Saghata Upazila. Highest increase occurred in summer vegetables (136%). On the other hand, highest decrease occurred in winter vegetables (-27%) and pulses (-13.04%). The main reason for decreased winter vegetables and pulses due to farmer's switchover cultivated less risk and high profitable crops. Highly significant changed or increased during ten years was occurred in spices (382%) followed by sugarcane (233%), oilseeds (90%), maize (78%) and fruits gardening (57%) land use. Among the other purposes remarkable significant changed were occurred in Brick field (150%) and followed by poultry farm (129%), Housing (27%) and fish cultivation (14%) respectively.

The major problems in agriculture sector of Saghata Upazila identified are: Less availability of different quality HYV crop seeds, flood and river erosion, water logging and siltation of canals and river, inadequate irrigation facilities and katcha drainage system, lack of seed store for high value crops, lack of cold storage and vegetable cool-chamber, lack of vegetables and fruits whole sale market infrastructure, less availability of power tiller/tractor, harvester, sprayer & foot pump and high price, post-harvest loss of litchi, mango and potato and other vegetables is high. There is no agro processing center and industries at Unions level, power failure in Boro crop season and power failure in Boro crop season.

Non-stop electricity supply during Boro crop season and Kutcha drain need to be made pucca drain or underground pipe system. Road network at local level, agro-processing and marketing infrastructure development, re-excavation of canals and irrigation facilities need to be improved for mitigating impacts of crop production related vulnerabilities and climate change. Specific recommendations made for the improvement of agriculture sector are, in each union one wholesale market infrastructure need to be constructed in each Union one seed store infrastructure and cold storage and food godown/warehouse need to be established, and finally establishment of potato and vegetables & fruits processing, grading and packaging industry/facility in each Union of the Upazila

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List of Abbreviations/Acronyms

AEO	Agriculture Extension Officer
AEZ	Agro-Ecological Zone
AVRDC	Asian Vegetable Research and Development Center
BARI	Bangladesh Agriculture Research Institute
BCR	Benefit Cost Ratio
BINA	Bangladesh Institute of Nuclear Agriculture
BRRI	Bangladesh Rice Research Institute
BSRI	Bangladesh Sugarcane Research Institute
CC	Climate Change
DAE	Department of Agricultural Extension
DTW	Deep Tube well
DS/m	Deci-Siemens/meter
FAO	Food and Agricultural Organization
GO-	Government Organization
GoB	Government of Bangladesh
Ha	Hectare
HL	High Land
HQ	Head Quarter
HYV	High Yielding Variety
HHS	Household Survey
IPM	Integrated Pest Management
IPMP	Integrated Pest Management Plan (IPMP)
KII	Key informant Interview
LIV	Local Improved Variety
LV	Local Variety
LL	Low Land
LLP	Low Lift Pump
MoL	Ministry of Land
MHL	Medium High Land
MLL	Medium Low Land
NCA	Net Cultivable Area
NIPM	National Integrated Pest Management
NLUP	National Land Use Policy
NWP	National Water Policy

NWMP	National Water Management Plan
P^H	Negative Logarithm of Hydrogen Ion Concentration
SAAO	Sub-Assistant Agricultural Officer
SRDI	Soil Resource Development Institute
SPSS	Statistical Package for the Social Sciences
STW	Shallow Tube Well
T. Aman	Transplanted Aman
T. Aus	Transplanted Aus
ToT	Training of Trainers
UAO	Upazila Agricultural Officer
UDD	Urban Development Director
VLL	Very Low Land
ULO	Upazila Livestock Officer
UFO	Upazila Fisheries Officers
WARPO	Water Resources Planning Organization
W&S	Winter & Summer

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Area of Saghata Upazila is 225.67 sq. km. located in Rangpur division between $25^0$02' and $25^0$14' north latitudes and between $89^0$29' and $89^0$40' east longitudes. It is under Gaibandha district. The Upazila is bounded on the north by Gaibandha Sadar upazila, east by Fulchhari Upazila and Islampur Upazila of Jamalpur Zila, south by Saghata Upazila and west by Gobindaganj Upazila and Palashbari Upazila. The upazila consists of 10 unions, 116 populated mauzas and 130 villages.

Saghata Upazila of Gaibandha District is also situated in the right bank of Brahmaputra River. Other major rivers of the district are: Karatoya, Tista, Ghagot and Bangali. These rivers not only play an important role for the formation of land but also influence crop cultivation, trade, communication and socio-economic condition of the area. The AEZ of the district has been identified as a) Tista River Meander Floodplain and b) Active Brahmaputra River Floodplain. Most of the inhabitants are river eroded and landless. People migrate seasonally or permanently for their livelihood leaving their families and relatives behind. It has productive plain land, char land agriculture, housing, forestry, water bodies, capture and culture fisheries etc. This Upazila is susceptible to natural and human induced disasters like flood, drought, water pollution, deforestation, loss of fertile agricultural land, unplanned growth of brick fields and housing in agricultural land. However shifting agricultural land to non-agricultural purposes is a common phenomenon in this Upazila. Improper land use causes various forms of land degradation as a result Saghata Upazila under Gaibandha District agriculture production is being reduced. Indiscriminate land conversion will impose threat to national food security. As such, land use pattern of the Upazila is changing, creating pressure on land resources and biodiversity. To protect agricultural land, to minimize land degradation and introducing modern technology are the basic needs to cope-up with the increasing demand of food for the growing population of this Upazila.

In view of the above mentioned context, a comprehensive study was conducted in all the Unions of Saghata Upazila to assess present situation of land uses, related problems and potentialities of land for different other uses, and to find out possible coping ways to solve the problems. Therefore, considering all available parameters and characteristics of the area a sustainable land management is thought to develop better crop production.

1.2 Objectives of the Study

The main objective of the study is to assess the present cropping pattern and cropping intensities (single, double and triple crop area), land utilization and flood level. The main study questions are to determine the growth or decline of agricultural land during last ten years (from 2005-2016) and to find out causes for growth or decline considering possible quality of existing and future agricultural land in the project area. The study has also been commissioned to determine the present scenario in agriculture practices and assessment of potentials for sustainable future development of the sector.

1.3 Approach and Methodology

A multi-disciplinary, participatory and interactive method has been followed in carrying out the study. Both primary and secondary data were reviewed. The primary data were collected through KII (Key Informant Interview) and field visit. AII information was collected by using questionnaire survey (Annex-1). The secondary data were collected and reviewed on land use from DAE Union and Upazila Office documents. KII information was collected from 30 Sub-Assistant Agriculture Officers under 10 Unions through interview. Structured and semi-structured questionnaire was used for data collection (Annex-2). Data collection and consolidation occurred simultaneously. Data collection and consolidation occurred simultaneously. Data consolidation activities, such as editing, coding, classifying and data entry into the computer software for analysis were carried out simultaneously. Frequency tables (one, two or multiple ways) were prepared for interpretations and analyses using SPSS for data analysis.

CHAPTER TWO: AGRICULTURE RELEVANT POLICY FRAMEWORK

This Chapter presents a review of the national policy, legal and regulatory framework relevant to the agriculture aspects of the Project.

2.1 National Agriculture Policy, 2013

The National Agriculture Policy, 2013 approved by the Government of Bangladesh focuses on agriculture production, alleviating poverty through generating jobs and ensuring food security. The Policy outlined nine specific objectives. Although the policy does not emphasize the coastal zone separately, all specific objectives are applicable to the development of coastal zone agriculture.

The GoB will pursue programme for agro-ecologically disadvantaged regions in the hilly area, drought-prone area, Barind tract, char land, haor-baor and coastal belt with appropriate technological support.

To increase water productivity and enhance irrigation efficiency through optimal use of available water resources the GoB will facilitate dissemination of water management technology. Modern irrigation, drainage and water application systems will be introduced for expanding irrigation coverage including difficult or disadvantaged areas i.e. in char, hilly areas, Barind Tract, drought-prone and saline areas.

The proposed Preparation of Development Plan for Fourteen Upazilas Package: 04 are expected to contribute to achieving the objectives of the agriculture policy.

2.2 Master Plan for Agricultural Development in Southern Region of Bangladesh, 2013

The Master Plan for Agriculture Development in the Southern Region of Bangladesh has been prepared by the Ministry of Agriculture in collaboration with the Ministry of Fisheries & Livestock and Ministry of Water Resources and with technical assistance from the Food and Agriculture Organization of the United Nations (FAO). The Plan covers three hydrological regions- south central, southwest and southeast of the coastal zone covering 14 districts. The objective of the Plan is to provide a road map for integrated agricultural development in the coastal districts of Bangladesh, aiming at sustainable food security, poverty reduction and livelihood development for the poor. The Plan particularly focuses on, among others increasing agricultural production and productivity; improving water management, infrastructure development for surface water irrigation; improving productivity of brackish water shrimp and

capture fisheries; and promoting smallholder poultry and dairy development. The Plan formulated a set of programmes and activities across all branches of agriculture and other related fields. The Plan is for 2013 to 2021.

The proposed Preparation of Development Plan for Fourteen Upazilas Package 04 is expected to contribute to achieving the objectives of the Master Plan for Agriculture Development in the Saghata Upazila under Northern Region of Bangladesh.

2.3 National Water Management Plan, 2001 (Approved in 2004)

The National Water Management Plan (NWMP) 2001, approved by the National Water Resources Council in 2004, envisions establishing an integrated development, management and use of water resources in Bangladesh over a period of 25 years. WARPO has been assigned to monitor the national water management plan. The major programs in the Plan have been organized under eight sub-sectoral clusters: (i) Institutional development, (ii) Enabling Environment, (iii) Main Rivers, (iv) Towns and rural areas, (v) Major cities; (vi) Disaster Management; (vii) Agriculture and Water Management, and (viii) Environment and Aquatic Resources. Each cluster comprises of a number of individual programs, and a total of 84 sub-sectoral programs have been identified and presented in the investment portfolio.

Preparation of Development Plan for Fourteen Upazilas Package: 04 have been designed in line with this Plan and address its key objectives for the water resource management in the Saghata Upazila areas.

2.4 The Ground Water Management Ordinance, 1985 (Ordinance No. XXVIT of 1985)

This is an Ordinance to manage ground water resources for agricultural production. This Act authorizes the Thana Parishad (Police Station) to grant license for installing tube wells under its jurisdiction. The Thana Parishad may grant the license if the Parishad is satisfied that the installation of the tube well applied for complies with the following points;

- will be beneficial to the areas where it is to be installed; or
- will not have any adverse effect upon the surrounding areas, or is otherwise feasible.

Preparation of Development Plan for Fourteen Upazilas Package: 04 have been designed in line with this Plan and address its key objectives for the ground water management ordinance for Saghata Upazila.

2.5 National Land Use Policy (MoL, 2001)

The National Land Use Policy enacted in 2001, aims at managing land use effectively to support trends in accelerated urbanization, industrialization and diversification of development activities. The NLUP urges that increasing the land area of the country may not be possible through artificial land reclamation process, which is cost-effective only in the long run. Therefore, land use planning should be based on the existing and available land resources. The policy suggests establishing land data-banks where, among others, information on accreted reverie and chars will be maintained. Among the 28 policy statements of NLUP, the following are relevant to the Saghata Upazila area:

- Forests declared by the Ministry of Environment and Forests will remain as forest lands;
- Reclassification of forest lands will be prevented; and
- Effective green belts will be created all along the Upazila area.

Preparation of Development Plan for Fourteen Upazilas Package: 04 are designed in accordance with this Policy and will comply with the above listed requirements.

2.6 National Water Policy, 1999

Endorsed by the GoB in 1999, the National Water Policy (NWP) aims to provide guidance to the major players in the water sector for ensuring optimal development and management of water. According to the policy, all agencies and departments entrusted with water resource management responsibilities (regulation, planning, construction, operation, and maintenance) are required to enhance environmental amenities and ensure that environmental resources are protected and restored in executing their tasks.

The proposed Preparation of Development Plan for Fourteen Upazilas Package: 04 are expected to contribute to achieving the objectives of the national water policy.

2.7 National Integrated Pest Management (NIPM) Policy

IPM Action Plan supports a strategy that promotes use of biological or environmental pest control methods and reduces reliance on synthetic chemical pesticides. Agriculture, rural development and health sector projects have to avoid using harmful pesticides. Other pesticides can be used, but only as an element of an Integrated Pest Management Plan (IPMP) that emphasizes environmental and biological controls.

The proposed Preparation of Development Plan for Fourteen Upazilas Package: 04 are expected to contribute to achieve the reducing of pesticides used in agriculture sector and increases use of other pest control methods under National IPM policy.

CHAPTER THREE: PRESENT LAND USE

3.1 Description of the Present Situation

Saghata is the remotest potential agricultural Upazila under Gaibandha district. The land of this Upazila is intensively used for agricultural purposes. Bangladesh has been divided into 30 Agro Ecological Zones based on soil, landform and climatic characteristics. Saghata is Upazila falls into 02 Agro Ecological Zones: (i) Tista Meander Floodplain (AEZ-3) and (ii) Active Brahmaputra-Jamuna Floodplain (AEZ-7) (BARC 1997). Most of the areas of this upazila are developed from transformed alluvial deposit by the Tista river system. The landscape is complex and seasonally flooded. General soil color of Saghata Upazila is grey to dark grey. The top soil is occupied by moderately permeable loamy soils and some parts are clayey. In Saghata organic matter contents are low in the high land, but moderate in the lower parts. Moisture holding capacity of soil is low to medium. General fertility is relatively poor. The top soil pH level ranges from 4.5-7.0 (SRDI 2001 and BARC 1997). Saghata Upazila consists of 10 Unions. Majority of the people of this Upazila are directly or indirectly dependent on agriculture.

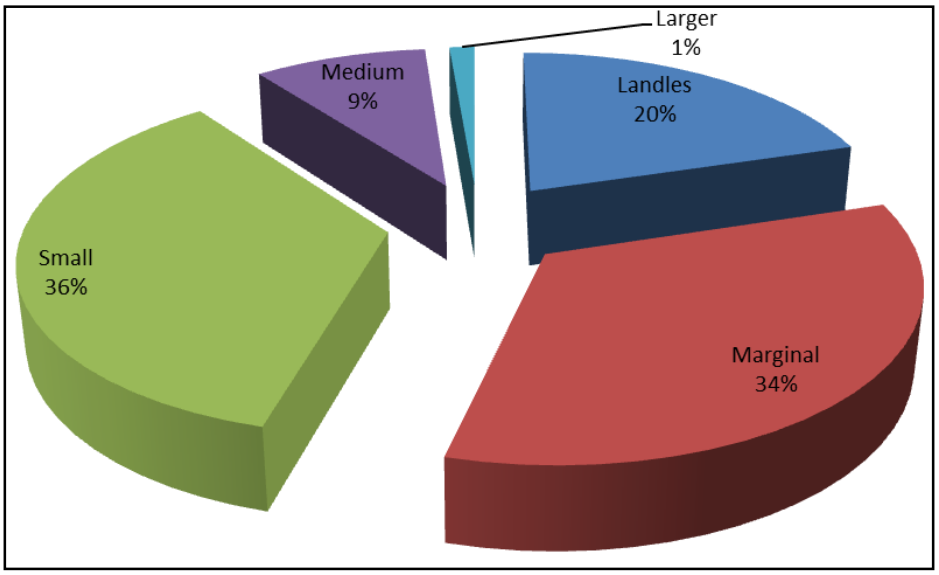
3.2 Saghata Upazila and Union Wise Farm Families

Farmers in Saghata Upazila lead their livelihood from land based agricultural activities. It is the main source of their employment and income. Saghata Upazila has 10 Unions. It has in total 112 mauza and 130 villages. Saghata has 30 agricultural blocks under DAE. Farm family is categorized according to farmer holding own land. There are five categories of farm family in Bangladesh. These are: landless (0.05-0.50 acre land), marginal (0.51-1.50 acre land), small (1.51-2.50 acre land), medium (2.51-7.50 acre land) and larger (above 7.50 acre land). Union and category wise farm family under Saghata Upazila is shown in Table 3.1. On an average there are about 15779 land less, 26253 marginal, 27558 small, 7047 medium large and remaining 1025 are larger farm families under Saghata Upazila. The highest percentages of farm families are Small (36%), followed by Marginal farmers (34%), landless (20%), medium farmers (9%) and remaining 1% larger farmers (Figure 3.1). It is evident that most of the farm families fall in the small and marginal category. With the increasing number of population the pressure on land is increasing day by day. As a result, the number of small, marginal and landless farm families is gradually increasing creating pressure on livelihood in the Upazila.

Table 3.1: Union and Category Wise Farm Family under Saghata Upazila

Name of Union	Landless (%) (.05-.50 acre)	Marginal (%) (.51-1.50 acre)	Small (%) (1.51-2.50acre)	Medium (%) (2.51-7.50 acre)	Larger (%) (above 7.50 acre)	Total
Bharatkhali	519 (9,37)	1754 (31.66)	2239 (40,42)	960 (17.33)	68 (1.23)	5540
Bonar Para	2080(22.13)	3551(37.78)	3170(33.72)	514(5.47)	85(0.90)	9400
Ghuridaha	1275(15.38)	3138(37.85)	2990(36.07)	742(8.95)	145(1.75)	8290
Haldia	740(11.33)	1925(29.48)	3310(50.69)	480(7.35)	75(1.15)	6530
Jumarbari	1530(19.91)	3335(43.39)	2391(31.11)	330(4.29)	100(1.30)	7686
Kachua	1412(20.96)	1707(25.33)	2782(41.29)	560(8.31)	277(4.11)	6738
Kamaler Para	1504(13.66)	3424(31.10)	4150(37.70)	1790(16.26)	140(1.27)	11008
Padumsahar	4730(44.30)	3106(29.09)	2155(20.18)	650(6.09)	37(0.35)	10678
Saghata	561(10.90)	2121(41.21)	1756(34.12)	645(12.53)	64(1.24)	5147
Muktinagar	1428(21.49)	2192(32.99)	2615(39.35)	376(5.66)	34(0.51)	6645
Total	**15779(20.32)**	**26253(33.80)**	**27558(35.48)**	**7047(9.07)**	**1025 (1.32)**	**77662**

Source: SAAOs and UAO Saghata Upazila, DAE 2016



Source: SAAOs and UAO Saghata Upazila, DAE 2016

Figure 3.1: Percentage of Category wise Farm family under Saghata Upazila

3.3 Present Agricultural Land Use

3.3.1 Present Upazila Land Use

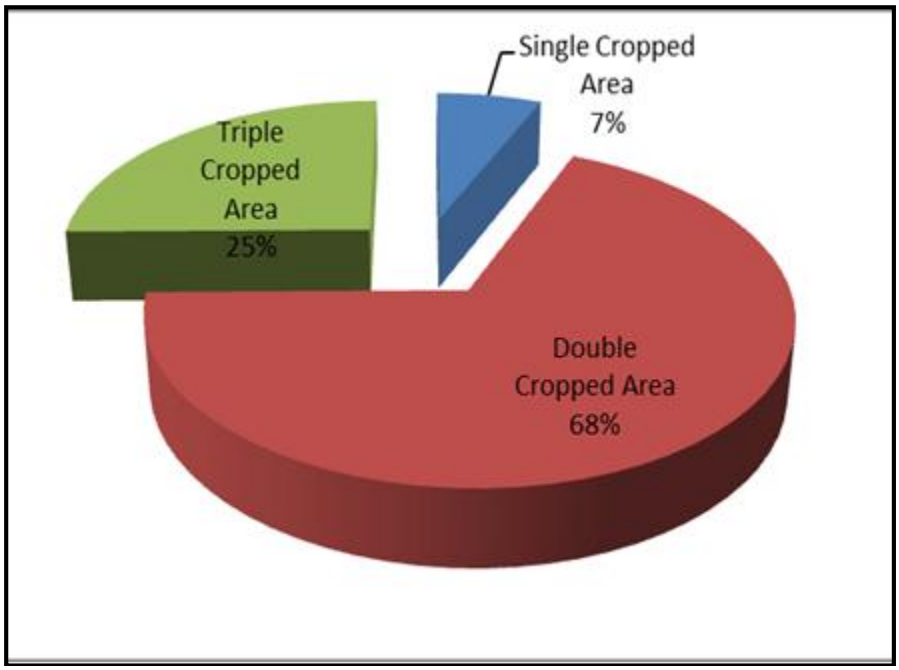
Land is a finite resource for most human activities including agriculture, industry, forestry, energy production, settlement, recreation, and water catchment and storage. Bangladesh is a densely populated country. Increased population imposes high pressure on land resources for agricultural production. Saghata Upazila gets high potentials for its land on agricultural production. This Upazila holds an important arena in Gaibandha district with her natural

resources and ecosystem. The scenario of Saghata Upazila present different land utilized is shown in Table 3.2. Types of lands are 4424 ha high land, 16001 ha medium high land, 787 ha medium low land and 1897 ha low land respectively. Saghata Upazila covers 18450 ha of net cropped area of which about cultivated area is 36900 ha. The highest land area is 12615 ha is used as double crop and followed by triple crop of 4650 ha and remaining 1185 ha is used as single crops under Saghata Upazila. Other land use: Permanent Fruit Garden 11 ha, and Fish cultivation1559 ha. Saghata Upazila has 18450ha permanent fallow land and 9.71 ha forest land. Percentage of single, double, triple and more than three cropped area used in Saghata Upazila is shown in Figure 3.2. The highest percentage is double cropped area (68%) followed by triple cropped area (25%), single crop area (7%) under Saghata Upazila. The cropping intensity of Saghata Upazila is 221%.

Table 3.2: Present Land Use of Saghata Upazila

Sl. No.	Upazila Land use	Total Area (ha)
1.	Total Agricultural land	23109
2.	Single cropped area	1185
3.	Double cropped area	12615
4.	Triple cropped area	4650
5.	Net Cropped area	18450
6.	Total cropped area	36900
7.	Cropping Intensity (%)	221
8.	Permanent Fallow Land	18450
9.	Current/seasonal fallow land(with fallow period) → Rabi Season fallow	11860
10.	→ Kharif-1 seasonal fallow	1030
11.	→Kharif-11 seasonal fallow	755
12.	Irrigated land area	18400
13	Water land (River, Ponds and others)	1559
10.	High land	4424
11.	Medium high land	16001
12.	Medium low land	787
13.	Low land	1897
14.	Forest Area	9.71
15	Permanent Fruit Garden	11

Source: Upazila Agriculture Office, Saghata Upazila, DAE 2016



Source: Upazila Agriculture Office, Saghata Upazila, DAE 2016

Figure 3.2: Percentage of Single, Double and Triple Cropped Landuse in Saghata Upazila

Union-wise present agriculture land use information and identified land zoning of Saghata Upazila are shown in Table 3.3. There are four types of land zoning proposed for Saghata Upazila by National Land Zoning project 2015 which is shown in Table 3.4. These are: (1) Agriculture Zone, (2) Agro-Fisheries Zone (3) Agriculture-Char Land and (4) Mixed Use Zone (Upazila HQ- Char and Agriculture and Upazila Land used Map shown in Map 3.1.

Table 3.3: Union-wise Present Land Use Information and Identified Land Zoning

Union	Area (ha)	Land Type (%)	Soil pH	Top Soil Texture	Cropping Intensity (%)	Present Land Use (%)	Recommended Land Zoning
Bharatkhali	1425	HL-3 MHL-53 MLL-31 LL-9 VLL-8	5.5-6.5	Loam to clay loam	235	Agriculture=63 Char land =1 Road=1 Settlement=22 Urban area=3 Water Bodies=10	Agro-Fisheries Zone
Bonarpara	2292	HL-26 MHL-46 MLL-10 LL-10	5.5-6.5	Silt Loam to Loam	226	Agriculture=65 Road=1 Settlement=20 Urban area=4	Agro- Fisheries Zone

Union	Area (ha)	Land Type (%)	Soil pH	Top Soil Texture	Cropping Intensity (%)	Present Land Use (%)	Recommended Land Zoning
		VLL-8				Water Bodies=10	
Ghuridaha	2084	HL-20 MHL-42 MLL-26 LL-8 VLL-4	5.5-6.5	Loam to Clay	206	Agriculture=68 Char land =4 Road=1 Settlement=18 Urban area=1 Water Bodies=8	Agro- Fisheries Zone
Haldia	4679	HL-11 MHL-26 MLL-30 LL-19 VLL-14	5.5-6.5	Sandy Loam to Loam	211	Agriculture=28 Char land =44 Settlement=4 Water Bodies=24	Agriculture – Char Land Zone
Jumarbari	1813	HL-23 MHL-24 MLL-34 LL-15 VLL-4	5.5-6.5	Loam to Sandy Loam	246	Agriculture=73 Road=1 Settlement=21 Water Bodies=5	Agriculture Zone
Kachua	2113	HL-3 MHL-50 MLL-40 LL-4 VLL-3	5.5-6.5	Loam to Sandy Loam	223	Agriculture=70 Char land =1 Road=1 Settlement=21 Water Bodies=7	Agriculture Zone
Kamalerpara	2503	HL-15 MHL-67 MLL-15 LL-3	5.5-6.5	Loam to Sandy Loam	223	Agriculture=73 Char land =1 Road=1 Settlement=18 Water Bodies=7	Agriculture Zone
Padumsahar	2289	HL-13 MHL-42 MLL-35 LL-9 VLL-1	5.5-6.5	Loam to Clay Loam	212	Agriculture=69 Road=1 Settlement=22 Water Bodies=8	Agro-Fisheries Zone
Saghata	2437	HL-9 MHL-43	5.5-6.0	Silt Loam to Loam	231	Agriculture=39 Char land =22	Agriculture Zone

Union	Area (ha)	Land Type (%)	Soil pH	Top Soil Texture	Cropping Intensity (%)	Present Land Use (%)	Recommended Land Zoning
		MLL-24 LL-20 VLL-4				Road=1 Settlement=10 Urban area=2 Water Bodies=26	
Muktinagar	1477	HL-22 MHL-43 MLL-27 LL-7 VLL-1	5.5-6.5	Loam to Clay Loam	229	Agriculture=66 Road=1 Settlement=25 Water Bodies=8	Mixed Use Zone (Upazila HQ-Char and Agriculture)

Source: National Land Zoning Project Report December 2014

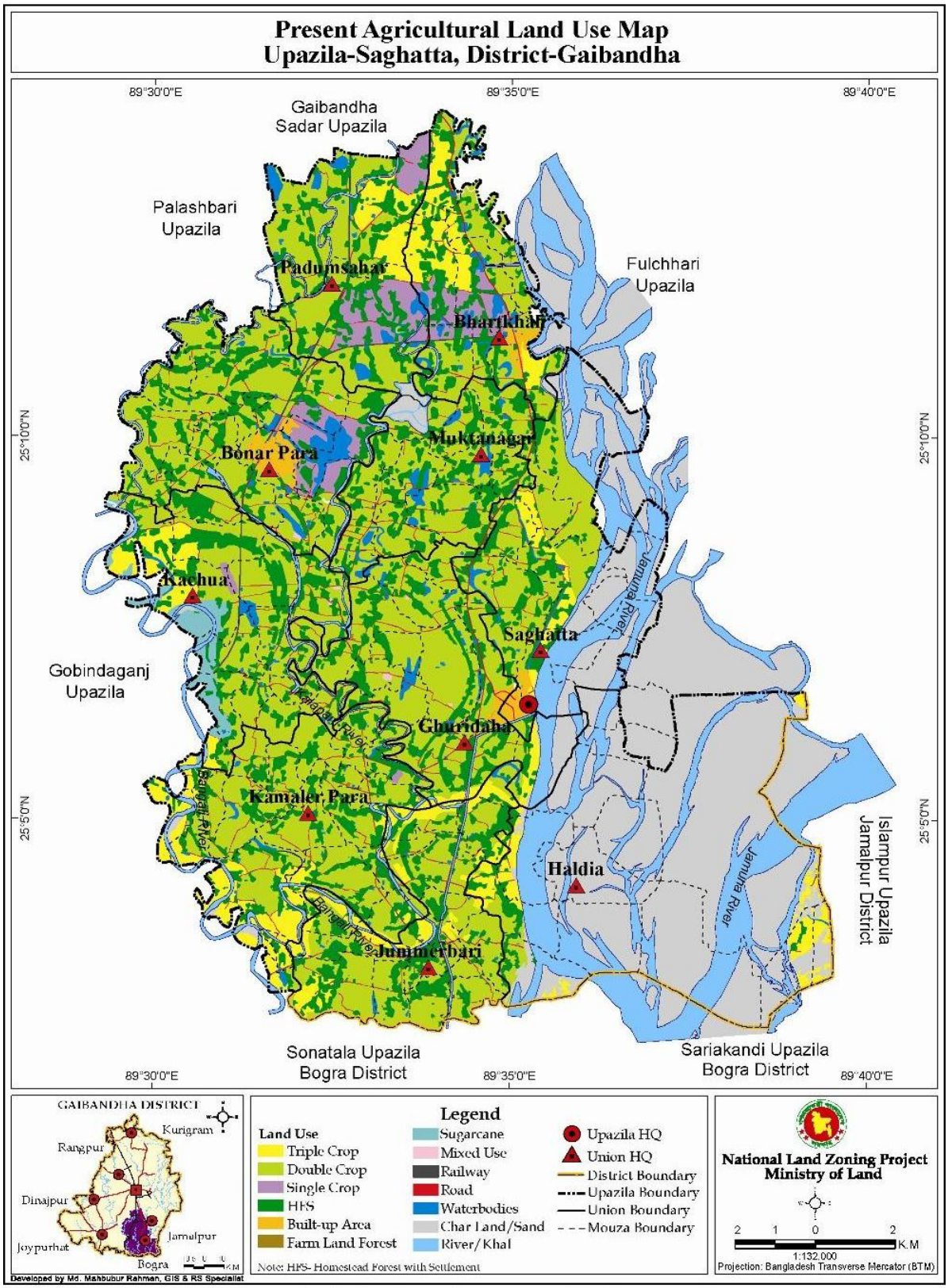
Note: HL=High Land, MHL= Medium High Land, MLL= Medium Low Land, LL= Low Land and VLL= Very Low Land.

Table 3.4: Union-wise Present Land Use Information and Identified Land Zoning

Name of Zone	Union	Remarks
1.Agriculture Zone	Jumarbari, Kachua, Kamalerpara and Padumsahar	Considering the present agricultural land use, land suitability and peoples opinion these union are recommended as agricultural zone
2. Agro-Fisheries Zone	Bharatkhali, Bonarpara, Ghuridaha and Muktinagar	Beel and wetland of the area is potential for capture and culture fisheries and it has high production of fisheries.
3. Agriculture- Char Land Zone	Haldia	The union consists of vast char land with river water bodies and located in the bank of Brahmaputra river.
4. Mixed Use Zone (Upazila HQ- Char and Agriculture)	Saghata	Development of upazila urban area should be done without degradation of fertile Agricultural land.

Source: National Land Zoning Project Report December, 2014

Map 3.1: Present Agricultural Land use Map of Saghata Upazila



Source: National Land Zoning Project Report December, 2014

3.4 Union-Wise Present Agriculture Land Use

Saghata Upazila has 10 Unions and present lands used are given below.

3.4.1 Bharatkhali Union Land Use

General Description

Bharatkhali Union having agriculture cultivated area of 2641 ha of land of which net cropped area is 1216 ha. This union consists of 8 mauza and 8 villages. The land types of this union are highland (3%), medium high land (53%), Medium low land (31%) , Low land (9%) and very low land (4%) and soil texture is loam to clay loam which indicates lands are suitable for different Rabi crops and Kharif crops Cultivation (SAAO, 2016). Union falls into 2 Agro-ecological zones are (i) Tista Meander Floodplain (AEZ-3) and (ii) Active Brahmaputra-Jamuna Floodplain (AEZ-7). Most of the areas of these unions are developed from transformed alluvial deposit by the Tista river system. The soil P^H is 5.5-6.5. This Union is highly suitable for cultivation of Boro, T.Aman, wheat, Mustard, Jute, Potato and vegetables (Land Zoning Report, January 2014 & SAAOs 2016).

Present Agriculture Land Use

Bharatkhali Union dominant land use is agriculture followed by fish production. From the agriculture point of view, this union is suitable for agriculture. Boro (HYV) is the main irrigated crops cultivated by using ground water and surface water. Ten cropping patterns are practiced under Bharatkhali Union which is shown in Table 3.5. The cropping intensity of this union is 204%. Boro and T.Aman is the principal crops under this Union. Major crops cultivated in this union are: paddy, jute, wheat, maize, potato, pulses, mustard, Rabi and Kharif different vegetables.

Table 3.5: Present Cropping Patterns of Bharatkhali Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area (ha)	% of NCA
Bharatkhali	1294	Boro(HYV)→Fallow→T.Aman(HYV)	204	460	35.55
		Boro (HYV)→Fallow→ Fallow		82	6.34
		Boro→ Fallow → T.Aman		216	16.69
		Wheat/Maize→Jute→ T.Aman		49	3.79
		Mustard→Boro (HYV)→ T.Aman		142	10.97
		Potato→Til→ Fallow		80	6.18
		Sweet Potato→Fallow→T.Aman		60	4.64
		Pulses→Fallow→ T.Aman		120	9.27
		Spices→ Fallow→ T.Aman		50	3.86

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area (ha)	% of NCA
		Vegetable→Vegetable→Vegetable		35	2.70
		Total		**1294**	**100.00**

Source: SAAOs of Bharatkhali Union 2016

Major Problems on Crop Cultivation

The major problems in Bharatkhali Union crop cultivation are: (i) Water stagnation/drainage congestion, (ii) River silted and erosion, (iii) Lack of electricity, (iv) Canals are silted and katcha drainage system, (v) Lack of electricity for irrigation machine, (vi) No cold storage and seed store, (vii) Lack of vegetables and fruits wholesale market infrastructure, (viii) Prolonged to partial drought, (ix) Low organic matter in soil, (x) Pests and diseases, (xi) Flood and other natural hazards occurred frequently and cause damage crops, (xii) Damage of perishable vegetables due to poor transport facility and post-harvest fruits loss of litchi, mango and potato, (xiii) Low market price of agricultural commodities, (xix) The valuable agriculture land is reducing rapidly due to unplanned construction of houses, settlement, brick field and for various infrastructural development.

Recommendation

Agricultural productivity is measured in terms of agricultural outputs to agricultural inputs. It will increase agricultural production, generate income, increase purchase capacity and improve rural livelihoods. The suggested management practices for improving crop cultivation are: (1) Ensure improve quality HYV crop seeds, (2) Re-excavation of canals/rivers, (3) Reconstruction of water management infrastructures, (4) Wholesale market infrastructures development and also road communication system at local level, (5) Construction of cold storage and seed store, (6) Availability of high yields and drought tolerant and cold susceptible crops varieties, (7) Follow fertilizer recommendations for particular soil after test and also follow integrated pest management methods, (8) Maintain crop rotation and grow green manure for increasing organic matter in soil, (9) Uninterrupted power supply to irrigation pumps, (10) Construction of potato and vegetable processing, grading and packaging industry/facility and establishment of agro-based industry, (11) Supply of cultivation equipment in subsidized price, and (12) Arrange and allocate sufficient credit for farmers.

3.4.2 Bonarpara Union Land Use

General Description

Bonarpara Union having agriculture cultivated area of 3730 ha of land of which net cropped area is 1845 ha. This union consists of 10 mauza and 10 villages. The land types of this union are highland (26%), medium high land (46%), medium low land (10%) , low land (10%) and very low land (8%) and soil texture is silt loam to loam which indicates lands are suitable for different Rabi crops and Kharif crops cultivation (SAAO, DAE 2016). Union falls into 2 Agro-ecological zones are (i) Tista Meander Floodplain (AEZ-3), and (ii) Active Brahmaputra-Jamuna Floodplain (AEZ-7). Most of the areas of these unions are developed from transformed alluvial deposit by the Tista River system. The soil P^H is 5.5-6.5. This Union is highly suitable for cultivation of Boro, T. Aman, wheat, mustard, jute, potato, vegetables and fish production (Land Zoning Report, January 2014 and SAAOs 2016).

Present Agriculture Land Use

Bonarpara Union dominant land use is agriculture followed by fish production. From the agriculture point of view, this union is suitable for agriculture. Boro (HYV) is the main irrigated crops cultivated by using ground water and surface water. There are eight cropping patterns practiced under Bonar Para Union which is shown in Table 3.6. The cropping intensity of this union is 202%. Boro and T. Aman are the principal crops under this Union. Major crops cultivated in this union are: paddy, Jute, Wheat, Maize Potato, Sweet Potato, Mustard and Rabi and Kharif different vegetables. This Union has commercial 5 Mango garden, 7 Litchi garden, 2 Banana, 7 Papaya and 1 Guava garden.

Table 3.6: Present Cropping Patterns of Bonarpara Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area (ha)	% of NCA
Bonarpara	1845	Boro(HYV)→Fallow→T.Aman(HYV)	202	1235	66.94
		Boro (HYV)→Fallow→ Fallow		275	14.91
		Wheat/→Jute→ T.Aman(HYV/LV)		60	3.25
		Mustard→Boro(HYV)→ T.Aman (HYV)		120	6.50
		Potato→ Boro (HYV)→ T. Aman		55	2.98
		Sweet Potato→Fallow→T.Aman (HYV)		20	1.08
		Sweet potato→Fallow→ T.Aman		20	1.08
		Vegetable→Vegetable→Vegetable		60	3.25
		Total		**1845**	**100.00**

Source: SAAOs of Bonarpara Union, 2016

Major Problems on Crop Cultivation

The major problems in this Union are: (i) The union is vulnerable to different natural and man-made hazards like water logging and drainage congestion during rainy season, (ii) River erosion, iii) No cold storage and seed store, (iv) Lack of vegetables and fruits market infrastructure, (viii) Partly availability of power tiller/tractor, harvester, sprayer and foot pump and high price, (v) Prolonged to partial drought, (vi) Risk of flood, (vii) Soil moisture deficiency during dry month, (viii) Damage of perishable vegetables due to poor transport facility and Post-harvest loss of litchi, mango and potato, (ix) Farmers lack of modern technological knowledge (SAAOs, Bonarpara Union 2016).

Recommendation

The main suggested management practices are: (1) Removal of drainage congestion, (2) Re-excavation of canals/rivers and kutcha drainage convert into pucca, (3) Wholesale market infrastructures development and also road communication system union local level, (4) Construction of cold storage (5) Ensure of high yields and drought tolerant and cold susceptible crops varieties seeds (6) Maintain crop rotation and grow green manure for increasing organic matter in soil (7) Electricity supply to all irrigation pumps, (8) Farmers technological training (9) Construction of potato and vegetable processing, grading and packaging industry/facility and Establishment of agro-based, and (10) Construction of embankment along with sluice gates and drainage system for flood control.

3.4.3 Ghuridaha Union Land Use

General Description

Ghuridaha Union having agriculture cultivated area of 3549 ha of land of which net cropped area is 1744 ha. This union consists of 10 mauza and 11 villages. The land types of this union are highland (20%), medium high land (42%), Medium low land (26%) , Low land (8%) and very low land (4%) and soil texture is loam to clay which indicates lands are suitable for different Rabi crops and Kharif crops Cultivation (SAAO, 2016). Union falls into 2 Agro-ecological zones are (i) Tista Meander Floodplain (AEZ-3), and (ii) Active Brahmaputra-Jamuna Floodplain (AEZ-7). Most of the areas of these unions are developed from transformed alluvial deposit by the Tista river system. The soil PH is 5.5-6.5. This Union is highly suitable for cultivation of Boro, T. Aman, wheat, mustard, jute, potato and vegetables and fish production (Land Zoning Report, January 2014 and SAAOs 2016).

Present Agriculture Land Use

Ghuridaha Union dominant land use is agriculture followed by fish production. From the agriculture point of view, this union is suitable for agriculture. Boro (HYV) is the main irrigated crops cultivated by using ground water and surface water. There are ten cropping pattern are practiced under Ghuridaha Union which is shown in Table 3.7. The cropping intensity of this union is 203%. Boro and T. Aman are the principal crops under this Union. Major crops cultivated in this union are: paddy, jute, wheat, maize, and potato, pulses, mustard, pulses, spices and Rabi and Kharif different vegetables. This Union has commercial 2 mango garden, 2 litchi garden, 4 banana garden, 3 papaya and 4 guava garden.

Table 3.7: Present Cropping Patterns of Ghuridaha Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area (ha)	% of NCA
Ghuridaha	1744	Boro(HYV)→Fallow→T.Aman(HYV)	203	872	50
		Boro (HYV)→Fallow→ Fallow		160.1	9.18
		Boro→ B.Aman → T.Aman		87.2	5.00
		Wheat/Maize→Jute→ T.Aman		88.2	5.06
		Mustard→Boro (HYV)→ T.Aman		422.2	24.21
		Potato→Til→ Fallow		17.24	0.99
		Sweet Potato→Fallow→T.Aman		27.44	1.57
		Pulses→Fallow→ T.Aman		22.24	1.28
		Spices→ Fallow→ T.Aman		30	1.72
		Vegetable→Vegetable→Vegetable		17.38	1.00
		Total		**1744**	**100**

Source: SAAOs of Ghuridaha Union, 2016

Major Problems on Crop Cultivation

Agriculture is the backbone of Ghuridaha Union and is synonymous to the food security. The major problems in Ghuridaha Union crop cultivation are: (i) Less availability of quality HYV seeds, (ii) Low organic matter contents in soil and risk of flood which are restricting intensive crop cultivation, (iii) Most of the canals silted and katcha drainage system, (iv) Lack of seed store and cold storage, (v) Agricultural machineries (power tiller/tractor, harvester , sprayer and foot pump and irrigation pumps) are less available in local market and high price, (vi) Scarcity of surface water, (vii) Damage of perishable vegetables due to poor transport facility and Post-harvest loss of litchi, mango and potato, (viii) Low market price of agricultural commodities and scarcity of agricultural labor during crops planting and harvesting time.

Recommendation

The suggested management practices are: (1) Construction of embankment along with sluice gates and drainage system for flood control, (2) Re-excavation of canals/rivers and katcha irrigation drainage system need to be mate underground pipe systems which will be reduced loss of irrigation water, (3) Ensure improve quality HYV crop seeds, (4) Development road communication and wholesale market infrastructures, (5) Farmers technological training, (6) Availability of high yields and drought tolerant and cold susceptible crops varieties, (7) Lack of electricity supply to irrigation pumps, (8) Construction of potato and vegetable processing, grading and packaging industry/facility and establishment of agro-based industry, and (9) Construction of cold storage.

3.4.4 Haldia Union Land Use

General Description

Haldia Union having agriculture cultivated area of 6065 ha of land of which net cropped area is 2955 ha. This union consists of 10 mauza and 10 villages. The land types of this union are highland (11%), medium high land (26%), medium low land (30%) , low land (19%) and very low land (14%) and soil texture is sandy loam to loam which indicates lands are suitable for different Rabi crops and Kharif crops cultivation (SAAO, 2016). Union falls into 2 Agro-ecological zones are (i) Tista Meander Floodplain (AEZ-3), and (ii) Active Brahmaputra-Jamuna Floodplain (AEZ-7). Most of the areas of these unions are developed from transformed alluvial deposit by the Tista river system. The soil P^H is 5.5-6.5. This union is highly suitable for cultivation of Boro, T. Aman, wheat, maize, mustard, jute, potato, spices and vegetables (Land Zoning Report, January 2014 & SAAOs 2016).

Present Agriculture Land Use

Haldia Union dominant land use is agriculture followed by homestead and fruit garden. From the agriculture point of view, this union is suitable for agriculture. Boro (HYV) is the main irrigated crops cultivated by using ground water and surface water. There are ten cropping pattern are practiced under Haldia Union which is shown in Table 3.8. The cropping intensity of this union is 205%. Boro and T. Aman are the principal crops under this union. Major crops cultivated in this union are: paddy, jute, wheat, maize, potato, sweet potato, pulses, mustard and Rabi & Kharif different vegetables and different fruits. This union has commercial 5 mango garden, 1 litchi garden, 30 banana garden, 10 papaya, 2 guava garden and 2 kul garden.

Table 3.8: Present Cropping Patterns of Haldia Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area (ha)	% of NCA
Haldia	2955	Boro(HYV)→Fallow→T.Aman (HYV)	205	1308	44.26
		Boro (HYV)→Fallow→ Fallow		500	16.92
		Wheat/Maize→Jute→ T.Aman		600	20.30
		Mustard→Boro (HYV)→ T.Aman		100	3.38
		Potato→Til→ Fallow		37	1.25
		Sweet Potato→Fallow→T.Aman		25	0.85
		Pulses→Fallow→ T.Aman		25	0.85
		Spices→ Fallow→ T.Aman		300	10.15
		Onion→fallow-→Fallow		50	1.69
		Vegetable→Vegetable→Vegetable		10	0.34
		Total		**2955**	**100.00**

Source: SAAOs of Haldia Union, 2016

Major Problems on Crop Cultivation

The major problems in Haldia Union crop cultivation are: (i) Prolonged to partial drought, (ii) River erosion and silted, (iii) Water Logging, (iv) Less irrigation facilities and katcha drainage system, (v) Farmers lack of technological knowledge, (vi) Lack of vegetables and fruits market infrastructure, (vii) Less availability of power tiller/tractor, harvester, sprayer and foot pump and high price, (viii) Market infrastructure is very poor for vegetables and other high value crops, (ix) Damage of perishable vegetables due to poor transport facility and post-harvest loss of litchi, mango and potato, (x) Lack of seed store and cold storage, (xi) Poor and damage road system from Union to Upazila, and (xii) The valuable agricultural land is rapidly reducing every year due to unplanned construction of houses and settlements, industries and various infrastructural activities (SAAOs, Haldia Union 2016).

Recommendation

(1) Drainage congestion can be removed by excavating new canals and re-excavating the old canals connecting to the nearby rivers or bigger canals, (2) Most of the old canals of the union had been diverted or closed due to unplanned infrastructural construction which area creating barriers to normal water flow and making drainage congestion. So, appropriate measures with motivation and awareness building program should be immediately to resist the construction of these unwanted intervention, (3) wholesale market infrastructures development and also road communication system union level, (4) Construction of cold storage for vegetables, (5) Availability of high yields and drought tolerant and cold susceptible crops varieties, (6) Farmers technological training, (7) Supply of cultivation equipment in subsidized price, and (8) Construction of embankment along with sluice gates and drainage system for flood control.

3.4.5 Jumarbari Union Land Use

General Description

Jumarbari Union having agriculture cultivated area of 3195 ha of land of which net cropped area is 1395 ha. This union consists of 16 mauza and 16 villages. The land types of this union are highland (23%), medium high land (24%), medium low land (34%) , low land (15%) and very low land (4%) and soil texture is loam to sandy loam which indicates lands are suitable for different Rabi crops and Kharif crops cultivation (SAAO, 2016). Union falls into 2 Agro-ecological zones are (i) Tista Meander Floodplain (AEZ-3), and (ii) Active Brahmaputra-Jamuna Floodplain (AEZ-7). Most of the areas of these unions are developed from transformed alluvial deposit by the Tista River system. The soil P^H is 5.5-6.5. This union is highly suitable for cultivation of Boro, T.Aman, mustard, jute, potato and vegetables (Land Zoning Report, January 2014 & SAAOs 2016).

Present Agriculture Land Use

Jumarbari Union dominant land use is agriculture followed by homestead gardening. From the agriculture point of view, this union is suitable for agriculture. Boro (HYV) is the main irrigated crops cultivated by using ground water and surface water. There are eight cropping pattern are practiced under Jumarbari Union which is shown in Table 3.9. The cropping intensity of this union is 229%. Boro and T.Aman is the principal crops under this union. Major crops cultivated in this union are: paddy, jute, potato, pulses, mustard and Rabi and Kharif different vegetables and fruits. This union has commercial 3 mango garden, 3 litchi garden, 4 banana garden, 4 papaya and 4 guava garden (Land Zoning Report, January 2014 & SAAOs 2016).

Table 3.9: Present Cropping Patterns of Jumarbari Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area (ha)	% of NCA
Jumarbari	1395	Boro(HYV)→Fallow→ T.Aman (HYV)	229	470	33.69
		Boro (HYV)→Fallow→ Fallow		90	6.45
		Boro (HYV)→ B.Aman → T.Aman		140	10.04
		Boro→Jute→ T.Aman		265	19.00
		Mustard→Boro (HYV)→ T.Aman		50	3.58
		Vegetables→Boro (HYV)→ T.Aman		170	12.19
		Spices→ Fallow→ T.Aman		95	6.81
		Vegetable→Vegetable→Vegetable		115	8.24
Total				**1395**	**100.00**

Source: SAAOs of Jumarbari Union 2016

Major Problems on Crop Cultivation

The major problems in Jumarbari Union crop cultivation are: (i) Water logging, (ii) Katcha drainage system, (iii) Lack of cold storage, (iv) Lack of vegetables and fruits market infrastructure, (v) Less availability of power tiller/tractor, harvester, sprayer and foot pump and high price, (vi) Katcha and damaged road, (vii) Farmers lack of money, (viii) Damage of perishable vegetables due to poor transport facility and post-harvest loss of litchi, mango and potato, (ix) Low market price of agricultural commodities, (x) High cost of agriculture tools like LLP, DTW and STW in local market, and (xi) Shortage of farmers training.

Recommendation

(1) Farmers technological training, (2) Re-excavation of old canals/rivers, (3) Electricity needs to be available for all irrigation pump, (4) Wholesale market infrastructures development and also road communication system at local level, (5) Construction of cold storage, (6) Availability of high yields and drought tolerant and cold susceptible crops varieties, (7) Construction of potato and vegetable processing, grading and packaging industry/facility and establishment of agro-based industry, (8) Arrange and allocate sufficient credit for farmers, and (9) Development of irrigation facility, proper and planned uses of land as per its criteria could ensure better yields of agriculture (SAAOs, Jumarbari Union, 2016).

3.4.6 Kachua Union Land Use

General Description

It is a very fertile potential agricultural union in Saghata Upazila under Gaibandha District. Kachua Union having agriculture cultivated area of 4057 ha of land of which net cropped area is 1770 ha. This union consists of 10 mauza and 14 villages. The land types of this union are highland (3%), medium high land (50%), medium low land (40%), low land (4%) and very low land (3%) and soil texture is loam to sandy loam which indicates lands are suitable for different Rabi crops and Kharif crops cultivation (SAAO, 2016). Union falls into 2 agro-ecological zones are (i) Tista Meander Floodplain (AEZ-3), and (ii) Active Brahmaputra-Jamuna Floodplain (AEZ-7). Most of the areas of these unions are developed from transformed alluvial deposit by the Tista River system. The soil P^H is 5.5-6.5. This Union is highly suitable for cultivation of Boro, T.Aman, wheat, mustard, jute, potato and vegetables and fruits production (Land Zoning Report, January 2014 & SAAOs 2016).

Present Agriculture Land Use

Kachua Union dominant land use is agriculture followed by vegetables and fruits production. From the agriculture point of view, this union is suitable for agriculture. Boro (HYV) is the

main irrigated crops cultivated by using ground water and surface water. There are eight cropping pattern are practiced under Kachua Union which is shown in Table 3.10. The cropping intensity of this union is 229%. Boro and T.Aman is the principal crops under this union. Major crops cultivated in this union are: paddy, jute, wheat, maize, potato, pulses, mustard, Rabi and Kharif different vegetables and fruits crops. Kachua Union has commercial 3 mango garden, 4 litchi garden, 4 banana garden, 8 papaya garden and 2 guava garden.

Table 3.10: Present Cropping Patterns of Kachua Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area(ha)	% of NCA
Kachua	1770	Boro(HYV)→Fallow→T.Aman(HYV)	229	1004	56.72
		Boro (HYV)→Fallow→ Fallow		175	9.89
		Wheat/Maize→Jute→ T.Aman		82	4.63
		Mustard→Boro (HYV)→ T.Aman		187	10.56
		Potato→ Boro→ T.aman		177	10.00
		Pulses→Fallow→ T.Aman		10	0.56
		Spices→ Fallow→ T.Aman		27	1.53
		Vegetable→Vegetable→Vegetable		108	6.10
		Total		**1770**	**100.00**

Source: SAAOs of Kachua Union, 2016

Major Problems on Crop Cultivation

The major problems in Kachua Union crop cultivation are: (i) Farmers lack of modern crop production knowledge, (ii) Water logging, (iii) Katcha drainage system, (iv) Lack of cold storage and vegetable seed store, (v) Lack of vegetables wholesale market infrastructure, (vi) Silted canals and river, (vii) River erosion, (viii) Katcha and damaged road, and ix) Risk of flood.

Recommendation

(1) Construction of embankment along with sluice gates and drainage system for flood control, (2) Farmers technological training, (3) Re-excavation of canals/rivers, (4) Wholesale market infrastructures development and also road communication system at local level, (5) Construction of cold storage, (6) Uninterrupted power supply to irrigation pumps, (7) Construction of potato and vegetable processing, grading and packaging industry/facility and establishment of agro-based industry, and (8) Supply of cultivation equipment in subsidized price.

3.4.7 Kamaler Para Union Land Use

General Description

Kamaler Para Union having agriculture cultivated area of 4575 ha of land of which net cropped area is 2112 ha. This union consists of 22 mauza and 26 villages. The land types of this union are highland (15%), medium high land (67%), medium low land (15%) , low land (3%) and soil texture is loam to sandy loam which indicates lands are suitable for different Rabi crops and Kharif crops cultivation (SAAO, 2016). Union falls into 2 agro-ecological zones are (i) Tista Meander Floodplain (AEZ-3), and (ii) Active Brahmaputra-Jamuna Floodplain (AEZ-7). Most of the areas of these unions are developed from transformed alluvial deposit by the Tista river system. The soil P^H is 5.5-6.5. This union is highly suitable for cultivation of Boro, T.Aman, wheat, mustard, jute, potato and vegetables and fruits (Banana & Litchi) production (Land Zoning Report, January 2014 & SAAOs 2016).

Present Agriculture Land Use

Kamaler Para Union dominant land use is agriculture followed by fish production. From the agriculture point of view, this union is suitable for agriculture. Boro (HYV) is the main irrigated crops cultivated by using ground water and surface water. There are ten cropping pattern are practiced under Kamaler Para Union which is shown in Table 3.11. The cropping intensity of this union is 216%. Boro and T.Aman is the principal crops under this Union. Major crops cultivated in this union are: paddy, jute, wheat, maize, potato, pulses, mustard and Rabi & Kharif different vegetables. This union has commercial 8 mango garden, 4 litchi garden, 5 banana garden, 2 papaya garden and 3 guava garden.

Table 3.11: Present Cropping Patterns of Kamaler Para Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area (ha)	% of NCA
Kamaler Para	2112	Boro(HYV)→Fallow→T.Aman(HYV)	216	858	40.63
		Boro (HYV)→Fallow→ Fallow		30	1.42
		Vegetables→ Boro → T.Aman		160	7.58
		Wheat/Maize→Jute→ T.Aman		130	6.16
		Mustard→Boro (HYV)→ T.Aman		361	17.09
		Boro (HYV)→Jute→ T.Aman		222	10.51
		Sweet Potato→Fallow→T.Aman		66	3.13
		Pulses→Fallow→ T.Aman		105	4.97
		Spices→ Fallow→ T.Aman		125	5.92
		Vegetable→Vegetable→Vegetable		55	2.60
		Total		**2112**	**100.00**

Source: SAAOs of Kamaler Para Union, 2016

Major Problems on Crop Cultivation

The major problems in Kamaler Para Union crop cultivation are: (i) Less number of DTW, (ii) Katcha irrigation drainage system, (iii) Farmers lack of knowledge on modern production technology, (iv) Less available quality improved crops variety seeds, (v) Lack of seed and cold storage and vegetable cool-chamber, (vi) water congestion, (vii) Lack of vegetables wholesale market infrastructure, (viii) Less availability of modern cultivation machineries and high price, (ix) Lack of electricity facilities for irrigation pumps and shortage of electricity, and (x) Lack of flood control embankment.

Recommendation

(1) Drainage congestion is a common problem of the area could be removed by re-excavating the old silted canals making connection to the adjacent rivers and canals of the Union. Excavated rivers and canals could accommodate huge rain water thus improve the water logging condition which will facilitate intensive crop cultivation in the area. (2) Development of irrigation facility, proper and planned uses of land as per its physical and chemical characteristics could help to control land degradation and ensure better yields of agricultural crops. (3) Irrigation kutcha drain needs to convert into pucca which will reduce the wastage of water, (4) Wholesale market infrastructures development and also road communication system at local level, (5) Construction of seed & cold storage, (6) Intensive farmers training, and (7) Construction of embankment along with sluice gates and drainage system for flood control.

3.4.8 Padumsahar Union Land Use

General Description

Padumsahar Union having agriculture cultivated area of 4150 ha of land of which net cropped area is 1996 ha. This union consists of 3 mauza and 16 villages. The land types of this union are highland (13%), medium high land (42%), medium low land (35%), low land (9%) and very low land (1%) and soil texture is loam to clay loam which indicates lands are suitable for different Rabi crops and Kharif crops cultivation (SAAO, 2016). Union falls into 2 agro-ecological zones are (i) Tista Meander Floodplain (AEZ-3), and (ii) Active Brahmaputra-Jamuna Floodplain (AEZ-7). Most of the areas of these unions are developed from transformed alluvial deposit by the Tista river system. The soil P^H is 5.5-6.5. This union is highly suitable for cultivation of Boro (HYV/Hybrid), T. Aman, wheat, mustard, jute, potato and vegetables and fish production (Land Zoning Report, January 2014 & SAAOs 2016).

Present Agriculture Land Use

Padumsahar Union dominant land use is agriculture followed by fish production. From the agriculture point of view, this union is suitable for agriculture. Boro (HYV) is the main irrigated crops cultivated by using ground water and surface water. There are eight cropping pattern are practiced under Padumsahar Union which is shown in Table 3.12. The cropping intensity of this union is 207%. Boro and T.Aman is the principal crops under this union. Major crops cultivated in this union are: paddy, jute, wheat, maize, potato, pulses, mustard, Rabi and Kharif different vegetables and fruits crops. This union has commercial 4 mango garden, 8 litchi garden, 6 banana garden, 22 papaya and 10 guava garden.

Table 3.12: Present Cropping Patterns of Padumsahar Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area (ha)	% of NCA
Padumsahar	1996	Boro(HYV)→Fallow→T.Aman(HYV)	207	881	44.14
		Boro (HYV)→Fallow→ Fallow		210	10.52
		Wheat/Maize→Jute→ T.Aman		175	8.77
		Mustard→Boro (HYV)→ T.Aman		468	23.45
		Potato→Boro→ Fallow		67	3.36
		Pulses→Fallow→ T.Aman		70	3.51
		Spices→ Fallow→ T.Aman		80	4.01
		Vegetable→Vegetable→Vegetable		45	2.25
Total				**1996**	**100.00**

Source: SAAOs of Padumsahar Union 2016

Major Problems on Crop Cultivation

The major problems in Padumsahar Union crop cultivation are: (i) During field survey it was found that most of the old canals of the union had been closed due to human interventions like construction of houses, markets and other infrastructures which are creating barriers to natural flow of water and causing drainage congestion in the area, (ii) Farmers knowledge gap on crop production technology, (iii) High cost of irrigation tools like LLPs, DTWs and STWs in the local markets and lack of electricity are the problems for intensive irrigation in the peak seasons, (iv) Lack of wholesale market infrastructure and cold storage facilities and poor road communication system, (v) Deficiencies of essential plant nutrients and drought in dry season are the other common problems restricting intensive crop cultivation in the union, (v) Flood occurred frequently and cause degradation of natural vegetation and loss of agricultural crops.

Recommendation

The main suggested management practices are: (1) Removal of drainage congestion by re-excavating of canals/rivers and kutcha drain are made to be pucca or underground pipe system, (2) Ensuring availability of both chemical and organic fertilizers, encouragement cultivation of leguminous crops etc., (3) Infrastructures development road communication system and wholesale market infrastructure, (4) Construction of seed and cold storage, (5) Availability of high yields and drought tolerant and cold susceptible crops varieties, (6) Increasing electricity supply to irrigation pumps, (7) Construction of potato and vegetable processing, grading and packaging industry/facility and Establishment of agro-based industry, (8) Construction of embankment along with sluice gates and drainage system for flood control, and (9) Farmers technological training and technological information.

3.4.9 Saghata Union Land Use

General Description

Saghata Union having agriculture cultivated area of 4416 ha of land of which net cropped area is 1796 ha. This union consists of 9 mauza and 9 villages. The land types of this union are highland (9%), medium high land (43%), medium low land (24%) , low land (20%) and very low land (4%) and soil texture is silt loam to loam which indicates lands are suitable for different Rabi crops and Kharif crops cultivation (SAAO, 2016). Union falls into 2 agro-ecological zones are (i) Tista Meander Floodplain (AEZ-3), and (ii) Active Brahmaputra-Jamuna Floodplain (AEZ-7). Most of the areas of these unions are developed from transformed alluvial deposit by the Tista River system. The soil P^H is 5.5-6.0. This union is highly suitable for cultivation of Boro, T.Aman, wheat, mustard, jute, potato, vegetables and fruits crop production (Land Zoning Report, January 2014 & SAAOs 2016).

Present Agriculture Land Use

Saghata Union dominant land use is agriculture followed by fish production. From the agriculture point of view, this union is suitable for agriculture. Boro (HYV) is the main irrigated crops cultivated by using ground water and surface water. There are ten cropping pattern are practiced under Saghata Union which is shown in Table 3.13. The cropping intensity of this union is 246%. Boro and T.Aman is the principal crops under this Union. Major crops cultivated in this union are: paddy, jute, wheat, maize, potato, pulses, mustard and Rabi & Kharif different vegetables. Saghata Union has commercial 4 mango garden, 3 litchi garden, 2 banana garden, 10 papaya and 10 guava garden.

Table 3.13: Present Cropping Patterns of Saghata Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area(ha)	% of NCA
Saghata	1796	Boro(HYV)→Fallow→T.Aman(HYV)	246	460	35.55
		Boro (HYV)→Fallow→ Fallow		82	6.34
		Boro→ Fallow → T.Aman		216	16.69
		Wheat/Maize→Jute→ T.Aman		49	3.79
		Mustard→Boro (HYV)→ T.Aman		142	10.97
		Potato→Til→ Fallow		80	6.18
		Sweet Potato→Fallow→T.Aman		60	4.64
		Pulses→Fallow→ T.Aman		120	9.27
		Spices→ Fallow→ T.Aman		50	3.86
		Vegetable→Vegetable→Vegetable		35	2.70
		Total		**1294**	**100.00**

Source: SAAOs of Saghata Union 2016

Major Problems on Crop Cultivation

The major problems in Saghata Union crop grown are: (i) Water stagnation/drainage congestion, (ii) Risk of frequent flood, (iii) Katcha irrigation drainage system and loss of water, (iv) Most of the old canals of the union had been closed due to human unplanned intervention, (v) Farmers poor knowledge on crop production technology due to lack of sufficient training, (vi) Lack of cold storage, seed store and market infrastructure, (vii) Scarcity of farmers capital for use of modern crop production technology, (viii) Damage of perishable vegetables due to poor transport facility and bad communication and post-harvest loss of litchi, mango and potato, (ix) Low market price of agricultural commodities, and (x) Deficiencies of essential plant nutrients and drought in dry season are the other common problems restricting intensive crop cultivation in the union.

Recommendation

(1) Drainage congestion is a common problem of this union that could be removed by excavating new canals and re-excavating old canals by making connection to adjacent rivers and khals of the union, (2) Irrigation katcha drains needs to be made pucca or underground pipe system which will reduced the water loss and increased commands area, (3) Wholesale market infrastructures development and improvement of road communication system at local level, (4) Farmers needs technological training and technological information and quality inputs, (5) Availability of high yields and drought tolerant and cold susceptible crops varieties, (6) Construction of embankment along with sluice gates and drainage system for flood control, and (7) Land degradation especially agricultural land degradation is becoming more severe. So,

appropriate measures with motivation and awareness building program should be taken immediately to control the unplanned and unwanted interventions responsible for land degradation.

3.4.10 Muktinagar Union Land Use

General Description

Muktinagar Union having agriculture cultivated area of 3061 ha of land of which net cropped area is 1298 ha. This union consists of 10 mauza and 10 villages. The land types of this union are highland (22%), medium high land (43%), medium low land (27%), low land (7%) and very low land (1%) and soil texture is loam to clay loam which indicates lands are suitable for different Rabi crops and Kharif crops cultivation (SAAO, 2016). Union falls into 2 agro-ecological zones are (i) Tista Meander Floodplain (AEZ-3), and (ii) Active Brahmaputra-Jamuna Floodplain (AEZ-7). Most of the areas of these unions are developed from transformed alluvial deposit by the Tista river system. The soil P^H is 5.5-6.5. This union is highly suitable for cultivation of Boro, T.Aman, wheat, maize, mustard, jute, potato, chili, vegetables and fruits production (Land Zoning Report, January 2014 & SAAOs 2016).

Present Agriculture Land Use

Muktinagar Union dominant land use is agriculture followed by fish production. From the agriculture point of view, this union is suitable for agriculture. Boro (HYV) is the main irrigated crops cultivated by using ground water and surface water. There are ten cropping pattern are practiced under Muktinagar Union which is shown in Table 3.14. The cropping intensity of this union is 238%. Boro and T.Aman is the principal crops under this Union. Major crops cultivated in this union are: paddy, jute, wheat, maize, potato, pulses, mustard, Rabi & Kharif different vegetables and fruits production. Muktinagar Union has many commercial 16 mango garden, 5 litchi garden, 12 banana garden, 20 papaya and 3 guava garden.

Table 3.14: Present Cropping Patterns of Muktinagar Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area (ha)	% of NCA
Muktinagar	1298	Boro(HYV)→Fallow→T.Aman(HYV)	238	533	41.06
		Boro (HYV)→Fallow→ Fallow		51	3.93
		Boro→ Jute→ T.Aman		188	14.48
		Wheat/Maize→Jute→ T.Aman		107	8.24
		Mustard→Boro (HYV)→ T.Aman		157	12.10
		Potato→ Boro(HyV)→ T.Aman		70	5.39
		Vegetale→ Boro→ T.Aman		50	3.85

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area (ha)	% of NCA
		Spices→ Fallow→ T.Aman		122	9.40
		Vegetable→Vegetable→Vegetable		20	1.54
Total				**1298**	**100.00**

Source: SAAOs of Muktinagar Union 2016

Major Problems on Crop Cultivation

The major problems in Muktinagar Union crop cultivation are: (i) During field survey it was found most of the old canals of the union had been closed due to unplanned human interventions (like construction of market) which are creating barriers to natural flow of water and causing drainage congestion in the area, (ii) River erosion and silted, (iii) Katcha irrigation drainage system, (iv) Low organic matter contents in soil and also soil moisture deficit during dry season, (iv) Lack of quality agricultural inputs (seeds, fertilizers & machineries) and price is high, (v) No whole sale market infrastructure for vegetables and others crops, (vi) No cold storage and seed store, (vii) Prolonged to partial drought and sudden risk of flood, (viii) Damage of perishable vegetables and fruits due to poor transport facility and poor road communication, (ix) Low market price of agricultural commodities, and (x) The valuable agricultural land is reducing every year due to unplanned construction of houses, settlements, market, industries, brick field and other infrastructural developments.

Recommendation

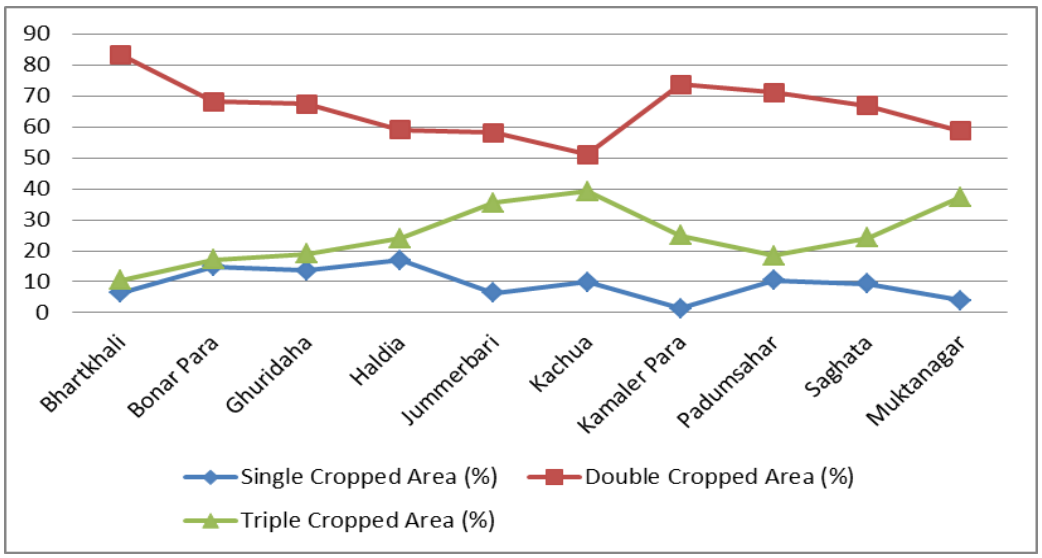
(1) Drainage is a chronic problem of the union could be removed by re-excavating old canals and also excavating new canals making connection to the adjacent river and khals of the union. Excavated and re-excavated canals and khals could accommodate huge rain water helping to improve drainage system in the area. (2) Development of road communication system and wholesale market infrastructures, (3) Uninterrupted electricity supply is an important issue for ensuring timely irrigation in the area, (4) Availability of high yields and drought tolerant and cold susceptible crops varieties seeds, (5) Katcha irrigation drainage needs to be converted underground pipe system which will be increased commands area and reduced the water loss, (6) Construction of potato and vegetable processing, grading and packaging facility and cold storage, (7) Supply of cultivation equipment in subsidized price, (8) Season wise crop production farmers training, (9) Unplanned human construction intervention should be stopped immediately by imposing land zoning law and other regulatory measures by the concerned authority.

All 10 Unions percent of land used for single, double and triple crops under Saghata Upazila is shown in Figure 3.3. It shows that highest percentage of single cropped area were used in Haldia Union (17%) followed by Bonar Para (15%), Ghuridaha (14%) and Padumsahar Unions (11%). Similarly, all unions highest areas were used for double crops. Further, highest land used for triple crops in Kachua Union (39%) followed by Kamaler Para (25%) and both unions of Haldia and Saghata (24%). Union wise land used of single, double and triple cropped area and cropping intensities under Saghata Upazila is shown in Table 3.15.

Table 3.15: Union Wise Land Used of Single, Double and Triple cropped Area under Saghata Upazila

Name of Union	Present Land Used in ha (%)					
	Cultivated Area	Single Cropped Area	Double Cropped Area	Triple Cropped Area	Net Cropped Area (ha)	Cropping Intensity (%)
Bharatkhali	2641	82 (6.34)	1077 (83.23)	134 (10.43)	1294	204
Bonar Para	3730	275 (14.91)	1255 (68.02)	315 (17.07)	1845	202
Ghuridaha	3549	239 (13.70)	1175 (67.37)	330 (18.92)	1744	203
Haldia	6065	500 (16.92)	1545 (59.05)	710 (24.03)	2955	205
Jumarbari	3195	90 (6.45)	810 (58.06)	495 (35.48)	1395	229
Kachua	4057	175 (9.89)	903 (51.02)	692 (39.10)	1770	229
Kamaler Para	4575	30 (1.42)	1556 (73.67)	526 (24.91)	2112	216
Padumsahar	4150	210 (10.52)	1488 (71.04)	368 (18.44)	1996	207
Saghata	4416	167 (9.30)	1198 (66.70)	431 (24.09)	1796	245
Muktinagar	3061	51 (3.93)	762 (58.71)	485 (37.36)	1298	246

Source: SAAOs and UAO Saghata Upazila, DAE 2016



Source: SAAOs and UAO Saghata Upazila, DAE 2016

Figure 3.3: Union Wise Percentage of Single, Double and Triple Cropped Area in Saghata Upazila

CHAPTER FOUR: CROPPING PATTERN AND CROPPING INTENSITIES

4.1 Cropping Pattern

The term 'Cropping Pattern' as it applies to the area of reclamation can be defined as the acreage distribution of different crops in any one year in a given farm area such as a water agency, or farm. Thus, a change in a cropping pattern from one year to the next can occur by changing the relative acreage of existing crops, and/or by introducing new crops, and/or by cropping existing crops'. Information that defines a cropping system consists of the number of crops on a given field per year including the accompanying cropping periods from sowing to maturity for each crop cycle and whether each crop is grown under rain fed or irrigated conditions.

The scenario of present cropping pattern under Saghata Upazila is complex and predominantly Boro (HYV/Hybrid) & T. Aman (HYV/LV) Rice, Jute, potato, Wheat, Maize, Vegetables, Oilseeds, Pulses, Spices, Fruits Garden based. Detailed Upazila cropping patterns by season are presented in Table 4.1. Study finding shows that 14 different cropping pattern are practiced by Saghata Upazila farmers. Saghata Upazila present one main cropping pattern area is Boro (HYV/Hybrid)→Fallow→T.Aman(HYV) which is practiced 64.28% of the Net Cultivable Area (NCA). Similarly, Boro (HYV/Hybrid) → Fallow→ Fallow which is practiced 5.58% of the Net Cultivable Area (NCA). Further, Wheat/Maize→ Jute→ T.Aman which is practiced about 4.61% of the Net Cultivable Area (NCA). Mustard→Boro→T. Aman (HYV/LV) is covering about 3.25 % of the NCA. Potato and Sweet Potato are the cropping pattern covering about 3% of the NCA. Fruits Garden is covered about 3.25% of the net cultivable area. Spices→Jute→T.Aman is practiced about 2.44% net cultivable area. Both winter and summer vegetables cropping pattern covering about 2% of the net cultivable area. This finding clearly indicated that Saghata Upazila soil is very fertile and principal crop is Boro, T. Aman, wheat, maize, jute and farmers also cultivated multiple crops such as vegetables, spices, pulses and different fruits (Mango, Litchi, Papaya and Guava) production.

Table 4.1: Present Cropping Pattern under Saghata Upazila

Major Cropping Pattern			Area (ha)	Contribution (%)
Rabi	Kharif-1	Khari-2		
Boro (HYV/Hybrid)	Fallow	T. Aman (HYV)	11860	64.28
Boro (HYV/Hybrid)	Fallow	Fallow	1030	5.58
Winter vegetables	Summer vegetables	T.Aman(HYV)	350	1.90
Winter vegetables	Jute	T.Aman(HYV)	350	1.90
Winter Vegetables	Vegetables	Vegetables	350	1.90

Major Cropping Pattern			Area (ha)	Contribution (%)
Rabi	**Kharif-1**	**Khari-2**		
Pulses	Jute	T.Aman(HYV)	300	1.63
Mustard/groundnut	Boro (HYV/Hybrid)	T. Aman (LIV)	600	3.25
Pulses (Lentil, Mung Bean)	Fallow	T.Aman(HYV)	200	1.08
Wheat/Maize	Fallow	T. Aman (HYV)	850	4.61
Wheat/Maize	Jute	T.Aman	850	4.61
Potato	Maize	T.Aman(HYV)	180	0.98
Potato/Sweet Potato	Boro (HYV/Hybrid)	T.Aman(HYV)	480	2.60
Spices (Onion, Garlic, Chili, Turmeric etc.)	Jute	T. Aman (HYV)	450	2.44
Fruits Garden (Orchard)	Fruits Garden (Orchard)	Fruits Garden (Orchard)	600	3.25
Total			**18450**	**100.00**

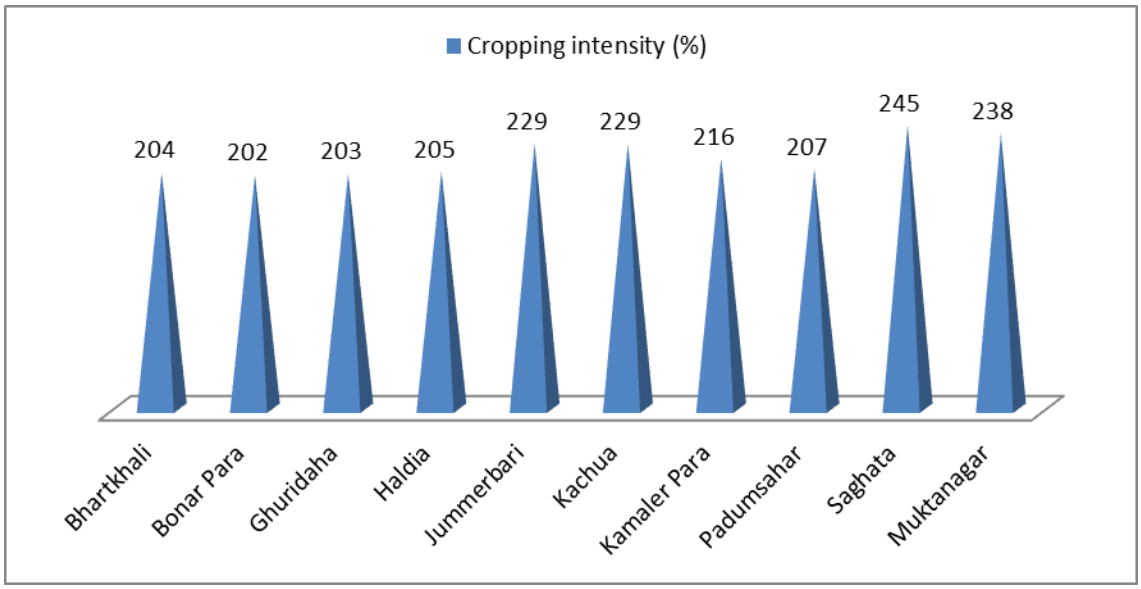
Source: SAAOs and UAO Saghata Upazila, DAE 2016

Note: Rabi Season= Month of November-February, Kharif-1 Season= Month of March-June and Kharif-2 Season= Month of July- October.

4.2 Cropping Intensity

Cropping intensity is an important index of utilization of land. Crop intensity index assesses farmers actual land use in area and time relationship for each crop or group of crops compared to the total available land area and time, including land that is temporarily available for cultivation. It is calculated by summing the product of area and duration of each crop divided by the product of farmers total available cultivated land area and time periods plus the sum of the temporarily available land area. For a specific crop, the cropping intensity is the number of times that crop is grown in one year on the same field. It is distinguish single, double and triple cropping systems respectively.

Different cropping pattern are practiced in Saghata Upazila. The present Union wise (10 Unions) cropping intensity is shown in Figure 4.1. The average cropping intensity under Saghata Upazila is 221% which is higher than cropping intensity of 5 unions and also less than 5 Unions (Figure 4.1). The highest cropping intensities were achieved in Saghata Union (245%), Muktinagar Union (238%) and Kachua Union (229%) and Jumarbari Union (229%) and lowest cropping intensity under Bonarpara Union (202%). The average cropping intensity under Saghata Upazila is 221% which is higher than Gaibandha District (215%) and national average cropping intensity (190%) (Krishi Diary 2016). Figure 4.1 shows all the 10 unions under Saghata Upazila cropping intensities are higher than national average cropping intensity (190%).



Source: SAAOs and UAO Saghata Upazila, DAE 2016

Figure 4.1: Union wise Cropping Intensities under Saghata Upazila

4.3 Present Cropped Area

Rice, jute, wheat, maize, winter and summer vegetables, potato, mustard, groundnut and pulses, and various fruits crops are grown in 10 Unions under Saghata Upazila. Saghata Upazila present scenario of different cropped area, yield rate and production levels are shown in Table 4.2. The present total different cropped area is 34915 ha of which rice cropped area are 29580 ha and the rest 5335 ha is covered by non-rice crops (Jute, potato, winter and summer vegetables, pulses and oilseeds and fruits etc.). The rice and non-rice cropped area are about 85% and 15% respectively of the total cropped area. The highest land area was used for Boro (HYV/Hybrid), T. Aman (HYV) rice and Jute cultivation.

4.4 Present Crop Production

HYV/Hybrid rice or others crops gives higher yield in compared to local variety crops. Total crop production is 153317.6 metric tons of which rice production is 98113.6 metric tons and non-rice production is 55204 metric tons (Table 4.2). Among the rice crops the contributions of T. Aman (LV), T. Aman (HYV), Boro (HYV) and Boro (Hybrid) are about 7%, 38%, 36% and 18% respectively. The highest contribution among the non-rice crops are sweet potato (35%), fruits (14%) and winter vegetables (11%) followed by spices (8%), potato (8%) and jute (7%) respectively (Table 4.2).

Table 4.2: Present Cultivated Area, Yield and Production under Saghata Upazila

Crop Grown	Crop Area (ha)	Yield/ha (mt)	Production (mt)	Contribution (%)
T. Aman(LV)	3000	2.4	7200	7.34
T. Aman(HYV)	11700	3.2	37440	38.16
Boro (HYV)	10280	3.47	35671.6	36.36
Boro (Hybrid)	4600	3.87	17802	18.14
Sub Total Rice	**29580**		**98113.6**	**100.00**
Summer Vegetables	260	12	3120	5.65
Winter vegetables	375	16	6000	10.87
Wheat	740	3.1	2294	4.16
Maize	320	8.5	2720	4.93
Jute	1100	3.5	3850	6.97
Sweet Potato/Potato	480	40	19200	34.78
Potato	180	24	4320	7.83
Spices (Onion & Garlic etc)	660	7	4620	8.37
Oil seeds (Mustard, Til, Groundnut)	600	1.2	720	1.30
Pulses	300	1.2	360	0.65
Fruits (Orchard)	320	25	8000	14.49
Sub-Total	**5335**		**55204**	**100.00**
Total	**34915**		**153317.6**	

Source: SAAOs and UAO, Saghata Upazila, DAE 2016

4.5 Irrigation Facilities under Different Unions

Irrigation is the lifeline of agriculture, because without irrigation facility crops diversification or HYV/Hybrid cultivation would be impossible. Irrigation facilities assured production of crops in the dry season as well as stabilized production through supplemental irrigation of the rain fed crops and ensured greater productivity. The main source of water is both surface and ground water. For Boro Rice cultivation ground water conservation and proper utilization in this Upazila is very important. This study are assessed the present scenario of irrigation facilities and problems. For irrigation purposes, generally, Deep Tube Wells (DTW), Shallow Tube Well (STW) and Low Lift Pump (LLP) and also traditional instrument are used. Union wise DTW, STW and LLP under Saghata Upazila is shown in Table 4.3. A total of 6853 machine were used for irrigation under unions in Saghata Upazila. A total 60 DTW, 38 STW and 297 LLP along with other indigenous irrigation tools are used for lifting water. In many cases small and marginal farmers are involved in operation and maintenance of irrigation equipment. All DTW and 1338 STW has electricity facilities but 5437 STW and 38 LLP has no electricity. Electricity user's farmers reported that failed or disruption of electricity supply during Boro season were acute problems under Saghata Upazila. Framers wanted nonstop electricity supply during Boro

season. Majority of the Farmers reported irrigation drainage system DTW is pucca but 90-100% STW drain is katcha which is causes wastage of irrigation water. Farmers wanted pucca drainage system.

Table 4.3: Union Wise Irrigation Machine under Saghata Upazila

Name of Union	DTW		STW		LLP		Remarks	
	Electricity	Diesel	Electricity	Diesel	Electricity	Diesel	% of Pucca drain	% of Katcha drain
Bharatkhali	5	0	106	179	0	0	DTW=60 STW=10	DTW=40 STW=90
Bonarpara	12	0	143	521	0	21	DTW=90 STW=3 LLP=80	DTW=10 STW=97 LLP=20
Ghuridaha	8	0	155	450	0	0	DTW=2 STW=0	DTW=98 STW=100
Haldia	0	0	0	550	0	10		STW=100
Jumarbari	4	0	65	840	0	0	DTW=30	DTW=70 STW=100
Kachua	13	0	33	417	0	5	DTW=80 STW=10	DTW=20 STW=10
Kamaler Para	12	0	217	826	0	0	DTW=35	DTW=65 STW=100
Padumsahar	2	0	172	444				DTW&STW=100
Saghata	2	0	110	892	0	0	DTW=100	STW=100
Muktinagar	2	0	317	318	0	2	DTW=50	STW & LLP=100
Total	**60**	**0**	**1318**	**5437**	**0**	**38**		

Source: SAAOs under Saghata Upazila DAE 2016

Irrigation is considered as a basic input for producing cereals and many other crops. Most of the farmers are dependent on irrigation. Good coordination between land and water is required for ensuring food security. In Rabi season mechanized irrigation can help to increase crop diversification. Status of union wise irrigation and ground and surface water used under Saghata Upazila is shown in Table 4.5. It shows that 94-95% land area covered by irrigation water. This indicates that most of the farmers have access to irrigation water which is a good sign for intensive farming. But in the long term, excessive ground water lifting may cause an adverse impact both in agricultural production and in the surrounding environment.

Table 4.4: Status of Union wise Irrigation and Ground and Surface Water Used Area

Union	Irrigated	Non-Irrigated	Irrigated Area						Char Land	Remarks
			Ground				Surface			
	Area (%)	Area (%)	DTW		STW		LLP			
			No	Area (%)	No	Area (%)	No	Area (%)		
Bharatkhali	95	5		4	285	96	-		√	Rain fed crops supplemental irrigation
Bonar Para	94	6		21	664	69	21	10	√	
Ghuridaha	94	6	6	6	585	94	-	-	√	Rain fed crops need supplemental irrigation
Haldia	95	5	-	-	550	97	10	3	√	
Jumarbari	95	5	4	3	905	97	-	-	-	
Kachua	95	5	13	12	540	83	8	5	√	
Kamaler Para	95	5	10	5	1043	95	-	-	√	
Padumsahar	94	6	2	2	616	98	-	-	√	
Saghata	94	6	1	1	1002	99	-	-	√	
Muktinagar	94	6	2	2	448	97	2	1	-	

Source: National Land Zoning Project Report December 2014

4.6 Cultivation Practices

All the unions are dominated by agriculture crops are: Boro HYV/Hybrid variety of rice and Transplanted Aman (HYV) rice, potato, jute and different kinds of winter and summer vegetables, spices, pulses which are cultivated under both rain fed and irrigation condition. Banana, mango, litchi and papaya cultivation are very famous in Saghata Upazila. Farmers cultivate different vegetables such as brinjal, potato, chili and cabbage etc. All the SAAOs and UAO reported that about 87% farmers used power tiller, 30% tractor and 10% farmers used bullock during land preparation. Boro and T. Aman rice seedlings grown in seedbed are uprooted when they are about 30-45 days old and transplanted in the main fields. They transplanted Boro and T. Aman rice practiced line sowing. Generally in rice field weeding is done once, about a month after transplanting and this exercise is closely followed by top dressing with urea. Majority of the farmers did not use balance dose of chemical fertilizers due to lack of knowledge. Farmers reported pests are acute problems for crop production. Farmers used pesticides over and under dose as preventive and curative measures for controlling different pests because of lack of knowledge.

4.7 Major Types of Crops Cultivated

Main Crops

Paddy is a primary crop and a staple food of this area. Here the growth of rice production is much faster. Paddy (Boro rice (HYV/Hybrid), T. Aus (HYV) and T. Aman (HYV/LIV), Jute, Wheat, Maize, Vegetables, Mustard, Groundnut, and Pulses etc. Jute is a primary and one of the main cash crops of this Upazila. It is an eco-friendly fiber. Jute cultivation requires less labor and less input. Despite the relative decline in importance of jute in agriculture, potential still exists for the fiber to increase its contribution to the economy through productivity increases and diversification. Farmers need to cultivate BJRI innovative variety of Jute such as HC-95, HS-14 for better yield. Yield increase, availability of better quality seeds, and improved provision of extension and credit support to grower's for this crop. Jute leaf is a common and favorable vegetable item to the farmer.

Maize Cultivation

Now-a day's Maize is very important cash crops in Bangladesh. Low risk in maize production is another privilege taken by farmers. Marginal and poor farm families are showing interest in maize cultivating. This is possible due to the adaption of modern maize varieties since production has been expanding fast. Its price, demand, and supply are increasing in domestic market. Pop-corn as an alternative food has been getting priority. It has diversified usages in small business and poultry feed production. Farmers can earn more by maize cultivation. For getting better yield farmers need to cultivate BARI Hybrid Bhuta-1, 8, 9, 10, 11 varieties. Lack of capital as well as high price of inputs is a barrier to its higher production.

Potato

It is widely commercially cultivated in winter with huge potential in Saghata area. The soil and climate conditions of Saghata area are favorable for potato production. It is one of the cash crops for Saghata farmers. Sunny land with cool and moisture in soil is appropriate for potato cultivation. Potato, a tuber crop, is cooked and eaten as a vegetable. In the context of nutrient, potato is comparable with rice and wheat. But unavailability of quality inputs (seeds, fertilizer and pesticide), lack of knowledge on proper cultivation techniques and finally low investment capacity of the farmers are some of the major challenges in potato farming.

Oilseed Crops

Farmers of Saghata Upazila generally cultivate mustard before Boro cultivation. Mustard, Groundnut, and Til are popularly cultivated in Saghata Upazila. Mustard as an oilseed crops takes first place in respect of cultivated area in Bangladesh. Mustard oilcake is a nutritious food

for cattle. This oilcake also used as organic fertilizer and the dry mustard plants can use as fuel.

Vegetables

The soil and climate conditions of this Saghata area are favorable for multiple vegetables production. Tomato, Sweet potato, Brinjal,, Radish, Cauliflower, Cabbage, Bean, Chili, Lalshakh, Loncho, Kolmi, Peas, Kochu, Bitter gourd, Pumpkins, Gourd, Rai Shakh, Ladies finger, Palong, Spinach, Cucumber etc. Encouraging homestead level vegetables cultivation could be alternative source of household income generation. It is widely cultivated in winter with huge potential in Saghata Upazila. But unavailability of quality inputs (seeds, fertilizer and pesticide), lack of knowledge on proper cultivation techniques and finally low investment capacity of the farmers are some of the major challenges in vegetables farming.

Spices

Chili, Turmeric, Ginger, Onion, Garlic etc. The soil and climate conditions of this Saghata area are favorable for Chili and Onion production.

Fruits

Mango, Jackfruit, Litchi, Banana, Coconut, Betel Nut, Country Goose Berry, Guava, Plum, Kul, Papaya etc. are grown in this Upazila. Many farmers were Established commercial fruit garden of Mango, Litchi, Papaya and Guava etc.

Conversion of Agriculture Land to Non-agriculture

Agricultural land denotes the land suitable for crop production. It is one of the main resources in agriculture. Many high value crops are grown in Saghata Upazila. "Non-agricultural land" means such land which is used for different purposes and is not connected with agriculture. Such kind of land can be called non-agricultural land, if any developmental activity is carried over on the land and makes land unfit for crop production. In Saghata a substantial amount of agricultural land had been shifted to a non-agricultural one viz construction of houses, brickfield, sawmill, industry, road, market and other infrastructures. Without proper planning conversion of the arable land to other uses is continuing rapidly. The major components of transforming agricultural land to non-agricultural purposes are as follows:

- Non –agricultural development activities on agricultural land.
- New or existing infrastructure and urban expansion.
- Construction of brick fields and new settlements in agricultural land.
- Acquisition of agricultural land for non-agricultural purposes.

Plate 4.1: Farmers Banana Garden

Plate 4.2: Farmers Maize Field

Plate 4.3: Tomato Field

Plate 4.4: Farmers Rice Field in Saghata

Plate 4.5: Brinjal Field with Pheromone Trap

Plate 4.6: Harvested Jute in Saghata

CHAPTER FIVE: PRODUCTION COST OF RICE AND VEGETABLES

5.1 Cost of Rice Production

The production cost of paddy varies depending on crop season, variety (HYV/Hybrid/LV), land preparation (Power tiller/Tractor/Bullock), seeds and seedlings, manure and fertilizer, irrigation (complete irrigated Boro Rice) and rain fed or provided supplementary irrigation), pesticide and labor. To assess farmers cost of rice production, Agriculture Economic Division of BRRI (2014-15) were conducted survey all over the country in three rice seasons (Boro, Aus and Aman paddy). BRRI study findings shows that Boro and Aus farmers per kg rice production cost is Tk. 18.65 and Tk.18.64 and Aman rice production cost is Tk. 17.61 which is less than Boro and Aus (Table 5.1). Department of Agriculture Marketing was estimated production cost for Boro rice Tk. 18.08 per kg, Aman Rice Tk. 18.20 per kg and Wheat Tk. 23.50 per kg in the year 2015-16. On this basis Government has declared buying rate of Boro rice Tk. 20.70, Aman rice Tk. 18.50 per kg and wheat Tk. 27.02 per kg respectively. Saghata upazila farmers and DAE SAAOs reported that Boro rice per kg or per ha production cost is higher than T. Aman rice because T. Aman rice is cultivated by natural water or rain water. There is no need for supplementary irrigation for Aman rice production. Fertilizers and pesticides are needed more in Boro rice production in compared to Aman rice.

Table 5.1: Cost of Rice Production (2014-15)

Name of Rice	Average per kg Rice Production Cost (Tk.)	Crop season
Boro	18.65	Rabi
Aus	18.64	Kharif-1
Aman	17.61	Kharif-11

Source: Agriculture Economic Division, BRRI 2016

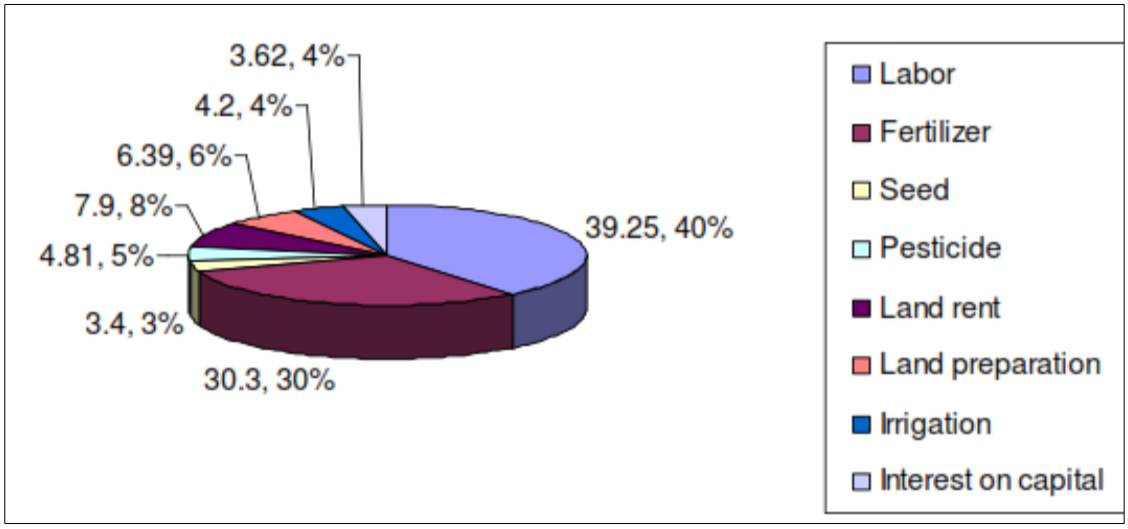
5.2 Cost of Vegetable Production

The production cost of vegetables varies depending on crop, variety, time, place, and season. During the survey, farmers were asked to identify the major types of production costs on which they usually spend. According to the respondents, the production cost of vegetables can be categorized into eight major categories: land preparation, seeds and seedlings, manure and fertilizer, irrigation, pesticide, labor, lease/rent of land, and other expenses like fencing, shedding, mulching etc.

Monsura Zaman, Rokhsan-Ara-Hemel and Tahmina Ferdous (2010) assessed the cost of production of four winter vegetables namely cauliflower, cabbage, tomato and brinjal in five

villages under Dhaka district. The study finding shows that 39.2% of the total cost was devoted to labor, 30.3% to fertilizer, 3.4% to seed, 4.8% to pesticides, 7.9 % land rent, 6.3% to land preparation, 4.2% to irrigation and 3.6% to interest on capital, whereas, the result estimated by AVRDC (2001) shows that 48.4% of the total cost was devoted to labor, 24.2% to fertilizer, 6.1% to irrigation, pesticides and 3.7% to seeds (Figure 5.1). Cost of per kg and per 40 kg was found approximately the highest for tomato and the lowest for cabbage and cauliflower.

Farmers of Saghata Upazila reported that major cultivation occurred in land preparation (Power tiller/tractor cost), irrigation, pesticides, fertilizers and labor. Farmers reported that per ha land cultivation cost is Tk. 6000-7000/- *(Upazila Agriculture Office, Saghata).* Generally, supplementary irrigation provided potatoes, Chili and winter vegetables. Supplementary irrigation cost is 2000-3000 taka or more depends on crops and number of application. The highest supplementary irrigation provided in winter and summer vegetables crop field. Farmers did not practice supplementary irrigation T. Aman crops. The highest pesticides used in T. Aman and Boro rice fields (Tk.4000-5000/-) and Winter & Summer vegetables fields (Tk. 3000-4500/ha). Labor cost day by day increased and per day labor cost more or less Tk. 350-400 depends on crop season.



Source: ASA University Review, Vol. 4 No. 1, January–June, 2010

Figure 5.1: Percentage of Major Types of Production Costs for Vegetables

Brinjal is one of the most popular and important vegetable in Saghata Upazila. Farmers are cultivated this vegetables throughout year. Compare the financial profitability of brinjal vegetable production in different region in Bangladesh. Several studies were done to estimate the financial profitability of brinjal vegetable production (Table 5.2). It is evident from the table that productions of brinjal vegetable were increased chronologically. This is due to adoption of farmers for different HYV varieties of brinjal. Price of brinjal vegetable was also increased

through time change. Farmers were adjusted their vegetables price due to change the production cost. Now farmers used different insecticide, pesticide and fertilizer to increase production and protect vegetables from disease and pest. For this reason profitability of different vegetables also increased. It is true that total production cost of different vegetables increased but net margin also increased. Farmers were produce different vegetables because vegetables productions were profitable in the present study area which is reflected by high BCR for brinjal vegetable. The previous studies were done several years ago and we can interpret the different return by yield, price and place difference. The prices of brinjal vegetable are high in all over the country. Finally it is clear that productions of vegetables are more profitable in the study area like other vegetables growing areas.

Table 5.2: Compare the Financial Profitability of Brinjal Vegetable Production in Different Region

Cultivation year	Study Area	Yield (kg/ha)	Price (Tk./kg)	Gross Return (Tk./ha)	Total Cost (Tk./ha)	Net Return (Tk./ha)	BCR	Sources
1997	Bangladesh	11730	6.0	70372	17,343	53,029	4.06	EPC, 1997
1998	Comilla	24,699	2.51	61,994	31,339	30,655	1.98	Miahet et al., 1998
2002	Jessore	43,899	7.09	3,10,293	1,77,457	1,32,836	1.75	Rashid et al. 2002
2014	Dhaka	55,691	18.00	10,02,438	269,627	732,811	3.72	Hasan et.al 2014

The present study was assessed financial profitability of Brinjal, Tomato, Potato and Cabbage/cauliflower vegetables production under Saghata Upazila which is shown in Table 5.3. Finding shows that Tomato cultivation is more profitable (Tk. 746514.4 per ha) followed by Brinjal (Tk. 589086 per ha), Cabbage/Cauliflower (Tk. 309776.67 and potato (Tk. 231890 per ha) and Cucumber vegetables (Tk. 200000/-) respectively.

Table 5.3: Financial Profitability of 4 types of Vegetables Production in Saghata Upazila

Vegetables	Yield (Kg/kg)	Price (Tk./Kg)	Gross Return (Tk./ha)	Total Cost (Tk./ha)	Net Return (Tk./ha)
Brinjal	45700	15.3	699210	112320	589086
Tomato	53630	15.88	851644.4	105130	746514.4
Potato	24000	14.5	348000	116110	231890
Cabbage/Cauliflower	33000	11.67	385110	75333.33	309776.67

Source: SAAOs Saghata Upazila, DAE 2016

CHAPTER SIX: GROWTH OR DECLINE OF AGRICULTURAL LAND DURING LAST TEN YEARS

Quantification of various parameters in relation to land use and farming is really a very difficult task, specially, in Bangladesh where record keeping is poor either by an organization or by individual. Beside this difficulty in mind a sincere attempt has been made to collect land use last ten year data (2005 to 2015) from Upazila Agriculture Office and discussion with 10 Unions all Sub- Assistant Agriculture Officers of Saghata Upazila and review the other documents. The growth or decline of agricultural land use during last ten years under Saghata Upazila is shown in Table 6.1. Table 6.1 finding shows 62% local variety rice was decreased during last ten years. The main reason for decreased local variety rice area due to yield is less in compared to HYV rice and farmers dictated to switchover cultivated HYV and Hybrid rice. The HYV/Hybrid paddy cultivation area 24% was increased. The reason for increased HYV rice cultivated area due to higher yield many farmers were cultivated HYV and Hybrid rice. Remarkable significant changed or increased during 10 years was occurred in summer vegetables (136%) increased but decreased in winter vegetables (-27%) and pulses (-13.04%). The main reason for decreased winter vegetables and pulses due to farmer's switchover cultivated less risk and high profitable crops. Highly significant changed or increased during ten years was occurred in Spices (382%) followed by sugarcane (233%), oilseeds (90%), maize (78%) and fruits gardening (57%) land use. The main reasons for increases are produce crop market demand and price is high. Table 6.1 shows, among the other purposes remarkable significant changed were occurred in Brick field (150%) and followed by poultry farm (129%), housing (27%) and fish cultivation (14%) respectively. This finding clearly indicated crop land day by day has gradually decreased which will be reflected on agriculture crop production.

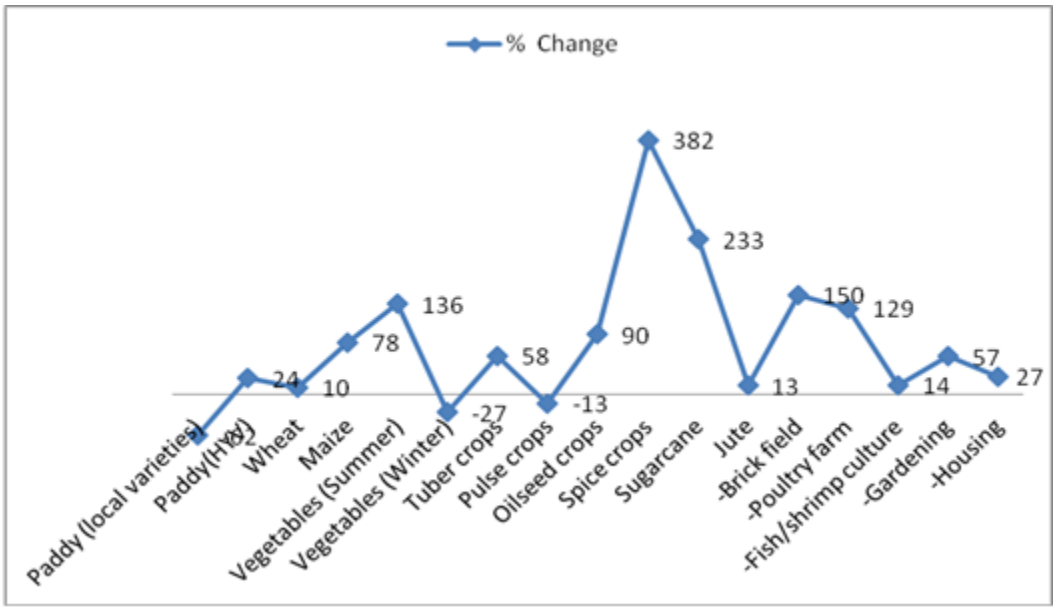
Table 6.1: Growth or Decline Agriculture Land Use during the Last 10 Year

Sl. No.	Agricultural land use	Land Use (2005) in ha	Land Use (2015) in ha	% Change
1	Paddy (local varieties)	210	80	-61.9
2	Paddy (HYV)	11914	14800	24.22
3	Wheat	670	740	10.45
4	Maize	180	320	77.78
5	Vegetables (Summer)	110	260	136.36
6	Vegetables (Winter)	515	375	-27.18
7	Tuber crops	380	600	57.89
8	Pulse crops	345	300	-13.04
9	Oilseed crops	315	600	90.48
10	Spice crops	137	660	381.75

Sl. No.	Agricultural land use	Land Use (2005) in ha	Land Use (2015) in ha	% Change
11	Sugarcane	30	100	233
12	Jute	400	450	12.5
14	Other purposes			
	-Brick field	5 (#2)	12.5 (#5)	150
	-Poultry farm	2(#)48	4.57 (113)	128.5
	-Fish/shrimp culture	2250	2561.64	13.85
	-Gardening	7	11	57.14
	-Housing	5500	7000	27.27

Source: SAAOs, UAO, ULO, UFO and Upazila Statistic Office of Saghata Upazila 2016

Note: # Number



Source: SAAOs, UAO, ULO, UFO and Upazila Statistic Office of Saghata Upazila 2016

Figure 6.1: Growth or decline Agriculture Land in Saghata during Last 10 Years (2005-2015)

CHAPTER SEVEN: MAJOR PROBLEMS OF CROP PRODUCTION IN SAGHATA UPAZILA (10 UNIONS)

Agriculture survey findings and Participatory Rural Appraisal (PRA) conducted in March 2016 report findings show for farmers some problems are common in different unions under Saghata Upazila such as flood, water logging, drought, bad communication, unavailability of wholesale market and infrastructure. Major problems identified are:

(i) Less availability of quality different HYV crop seeds;
(ii) Flood and river erosion;
(iii) Water Logging and siltation of canals and river;
(iv) Inadequate irrigation facilities and katcha drainage system;
(v) Lack of seed store for high value crops;
(vi) Lack of cold storage and vegetable cool-chamber;
(vii) Lack of vegetables and fruits whole sale market infrastructure;
(viii) Less availability of power tiller/tractor, harvester, sprayer & foot pump and high price;
(ix) Prolonged to partial drought during Rabi and Kharif Season;
(x) Changes in rainfall pattern;
(xi) Pests and diseases;
(xii) Power failure in Boro crop season;
(xiii) Damage of perishable vegetables due to undeveloped road system and poor transport facility;
(xiv) Low market price of agricultural commodities & agriculture labor crisis & high Wage rate;
(xv) Poor use of organic matter and soil nutrients deficiency and decrease of agricultural land;
(xvi) Farmer's knowledge gap on crop production technology;
(xvii) Change in rivers and canals morphology;
(xviii) Post-harvest loss of litchi, mango and potato and other vegetables is high;
(xix) Shortage of mechanical tools and equipment (fruit harvesting tool);
(xx) Top soil cutting and decreasing fruit setting;
(xxi) Farmers are facing increasing pressures of infrastructural development that may encumber agricultural practices. Change in land morphology and negative impact on food security;
(xxii) There is no agro processing center and industries under Unions level.

CHAPTER EIGHT: POLICY FRAMEWORK AND CONCLUSION

8.1 Policy Framework

As per Sub-Assistant Agriculture Officers, Farmers and District, Upazila level different organizational Officers opinions and field visit following recommendations are made which will help for proper planning and adoption of appropriate crop production measure in future to different unions beneficiaries under Saghata Upazila.

1. Developing Infrastructural Facilities

Road network at local level, agro-processing and wholesale marketing infrastructure development, re-excavation of canals and irrigation facilities need to be improved for mitigating impacts of crop production related vulnerabilities and climate change. Reconstruction of damaged water management infrastructures need to be made. In each union, one wholesale market infrastructure needs to be constructed. Further in each union, one seed store infrastructure need to be constructed and also cold storage and food godown need to be established.

2. Reducing the Irrigation water Wastage

To Reduce the Irrigation water Wastage, proper utilization and increase the irrigated command crop area the DTW, STW and, LLP katcha drain need to be converted into pucca drainage system or introduce underground pipe irrigation system. Uninterrupted power supply to irrigation pumps (STW & LLP). Need to be monitoring ground water table.

3. Farming and Adaptation Practices

Adapt modern farming techniques and choose high yields and drought tolerant varieties are needed. There is need for conducting, strengthening and expanding crop demonstrations and block farming based on adaptation practices. Introduction of risk resistant crop varieties in agriculture with emphasis on crop diversification should be an integral part of the ToT, farmers training and demonstrations.

4. Vegetables Production

Different types of winter and summer vegetables are grown under 10 unions area. All the Unions are excellent suitable for vegetables cultivation round the year. There is no cold storage and large vegetable selling center (market) under 10 Unions. As results farmers could not get good price for their produced products. There is a need for establishment of cold storage each Union and development of market infrastructure.

5. Crop Production Inputs Availability

It is needed to ensure availability of quality HYV and Hybrid crop seeds, fertilizer, pesticides and cultivation machineries in subsidized rate. Information on quality seed need to be provided up to block level.

6. Availability of Crop Seeds

Drought and submergence tolerant variety of different quality HYV/Hybrid crop seeds are needed. BRRI, BARI, BSRI and BINA have recommended drought tolerant rice, wheat, maize, potato, pulses and oilseeds. These are BRRI Dhan-71, -72, 55, -57, -66, -67 and BINA Dhan-8, BARI Wheat-25, BARI-28, 29, 30 Muatard-11, 14, 17 BARI poato-21, 22, 50 should be widely introduced and farmers should be encouraged to cultivate.

7. Fertilizer Management and Soil Health

Chemical fertilizers application in HYV varieties crops trend is increasing but inorganic fertilizer (Green manure, cow dung) use is decreasing. As a result, soil nutritional health will be at alarming situation which in future will have serious effect on yield. There is a need for soil health improving program for Union farmers. DAE may arrange joint collaborative soil testing and recommendation and training program for beneficiaries. Financial support need to be provided to DAE from different Government project. One leguminous crop (Dhaincha/Pulses/Fodder etc.) should be grown between two cereal crops. For increasing organic manure in the soil changing cropping pattern/crop rotation system need to be practiced.

8. Pest Management

Insects, rats, weeds and diseases are a chronic problems which causes considerable damage of crops every season and increase the farmers cultivation cost. For control this pests farmers apply pesticides under or over dose. Judicious use of pesticides needs to be developed and pest surveillance, monitoring and forecasting system should be implemented. Farmers also need to increase knowledge on Integrated Pest Management (IPM) technology through practical oriented program and DAE joint collaborative crop production training. Farmers training budget need to be provided to DAE from different Government projects.

9. Agro-based Industries

Establishment of Agro-based processing center & industries in 10 unions. There is a need for construction of infrastructure for some agro-base processing center. Construction of potato and vegetables & fruits processing, grading and packaging industry/facility need to be developed under each Union. There is a need to integrated effort for industrial effluents and waste management.

10. Zoning of Land

Zoning of land as per its present uses and potentialities and the proper implementation of "**Preparation of Development Plan for Fourteen Upazilas**" Package 04 (Saghata, Sonatala and Sariakandi Upazila) which will be helpful to reduce unplanned infrastructural development intervention as well as ensure proper utilization of agricultural land are essential.

11. The following additional systems may be adopted in innovative ways for sustainable crop production and for ensuring sound environmental conditions of Saghata Upazila:

- Biodynamic/eco-friendly agriculture;
- Rice and non-rice crops integrated farming;
- Grow vegetables predominantly;
- Fruit tree based agro-forestry system;
- Integrated pest management;
- Natural disasters adaptive, rain fed and resilience farming;
- Minimize conversion of agricultural land to non-agricultural use and increase awareness among the people and land users for conservation of land.

Ensuring planned and economic use of agriculture land, minimize agricultural land degradation and introducing regulatory measure like adopting land zoning law are necessary to protect the agriculture land.

8.2 Conclusion

Soil and weather conditions are suitable for different vegetables and other high value crops cultivation round the year in Saghata Upazila. There is a need to develop vegetables wholesale market and improvement of communication system different Unions to Upazila. Farmers need modern crop production technological training which will be helpful for crop diversification and proper utilization land and increase crop production. For improvement of irrigation facilities kutcha drain are to be made lined channel which will reduced irrigation water wastage and increase crop production. Integrated pest management need to implement for Banana, Papaya, orchard and vegetable cultivation and reduce the pesticide use. Electricity power supply should be ensured during Boro crop season. Construction of potato and vegetables & fruits processing, grading and packaging industry/facility need to be developed under each Union. Increase agriculture production through optimum use of land. Many high value crop vegetables are grown in this upazila. There is wide opportunity to mango and litchi, maize, jute and vegetables as commercial basis to export.

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ANNEXURE

Annexure- I: Questionnaire for KII

Name ---------- Designation ---------- Department ----------

Upazila ---------- District ---------- Mobile No. ---------- Date ----------

1. Category Wise Distribution of Farm Families

Sl. No.	Category	No of farm family	%
1.	Land less (0.05 - 0.50 acre)		
2.	Marginal (0.51 - 1.50 acre)		
3.	Small (1.51 - 2.50 acre)		
4.	Medium (2.51 - 7.50 acre)		
5.	Larger (above 7.50 acre)		
Total			

Present Land Use under Union

Sl. No.	Type of Land use	Present land used	
		Area (ha)	Percentage (%)
1.	Cultivated Area		
	Single Cropped area		
	Double Cropped area		
	Triple Cropped area		
2.	Net cropped area		
3.	Cropping intensity		

2. Relationship of Land Type and Flood Depth with Area Cultivated

Sl. No.	Land type and Flood Depth. (cm)	Present	
		NCA (ha)	Percentage (%)
1.	High land (0-30 cm) F0		
2.	Medium high land (30-90 cm) F1		
3.	Medium low land (90-180 cm) F2		
4.	Low land (180-360 cm) F3		
5.	Very low land above (360 cm) F4		
Total			

Source: CEIP field data and Upazila Agriculture Office, DAE

3. Major Crops/Cropping Patterns (both improper/exhaustive and sustainable)

Season	Farming Practices
Rabi (Mid October-Mid March)	
Kharif-I (Mid March-Mid July)	
Kharif-II (Mid July-Mid October)	
Irrigated Farming Rabi (Mid- October Mid March)	
Kharif-I (Mid March-Mid July)	
Kharif-II (Mid July-Mid October)	
Name major cropping patterns	1. 2. 3. 4.

4. Crop Cultivated and Variety in Polder Area

Crop area	Name of crop	Name of variety
Cultivated crops under single crop area=		
Cultivated crops under double crop area=		
Cultivated crops under triple crop area=		
Cultivated crops under irrigated crop area=		
Cultivated crops under non crop area=		
Cultivated crops under homestead garden area=		
Orchard area=		
Seasonal Fallow land =		
How many commercial fruit garden within polder area? Yes ---------- No----------	Name of fruits garden Banana: Papaya: Coconuts: Mango: Others:	Number:
In future which crops will be profitable in your polder area:		

5. Present Crop Production and Area under polder/Upazila

Crop Area (ha)	Yield/ha	Total Production (MT)	Crop Area (ha)	Yield/ha	Total Production (MT)
Aus rice= LV = HYV =			Oilseeds=		
Aman rice= LV = HYV = Hybrid =			Mustard=		
Boro Rice= LV = HYV = Hybrid =			Sesame=		
Total Rice=			Sunflower=		
Wheat =			Groundnut=		
Maize =			Others=		
Pulses =			Winter vegetables=		
Khesari =			Summer vegetables=		
Mung bean =			Total vegetables=		
Soybean =			Fruits Watermelon=		
Cowpea =			Species=		
Chickpea=			Chili=		
Others=			Onion=		
Tuber crops=			Garlic=		
Potato=			Jute=		
Sweet potato=			Sugarcane=		
Bamboo=			Betel nut=		
Bete line (Pan)=					

6. (a) Short Term Needs for Better Crop Production under Polder

1. ---------- 2. ----------

3. ---------- 4. ----------

5. ---------- 6. ----------

(b) Long Term Needs for Better Crop Production under Polder

1. ---------- 2. ----------

3. ---------- 4. ----------

5. ---------- 6. ----------

Annexure-II: Agriculture Questionnaire for Urban and Rural Economy Study

Name: _____ Designation: _____

Department: _____ Name of Block: _____

Name of Union: _____ Upazila: _____

District: _____

Mobile No.: _____ Date: _____

1. Category wise distribution of Farm Families in Block

Sl. No.	Category	No. of farm family	%
1	Land less (0.05 - 0.50 acre)		
2	Marginal (0.51 - 1.50 acre)		
3	Small (1.51 - 2.50 acre)		
4	Medium (2.51 - 7.50 acre)		
5	Larger (above 7.50 acre)		
Total			

2. Agricultural land and land Use in Block

Sl. No.	Description of agricultural land	Area (ha)
1	Total agriculture land area	
	High land	
	Medium high land	
	Medium low land	
	Low land	
2	Permanent fallow land	
3	Current/seasonal fallow land (with fallow period) -Rabi fallow	
4	-Kharif-I fallow -Kharif-II fallow	
5	Net cropped area	
6	Single cropped area	
7	Double cropped area	
8	Triple cropped area	
9	Total cropped area	
10	Cropping intensity (%)	

Sl. No.	Description of agricultural land	Area (ha)
11	Irrigated land area (%)	

3. Irrigation Facilities

Deep Tube Well (DTW) Yes---------- No---------- Number----------

Shallow Tube well (STW) Yes---------- No---------- Number----------

Low Lift Pump (LLP) Yes---------- No--------- Number----------

Others----------

4. Cultivation Practices

Power tiller----------% Used, Tractor ----------% Used

Bullock ----------% Used

5. Cropping Pattern

Sl. No.	Cropping Pattern			Area of Land	Percentage (%)
1|					
2|					
3|					
4|					
5|					
6|					
7|					
8|					
9|					
10|					
11|					

6. Cropping type and Present Crop Area & Production under Block

Crop Area (ha)	Area (ha)	Yield/ha	Crop Area (ha)	Area (ha)	Yield/ha
Aus rice LV HYV			Oilseeds		
Aman rice LV HYV Hybrid			Mustard		
Boro Rice LV HYV Hybrid			Sesame		
Total Rice			Sunflower		
Wheat			Groundnut		
Maize			Others		
Pulses			Winter vegetables		
Khesari			Summer vegetables		
Mung bean			Total vegetables		
Soybean			Fruits Watermelon		
Cowpea			Species		
Chickpea			Chilli		
Others			Onion		
Tuber crops			Garlic		
Potato			Jute		
Sweet potato			Sugarcane		
Bamboo			Betel nut		
Betelvine(Pan)			banana		
Other crops			Mango		
			Papaya		

7. Growth or Decline Agriculture Land During the Last 10 year.

SL No.	Agricultural land use	Land use (2005-06) in ha	Land use (2015-16) in ha	Causes of increase or decline
01	Paddy (local varieties)			
02	Paddy (HYV)			
03	Vegetables (Summer)			
04	Vegetables (Winter)			
05	Tuber crops			
06	Pulse crops			

SL No.	Agricultural land use	Land use (2005-06) in ha	Land use (2015-16) in ha	Causes of increase or decline
07	Oilseed crops			
08	Spice crops			
09	Fruit crops			
10	Wheat			
11	Maize			
12	Sugarcane			
13	Jute			
14	**Other purposes** -Brick field			
	-Poultry farm			
	-Fish/shrimp culture			
	-Gardening/forestry			
	-Industries			
	-Housing			
	-Others			

9. Major problems to Crop Production in Block/Union

1. _____
2. _____
3. _____
4. _____
5. _____

10. Future Need for Sustainable Crop production.

a)

_____

b)

_____

c)

_____

d)

_____

e)

_____

11. Major problems related to crop production system Under Union

1.

2.

3.

4.

5.

12. Future Need for Sustainable Crop production under Union

1.

2.

3.

4.

5.

13. Conclusion and Recommendation

1.

2.

3.

4.

5.

Annexure-III: Photographs

Part-1: Photo of Discussion with SAAO

Meeting With Sub-Assistant Agriculture Officers in Saghata Upazila Parishad	
	
Project Manager with Agriculture Expert	Agriculture Expert is lecturing to SAAOs.
	
Agriculture Expert is collecting data.	Project Manager is giving speech on the relation between project and agriculture.