Government of the People's Republic of Bangladesh

Ministry of Housing and Public Works

Urban Development Directorate

Preparation of Development Plan for Fourteen Upazilas

Package-03

(Bagmara Upazila, Rajshahi District;

Faridpur Sadar Upazila, Faridpur District and Gangni Upazila, Meherpur District)

Draft Survey Report

Agricultural Survey

Of

Gangni Upazila, Meherpur

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Executive Summary

Gangni is the biggest Upazila under Meherpur District. Gangni Upazila of Meherpur District is the smallest District of Bangladesh situated in south west of Bangladesh bordering with West Bengal (India). It is a historical District in Bangladesh for the proclamation of independence at Muzibnagar on 17 April 1971.The Upazila consists of 09 unions, and 01 Paurashava, 103 mauzas. 27 agriculture blocks and 145 villages. The biggest Jute seed farm of Bangladesh has been established here and it is under Bangladesh Development Corporation (BADC). The major rivers in the area are Matabhanga, Bhairab and Kazli. There are some beels and wetlands in the Upazila which are valuable source of indigenous species of fishes and potential for culture fisheries. Gangni Upazila falls into 01 Agro Ecological Zone: (i) High Ganges River Floodplain (AEZ-11) lying in the western part of the Ganges river floodplain. The landscape is complex and seasonally flooded. It is reported that natural disaster like drought, flood, decreasing ground water, heavy rain, early rain, erosion, cold wave, fog and hail-storm damage crops of this Upazila. Shifting agricultural land to non-agricultural purposes is a common phenomenon in this Upazila. Improper land use causes various forms of land degradation resulting in a reduced agriculture production. Indiscriminate land conversion will impose threat to national food security. 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 03 is expected to contribute to achieving the objectives of the National Agriculture Policy.

Cropping intensities has given utilization status of agricultural land and cultivation of crops. The highest percentage is triple cropped area (55%) followed by double cropped area (33%), single and more than three cropped areas (1%) under in Gangni Upazila. The average cropping intensity under Upazila is 255% which is less than cropping intensity of Meherpur District cropping intensities (262%) but higher than national average cropping intensities 192%. Study findings show that all the 9 unions and 1 Paurashava under Gangni Upazila cropping intensities is 231-265% which is higher than national average cropping intensity 192%.

Multiplicity of cropping systems has been one of the main features of the Gangni Upazila. Study finding shows that 33 different cropping pattern are practiced by Gangni Upazila farmers. The present 5 major cropping pattern are: Wheat → Jute →T.Aman (15%) followed by Boro→ Fallow→ T.Aman(13%),Mustard→Boro→T. Aman(10%),Wheat→Jute→Maskalai (8%),and Tobacco→ Jute→ T.Aman (6%).The high value agriculture products in the region is betel leaf, sugarcane and banana farming and its cultivation is the main source of income for the farmers.

The present total different cultivated cropped area is 63466 ha. of which rice cropped area covered 20460 ha. and the rest 43006 ha. is occupied by non-rice crops. The rice and non-rice cropped area are about 32% and 68% respectively of the total cropped area. This clearly indicated that highest area of Gangni Upazila lands are used for non-rice crop production.

It is one of the foods producing self sufficient Upazila. Total crop production is 332340.2 metric tons of which rice production is 105189 metric tons and non-rice production is 227151.2 metric tons**.** The rice and non-rice cropped production are about 32% and 68% respectively of the total cropped production. The highest contribution among the various crops was given by T aman (57%) followed by Boro (34%), winter vegetables (19%), Jute (14%) and summer vegetables (11%).

The farmers of Gangni Upazila are dependent on irrigation. The main source of water is both surface and ground water. A total of 4500 machine were used for irrigation under Unions in Gangni Upazila. Out of total machine, 16 DTW, 4478 STW and 6 LLP along with other indigenous irrigation tools are used for lifting water. Only 14 DTW, 242 STW and 6 LLP have electricity facilities but 2 DTW and 3774 STW has no electricity. Electricity supply during Boro season was acute problems and famers wanted nonstop electricity supply. Irrigation drainage system of DTW, STW and LLP 80-100% drain is kutcha which is causes wastage of irrigation water. Farmers wanted pucca drainage system.

All Unions & Paurashava 100 % land area covered by irrigation water in rabi season. 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. Farmers have given supplementary irrigation in drought prone and water logged areas in this Upazila. All the SAAOs and UAO reported that 60% farmers used power tiller and 35% farmers used tractor and only 5% farmers used bullock during land preparation. Generally, per hector cultivation cost is Tk. 2000-3000 tk.

During 2015-16, BRRI study shows that farmer's average per kg cost of Boro Tk.20.07 followed by Aus Tk. 18.37 and Aman Tk. 17.83 in the year 2015-16. Cost of per kg Boro rice production is increased Tk. 1.42. Department of Agriculture Marketing was estimated production cost for Boro rice Tk. 22.06, Aman rice Tk. 19 and Wheat Tk. 28.50 per kg in the year 2016-17. On this basis Government has declared buying rate of Boro rice Tk. 20.70, Aman rice Tk. 18.50 per kg and Wheat 27.02 per kg respectively in 2016. Farmers wanted and also need to ensure the profitable farm gate price for rice. The present study was assessed financial profitability of Brinjal, Tomato, Potato and Cabbage/cauliflower vegetables production under Gangni Upazila. Tomato cultivation is more profitable Tk.1261850/-per ha followed by Brinjal Tk. 802500/- per ha., Cabbage/Cauliflower Tk. 548840/- per ha and potato Tk. 328400/- per ha. respectively.

Study finding shows that all four types of vegetables cultivation are profitable for farmers of Gangni Upazila.

The growth or decline of agricultural land use during last ten years under Gangni Upazila shows above 99% local variety rice was decreased during last ten years. The HYV/Hybrid paddy cultivation area 265% was increased. Remarkable significant changed or increased during 10 years was occurred in maize 233% increased but only 15% increased in wheat cultivated area. Highly significant changed or increased during ten years was occurred in Spices (91%) followed by betel leaf (85%), fruit gardening (72%), tobacco (55%), pulses (37%), and winter vegetables (29%) cultivated area under this Upazila. Similarly, the highest cultivated area was decreased in sugarcane (66%) followed by tuber crops (49%) and winter vegetables (15%) cultivated area. Among the other purposes remarkable significant changed were occurred in poultry farm (129%) and followed by Brick field (64%), and rural settlement & rapid Urbanization (43%) and fish cultivation (8%) respectively. This finding clearly indicated crop land day by day has gradually decreased. Protection of double and triple cropped land area is the top priority issue.

Farmers faces some problems which are common in different 09 Unions & 01 Paurashava under Gangni Upazila. Major problems are: Water stagnation/drainage congestion, Drought and cold wave create negative impact on diversification of crops, Siltation of Baor wet lands, rivers and old canals, Changes in rainfall pattern and climate change, River erosion, sand deposition on agricultural land, Less supply o f quality HYV/Hybrid crop seeds and cultivation & irrigation equipments ,Inadequate drainage facilities and kutcha irrigation drainage system, Farmers lack of knowledge on modern crop production technology, Inadequate electricity supply hampers irrigation for Boro and other crops, Abrupt reduction of wetland restricts open water fisheries and its breeding place, Lack of cold storage, seed store and wholesale vegetables market infrastructure & no agro processing center and industries, Trend of tobacco cultivation areas increasing, Soil testing laboratory is not available in Upazila and District, Acquisition of agricultural land for non- agriculture purposes. Top soil cutting and filling sand, unplanned expansion of urban and commercial areas, and City migration are the acute problems. They are:

(1) Drainage congestion can be removed by re-excavating the old canals by making connection to adjacent rivers and khals of the Union,
(2) kutcha drainage converted into underground pipe system which will reduce the wastage of irrigation water,
(3) Ensure supply of improve quality of HYV/Hybrid and drought tolerant and cold susceptible short durable crops varieties,
(4) Nonstop electricity supply during irrigation period,
(5) Development of wholesale market infrastructure and road communication at local level,

(6) Farmers training on modern agriculture crop production, and balance dose of fertilizers and integrated pest management technology,
(7) Establishment of soil testing laboratory facilities,
(8) Adapt rice and non-rice crops integrated farming (eco-friendly agriculture),
(9) Cultivated more high value crops with fruit tree based Agro -forestry system,
(10) Infrastructure development of agro processing center and agro based industries, and (11) Double and triple crop lands should be protected by administrative & awareness program and to ensure proper uses of land,
(12) Fallow land should be used for infrastructure development, and
(13) Preparation of Development Plan for Fourteen Upazilas Pakage-03, Land Zoning and also village improvement act need to be implemented which will reduce the unplanned conversation of agricultural land to non-agricultural purposes.

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List of Abbreviations

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
GED	General Economic Division
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

Gangni is the biggest Upazila under Meherpur District. The Upazila situated between Kazla River in the east and Mathabhanga River in the east of which Mathabhanga is considered daughter of Gonga River and called Gangni. It is an agriculture intensive Upazila has been established as Thana in 1923 and turned into an Upazila in 1984. Gangni Upazila in Meherpur District is located in between 23^0 44´ and 23^0 52´ north latitudes and between 88^0 34´ and 88^0 47´ east longitudes with the area of about 33932 hectares. The Upazila is surrounded on the north by Daulatpur Upazila of Kushtia District, on the east by Mirpur Upazila of Kustia District and Alamdanga Upazila of Chuadanga District, on the south by Gangni Upazila and on the west by India. The Upazila consists of 09 unions, and 01 Paurashava, 103 mauzas, 27 agriculture blocks and 145 villages. Gangni Upazila of Meherpur District is the smallest District of Bangladesh situated in south west of Bangladesh bordering with West Bengal (India). It is a historical District in Bangladesh for the proclamation of independence at Muzibnagar on 17 April 1971. The biggest Jute seed farm of Bangladesh has been established here and it is under Bangladesh Development Corporation (BADC). The major rivers flow in the area are Matabhanga, Bhairab and Kazli. There are some beels and wetlands in the Upazila which are valuable source of indigenous species of fishes and potential for culture fisheries. The high value agriculture products in the region is betel leaf, sugarcane, mango and banana farming and its cultivation is the main source of income for the farmers.

The land of this Upazila is intensively used for agricultural purposes. Wide range of crops cultivated here in rabi and kharif season like paddy, jute, wheat, sugarcane, tobacco, maize, mustard, vegetables etc. Fruits cultivated well here are mango, litchi, jackfruit, banana, coconut etc. *Indigo* is a traditional crop in this area and oldest natural dyeing material in the world. Land resources of this Upazila have been brought into fruit garden and year round vegetables production as commercial basis. Bangladesh has divided into 30 Agro Ecological Zone based on soil, landform and climatic characteristics. Gangni Upazila falls into 01 Agro Ecological Zone: (i) High Ganges River Floodplain (AEZ-11) lying in the western part of the Ganges river floodplain. The landscape is complex and seasonally flooded. It is reported that natural disaster like drought, flood, decreasing ground water, heavy rain, early rain, erosion, cold wave, fog and hail-storm damage crops of this Upazila. Shifting agricultural land to non-agricultural purposes is a common phenomenon in this Upazila. Improper land use causes various forms of land degradation resulting in a reduced agriculture production. 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. Protecting fertile agricultural land and to meet rational needs of other sectors are our great national challenges. 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 Gangni 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 was considered 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 their causes for growth or decline covering a possible quality of existing and future agricultural land for the project area. The study is to determine the present scenario in agriculture practices and assessment of potential 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 28 Sub-Assistant Agriculture Officers under 9 Unions & 01 Paurashava through interview. Structured and semi-structured questionnaire was used for data collection (Annex-2). Data collection and consolidation occurred simultaneously. Data collection activities were completed from 01-30 December 2016. 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 appropriate 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 & saline areas.
The proposed Preparation of Development Plan for Fourteen Upazilas Package: 03 are expected to contribute to achieving the objectives of the agriculture policy.

2.2 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) Town 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: 03 have been designed in line with this Plan and address its key objectives for the water resource management in the Gangni Upazila areas.

2.3 The Ground Water Management Ordinance, 1985 (Ordinance No. Xxvii 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 03 has been designed in line with this Plan and addresses its key objectives for the ground water management ordinance for Gangni Upazila.

2.4 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 Gangni Upazila are: forests declared by the Ministry of Environment and Forests will remain as forest lands and re-classification of forest lands will be prevented. Preparation of Development Plan for Fourteen Upazilas Package 03 is designed in accordance with this Policy and will comply with the above listed requirements.

2.5 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: 03 are expected to contribute to achieving the objectives of the national water policy.

2.6 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 03 is expected to contribute to achieving the reduce pesticides used in agriculture sector and increases use of other pest control methods under National IPM policy.

2.7 The Perspective Plan of Bangladesh (2010-2021) and 7 the Five Year Plan (2016-20)

Both the plans have emphasized on food production with specific targets to achieve by 2021 which will be the golden jubilee year of Bangladesh independence. The 7th Five Year Plan (2016-20) has prescribed for the transformation of agriculture into its newer and modern form which will certainly require short-and medium-term adjustments with adequate investment. These include among others (i) crop diversification with the application of innovative technology;(ii) modern forms of irrigation and fertilizer use;(iii) well integrated and developed storage facilities and transportation systems;(iv) advanced agriculture research in a wide range of products beyond its traditional focus on rice and introduction of hybrid seeds; and(v) development of drought or flood resistant crops (GED 2010 and GED 2015). The proposed Preparation of Development Plan for Fourteen Upazilas Package: 03 are expected to contribute to achieving the objectives of the Perspective Plan of Bangladesh (2010-2021) and 7 the Five Year Plan (2016-20).

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CHAPTER-THREE: PRESENT LAND USE

3.1 Description of the Present Situation

Bangladesh soil and climatic condition is suitable for growing wide ranges of both tropical and temperate crops. Multiplicity of cropping systems has been one of the main features of the Gangni Upazila. At the same time, the pressure of population on land and other natural resources along with unplanned settlement is a major factor for changing land use patterns rapidly which has adverse effect upon Upazila agricultural land and crop production. Mango, Litchi, Jackfruit, Banana, Citrus and other horticultural crop based Agro-forestry has high potentialities in this Upazila. Tobacco grows well in Gangni Upazila. Boro and transplanted aman are two major rice cultivars and various vegetables are grown. The Agro-Ecological Zone of the Upazila is High Ganges River Floodplain (AEZ-11) lying in the western part of the Ganges river floodplain. The landscape is complex and seasonally flooded. General soil color of

Gangni Upazila is grey to dark grey. The top soil is composed of moderately permeable loamy soils and some parts are clayey. In Gagni Upazila soil 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 5.8-8.1(SRDI 2005 and BARC 1997). Gangni Upazila gets high potentials for its land and agricultural production. Farmers are harnessing their life style by producing various crops round the year.

3.2 Gangni Upazila and Union Wise Farm Families

Farmers in Gangni Upazila lead their livelihood from agricultural activities and also main source of their employment and income. Gangni Upazila of Maherpur district is potential for diversified agricultural practices. This Upazila has 09 Unions and 01 Paurashava. It has 103 Mauza and 145 villages with 9 Wards. This Upazila has 28 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), and 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 Gangni Upazila is shown in Table 3.1. Out of 63317 farm families most are landless 8459(13.36%), marginal 21138(33.38%), small 24734(39.06%), medium 8254(13.04%) and larger 732(1.16%) farmers (Table 3.1 and Figure 3.1). Majority peoples of this Upazila are directly or indirectly involved in agricultural activities. Landless and marginal farm families occupy 13.36% and 33.38%. They are relatively poor and often cannot meet up their basic needs from existing crop production practices. However, with the increasing number of population the pressure on land is increasing day by day. As a result, the number the number of landless farm families is gradually increasing that create pressure on livelihood in the Upazila.

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

Name of Union	Landless (%)	Marginal (%)	Small (%)	Medium (%)	Larger (%)	Total
	(.05-.50 acre)	(.51-1.50 acre)	(1.51-2.50acre)	(2.51-7.50 acre)	(above 7.50 acre)	
Bamandi	950(23.46)	1080(26.67)	1127(27.83)	855(21.11)	38(0.93)	4050
Dhankhola	1220(11.87)	3390(32.98)	4180(40.66)	1380(13.42)	110(1.07)	10280
Kathuli	810(13.59)	1967(32.99)	2350(39.42)	740(12.41)	95(1.59)	5962
Kazipur	1257(20.98)	1942(32.41)	1828(30.51)	856(14.28)	109(1.82)	5992
Matmura	1360(14.99)	3810(41.99)	3360(37.03)	500(5.51)	44(0.48)	9074
Roypur	177(3.09)	2292(40.08)	2782(48.65)	446(7.80)	22(0.38)	5719
Shaharbati	588(10.00)	1214(20.64)	2637(44.83)	1347(22.90)	96(1.63)	5882

Sholo Taka	833(14.49)	1785(31.04)	2364(41.11)	680(11.83)	88(1.53)	5750
Tentul baria	1134(15.52)	2378(32.54)	2606(35.66)	1160(15.87)	30(0.41)	7308
Gangni Pauraashava	130(3.94)	1280(38.79)	1500(45.45)	290(8.79)	100(3.03)	3300
Total	8459(13.36)	21138(33.38)	24734(39.06)	8254(13.04)	732(1.16)	63317

Source: SAAOs & UAO Gangni Upazila, DAE 2016

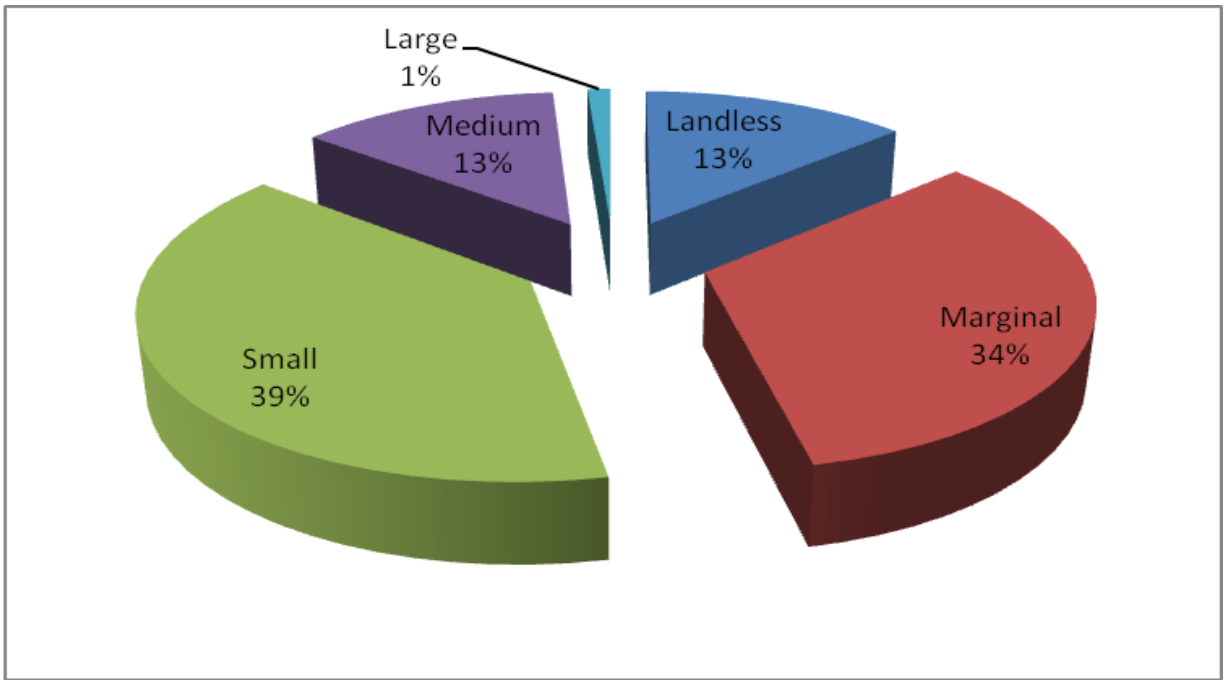


Figure 3. 1: Percentage of Category wise Farm family under Gangni Upazila.

3.3 Present Agricultural Land Use

3.3.1 Present Upazila Land Use

Agriculture is very important to local communities in Gangni. Multiplicity of cropping systems has been one of main features of the Upazila agriculture and it is attributed to agriculture and prevailing socio-economic situations of the farming community. It is a science, art and business of cultivating soil, producing crops, and raising livestock and also fish production. Land resources are gradually degrading in Gangni Upazila due to natural disasters and manmade reason. Farmers of Gangni Upazila are facing increasing pressure of infrastructural development (rural settlement, rapid urbanization, road construction, construction of brick field, top soil cutting and land acquisition) that may encumber agricultural practices. They are losing agricultural lands and farming opportunities at an alarming rate. This dramatically alters the traditional landscape. Mango, banana, jute, rice and wheat are principal crops. Fallow and grazing land in this Upazila has been converted into banana, papaya, orchard,

and vegetables cultivation. The scenario of Gangni Upazila present different land utilized is shown in Table 3.2. Out of 33932 ha total land area are 16094 ha high land, 14305 ha medium high land, 2885 ha medium low land, and 648ha low land respectively. Gangni Upazila covers 27114 ha of net cropped area of which about cultivated area is 73672 ha. Out of the total cultivable land in Gangni Upazila triple cropped area 17538 ha, double cropped area 9126ha, single cropped area 250ha and more than three cropped areas 200 ha (Table 3.2). Other purposes land use: Rural settlement and Homestead Vegetation (HV) 5985.12 ha, Sugarcane 289.8 ha, Permanent Fruit Garden (Mango & Litchi) 231.3 ha, and Fish cultivation 924.9 ha. Percentage of single, double, triple cropped area used in Upazila is shown in Figure 3.2. The highest percentage is triple cropped area (55%) followed by double cropped area (33%), single and more than three cropped areas (1%) under in Gangni Upazila. The cropping intensity of Gangni Upazila is 255% which is less than average Maherpur District cropping intensities (262%). Union-wise Present Agriculture Land Use Information and Identified Land Zoning of Gangni Upazila are shown in Table 3.3. There are five types of land zoning proposed for Gangni Upazila by National Land Zoning project report 2015 which is shown in Table 3.4. These are: (1) Agriculture Zone, (2) Agro-Fisheries and Jute Seed Farm Zone, (3) Agriculture Sugarcane Zone, (4) Agro-Fisheries Zone, and (5) Paurashava Area. Upazila Land used Map shown in Map 3.1. There is wide opportunity to grow different fruits, betel leaf, sugarcane, oil seed and winter & summer vegetables as commercial basis to export. The Upazila is considered as highly potential for agriculture.

Table 3. 2: Gangni Upazila Present Land Use

Sl. No.	Upazila Land use	Total Area (ha)
1.	Total Area	33932
2.	High land	16094
3.	Medium high land	14305
4.	Medium low land	2885
5.	Low land	648
6.	Single cropped area	250
7.	Double cropped area	9126
8.	Triple cropped area	17538
9.	More than three cropped area	200
10.	Net Cropped area	27114
11.	Total cropped area	73672
12.	Cropping Intensity (%)	265
13.	Sugarcane	289.8
14.	Mango/Litchi Garden	231.3

Sl. No.	Upazila Land use	Total Area (ha)
15.	Betel Vine	154.4
16.	Irrigated land area	8546
17.	Water land (River, Ponds and others)	924.9
18	Brick Field	108
19.	Rural Settlement and HV	5985.12

Source: Upazila Agriculture Office Gangni, DAE 2016

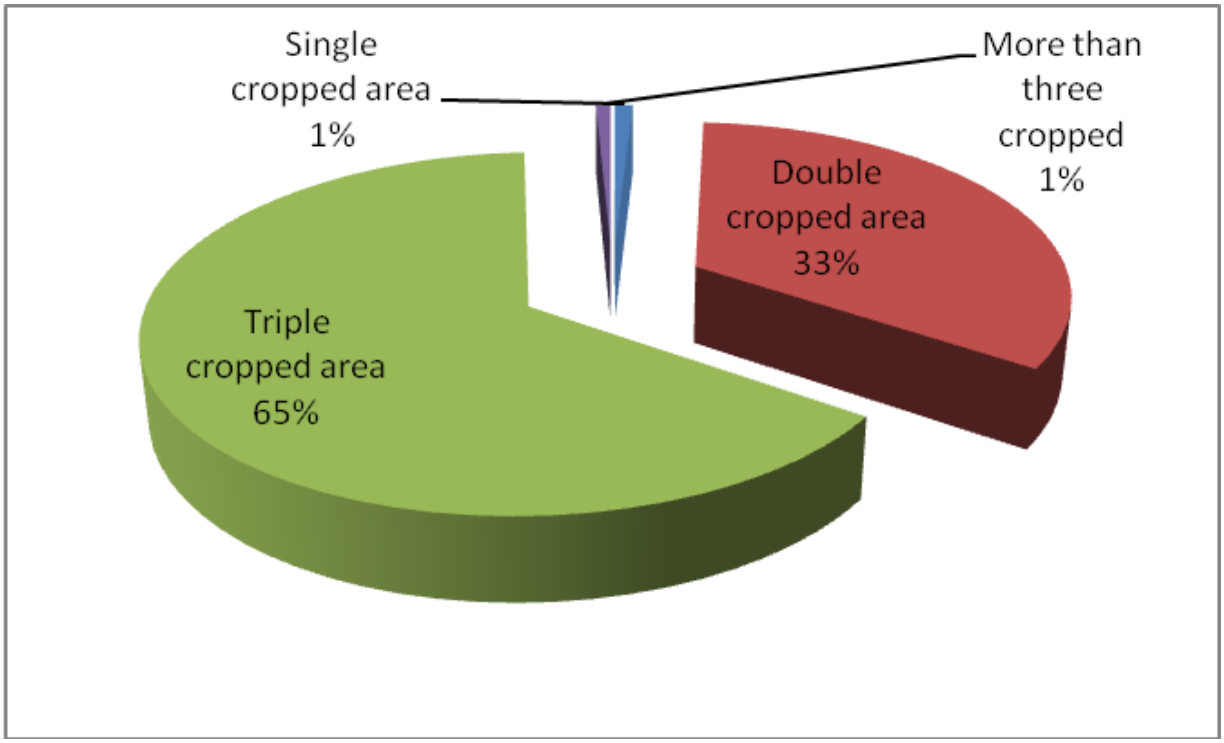


Figure 3. 2: Percentage of single, double, triple & more than three cropped land used Gangni Upazila.

Table 3. 3: Union-wise Present Land Use Information and Identified Land Zoning

Union	Area (Hectare)	Top Soil Texture	Cropping Intensity %	Land Use (Summarized)	Area (Hectare)	%	Recommended Land Zoning
Bamandi	3038.46	Loam to Clay Loam	267	Agricultural Land	2210.7	76.11	Agriculture Zone
				Brick Field	23.1	0.80	
				Road	22.8	0.79	
				Rural Settlement & HV	554.8	19.10	
				Water Bodies	93.3	3.21	
Dhankhola	5802.02	Clay to Loam	259	Agricultural Land	4841.6	78.55	Agro –Fisheries and Jute Seed Farm Zone
				Mango/Litchi Garden	174.9	2.84	
				Brick Field	21.5	0.35	
				Road	34.4	0.56	
				Rural Settlement & HV	955.6	15.50	
				Urban Build-up Area	1.2	0.02	
				Water Bodies	135.0	2.19	
Kathuli	3324.29	Clay to Loam	233	Agricultural Land	2904.3	86.76	Agriculture Zone
				Brick Field	1.5	0.04	
				Road	20.4	0.61	
				Rural Settlement & HV	384.7	11.49	
				Water Bodies	36.6	1.09	
Kazipur	5497.98	Clay Loam to Loam	249	Agricultural Land	2633.6	74.31	Agriculture Zone
				Mango/Litchi Garden	12.1	0.34	
				Brick Field	9.3	0.26	
				Road	21.1	0.60	
				Rural Settlement & HV	835.7	23.58	
				Water Bodies	32.1	0.91	

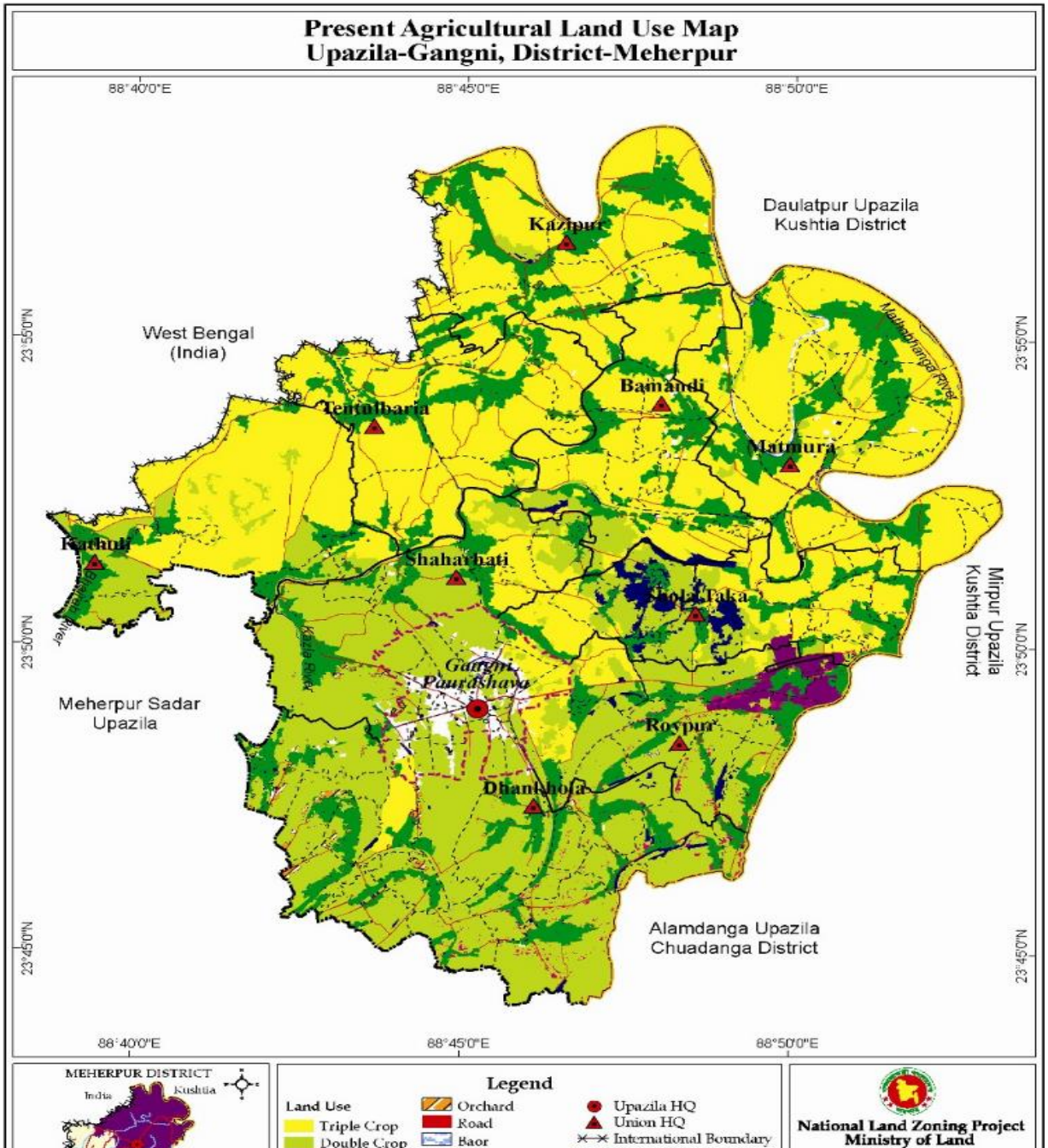
Union	Area (Hectare)	Top Soil Texture	Cropping Intensity %	Land Use (Summarized)	Area (Hectare)	%	Recommended Land Zoning
Matmura	4562.75	Clay Loam to Loam	260	Agricultural Land	3554.6	76.32	Agriculture Zone
				Brick Field	19.2	0.41	
				Road	34.1	0.73	
				Rural Settlement & HV	964.1	20.70	
				Water Bodies	85.4	1.83	
Roypur	2872.87	Loam to Clay Loam	251	Agricultural Land	1940.4	66.11	Agriculture-sugar cane Zone
				Sugarcane	244.4	8.33	
				Betel Vine	132.6	4.52	
				Brick Field	3.6	0.12	
				Road	26.4	0.90	
				Rural Settlement & HV	497.9	16.96	
				Urban Build-up Area	0.2	0.01	
				Water Bodies	89.4	3.05	
Shaharbati	2807.29	Clay Loam to Loam	273	Agricultural Land	2196.3	80.16	Agriculture Zone
				Mango/Litchi Garden	34.3	1.25	
				Brick Field	4.6	0.17	
				Road	21.4	0.78	
				Rural Settlement & HV	432.1	15.77	
				Urban Build-up Area	6.9	0.25	
				Water Bodies	44.3	1.62	
				Agricultural Land	1943.9	68.69	

Source: National Land Zoning Project Report, March 2015

Table 3. 4: Proposed Land Zoning for Gangni Upazila

Name of Zone	Union	Remarks
1. Agriculture Zone	Bamandi, Kathuli, Kazipur, Shaharbati Matmura and Tentulbaria	Considering present agriculture land use, land suitability analysis and as per opinion of local people these unions are identified as agriculture zone.
2. Agro– Fisheries and Jute Seed Farm Zone	Dhankhola	The biggest jute seed farm of Bangladesh has been established at Chitla village under this union
3. Agriculture-Sugarcane Zone	Roypur	Sugarcane is the most important agricultural crop and it is cultivated extensively in the area.
4. Agro- Fisheries Zone	Shola Taka	Several ponds and water bodies lie in the upazila and is potential for fish culture.
5. Paurashava Area	Gangni Paurashava	Paurashava urban development activities should be carried out without degrading fertile agriculture land.

Source: National Land Zoning Project Report, March 2015



Map 3.1: Present Agricultural Land Use Map of Gangni Upazila
(Source: National Land Zoning Project, March 2015)

3.4 Union-Wise Present Agriculture Land Use

Gangni Upazila gets high potential for its land and agricultural production. Total area of this Upazila is about 36,411 ha and consisting of 09 Unions with a Paurashava and 139 villages with 9 wards. All Unions different land types, cropping pattern and land used. Gangni Upazila Union wise present lands used are given below.

3.4.1 Bamandi Union Land Use

Bamandi Union of Gangni Upazila is potential for diversified agricultural crop cultivation. Soil of the Union comprises mostly loam to clay loam. The Agro-Ecological Zone of the Union is Highly Ganges River Floodplain (AEZ-11). This union consists of 09 Mauza and 15 villages. The land types of this union are highland (35.77%), medium high land (39.43%), Medium low land (21.75%), and Low land (3.05%). The soil P^H is 5.8-7.5. Land fertility is moderate fertile, productive and potential for agricultural uses. Bamandi Union having agriculture cultivated area of 6490ha of land of which net cropped area is 2450 ha. Out of the total cultivable land in Bamandi Union triple cropped area (62.04.47%) followed by double cropped (33.47%), single cropped (2.04%) and four cropped areas (2.45%). The cropping intensity is 265%. National Land Zoning Project, March 2015 was identified and proposed this Union as **Agriculture Zone**. Land utilization and cropping pattern in Bamandi Union depend on effective/planned use of land resources, availability of irrigation facilities and technologies etc. About 11 cropping patterns are practiced by farmers under Bamandi Union which is shown in Table 3.5. Crop land areas are occupied with rice production in Bamandi Union. Other crops like wheat, jute, mustard, tobacco, chili, mango, banana and vegetables etc. are included in cropping pattern in this Union (Land Zoning Report, March 2015 & SAAOs December 2016).

Table 3. 3: Present Cropping Patterns of Bamandi Union

Name of Union	Net Cultivable	Major Cropping Patterns	Cropping Intensity	Area(ha)	% of NCA

	Area (ha)		(%)		
Bamandi	2450	Boro(HYV), Fallow, T.Aman(HYV)	265	547.17	22.33
		Wheat, Jute, Vegetables		61.25	2.50
		Wheat, Jute, T.Aman		620.67	25.33
		Tobacco, Jute, T. Aman		245	10.00
		Pulses, Jute, T.Aman		269.5	11.00
		Potato, Chili, Vegetables		93.92	3.83
		Vegetables, Aus, Muskalai		163.33	6.67
		Mustard, Vegetables, Muskalai		114.33	4.67
		Maize, Aus, T.Aman		70.33	2.87
		Spices, Fallow, Vegetables		60.33	2.46
		Orchard, Orchard		204.17	8.33
		Total		2450	100.00

Source: SAAOs of Bamandi Union 2016

Major Problems on Crop Cultivation

The major problems in Bamandi Union for crop cultivation are: (i) Water stagnation/drainage congestion, (ii) River erosion, sand deposition on agricultural land and Kutcha drainage system, (iii) Drought and cold wave create negative impact on diversification of crops, (iv) Shortage of cold storage and Seed store, (v) Lack of knowledge and awareness on modern crop production technology, (vi) Less supply of quality HYV/Hybrid drought, cold tolerant, pest &disease resistant variety of different crop seeds,(vii) Cultivable agriculture lands are reducing rapidly due to unplanned construction of houses, settlement, brick field and for various infrastructural development on agriculture land,(vii) Top soil cutting & land degradation, (ix) Lack soil testing facilities and agro process center and industry.

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. Considering major constraints and problems of the area the following management practices can be taken: Considering major constraints and problems of the area the following management practices can be taken:

(1) Ensure improve quality of HYV/Hybrid and drought tolerant and cold susceptible crops varieties,

(2) Improvement of drainage congestion by re-excavating the silted river, old canals, khals etc help to increase water flow,

(3) Development of irrigation facilities and Kutcha drainage system converted into underground pipe system,

(4) Training on modern agriculture crop production, proper uses of fertilizer, pesticides and preparation of vermi-compost,

(5) Multipurpose cold storage facilities should be provided to preserve the perishable products,

(6) Ensure required electricity supply during irrigation period,

(7) Establishment of agro processing center and industries,

(8) Preparation of Development Plan for Fourteen Upazilas Pakage-03, Land Zoning and also village improvement act need to be implemented which will reduce the conversation of agricultural land to non-agricultural purposes.

3.4.2 Dhankhola Union Land Use

The biggest Jute seed farm of Bangladesh has been established at Chitla village in Dhankhola Union of Gangni Upazila under Meherpur district. The total area of the farm is about 400-acre land including its office, residence and ponds etc. During the British period this farm was used for cultivation of Neel (Indigo) seed. After purchasing the farm by Medinipur estate of west Bengal it has been changed to a Jute seed farm which is now renamed as Chitla Jute Seed Farm. It is now under Bangladesh Agricultural Development Corporation (BADC) and improved variety of Jute seed is produced here. National Land Zoning Project, March 2015 was identified and proposed this Union as **Agriculture-Fisheries and Jute Seed Farm Zone.** The Agro-Ecological Zone of the Union is Highly Ganges River Floodplain (AEZ-11). This union consists of 18 Mauza and 26 villages with the area of 5802.02ha. Land type is the dominant factor guiding choice of crops and cropping patterns of Dhankhola Union. The land types of Dhankhola union are medium high land (50.92%) followed by highland (22.39%), medium low land (20.33%), Low land (1.30%) and also fallow land 5.06%). Soils of the Union comprise mostly clay to loam. The soil P^H is 5.8-7.5. Land fertility is moderate fertile, productive and potential for agricultural uses. Dhankhola Union having agriculture cultivated area of 13091ha of land of which net cropped area is 5045 ha. Out of the total cultivable land in Dhankhola Union triple cropped (59.19%) followed by double cropped (36.95%), single cropped (2.48%) and four cropped areas (1.38%). The cropping intensity is 259%. In agriculture, multiple cropping is the practice of growing two or more crops in the same land during a single growing season. It can take the form of double cropping, in which a second crop is planted after the first has been harvested. Dhankhola Union farmers at present about 11 cropping patterns are practiced which is shown in Table 3.6. Crop land areas are occupied with rice production in Dhankhola Union. Other crops like wheat, jute, mustard, tobacco, chili, mango, litchi and vegetables etc. are included in cropping pattern in this Union (Land Zoning Report, March 2015 & SAAOs December 2016).

Table 3.6: Present Cropping Patterns of Dhankhola Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area(ha)	% of NCA
Dhankhola	5045	Boro(HYV), Fallow, T.Aman(HYV)	259	1984.37	39.33
		Wheat, Jute, T.Aman		469.97	9.32
		Wheat, Jute, Vegetables		226.13	4.48
		Tobacco, Jute, T. Aman		45.23	0.90
		Pulses, Jute, T.Aman		704.5	13.96
		Potato, Chili, Vegetables		117.72	2.33
		Vegetables, Aus, Muskalai		109.65	2.17
		Mustard, Vegetables, Muskalai		486.78	9.65
		Maize, Aus, T.Aman		645.4	12.79
		Spices, Fallow, Vegetables		61.86	1.23
		Orchard, Orchard		193.39	3.83
		Total		5045	100.00

Source: SAAOs of Dhankhola Union 2016

Major Problems on Crop Cultivation

The major problems in Dhankhola Union for crop cultivation are: (i) Most of the canals silted, sand deposition on agricultural land and Kutcha drainage system, (ii) Drought and cold wave create negative impact on diversification of crops and also inadequate electric supply during boro season, (iv) Shortage of cold storage, Seed store and lack of wholesale market infrastructure, (v) Farmers lack of knowledge and awareness on modern crop production technology, (vi) Less supply of quality HYV/Hybrid crop seeds and equipments,(vii) Less market price of agricultural produce crops, and (viii) Productive agriculture lands are reducing rapidly due to new or existing unplanned construction of houses, settlement, brick field, (ix) Top soil cutting , unplanned fisheries, sand deposition and also various infrastructural development on agriculture land, (x) Risk of early flood causes crop damage and (xi) Higher cost of Low Lift Pumps(LLPs),Shallow Tube Wells (STWs), fuel and pesticides etc.

Recommendation

Considering major constraints and problems of the area the following management practices can be taken:

(1) Development of irrigation and other input facilities,

(2) Ensure required electricity supply during irrigation period,

(3) Re-excavation of silted canals and kutcha drainage converted into underground pipe system,

(4) Follow fertilizer recommendation by soil testing,

(5) Ensure improve quality of HYV/Hybrid and drought tolerant and cold susceptible crops varieties,

(6) Farmers training on modern agriculture crop production technologies, proper use of pesticides, chemical fertilizers and vermi-compost,

(7) Multipurpose cold storage facilities should be provided to preserve the perishable products and also development of wholesale market infrastructure,

(8) Protect land degradation and also minimize conversion of agricultural land to non-agricultural uses,

(9) Rice and non-rice crops integrated farming,

(10) Establishment of agro based processing center and industries, and

(11) Preparation of Development Plan for Fourteen Upazilas Pakage-03, Land Zoning and also village improvement act need to be implemented which will reduce the conversation of double & triple crop land areas to non-agricultural purposes.

3.4.3 Kathuli Union Land Use

This union consists of 6 Mauza and 11 villages with the area of 3324.29ha. Land type is the dominant factor guiding choice of crops and cropping patterns of Kathuli Union. Selection of crops largely depends on topographic position of land and crops cultivation facilities. Data collected during field study shows that Kathuli Union comprises predominantly with medium low lands (46.18%) followed by medium high land (38.27%), high land (7.97%), and low land (7.21%) and very low land (0.37%). Land which is above flooding level can provide wide range of opportunities for growing crops. Considering present land use National Land Zoning Project, March 2015 was identified and proposed this Union as **Agriculture Zone.** High land and medium high land is suitable for diversified crop cultivation including Boro, T. Aman, Tobacco, Sugarcane, Chili, Mustard, Banana, Mango, Litchi, Maize, Betel leaf and vegetables etc. which is included in cropping pattern in this Union (Land Zoning Report, March 2015 & SAAOs December 2016). kathuli Union having agriculture cultivated area of 6517ha of land of which net cropped area is 2817 ha. Out of the total cultivable land in kathuli Union double cropped (45.79%) followed by triple cropped (40.11%), single cropped (12.32%) and four cropped (1.78%). Kathuli Union farmers at present about 12 cropping patterns are practiced which is shown in Table 3.7. Land fertility is moderate fertile, productive and potential for agricultural uses. Soils of the Union comprise mostly clay to loam. The soil P^H is 5.8-7.5. The Agro-Ecological Zone of the Union is Highly Ganges River Floodplain (AEZ-11). The cropping intensity is 231%.

Table 3.7: Present Cropping Patterns of Kathuli Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area(ha)	% of NCA
Kathuli	2817	Boro(HYV), Fallow, T.Aman(HYV)	231	742.42	26.35
		Wheat, Jute, T.Aman		760.59	27.00
		Wheat, Jute, Vegetables		281.7	10.00
		Tobacco, Jute, T. Aman		291.09	10.33
		Pulses, Jute, T.Aman		187.8	6.67
		Potato, Chili, Vegetables		34.41	1.22
		Vegetables, Aus, Muskalai		112.68	4.00
		Mustard, Vegetables, Muskalai		124.6	4.42
		Maize, Aus, T.Aman		61.04	2.17
		Betel leaf		23.11	0.82
		Spices, Fallow, Vegetables		37.56	1.33
		Orchard		160	5.68
		Total		2817	100.00

Source: SAAOs of Kathuli Union 2016

Major Problems on Crop Cultivation

The major problems in Kathuli Union for crop cultivation are: (i) Risk of flooding, river erosion and sand deposition on agricultural lands and top soil cutting, (ii) Most of the canals silted, water congestion and Kutcha drainage system, (iii) Kutcha and damaged road system, (iv) Drought and inadequate electric supply during boro season, (v) Farmers lack of knowledge and awareness on modern crop production technology, (vi)Shortage of cold storage, Seed store and lack of wholesale market infrastructure, (vii) Less supply of quality HYV/Hybrid crop seeds, cultivation& irrigation equipments,(viii) Scarcity of agriculture labor and wage rate is high and Less market price of agricultural produce crops,(ix) Increase tobacco cultivation area ,(x) No soil testing facilities and (xi) land resources are gradually decreasing in Kathuli Union due to natural and manmade disasters/reasons. High population pressure, unplanned rural settlements, road construction and infrastructural development activities were on agricultural land.

Recommendation

Considering major constraints and problems of the area the following management practices can be taken:

(1) Re-excavation of old and silted river, canals/khals which help to increasing water flow,

(2) Adapt Rice and non-rice crops integrated farming,

(3) Farmers training on modern agriculture crop production technologies, water management,

(4) Follow fertilizer recommendation by soil testing,

(5) Ensure improve quality of HYV/Hybrid and drought tolerant and cold susceptible crops varieties,

(6) Nonstop electricity supply during boro crop season,

(7) Development of irrigation facilities and kutcha drainage converted into underground pipe system,

(8) Multipurpose cold storage facilities should be provided to preserve the perishable products, and

(9) Development of wholesale market infrastructure and road communication at local level,

(10) Improvement of soil fertility, preparation of vermin-compost program need to be implemented at farmer's level and arrange for financial assistance and training from DAE.

(11) Preparation of Development Plan for Fourteen Upazilas Pakage-03, Land Zoning and also village improvement act need to be implemented which will reduce the conversation of agricultural land to non-agricultural purposes,

3.4.4 Kazipur Union Land Use

Most of the areas of this Union are developed from transformed alluvial deposit by the Ganges-Padma river system. The landscape is complex and seasonally flooded. General soil color of Kazipur Union is grey to dark grey. The soil P^H is 6.5-7.8. The Agro-Ecological Zone of the Union is Highly Ganges River Floodplain (AEZ-11). Agricultural production is highly dependent on adaptable climatic conditions. Kazipur Union gets high potentials for its land and agricultural production. Considering present land use National Land Zoning Project, March 2015 was identified and proposed this Union as **Agriculture Zone.**

Total area of this union is 5497.98 and consisting 4 mauza and 10 villages. Kazipur Union comprises predominantly with medium high lands (64.35%) followed by high land (23.00%), medium low land (10.82%), and low land (1.82%). Land which is above flooding level can provide wide range of opportunities for growing crops. The cropping intensity is 261%. kazipur Union having agriculture cultivated area of 7728 ha of land of which net cropped area is 2957 ha. Out of the total cultivable land in this Union triple cropped (61.72%) area followed by double cropped (34.16%), single cropped (2.87%) and four cropped (1.25%) areas. This indicated that the highest lands are used for three or more crops production. Kathuli Union farmers at present about 12 cropping patterns are practiced which is shown in Table 3.8. Among the

cropping patterns the highest contribution two cropping patterns are: Wheat→Jute→T. Aman(39%) and Boro→Fallow→T. Aman (23.33%). Farmers cultivated multiple crops are: Tobacco, Chili, Mustard, Banana, Mango, Litchi, Maize, Betel leaf and vegetables etc. which is included in cropping pattern in this Union (Land Zoning Report, January 2015 & SAAOs December 2016).

Table 3.8: Present Cropping Patterns of Kazipur Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area(ha)	% of NCA
Kazipur	2957	Boro(HYV), Fallow, T.Aman(HYV)	261	689.97	23.33
		Wheat, Jute, T.Aman		1153.09	39.00
		Wheat, Jute, Vegetables		305.56	10.33
		Tobacco, Jute, T. Aman		54.21	1.83
		Pulses, Jute, T.Aman		167.28	5.66
		Potato, Chili, Vegetables		152.78	5.17
		Vegetables, Aus, Muskalai		69.00	2.33
		Mustard, Vegetables, Muskalai		167.42	5.66
		Maize, Aus, T.Aman		69.00	2.33
		Spices, Fallow, Vegetables		49.28	1.67
		Betel Leaf		10.56	0.36
		Orchard		68.85	2.33
		Total		2957	100.00

Source: SAAOs of Kazipur Union 2016

Major Problems on Crop Cultivation

The major problems in Kathuli Union for crop cultivation are: (i) Drought and inadequate electric supply during boro season, (ii) Water logging, (iii) River and canals silted and Kutcha drainage system, (iv) Sudden flooding,(v) No cold storage for vegetables and shortage of Seed store and lack of wholesale market infrastructure, (vi) Less supply of quality HYV/Hybrid crop seeds and equipments,(viii) Decrease of agricultural lands,(ix) Changes in rainfall pattern & climate change and (x) land resources are gradually decreasing in Kazipur Union due to non-agricultural development on agricultural land, (xi) Very poor road communication system and (xii) Top soil cutting, sand deposition in agricultural land and land degradation.

Recommendation

Considering major constraints and problems of the area the following management practices can be taken:

(1) Ensure improve quality of HYV/Hybrid and drought tolerant, early variety and cold susceptible short durable crops varieties,

(2) Re-excavation of silted canals/ khals for solving water logging problems,

(3) Development of irrigation facilities and kutcha drainage converted into underground pipe system,
(4) Multipurpose cold storage facilities should be provided to preserve the perishable products,
(5) Farmers training on modern agriculture crop production, and balance dose of fertilizers and integrated pest management technology,
(6) Ensure required electricity supply during irrigation period,
(7) Development of wholesale market infrastructure and road communication at local level, and
(8) Increase awareness among the people and land users for conservation of land and increase agricultural production through optimum use of land,
(9) Preparation of Development Plan for Fourteen Upazilas Pakage-03, Land Zoning and also village improvement act need to be implemented which will reduce the conversation of triple & double crop lands to unplanned non-agricultural purposes,
(10) Construction of embankment,
(11) Follow fertilizer recommendation by soil testing, and
(12) Establishment of agro processing center and agro based industries and marketing facilities.

3.4.5 Matmura Union Land Use

Matmura Union is comprised of 12 mauzas and 15 villages having an area of 4562.75ha. Selection of crops/cropping patterns largely depends on the types and their topographic position of land in relation to inundation depth and its duration. Lands which are above normal inundation level can provide wide range of opportunities for growing both perennial and year round annual dry-land crops. Matmura Union, the land types are high lands (54.98%) followed by medium high land (37.11%), and medium low land (7.91%) which indicates that most of the areas are free from monsoon flood and suitable for multiple crops cultivation. Soil texture is generally clay loam to loam. General fertility of the soil moderate fertile and organic matter contents is low in the high land, but moderate in the lower parts. Moisture holding capacity of soil is low to medium. The top soil P^H level ranges from 5.5-6.9. The Agro-Ecological Zone of the Union is Highly Ganges River Floodplain (AEZ-11). The agricultural potentiality of this soil is generally high for field crops. Considering present land use National Land Zoning Project, March 2015 was identified and proposed this Union as **Agriculture Zone.**

Matmura Union having agriculture cultivated area of 9622 ha of land of which net cropped area is 3660 ha. Out of the total cultivable land in this Union, triple cropped (64.56%) followed by double cropped (31.15%), single cropped (3.42%) and four cropped areas (0.87%). This indicated that the highest lands are used for three or more crops production. The cropping intensity is 263%. These Union farmers at present about 13 cropping patterns are practiced which is shown in Table 3.9. Among the cropping patterns the highest contribution three cropping patterns are: Boro→Fallow→T. Aman, Wheat→Jute→T. Aman, and Tobacco→Jute→ T.Aman.

Other cultivated crops are: Chili, Mustard, Banana, Mango, Litchi, Maize, Betel leaf and vegetables etc. which is included in cropping pattern in this Union (Land Zoning Report, March 2015 & SAAOs December 2016). Jute and Tobacco is the important cash crops in this Union.

Table 3.9: Present Cropping Patterns of MatmuraUnion

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area(ha)	% of NCA
Matmura	3660	Boro(HYV), Fallow, T.Aman(HYV)	263	683.2	18.67
		Wheat, Jute, T.Aman		524.6	14.33
		Wheat, Jute, Vegetables		305	8.33
		Tobacco, Jute, T. Aman		505	13.80
		Pulses, Jute, T.Aman		366	10.00
		Potato, Chili, Vegetables		378.2	10.33
		Vegetables, Aus, Muskalai		183	5.00
		Mustard, Vegetables, Muskalai		180	4.92
		Maize, Aus, T.Aman		139.8	3.82
		Sugarcane, Lentil, Sugarcane		44.6	1.22
		Spices, Fallow, Vegetables		117	3.20
		Betel Leaf		73.2	2.00
		Orchard		160.4	4.38
		Total		3660	100.00

Source: SAAOs of Matmura Union 2016

Major Problems on Crop Cultivation

The major problems in Matmura Union for crop cultivation are: (i) Most of the old canals of the Union found closed due to construction of unplanned housing, market and other infrastructures that are creating barriers to natural water flow and causing drainage congestion. (ii) Lack of wholesale vegetables market infrastructure, (iii) Less supply o f quality HYV/Hybrid crop seeds and equipments,(iv) Inadequate electricity supply hampers irrigation for Boro and other irrigated crops ,(v) High cost of tractor, Low Lift Pumps (LLPs), Shallow Tube wells (STWs), fuel, pesticides etc. (vi)Changes in rainfall pattern & climate change and (vi) Lack of farmers awareness on proper management of land and improper uses of pesticides and chemical fertilizers, and (vii) Very poor road communication system, (viii) The valuable agriculture land is reducing every year due to unplanned construction of houses and settlements, markets, industries, unplanned fish and poultry production and other non-agriculture development activities (ix) Increasing tobacco cultivation instead of other winter crops, (x) Top soil cutting, sand deposition & land degradation and (xi) Lack of soil testing facilities .

Recommendation

Considering major constraints and problems of the area the following management practices can be taken:
(1) Drainage congestion can be removed by re-excavating the old canals by making connection to adjacent rivers and khals of the Union,

(2) Development of irrigation facilities and kutcha drainage converted into underground pipe system which will reduce the wastage of irrigation water,

(3) Ensure improve quality of HYV/Hybrid and drought tolerant and cold susceptible short durable crops varieties,

(4) Ensure required electricity supply during irrigation period,

(5) Development of wholesale market infrastructure and road communication at local level,

(6) Farmers training on modern agriculture crop production, and balance dose of fertilizers and integrated pest management technology,

(7) Observe weather conditions and follow weather forecast,

(8) Establishment of soil testing laboratory facilities,

(9) Improvement of soil fertility, preparation of vermin-compost program need to be implemented at farmer's level and arrange for financial assistance and training from DAE,

(10) Development of agro processing center and agro based industries and commercial marketing system for high value crops, and

(11) Preparation of Development Plan for Fourteen Upazilas Pakage-03, Land Zoning and also village improvement act need to be implemented for protection of present double and triple cultivated land to non-agricultural purposes.

3.4.6 Roypur Union Land Use

Sugarcane is the most important agricultural crop and it is cultivated extensively in the area occupying up to 8% of total land of Roypur Union. The demand of sugar is primarily made from cane sugar and the rest is made from sugar beets. It is a perennial crop grows best in hot and sunny areas. It grows both in tropical and sub tropical region. In Bangladesh it is grown all over the country, however, the major sugarcane growing district are Rajshahi, Kustia, Jessore and Rangpur. High land and medium high land with well drained loamy soil neutral in reaction (P^H level ranges from 6.5-7.5) is most suitable. During growth phage rainfall encourages rapid cane formation. But during ripening stage rainfall is undesirable because it leads to poor juice quality. The marketing of sugarcane of the area is very good since the Darsana Sugar Mill is located in the nearby Upazila. Considering present land use National

Land Zoning Project, March 2015 was identified and proposed this Union as **Agriculture –Sugarcane Zone**. The top soil the Agro-Ecological Zone of the Union is Highly Ganges River Floodplain (AEZ-11). Roypur Union is consisting of 11 mauzas and 18 villages having an area of 2872.87ha.

Roypur Union, the land types are medium high land (42.29%) followed by high lands (34.53%), and medium low land (21.19%), low land (1.48%) and very low land (0.51%). Land is fertile in the char areas but it is unstable and vulnerable to natural calamities. The land use is changeable and duration of crop period is short and uncertain due to flood and natural hazards. Roypur Union having agriculture cultivated area of 5288ha of land of which net cropped area is 2118 ha. Out of the total cultivable land in this Union, triple cropped (53.16%) followed by double cropped (42.63%), single cropped (3.97%) and four cropped areas (0.24%). This indicated that the highest lands are used for three or more crops production. The cropping intensity is 250%. These Union farmers at present about 13 cropping patterns are practiced which is shown in Table 3.10. Among the cropping patterns the highest contribution three cropping patterns are: Boro→Fallow→T. Aman(31.36%), Wheat→Jute→T. Aman(29.70%), and Sugarcane→Sugarcane→ Sugarcane (8%). Other cultivated crops are: Tobacco, Pulses, Chili, Mustard, Banana, Mango, potato, Maize, Betel leaf and vegetables etc. which is included in cropping pattern in this Union (Land Zoning Report, March 2015 & SAAOs December 2016). Jute, Tobacco and Betel leaf is the principal cash crops in this Union.

Table 3.10: Present Cropping Patterns of Roypur Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area(ha)	% of NCA
Roypur	2118	Boro(HYV), Fallow, T.Aman(HYV)	250	664.25	31.36
		Wheat, Jute, T.Aman		629.12	29.70
		Wheat, Jute, Vegetables		112	5.29
		Tobacco, Jute, T. Aman		99.55	4.70
		Pulses, Jute, T.Aman		163.42	7.72
		Potato, Chili, Vegetables		36.57	1.73
		Vegetables, Aus, Muskalai		47.67	2.25
		Mustard, Vegetables, Muskalai		92.46	4.37
		Maize, Aus, T.Aman		29.51	1.39
		Spices, Fallow, Vegetables		25.35	1.20
		Sugarcane		169.44	8.00
		Betel Leaf		18.24	0.86
		Orchard		30.42	1.44
		Total		2118	100.00

Source: SAAOs of Roypur Union 2016

Major Problems on Crop Cultivation

The major problems in Roypur Union for crop cultivation are: (i) Sand deposition on agricultural land affecting normal crop cultivation,(ii) Severe river erosion damages valuable land and properties,(iii) Acute shortage of food, drought and river erosion,(iv) Less supply o f quality HYV/Hybrid crop seeds and equipments,(v) Shortage of cold storage and seed store and lack of wholesale vegetables market infrastructure,(vi) Inadequate electricity supply hampers irrigation for Boro and other irrigated crops and also kutcha irrigation drainage system, (vii) Lack of farmers awareness on proper management of land and improper uses of pesticides and chemicaI fertilizers, (viii) Kutcha and poor road communication system, and (ix)Oppression of jotdar (land grabber) and their hooligans in the char land areas , and (x) Affected people have to migrate for their livelihood in city areas,(x) Unplanned expansion of market, industries , housing and urban areas.

Recommendation

Considering major constraints and problems of the area the following management practices can be taken:

(1) River erosion should be controlled for protecting valuable land by implementation of embankment,

(2) It is an urgent issue and needs sustainable char development plan to solve the problem and in this context, Preparation of Development Plan for Fourteen Upazilas Pakage-03 will be helpful.

(3) Removal of sand by re-excavating the river and canals by making connection to adjacent rivers and khals of the Union,

(4) Development irrigation facilities and kutcha irrigation drainage converted into underground pipe system,

(5) Ensure improve quality of HYV/Hybrid and drought tolerant and cold susceptible short durable crops varieties,

(6) Ensure required electricity supply during Boro crop season,

(7) Development of wholesale market infrastructure, establishment of multiple cold storage,

(8) Development of road communication at local level,

(9) Observe weather conditions and follow weather forecast,

(10) Farmer training on water management, proper land used for crop cultivation, balance use of chemical fertilizers and judicious use of pesticides, and

(11) Intensive plantation of tree in char areas.

3.4.7 Shaharbati Union Land Use

Shaharbati Union of Gangni Upazila is potential for diversified crop cultivation. The land use and land cover of the Union is agriculture dominated. Shaharbati Union is consisting of 6 mauzas and 12 villages having an area of 2807.29 ha. The Agro-Ecological Zone of the Union is Highly Ganges River Floodplain (AEZ-11). The top soil

is occupied by moderately permeable loam to clay loam. The soil P^H level ranges from 6.4-6.8. Moisture holding capacity of soil is low to medium. Selection of crops largely depends on land types and topographic position of land. Shaharbati Union, the land types are medium high land (75.48. %) folllowed by high lands (18.15%), and medium low land (6. 37%).Majority of the land under this Union is under medium high and high land which are very suitable for diversified crop cultivation. Multiplicity of cropping system has been one of the main features of the Shaharbati Union. Farmers of this harnessing their life style by producing various crops round the year. Considering present land use National Land Zoning Project, March 2015 was identified and proposed this Union as **Agriculture Zone**.

In agriculture, multiple cropping is the practice of growing two or more crops in the same space during a single growing season. When more land area is suitable for triple or four crops then the cropping intensity will be increased. The cropping intensity is 263%. Shaharbati Union having agriculture cultivated area of 6840ha of land of which net cropped area is 2606 ha. Out of the total cultivable land in this Union, triple cropped (59.82%) followed by double cropped (37.53%), single cropped (1.04%) and four cropped areas (1.61%). Shaharbati Union farmers at present about 13 cropping patterns are practiced which is shown in Table 3.11. Among the cropping patterns the highest contribution three cropping patterns are: Boro→Fallow→T.Aman(29.67%), Wheat→Jute→T. Aman(23.98%), and Wheat→Jute→ Vegetables (12.33%). Other cultivated crops are: Tobacco, Pulses, Chili, Mustard, potato, Maize, Betel leaf and year round vegetables etc. which is included in cropping pattern in this Union (Land Zoning Report, March 2015 & SAAOs December 2016). Jute, Tobacco and Betel leaf is the principal cash crops in this Union.

Table 3.11: Present Cropping Patterns of Shaharbati Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area(ha)	% of NCA
Shaharbati	2606	Boro(HYV), Fallow, T.Aman(HYV)	263	773.11	29.67
		Wheat, Jute, T.Aman		625.03	23.98
		Wheat, Jute, Vegetables		321.41	12.33
		Tobacco, Jute, T. Aman		165.06	6.33
		Pulses, Jute, T.Aman		225.8	8.66
		Potato, Chili, Vegetables		64.81	2.49
		Vegetables, Aus, Muskalai		115.3	4.42
		Mustard, Vegetables, Muskalai		48.43	1.86
		Maize, Aus, T.Aman		34.75	1.33
		Spices, Fallow, Vegetables		66	2.53
		Sugarcane, Sugarcane, Sugarcane		42.12	1.62
		Betel Leaf, Betel leaf, Betel leaf		68.18	2.62

		Orchard, Orchard, Orchard		56	2.15
		Total		2606	100.00

Source: SAAOs of Shaharbati Union 2016

Major Problems on Crop Cultivation

The major problems in Shaharbati Union for crop cultivation are: (i) Cultivable agriculture lands are reducing every year due to unplanned construction of houses and settlements, markets, industries, unplanned fish and poultry production and other non-agriculture development activities,(ii)) Less supply o f quality HYV/Hybrid crop seeds,(iii) Kutcha and damaged road communication system,(iv) Produce agricultural crops less market price and scarcity of agriculture labor ,(v) Shortage of cold storage and lack of wholesale vegetables market infrastructure,(vi) Inadequate electricity supply hampers irrigation for Boro and other irrigated crops,(vii) During data collection most of old canals found closed due to siltation and unplanned infrastructure and kutcha irrigation drainage system,(viii) Top soil cutting, Sand deposition on agriculture land, (ix) High cost of tractor, Low Lift Pumps (LLPs), Shallow Tube wells (STWs), fuel, pesticides etc, (x) Lack of agro processing center and agro based industries, and (xi) lack of farmers knowledge on modern crop production technology, fertilizer & water management & proper land use.

Recommendation

Considering major constraints and problems of the area the following management practices can be taken:

(1) Drainage congestion can be removed by re-excavating the old canals and excavating new canals by making connection to adjacent rivers and khals of the Union,

(2) Development of irrigation system & kutcha drainage converted into underground pipe system which will reduce the wastage of irrigation water and increase the command area, (3) Ensure improve quality of HYV/Hybrid and drought and cold tolerant, pest & diseases resistant crop variety, susceptible short durable crops varieties,

(4) Ensure required electricity supply during irrigation period,

(5) Development of wholesale market infrastructure and road communication at local level,

(6) Farmers training on modern agriculture crop production, and balance dose of fertilizers and integrated pest management technology,

(7) Adapt rice and non-rice crops integrated farming (eco-friendly agriculture),

(8) Cultivated more high value crops with fruit tree based Agro -forestry system,

(9) Establishment of soil testing laboratories, multipurpose cold storage, agro processing center & agro based industries,

(10) Preparation of Development Plan for Fourteen Upazilas Pakage-03, Land Zoning and also village improvement act need to be implemented which will reduce the conversation of double and triple crop land areas to non-agricultural purposes. The local people opinion found very much positive to protect arable land through implemented PDPFUP-03.

3.4.8 Sholo Taka Union Land Use

Sholo Taka Union gets high potentials for its land for fish and agriculture production. Total area of this Union is 3238.06 ha and consisting of 11 mauzas and19 villages. Fish is cultivated extensively in the area occupying up to 7.77% of total land of Sholo Taka Union. Sholo Taka Union has a total wetland area of 251.80 ha of which 14.89ha is under open water capture fisheries and 236.91ha is under culture fisheries. Open water/culture fisheries throughout the year in the permanent water bodies but in the flood plain areas capture fisheries are abundant in the monsoon season. Baor are used for open water fisheries. The fisheries are one of the important sources of nutrition, income generation, employment and livelihood in this Union. Paddy fields and seasonal floodplains are promising and potential resources for fresh water aquaculture in Sholo Taka Union. Fish is the second valuable agricultural crop, and its production contributes to the livelihoods and employment of common people of this area. Considering present land use National Land Zoning Project, March 2015 was identified and proposed Sholo Taka Union as **Agro-Fisheries Zone.** The Agro-Ecological Zone of the Union is Highly Ganges River Floodplain (AEZ-11). The top soil is occupied by clay to clay loam. The soil P^H level ranges from 5.8-6.5.

Cultivation of crops and cropping pattern largely depends on land types and topographic position of land and irrigation facilities. Sholo Taka Union land types are medium high land (38.12%) followed by medium low lands (28.80%), high land (27.53%), low land (4.70%), and very low land (0.85%). In agriculture, multiple cropping is the practice of growing two or more crops in the same space during a single growing season. When more land area is suitable for triple or four crops cultivation, then the cropping intensity will be increased. The cropping intensity is 262%. Sholo Taka Union having agriculture cultivated area of 5386ha of land of which net cropped area is 2052ha. Out of the total cultivable land in this Union, triple cropped (60.04%) followed by double cropped (37.52%), single cropped (1.46%) and four cropped areas (0.98%). At present Sholo Taka Union farmers major cropping patterns are practiced which is shown in Table 3.12. Among the cropping patterns the highest contribution three cropping patterns are: Boro→Fallow→T. Aman (37.67%), Wheat→Jute→T. Aman(17.33%), and Wheat→Jute→ Vegetables (10.67%). Boro is the principal irriigated rice. Other cultivated crops are: Tobacco, Pulses, Chili, Mustard, potato, Maize, Betel leaf and year round vegetables etc. which is included in cropping pattern in this Union (Land Zoning Report, March 2015 & SAAOs December 2016). Jute, Sugarcane, Tobacco and Betel leaf are the major cash crops in this Union.

Table 3.12: Present Cropping Patterns of Sholo Taka Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area(ha)	% of NCA
Sholo Taka	2052	Boro(HYV), Fallow, T.Aman(HYV)	262	772.92	37.67
		Wheat, Jute, T.Aman		355.68	17.33
		Wheat, Jute, Vegetables		218.88	10.67
		Tobacco, Jute, T. Aman		198.36	9.67
		Pulses, Jute, T.Aman		116.28	5.67
		Potato, Chili, Vegetables		41.04	2.00
		Vegetables, Aus, Muskalai		34.2	1.67
		Mustard, Vegetables, Muskalai		102.6	5.00
		Maize, Aus, T.Aman		35.36	1.72
		Spices, Fallow, Vegetables		24.62	1.20
		Sugarcane, Sugarcane, Sugarcane		50.72	2.47
		Betel Leaf, Betel leaf, Betel leaf		37.3	1.82
		Orchard, Orchard, Orchard		64.04	3.12
		Total		2052	100.00

Source: SAAOs of Sholo Taka Union 2016

Major Problems on Crop Cultivation

Major constraints in Sholo Taka Union for crop cultivation are: (i) During field study most of the old canals found closed due to siltation and unplanned infrastructure and kutcha irrigation drainage system,(2) Siltation of Baor wet lands, rivers and canals,(iii) Lack of cold storage, seed store and wholesale vegetables market infrastructure,(iv) Kutcha and damaged road communication system,(v) Less supply o f quality HYV/Hybrid crop seeds and cultivation equipments (power tiller, thresher, foot pump etc),(vi) Cultivable agriculture lands are reducing every year due to unplanned construction of houses and settlements, markets, industries, unplanned fish and poultry production and other non-agriculture development activities,(vii) Farmers lack of knowledge and awareness about modern crop production technology and land use, (viii) Water pollution due to improper uses of pesticides and chemical fertilizer and also industrial waste pollution, (ix) Inadequate electricity supply hampers irrigation for Boro and other irrigated crops,(x)Abrupt reduction of wetland restricts open water fisheries and its breeding place ,and(xi) Lack of policy implementation to preserve the perennial wetland areas.

Recommendation

Considering major constraints and problems of the area the following management practices can be taken:

(1) Perennial wetland should be preserved for open water fisheries and ecological balance must be maintained,

(2) Adapt rich with fish cultivation technology which will reduce the pesticides use,

(3) Implementation of Integrated Crop Management (ICM) crop production technology,

(4) Removal of sand by re-excavating the canals by making connection to adjacent rivers and khals of the Union,

(5) Ensure improve quality of HYV/Hybrid and drought tolerant and cold susceptible short durable crops varieties,

(6) Development of wholesale market infrastructure and road communication at local level,

(7) Development of irrigation system and kutcha irrigation drainage converted into underground pipe system,

(8) Ensure required electricity supply during irrigation period,

(9) Construction of permanent structure such as roads, housing, settlement etc. in the perennial water body should be prohibited and in this context, Preparation of Development Plan for Fourteen Upazilas Pakage-03 may be considered,

(10) Farmers training on fish and crops production technology, and

(11) Establishment of agro processing center and agro base industries.

3.4.9 Tentulbaria Union Land Use

The physical suitability of an area or the suitability of land has a great influence on its multiple uses. It expresses the degree to which the sustained implementation of a land use on a certain land unit is feasible without risk to the human or natural environment. Tentulbaria Union is suitable for agriculture crop cultivation due to favorable land types and other characteristics. The land use and land cover of the Union is agriculture dominated. This Union is consisting of 8 mauzas and 13 villages having an area of 3395.55ha. The Agro-Ecological Zone of the Union is Highly Ganges River Floodplain (AEZ-11). The top soil is occupied by clay to clay loam. The soil P^H level ranges from 6.0-7.7. Moisture holding capacity of soil is low to medium. Land are moderate fertile, productive and potential for agriculture uses. Tentulbaria Union, the land types are medium high land (41.11. %) followed by high lands (25.96%), and medium low land (19.51%), low land (8.15%), very low land (0.37%) and fallow land (4. 90%).Majority of the land under this Union is under medium high and high land which are very suitable for multiple high value crop cultivation. Considering present land use National Land Zoning Project, March 2015 was identified and proposed this Union as **Agriculture Zone**.

Different crops cultivation area depends on available irrigation and inputs facilities. Tentulbaria Union having agriculture cultivated area of 7567ha of land of which net cropped area is 2890ha. Out of the total cultivable land in this Union, triple cropped (62.04%) followed by double cropped (36.71%), single cropped (0.90%) and four cropped areas (0.35%). The cropping intensity is 262%. Major cropping patterns of this Union are: Boro→Fallow→T.Aman, Wheat→Jute→T. Aman, and Pulses→Jute→ T. Aman (Table 3.13). Other cultivated crops are: Tobacco, Sugarcane, Chili, Mustard, potato, Maize, Betel leaf, orchard (mango, litchi, banana etc) and year round vegetables etc. which is included in cropping pattern in this Union (Land Zoning Report, March 2015 & SAAOs December 2016). Boro is the main irrigation crop which is cultivated by using surface water. Agriculture is very important to village communities in Tentulbaria Union. Farmers are facing increasing pressures of unplanned infrastructural development that may encumber agricultural practices.

Table 3.13: Present Cropping Patterns of Tentulbaria Union

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area(ha)	% of NCA
Tentulbaria	2890	Boro(HYV), Fallow, T.Aman(HYV)	262	751.4	26.00
		Wheat, Jute, T.Aman		674.33	23.33
		Wheat, Jute, Vegetables		173.4	6.00
		Tobacco, Jute, T. Aman		210.01	7.27
		Pulses, Jute, T.Aman		260.1	9.00
		Potato, Chili, Vegetables		86.7	3.00
		Vegetables, Aus, Muskalai		67.8	2.35
		Mustard, Vegetables, Muskalai		231.8	8.02
		Maize, Aus, T.Aman		41.42	1.43
		Spices, Fallow, Vegetables		65.51	2.27
		Sugarcane, Sugarcane, Sugarcane		105.97	3.67
		Betel Leaf, Betel leaf, Betel leaf		125.23	4.33
		Orchard, Orchard, Orchard		96.33	3.33
		Total		2890	100.00

Source: SAAOs of Tentulbaria Union December 2016

Major Problems on Crop Cultivation

The major constraints in Tentulbaria Union for crop cultivation are: (i) Cultivable agriculture lands are reducing every year due to unplanned construction of houses and settlements, markets, industries, unplanned fish and poultry production and other non-agriculture development activities,(ii) Farmers lack of knowledge on modern crop production technology, (iii) Less availability o f quality HYV/Hybrid crop seeds, cultivation & irrigation equipments,(iv) Less development of irrigation system and

kutcha drainage , (v) very poor and damaged road communication system,(vi) Produce agricultural crops less market price and scarcity of agriculture labor ,(vii) Shortage of cold storage and lack of wholesale vegetables market infrastructure ,agro processing center and industries,(viii) Inadequate electricity supply hampers irrigation for Boro and other irrigated crops,(ix) During data collection most of old canals found closed due to siltation and unplanned infrastructure and poor drainage system, (x) Drought, water logging and sudden flood and changes in rainfall pattern and (xi) Top soil cutting, sand filling on agricultural land and land degradation.

Recommendation

Considering major constraints and problems of the area the following management practices can be taken:

(1) Adapt rice and non-rice crops integrated farming (Eco-friendly agriculture) and ensure farmers training and improve quality of HYV/Hybrid and drought tolerant and cold susceptible short durable crops varieties of BRRI, BARI, and BINA,

(2) Excavation and re-excavation of new and the old canals by making connection to adjacent rivers and khals of the Union which will increase the water flow and solve the water logging problems,

(3) Development of irrigation facilities and kutcha irrigation drainage converted into underground pipe system,

(4) Uninterrupted power supply to all irrigation pumps,

(5) Development of wholesale market infrastructure and road communication at local level,

(6) To increase the organic matter contents in soil, leguminous crop cultivation could be suggested in the present cropping pattern. Besides, application of organic manure and bio-fertilizer can improve deficiency of soil nutrients, introduce vermin-compost program at farmer's level by DAE,

(7) Establishment of soil testing laboratory, agro processing center for high value crops, (8) Preparation of Development Plan for Fourteen Upazilas Pakage-03, Land Zoning and also village improvement act need to be implemented which will reduce the conversation of agricultural land to non-agricultural purposes,

(9) Construction of seed preservation cold storage and food go-down, and

(10) Agribusiness development and arrange & allocate sufficient micro-credit.

3.4. 10 Gangni Paurashava Land Use

Gangni Paurashava consists of 9 Wards and 29 Paura Mahalla with the area of 1872.06.9 ha. Agricultural land is limited in context of increasing population of Gangni Paurashava. In Gangni Paurashava, a substantial area of agricultural land had shifted to a non-agricultural one viz Sand filling on fertile agricultural land, unplanned expansion of housing, settlements & infrastructure, urban expansion. Drainage congestion in some areas creates livelihood hazard. National Land zoning project March 2015, Gangni Paurashava was identified and proposed as **Paurashava area.**

The Agro-Ecological Zone of the Gangni Paurashava is Highly Ganges River Floodplain (AEZ-11). The land types of this Paurashava are high land (57.08%) followed by medium high land (37.99%), and Medium low land (4.93%). Less risk of flood due to high land. Soil texture is loam to clay loam and the soil P^H is 6.4-7.5. Land is moderately fertile. Gangni Paurashava having agriculture cultivated area of 3381 ha of land of which net cropped area is 1419ha. The highest land area is 850(59.90%) ha is used as double crops and followed by triple crops of 520(36.65%) ha and remaining 25(1.76%) ha is used as single crops and 24(1.69%) ha used for four crops. The cropping intensity of Gangni Paurashava is 238% which is less than average cropping intensity of Gangni Upazila (265%). Land is moderately fertile. Major cropping patterns of this Paurashava are Wheat→Jute→T.Aman and Boro→fallow→ T. Aman(Table 3.14). Gangni Paurashava is suitable for cultivation of paddy, Jute, Mustard, Wheat, Chili, Pulses, Onion, Sugarcane, Betel leaf, year round vegetables and Rabi crops (Land Zoning Report, March 2015 & SAAOs December 2016).

Table 3.14: Present Cropping Patterns of Faridpur Sadar Paurashava

Name of Union	Net Cultivable Area (ha)	Major Cropping Patterns	Cropping Intensity (%)	Area(ha)	% of NCA
Gangni Paurashava	1419	Boro(HYV), Fallow, T.Aman(HYV)	238	263.8	18.59
		Wheat, Jute, T.Aman		425.7	30.00
		Wheat, Jute, Vegetables		263.8	18.59
		Tobacco, Jute, T. Aman		121.9	8.59
		Pulses, Jute, T.Aman		70.95	5.00
		Potato, Chili, Vegetables		56.76	4.00
		Vegetables, Aus, Muskalai		43.86	3.09
		Mustard, Vegetables, Muskalai		42.57	3.00
		Maize, Aus, T.Aman		44.57	3.14
		Spices, Fallow, Vegetables		14.19	1.00
		Sugarcane, Sugarcane, Sugarcane		25.48	1.80
		Betel Leaf, Betel leaf, Betel leaf		27.04	1.91
		Orchard, Orchard, Orchard		18.38	1.30
		Total		1419	100.00

Source: SAAOs of Gangni Paurashava 2016

Major Problems on Crop Cultivation

(1) The major problems in Gangni Paurashava crop cultivation are: (1) Sand filling on fertile agricultural land and unplanned expansion of housing, settlements and infrastructure, (ii) Unplanned expansion of urban and commercial areas, (iii) Drainage Congestion in some areas creates livelihood hazard,(iv) Silted canals, poor irrigation drainage system which is created water logging,(v) Farmers lack of knowledge on modern crop production technology, (vi) Less supply of quality HYV/Hybrid seeds and

cultivation & irrigation equipments and price is high, (vii)Lacking of urban facilities and lack of integration & cooperation among the line agencies, (viii) Acquisition of agricultural land for non- agriculture purposes, and (ix) Lack of sustainable land use long term plan.

Recommendation

(1) Adapt Biodynamic/Eco-friendly rice and non-crops integrated agriculture and also fruit tree based Agro-forestry system,
(2) Development of irrigation facility, proper plan use of land as per its criteria could ensure better yields of agriculture crops,
(3) Excavation and re-excavation of canals and irrigation drainage system made pucca or underground pipe system,
(4) Follow fertilizer recommendation by soil testing and judicious use of pesticides,
(5) Ensuring farmers training and improve quality of HYV/Hybrid and drought tolerant and cold susceptible short durable crops varieties of BRRI, BARI, and BINA,
(6) Ensuring planned and economic use of agricultural productive land and need to minimizing agricultural land degradation and also introducing regulatory measure like adopting land zoning law and urban rural development plan are necessary to protect the agricultural land which will be ensuring" food security" for all,
(7) Preparation of Development Plan for Fourteen Upazila Package-03 needs to be followed which will helpful to control unplanned human intervention as well as to ensure proper uses of agricultural land, and
(8) Development of commercial market infrastructure, modern agro base processing center and industries.

Land Used for Single, Double and Triple cropped Areas

Land utilization, cropping pattern & intensities in Gangni Upazila depend on effective planned use of land resources, availability of irrigation facilities and use of crop production technologies etc. In agriculture, multiple cropping is the practice of growing two or more crops in the same land during a single growing crop season. It can take the form of double cropping, in which a second crop is planted after the first has been harvested. Generally, triple or four crops cultivated areas cropping intensity is high. All 09 Unions and 01 Paurashava percent of land used for single, double, triple and four crops under Upazila is shown in Table 3.15 and Figure 3.3. Study finding shows that out of 9 unions 8 Unions highest percent lands (about 60-65%) used for triple crops. Similarly, Kathuli Union and Gangni Paurashava highest lands used for double crops (37-46%). Among all the unions and Paurashava the lowest cropping intensities were found in Kathuli Union (231%) and Gangni Paurashava (238%) and others unions cropping intensities from 250-265%). All the Unions of Gangni Upazila cropping intensities are higher than the national average cropping intensities (192%). This finding clearly indicated lands of Gangni Upazila highly potential for diversified crop production.

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

Name of Union	Present Land Used in ha (%)						
	Cultivated Area	Single Cropped Area	Double Cropped Area	Triple Cropped Area	Four Cropped area	Net Cropped Area (ha)	Cropping intensity (%)
Bamandi	6490	50(2.04)	820(33.47)	1520(62.04)	60(2.45)	2450	265
Dhankhola	13091	125(2.48)	1864(36.95)	2986(59.19)	70(1.38)	5045	259
Kathuli	6517	347(12.32)	1290(45.79)	1130(40.11)	50(1.78)	2817	231
Kazipur	7728	85(2.87)	1010(34.16)	1825(61.72)	37(1.25)	2957	261
Matmura	9622	125(3.42)	1140(31.15)	2363(64.56)	32(0.87)	3660	263
Roypur	5288	84(3.97)	903(42.63)	1126(53.16)	05(0.24)	2118	250
Shaharbati	6840	27(1.04)	978(37.53)	1559(59.82)	42(1.61)	26o6	263
Sholo Taka	5386	30(1.46)	770(37.52)	1232(60.04)	20(0.98)	2052	262
Tentul baria	7567	26(0.90)	1061(36.71)	1793(62.04)	10(0.35)	2890	262
Gangni Pauraashava	3381	25(1.76)	850(59.90)	520(36.65)	24(1.69)	1419	238
Total	71910	924(3.30)	10686(38.15)	16054(57.31)	350(1.25)	28014	

Source: SAAOs and UAO Gangni Upazila, DAE 2016

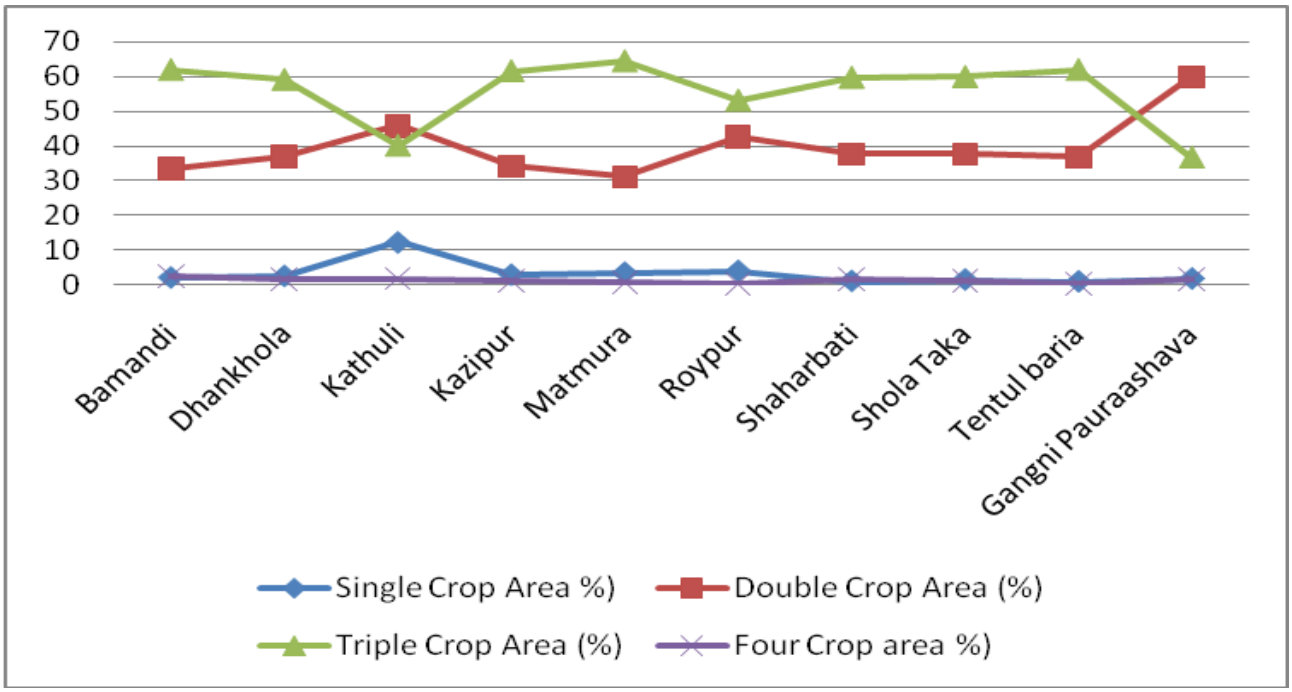


Figure 3. 3: Percent of Union Wise Single, Double, Triple & Four Cropped area under Gangni Upazila

Chapter-04 :Cropping Pattern and Cropping Intensities

4.1 Cropping Pattern

Cropping patterns has given idea about any area farmers which crops cultivated in their land. A cropping pattern is the yearly sequence and spatial arrangement of crops and fallow on a given area. Mixed farming involves the raising of crops, animals and trees. Multiple cropping is the growing of more than one crop on the same land in the period of a year, and sole cropping, or solid planting, is when one crop variety is grown at normal density, alone and in pure stands. The repeated growing of the same sole crop on the same land is monoculture, and crop rotation is the repetitive cultivation of an ordered succession of crops or crops and fallow on the same land.

Selection of crops and cropping patterns largely depends on the topographic position of land in relation to seasonal flood depth and its duration. Land types are the dominant factor guiding choice of crops and cropping patterns in Upazila as well as in the area. 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.

Land utilization and cropping pattern in Gangni Upazila depend on effective planned use of land resources, availability of irrigation facilities, use of modern technologies etc. Multiplicity of cropping systems has been one of the main features of the Gangni Upazila. Farmers are harnessing their life style by producing various crops round the year. Study finding shows that 33 different cropping pattern are practiced by Gangni Upazila farmers. The present 5 major cropping pattern are: Wheat → Jute →T.Aman (15%) followed by Boro→ Fallow→ T.Aman (13%), Mustard→Boro→T.Aman (10%), Wheat→Jute→Maskalai (8%), and Tobacco→Jute→T.Aman (6%) and other cropping pattern is shown in Table 4.1.Gangni Upazila land is very fertile and climate also very suitable for wide range of crop production. The high value agriculture products in the region is betel leaf, sugarcane and banana farming and its cultivation is the main source of income for the farmers. There are some potential beels and wetlands in the Upazila which are valuable source of indigenous species of fishes and potential for culture fisheries.

Table-4.1: Present Cropping pattern under Gangni Upazila

Major Cropping Pattern			**Area(ha)**	**Contribution %**
Rabi	**Kharif-1**	**Khari-2**		
Boro (HYV/Hybrid)	Fallow	T. Aman (HYV)	3500	12.91
Boro (HYV/Hybrid)	Aus	Vegetables	900	3.32
Mustard	Boro (HYV/Hybrid)	T.Aman	2800	10.33
Boro (HYV/Hybrid)	Aus	Fallow	1000	3.69
Wheat	Chili	Fallow	710	2.62
Wheat	Jute	Vegetables	700	2.58
Wheat	Jute	T. Aman	3980	14.68
Wheat	Jute	Maskalai	2200	8.11
Wheat	Kachu	T,Aman	180	0.66
Wheat	Aus	Fallow	680	2.51
Wheat	Vegetables	Fallow	350	1.29
Lentil	Jute	vegetables	100	0.37
Lentil	Jute	T. Aman	1185	4.37
Lentil	Jute	Maskalai	320	1.18
Lentil	Chili	Fallow	300	1.11
Lentil	Kachu	Fallow	200	0.74
Lentil	Vegetables	Fallow	500	1.84

Mustard	Jute	Vegetables	500	1.84
Tobacco	Jute	T.Aman	1620	5.97
Tobacco	Jute	Fallow	1020	3.76
Onion/Garlic	Jute	T.Aman	500	1.84
Maize	Jute	T.Aman	500	1.84
Maize	Jute	Fallow	300	1.11
Potato	Til	T.Aman	60	0.22
Boro	Dhaincha	T.Aman	160	0.59
Fallow	Aus/Jute	Cotton	670	2.47
Potato	Fodder	Fallow	100	0.37
Potato	Boro	Vegetables	200	0.74
Turmeric	Turmeric	Turmeric	300	1.11
Sugarcane	Sugarcane	Sugarcane	170	0.63
Banana	Banana	Banana	95	0.35
Betel leaf	Betel leaf	Betel leaf	265	0.98
Orchard	Orchard	Orchard	1049	3.87
Total			27114	100

Source: SAAOs and UAO Gangni Upazila, DAE 2016

4.2 Cropping Intensity

Lands which are seasonal flooded inundation longer period can only possible to grown single crops in a year. Lands, which are above normal inundation level, can provide a wide range of opportunities for growing both of perennial and year round annual crops in the area. Cropping intensities has given utilization status of agricultural land and cultivation of crops. Cropping intensity depends on land type, seasonal flood inundation period, types of crops selection for cultivation and soil. It is Index refers to the changes in the cropping intensity of crop compared to a given base year. Cropping intensity is the number of times a crop is planted per year in a given agricultural area.

It is the ratio of effective crop area harvested to the physical area. 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 distinguishing single, double and triple cropping systems respectively**.**

The land of this Upazila is intensively used for agriculture purposes. Farmers Gangni Upazila is practiced multiple cropping patterns. In agriculture, multiple cropping is the practice of growing two or more crops in the same space during a single growing season. It can take the form of double cropping, in which a second crop is planted after the first has been harvested. Any lands when three or more than three crops are

possible to cultivate the cropping intensities will be increased. The average cropping intensity under Upazila is 255% which is less than cropping intensity of Meherpur District cropping intensities but higher than national average cropping intensities 192% (Krishi Diary 2017). Study findings show that all the 9 unions and a Paurashava under Gangni Upazila cropping intensities is 231-265% which is higher than national average cropping intensity 192%. Due to more than 57% and 1% lands are used as three and four crops in this Upazila (UAO, 2017).

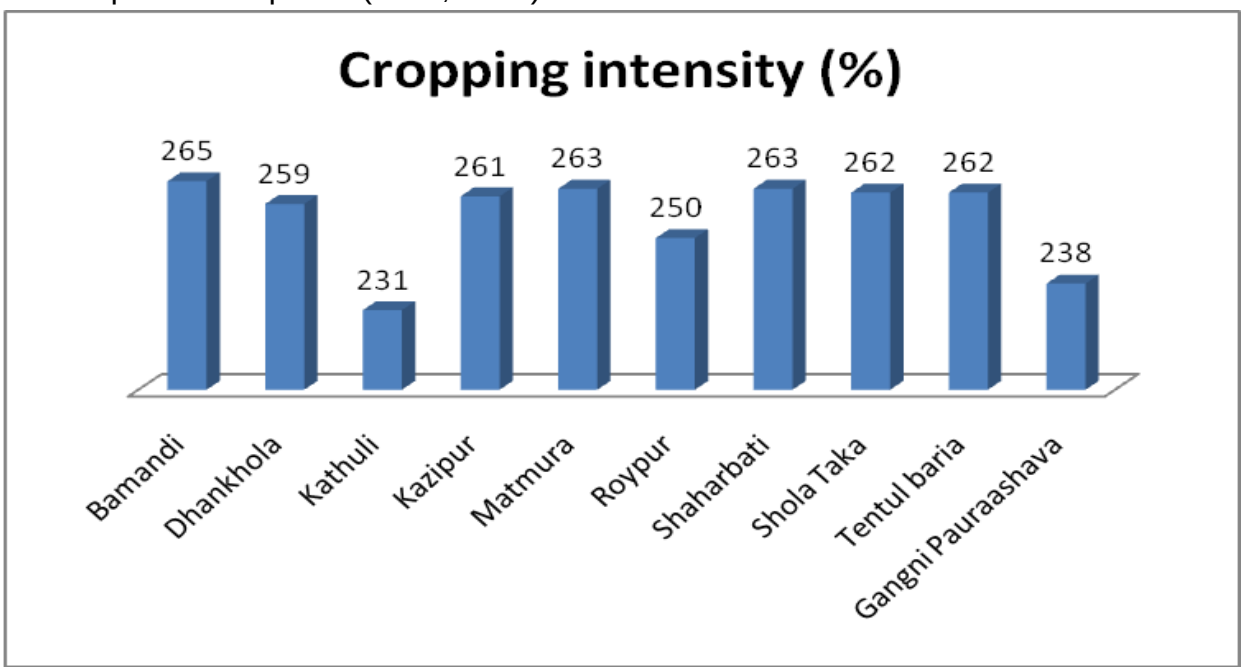


Figure 4.1: Union wise Cropping Intensities under Gangni Upazila

4.3 Present Cropped Area

Cropped cultivated area depends on land types & soil fertility, crop variety and irrigation facilities and inputs availability etc. Selection of crop largely depends on topographic position of land. Gangni Upazila land is fertile and suitable for diversified crop cultivation including Boro,T.aman, tobacco, sugarcane, chili, mustard, banana, mango, litchi, maize, betel leaf and vegetables round the year. It is recognized that a change has been taken place in production of different crops including fruits and vegetables in this Upazila. Gangni Upazila present scenario of rice and non-rice cropped area, yield rate and production levels are shown in Table 4.2. The present total different cultivated cropped area is **63466** ha of which rice cropped area covered **20460** ha and the rest **43006** ha is occupied by non-rice crops. The rice and non-rice cropped area difference are about 32% and 68% respectively of the total cropped area. This clearly indicated that highest area of Gangni Upazila lands are used for non-rice crop production.

4.4 Present Crop Production

Agricultural production is highly dependent on adaptable climatic conditions. Gangni Upazila enjoys a sub-tropical monsoon climate characterized by seasonal rainfall, moderate temperatures and humidity. Temperature, rainfall and other parameters are

the key factors of crop growth, flowering, fruiting that largely determine their yields. Crop production is a complex business, requiring many skills such as crop variety, agronomy, irrigation & pest management, mechanics and marketing.

It is one of the foods producing self sufficient Upazila. Total 113380 mt foods produced per year under Gangni Upazila. Food requirement for this Upazila population is 59424mt and food surplus is 53956 mt per year (UAO 2016). Crops higher yield depends on variety, soil types, balance use of fertilizer, pest's control, irrigation, weed and other management. Hybrid crops give higher yield in compared to HYV and local variety crops. Total crop production is 332340.**2**metric tons of which rice production is 105189 metric tons and non-rice production is 227151.2 metric tons (Table-4.2). The rice and non-rice cropped production are about 32% and 68% respectively of the total cropped production. The highest contribution among the various crops was given by T aman (57%) followed by Boro (34%) & winter vegetables (19%) and Jute (14%) and summer vegetables (11%) and others crops contribution are shown in Table 4.2.

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

Crop Grown	**Crop area(ha)**	**Yield/ha (mt)**	**Production (mt)**	Contribution (%)
Aus (LV)	20	1.95	39	0.04
T.Aus (HYV)	1800	4.5	8100	7.70
T. Aman(HYV)	12500	4.8	60000	57.04
Boro (HYV)	6000	6	36000	34.22
Boro (Hybrid)	140	7.5	1050	1.00
Sub Total Rice	**20460**		**105189**	100.00
S. Vegetables	750	33.8	25350	11.16
W. vegetables	**1320**	32	42240	18.60
Wheat	**6000**	2.8	16800	7.40
Maize	**900**	10	9000	3.96
Jute	12795	2.56	32755.2	14.42
Tobacco	2640	2.5	6600	2.91
Kachu	380	16.5	6270	2.76
Potato	375	25.45	9543.75	4.20
Sugarcane	170	15	2550	1.12
Spices	2080	9.5	19760	8.70
Oilseeds	2645	2.25	5951.25	2.62
Pulses	10872	1.5	16308	7.18
cotton	670	3.5	2345	1.03
Betel leaf	265	18.3	4849.5	2.13
Banana	95	45	4275	1.88

Fruits (Orchard)	1049	21.5	22553.5	9.93
Sub-Total	**43006**		**227151.2**	100.00
Total	**63466**		**332340.2**	

Source: SAAOs and UAO, Gangni 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. Now-a day's, most of the farmers of Gangni Upazila are dependent on irrigation. 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 was 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 Gangni Upazila is shown in Table-4.3. A total of 4500 machine were used for irrigation under different Unions in Gangni Upazila. Out of total machine, 16 DTW, 4478 STW and 6 LLP along with other indigenous irrigation tools are used for lifting water. Previously farmers have used traditional surface water lifting methods to irrigate dry season crops near rivers, canals, ponds and other depressed water basins. Extreme changes of weather conditions, water diversion, green revolution agriculture, industrial pollution, poor sanitation schemes, overpopulation and unplanned housing conditions have all been blamed for affecting the quantity and quality of surface water resources and for rendering traditional farming methods obsolete. These major shifts to ground water bring with new range of risk. So, for next century, policy-makers need to consider water management and access related issues by the concept of conservation and sustainable way.

In many cases small and marginal farmers are involved in operation and maintenance of irrigation equipments. Electricity facilities has given less cost for irrigation in compared to fuel. Only 14 DTW, 242 STW and 6 LLP have electricity facilities but 2 DTW and 3774 STW has no electricity. Electricity user's farmers reported that failed or disruption of electricity supply during Boro season were acute problems under Gangni Upazila. Famers wanted nonstop electricity supply during Boro season. Majority of the Farmers reported irrigation drainage system of DTW, STW and LLP 80-100% drain is kutcha which is causes wastage of irrigation water and reduce the target area. Farmers wanted pucca or underground pipe drainage system.

Table 4. 1: Union Wise Irrigation Machine under Gangni Upazila

Name of Union	DTW	STW	LLP	Remarks

	Electricity	Diesel	Electricity	Diesel	Electricity	Diesel	% Pucca drain	% Kutch drain
Bamandi	0	0	44	187	0	0		STW=100
Dhankhola	03	0	130	652	0	0	DTW=20	DTW=80,STW=100
Kathuli	0	0	08	620	0	0		STW=100
Kazipur	01	0	13	225	0	0	DTW=30	DTW=70,STW=100
Matmura	02	02	100	350	06	0	DTW=25	DTW=75,STW=100
Roypur	02	0	57	519	0	0	DTW=5	DTW=95,STW=100
Shaharbati	0	0	30	290	0	0	DTW=5	DTW=95,STW=100
Sholo Taka	4	0	75	361	0	0	DTW=40,STW=5	DTW=60,STW=95
Tentul baria	0	0	05	265	0	0		STW=100
Gangni Pauraashava	02	0	242	305	0	0		DTW &STW=100

Source: SAAOs under Gangni Upazila, DAE 2016

Now-a- days, irrigation is considered as a basic input for producing cereals and many other high value 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 Gangni Upazila is shown in Table 4.4. It shows that 9 Unions & a Paurashava 100 % land area covered by irrigation water in rabi season. 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. Farmers have given supplementary irrigation in drought prone and water logged areas in this Upazila.

Table4.4: Status of Union Wise Irrigation, Underground and Surface water Used

Union	Irrigated Area (%)	Irrigated Area						Availability of Surface Water	Drought Porn Area (in ha)	Remarks
		Ground				Surface				
		DTW		STW		LLP				
		No	Area (%)	No	Area (%)	No	Area (%)			
Bamandi	100	1	1	658	99	0	0	-	0	
Dhankhola	100	15	29	2572	71	0	0	-	0	
Kathuli	100	2	3	1520	97	0	0	-	3324	
Kazipur	100	0	0	846	100	0	0	-	0	-Rainfed crops need supplemental irrigation
Matmura	100	5	2	957	95	12	3	√	3686	
Roypur	100	6	4	1223	96	0	0	-	0	
Shaharbati	100	6	11	752	89	0	0	-	0	-Waterlogging
Shola Taka	100	6	9	962	91	0	0	-	0	-Drought
Tentulbaria	100	0	0	1207	100	0	0	-	0	
Gangni Paurashava	100	2	4	552	96	0	0	-	0	

Area

Source: National Land Zoning Project Report, March 2015

4.6 Cultivation Practices

Multiplicity of cropping systems has been one of the main features of the Gangni Upazila. Farmers are harnessing their life style by producing diversified crops round the year. During study, it was found that a positive change in adaption modern technologies like high-yielding varieties of rice and other crops, irrigation and mechanized cultivation in this Upazila. It is recognized that a change has been taken place in production of different crops including fruits and vegetables in this Upazila. The main thrust of mechanization is to reduce dependence on human labor and draft/animal power for tillage, planting, intercultural operation and harvesting crops. It contributed to timely cultivation and thus increased cropping intensity, reduce yield losses and wastage. Use of machines has also cut down the cost of threshing. Total of 2800 power tiller, 125 tractors and 5350 threshers are used for crop production in this Upazila. All the SAAOs and UAO reported that about 60% farmers used power tiller and 35% farmers used tractor and only 5% farmers used bullock during land preparation. Generally, per hector cultivation cost is Tk. 2000-3000/-. 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 and financial constrain. Farmers reported pests are acute problems for crop production. Farmers used pesticides over and under dose as preventive and curative measures for control of different pests because of lack of knowledge.

4.7 Major Types of Crops Cultivated

High Value Agriculture Cash Crop

Tobacco mainly a cash crop is grown well in Gangni Upazila. It is grown as a rabi crop as climate is congenial and soils are well drained then. Now it is a recognized agro-based industry. From the field study, it was found that the current demands are good export oriented factory, processing and storage facility. Farmer's were getting large amount of cash money and production loan from Tobacco Company. As a result, farmers are interested to grow tobacco instead of other rabi crops which has adverse impact on soil and crop production.

Land Use in Horticulture (orchard)

Mango is one of the most popular seasonal fruit grow well in Bangladesh. Deliciousness designated it as the 'king of fruit'. During 1980's vast area was coming under mango and other fruit tree as commercial orchard. This is considered as the organized form of horticulture of the country. The soil and climate of this Upazila is favorable for Mango production. Meherpur 'Mango' is famous for its color; juice, taste,

and yearly arrived in the market. In 2016, from the field study it was found that about 10% orchard contribution of Gangni Upazila (Table 4.2). Langra, Guti, Gopalbhog, Himshagar are the major mango varieties and it gives hard-cash to the farmers. Mango producing, processing, picketing, transport and marketing are creating seasonal income and employment. Due to unavailability of surface irrigation and labor crisis traditional field crop production lost popularity and orchard establishment became more famous to absentee land owners. From the field study it was found that the current demands are good marketing chain, processing and storage based industry. Litchi, Jackfruit, banana, citrus and other horticultural crop based Agro-forestry also has high potentialities in this Upazila.

Rice: Rice is a primary crop and a staple food of this Upazila. The rice production has significantly increased with the adoption of modern rice varieties and introduction of latest appropriate technological equipments as follows:

- Use of quality seeds;
- Increase in modern HYV/Hybrid variety Boro area;
- Replacement of local varieties by modern HYV varieties in T. Aman season;
- Increase of irrigation areas in both Boro and T.Aman season where possible and
- Application of resource management technologies.

Jute: The soil and climate of Gangni Upazila is suitable for jute production. The biggest Jute seed farm of Bangladesh has been established at Chitla village in Dhankhola Union of Gangni Upazila. It is now under Bangladesh Agricultural Development Corporation (BADC) and improved variety of jute seed is produced here. In Gangni upazila, 12795 ha area jute were cultivated in 2016. It is a primary and one of the main cash crops of this Upazila. Jute 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. Yield increase, availability of better quality seeds, and improved provision of extension and credit support to growers for this crop. Jute leaf is a common and favorable vegetable item to the farmers.

Maize Cultivation: Maize is third important cereal after rice and wheat. It is a versatile crop and is more nutritious and requires less irrigation. 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. Lack of capital as well as high price of inputs is a barrier to its higher production. Maize cultivation is becoming profitable than other cereals among farmers in Gangni Upazila.

Sugarcane: Sugarcane is the principal raw material for sugar, gur, and cane juice. It is only dependable industrial crop in Roypur Union under Gangni Upazila. The demand of sugar is primarily made from cane sugar and the rest is made from sugar beets. It is a perennial crop grows best in hot and sunny areas. The soil and climate of Gangni Upazila found very suitable for sugarcane plant growth. High humidity during the growing period and dry weather at maturation lead to high production. Family labor cost, cost of fertilizer, number of fertilizing, sowing/planting time of intercrop, cost of sett were the important factors which influence the profitability of sugarcane production both as intercrop and as monoculture. High prices of inputs, lack of scientific knowledge are the major problems in sugarcane production. The marketing of sugarcane of the area is very good since the Darsana Sugar Mill is located in the nearby Upazila.

Oilseed crops: Mustard, Groundnut, Sunflower and Til are popularly cultivated in Gangni Upazila. In Gangni Upazila 2645 ha oilseeds crops were cultivated in the year 2016. Mustard as an oilseed crops takes first place in respect of cultivated area in Bangladesh. Farmers of Gangni Upazila generally cultivated mustard before Boro cultivation. 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: Vegetables is one of the essential food items for growth and maintenance of health of human being. Farmers are now well motivated to grow vegetables as commercial. Encouraging homestead level vegetables cultivation could be alternative source of household income generation. Rabi season vegetables are available in the month of December to March. Numerous kharif vegetables are available in April to November. Field study data shows that 750 ha. S. vegetables and 1320 ha W. vegetables was cultivated in 2016 under Gangni Upazila (Table 4.2). The soil and climate conditions of this Upazila area are favorable for multiple vegetables production. 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: The important spices are Chili, Turmeric, Ginger, Onion & Garlic etc. The soil and climate conditions of Gangni Upazila are favorable for Chili and Onion production. There is wide opportunity to grow onion & garlic as commercial basis to meet up national and internal demand and also to export.

Pluses: The pulses of Bangladesh comprise of six major crops, namely, lentil, khesari, black-gram, mungbean, chickpea and pigeon pea. The soil and climate of Gangni Upazila areas are highly suitable for cultivation of different types of pulses. At present 10872 ha lands used for pulses cultivation. Lentil, mungbean and pigeon pea occupy important place in this area. The cropped area and production of these pulses have been on the decline over the past few years mainly because of the increased

emphasis on HYV rice, wheat and maize. But pulses are very important because of their protein supply to the human diet and nitrogen fixation for soil nutrition.

Conversion of Agriculture Land to Non-agriculture

Agricultural land is the main resource in agricultural crop production. Many high value crop vegetables are grown in this Upazila. There is wide opportunity to grow different fruits, betel leaf, sugarcane, onion, garlic, pulses, oilseeds, and vegetables as commercial basis to export. “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 Gangni Upazila a substantial amount of agricultural land had been shifted to a non-agricultural one like construction of houses, brickfield, sawmill, industry, road, market and other infrastructures. Absence of proper planning converts the arable land to other uses 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 1: Mustard & Tobacco Crop Field

Plate 2: Mango Garden

Plate 3: Maize Crop Field

Plate 4: Farmers Onion Crop Field

Plate 5: Banana with Chili Crop Field

Plate 5: Rice Crop Field

Plate 6: Tobacco & Wheat Crop Field

Plate 7: Banana Garden

Plate 8: Wheat, Tobacco & Mustard Field

Plate 9: Chili Crop Field

Plate 10: Betel Leaf Field

Plate 11: Pulse Crop Field

Plate 12: Lady's' Finger Vegetable Field

Plate: 13: Groundnut Field

Plate 14: Tomato Field

Plate 15: Cucumber Vegetable Field

Plate 16: Gangni Upazila Gate

Plate 17: Map of Agriculture Block

Plate 19: UAO given speech to SAAOs agri- information

Plate 20: Consultant discussed about

Plate 21: AEO given speech to SAAOs Information

Plate 22: SAAOs Given Agriculture

Plate 23: SAAOs fill up the Questionnaire

Plate 24: Agri-Consultant given Instruction

Plate 25: Consultant checking forms

Plate 26: SAAOs Given Information

Plate 27: Consultant checking given information Plate 28: Closing speech given by UAO

CHAPTER FIVE: PRODUCTION COST OF RICE AND VEGETABLES

5.1 Cost of Rice production

Bangladesh has achieved the self-sufficient in rice production in 2012. In terms of individual crops, rice continuous to dominate the agriculture sector-occupying more than three fourths of cropped area. 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 and 2015-2016 were conducted survey all over the country in three rice seasons (Boro, Aus and Aman paddy). BRRI study findings show that Boro and Aus farmers per kg rice production cost was Tk 18.65 and Tk.18.64 and Aman rice production cost was Tk17.61 which is less than Boro and Aus. During 2015-16, BRRI study shows that

farmer's average per kg cost of Boro Tk.20.07 followed by Aus Tk.18.37 and Aman Tk.17.83 in the year 2015-16 (Table 5.1). Cost of per kg Boro rice production is increased Tk.1.42.

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 and also production cost was calculated for Boro Tk. 22.06, Aman riceTk.19.0 and Wheat Tk. 28.50 per kg in the year 2016-17. Table 5.1 shows that farmer's production cost of Boro, Aman and wheat is increased in 2016-17 in compared the rice production cost of 2015-16. Generally, Government has declared the buying rat of Boro, Aman and Wheat from farmers every year. On this basis Government has declared buying rate of Boro rice Tk.20.70, Aman rice Tk18.50 per kg and Wheat 27.02 per kg respectively in 2016. Gangni 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. Farmers wanted and also need to ensure the profitable farm gate price for rice.

Table 5. 1: Cost of Rice Production (2014-15)

Name of Crops	Average per kg crop production cost (Tk.) in 2014-15 (BRRI)	Average per kg crop production cost (Tk.) in 2015-16 (BRRI)	Average per kg crop production cost (Tk.) in 2015-16 (DAM)	Average per kg crop production cost (Tk.) in 2016-17 (DAM)
Boro	18.65	20.07	1808	22.06
Aus	18.64	18.37	-	-
Aman	17.61	17.83	18.20	19.00
Wheat	-	-	23.50	28.50

Source: Agriculture Economic Division, BRRI 2016, and Department of Agriculture Marketing DAM) 2016 &2017

5.2 Cost of Vegetable Production

Production of vegetables is a key factor in ensuring a continuous supply of raw materials for the development of agribusiness in horticulture. It is often argued that vegetable production in Bangladesh has comparative advantages, but despite these opportunities, agribusiness in horticulture is not flourishing commercially, especially for vegetables. 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. Farmers of Gangni 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. 7000-8000/- *(Upazila Agriculture Office, Gangni).* Generally, supplementary irrigation provided potatoes, Chili and others winter vegetables. Supplementary irrigation cost is Tk3000-5000/- 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.5000-6000/-) and Winter & Summer vegetables fields (Tk. 4000-4500/ha). Labor cost day by day increased and per day labor cost more or less Tk. 350-400 depends on crop season.

The present study was assessed financial profitability of Brinjal, Tomato, Potato and Cabbage/cauliflower vegetables production under Gangni Upazila which is shown in Table 5.2. Finding shows that Tomato cultivation is more profitable Tk.1261850/-per ha followed by Brinjal Tk. 802500/- per ha, Cabbage/Cauliflower Tk. 548840/- per ha and potato Tk 328400/-per ha respectively. Study finding clearly indicated that all four types of vegetables cultivation are profitable for farmers of Gangni Upazila. It is important to develop business based on growing vegetables to encourage the farmers, since horticultural crops have comparative advantages in Bangladesh. Cost-benefit analysis of these crops also suggests that production of vegetables is economically viable for the country. Despite the prevailing opportunity for these crops, the country has not been able to create any successful businesses in this sector.

Table 5.2: Financial Profitability of 4 types of Vegetables Production in Gangni Upazila

Vegetables	Yield (Kg/ha)	Price (Tk/Kg)	Gross Return (Tk/ha)	Total Cost (Tk./ha)	Net Return (Tk/ha)
Brinjal	50000	20.45	1022500	220000	802500
Tomato	55000	25.67	1411850	150000	1261850
Potato	30000	16.78	503400	175000	328400
Cabbage/Cauliflower	52000	12.67	658840	110000	548840

Source: SAAOs and UAO, Gangni Upazila 2016

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 (Fig.5.1). Cost of per kg and per 40kg was found approximately the highest for tomato and the lowest for cabbage and cauliflower.

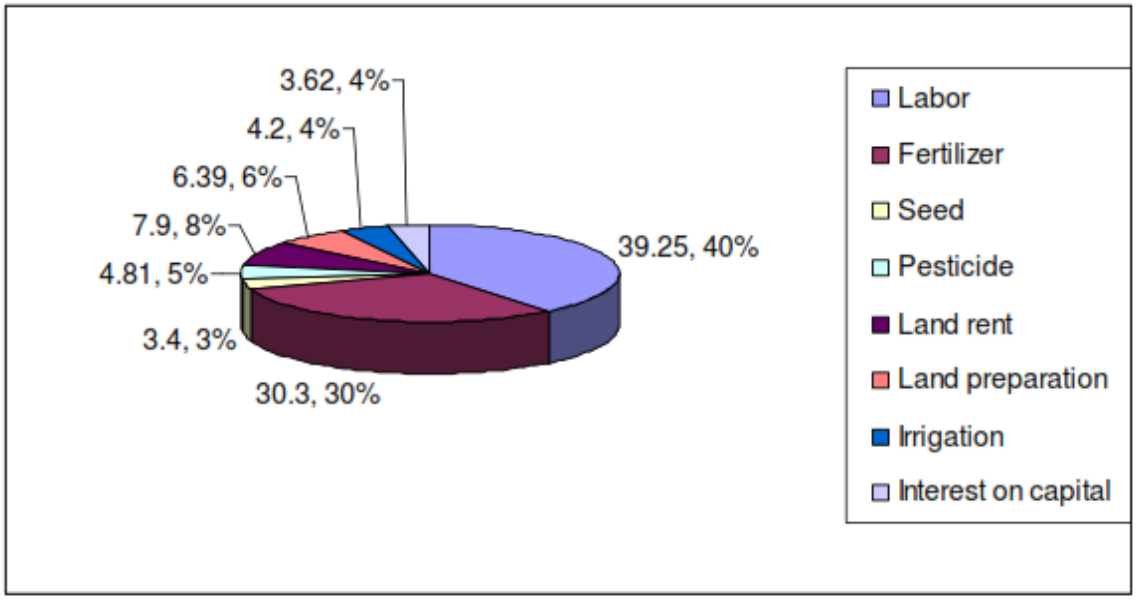


Figure 5. 1: Percentage of Major Types of Production Costs for Vegetables.

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

Brinjal is one of the most popular and important vegetable in Gangni Upazila. Farmers are cultivated these 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 5.3). 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. 3: Compare the Financial Profitability of Brinjal Vegetable Production in Different Region

Cultivati	Study	Yield	Price	Gross	Total	Net	BC	Source

on year	Area	(kg/ha)	(Tk/kg)	Return (Tk/ha)	Cost(Tk/ha)	Return (Tk/ha)	R	s
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

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

Agricultural land is the main resource in agriculture. Agricultural land resources are gradually degrading in Gangni Upazila due to natural and manmade reasons. High population pressure, rural settlements and rapid urbanization, road construction, unplanned fisheries, construction of brick fields, land acquisition and other infrastructural development are the dominant factors for changing land resources in Gangni Upazila.

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 09 Unions and a Paurashava all Sub- Assistant Agriculture Officers of Gangni Upazila and review the other documents. The growth or decline of agricultural land use during last ten years under Gangni Upazila is shown in Table 6.1 and Figure 6.1. Table 6.1 finding shows that above 99% local variety rice cultivation area 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 265% 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 maize 233% increased but only 15% increased in wheat cultivated area. The main reason for increased of maize yield, required less water, higher yield, market demand and price is high. Highly significant changed or increased during ten years was occurred in Spices (91%) followed by betel leaf (85%), fruit gardening (72%), tobacco (55%), pulses (37%), and winter vegetables (29%) cultivated area under this Upazila. Similarly, the highest cultivated area was decreased in sugarcane (66%) followed by tuber crops (49%) and winter vegetables (15%) cultivated area. The main reasons for decrease are less profitable, produce crop market demand and price is less in compared to others crops. Table 6.1 shows, among the other purposes remarkable significant changed were occurred in poultry farm (129%) and followed by Brick field (64%), rural settlement & rapid Urbanization (43%) and fish cultivation (8%) respectively. This finding clearly indicated fertile crop land day by day has gradually decreased which will be reflected on agriculture crop production as well as environment.

However, alike other parts of the country, the area of agricultural land of Gangni Upazila are reduced gradually because of growing pressure from increased human population. To ensure food supply to an increased population of the country, cultivable land should be protected from being converted to other land uses. Protection of double and triple cropped land area is the top priority issue.

Table 6. 1: Growth or Decline Agriculture Land Use during the Last 10 Years

Sl. No.	Agricultural land use	Land Use (2005) in ha	Land Use (2015) in ha	% Change
1	Paddy (local varieties)	3200	20	-99.38
2	Paddy(HYV)	7700	20440	265.45
3	Wheat	5200	6000	15.38
4	Maize	270	900	233.33
5	Vegetables (Summer)	580	750	29.31
6	Vegetables (Winter)	1560	1320	-15.38

7	Tuber crops	730	375	-48.63
8	Pulse crops	7920	10872	37.27
9	Oilseed crops	2250	2645	17.56
10	Spice crops	1090	2080	90.83
11	Betel Leaf	154.4	285	84.59
12	Sugarcane	500	170	-66.00
13	Jute	11470	12795	11.55
14	Tobacco	1700	2640	55.29
15	Fruit garden	460	790	71.74
16	Other purposes			
	Fish cultivation	855.59	928.9	8.00
	-Brick field	66	108	63.64
	-Poultry farm	7	16	128.57
	Rural settlement & rapidUrbanization	4494.64	6420.92	42.86

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

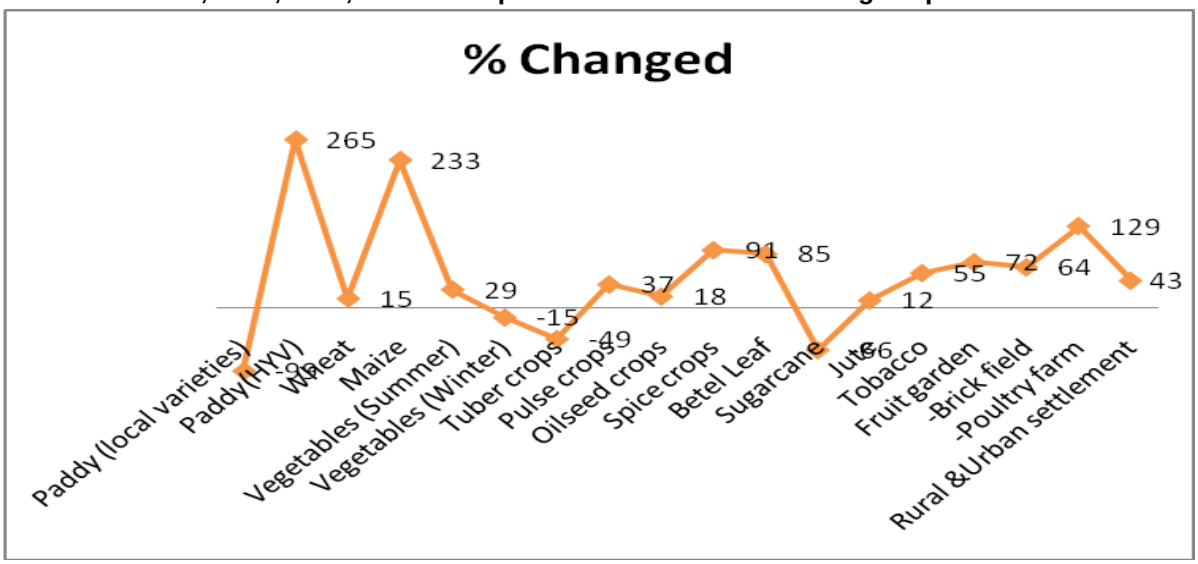


Figure 6.1: Growth or decline Agriculture Land in Gangni Upazila during Last 10 Years (2005-2015)

CHAPTER SEVEN: MAJOR PROBLEMS OF CROP PRODUCTION IN GANGNI UPAZILA (09 UNIONS & 01 PAURASHAVA)

Agriculture survey and Participatory Rural Appraisal December 2016 study report findings show farmers some problems are common in different 09 unions & 01 Paurashava under Gangni Upazila such as water logging, drought, power failure, climate change & change in rainfall pattern and infrastructure etc. Major problems are:

- ⇨ Water stagnation/drainage congestion,
- ⇨ Drought and cold wave create negative impact on diversification of crops,
- ⇨ Siltation of Baor wet lands, rivers and canals,
- ⇨ Changes in rainfall pattern and climate change,
- ⇨ River erosion, sand deposition on agricultural land,
- ⇨ Most of old canals found closed due to siltation and unplanned infrastructure,
- ⇨ Less supply of quality HYV/Hybrid crop seeds and cultivation equipments (power tiller, thresher, foot pump etc),
- ⇨ Inadequate drainage facilities and kutcha irrigation drainage system,
- ⇨ Farmers lack of knowledge on modern crop production technology,
- ⇨ Inadequate electricity supply hampers irrigation for Boro and other irrigated crops,
- ⇨ Water pollution due to improper uses of pesticides and chemical fertilizer and also industrial waste pollution,
- ⇨ Abrupt reduction of wetland restricts open water fisheries and its breeding place,
- ⇨ Agriculture marketing system are not developed,
- ⇨ Lack of cold storage, seed store and wholesale vegetables market infrastructure,
- ⇨ Sand filling on fertile agricultural land and unplanned expansion of housing, settlements and infrastructure development activities,
- ⇨ Trend of tobacco cultivation areas increasing,
- ⇨ Soil testing laboratory is not available in Upazila and District,
- ⇨ Using less amount of bio-fertilizers and green manure or compost,
- ⇨ Cultivable agriculture lands are reducing every year due to unplanned construction of houses and settlements, markets, industries, unplanned fish and poultry production,

- ⇨ Lack of policy implementation to preserve the perennial wetland areas,
- ⇨ Acquisition of agricultural land for non- agriculture purposes.
- ⇨ Top soil cutting and filling sand, unplanned expansion of urban and commercial areas,
- ⇨ Kutcha road and damaged and poor transportation in most of the Unions,
- ⇨ Change in rivers and canals morphology,
- ⇨ There is no agro processing center and industries under Unions and Upazila level,
- ⇨ Without planned cultivable agriculture lands are converted into other non-agriculture purposes.
- ⇨ City migration,
- ⇨ Lack of integration and cooperation among the line agencies, the lacking of urban facilities and also long term urban sustainable plan.

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 Gangni Upazila.

1. Developing Infrastructural Facilities: Re-excavation of canals and irrigation facilities need to be improved for mitigating impacts of crop production related vulnerabilities and climate change. Removal of sand by re-excavating the river and canals by making connected to adjacent rivers and khals of the Union. Road network at local level, soil testing laboratory, agro-processing and whole sale marketing infrastructure development, 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 multiple purpose facilities cold storage and food store need to be established and development of commercial business center.
2. To reduce the Irrigation water wastage, proper utilization and increase the irrigated command crop area the DTW, STW and, LLP kutcha drain need to be converted into pucca drainage system or introduce underground pipe irrigation system. Uninterrupted power supply to all irrigation pumps (STW & LLP). Need to be monitoring ground water table after Boro crop season every year.

3. Farming and Adaptation Practices: Adapt modern farming techniques and Choose high yields and drought tolerant varieties. Cultivated more high value crops with fruit tree based agro-forestry. Adapt rich with fish cultivation technology which will reduce the pesticides use. 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 on organic farming.

4. Vegetables Production: Different types of winter and summer vegetables are grown under 09 unions & a Paurashava area. All the Unions are excellent suitable for multiple vegetables cultivation round the year. There is no cold storage and large vegetable selling center (market) under 09 Unions. As results farmers could not get good price for their produced products. There is a need for establishment of multipurpose cold storage each Union and development of commercial market infrastructure.

5. Crop Production Inputs Availability: Ensure availability of quality HYV and Hybrid crop seeds, fertilizer, pesticides, cultivation and irrigation equipments. Information on quality seed need to be provided up to block level.

6. Availability of Crop Seeds: Drought, early variety and submergence tolerant variety of different quality HYV/Hybrid crop seeds. BRRI, BARI, BSRI and BINA have recommended drought tolerant, pest & disease resistant rice, wheat, maize, potato, pulses and oilseeds etc. 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 potato-21,22, 50, widely introduce and encouraged to cultivated farmers.

7. Fertilizer Management and Soil Health: Chemical fertilizers application in HYV varieties crops trend increasing but decreasing inorganic fertilizer (Green manure, cow

dung, compost). As a result, soil nutritional health will be alarming situation which is in future serious affected on yield. There is a need for soil health improving program for Union farmers. Soil testing facilities are not available in Upazila and District level. SRDI /DAE need to be establishing soil testing laboratory in Upazila and Union level. 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. Grow one leguminous crop (Dhaincha / Pulses/Fodder etc.) between two cereal crops. Incorporating organic manure in the soil by changing cropping patterns /crop rotation system need to be practiced. DAE need to be started preparation and sale vermi-compost by farmers under this Upazila which is improves the soil health and increase the crop yield. This vermi-compost program needs to be strengthening by helping financial assistance as well as technological training for farmers.

8. Pest Management: Insects, rats, weeds and diseases are some chronic problems which causes considerable damage of crops every season and increase the farmer's cultivation cost. For control this pest's farmers were applied pesticides under or over dose. Judicious use of pesticides needs to be developing and implement pest surveillance, monitoring and forecasting system. 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 project.

9. Agro-based Industries: Establishment of Agro-based processing center & industries in 09 unions and 01 Paurashava. There is a need for construction of commercial infrastructure for some agro-base processing center. Construction of spices crops, 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**:** As per its present used and potentialities and the proper implementation of **"Preparation of Development Plan for Fourteen Upazilas**" Package 03 (Faridpur Sadar Upazila, Bagmara Upazila, and Gangni Upazila) which will help to control unplanned human intervention as well as to ensure proper uses of agricultural land. Ensuring planned and economic use of agricultural productive land and need to minimizing agricultural land degradation and also introducing regulatory measure like adopting land zoning law, village improvement act and urban rural development plan are necessary to protect the agricultural land (double and triple crop cultivated land) which will be ensuring" food security" for all. During this study, the local people are in favor of Preparation of Development Plan for Fourteen Upazilas" Package 03 and found very much positive to protect arable land through implementing the urban rural plan.

11. The following additional systems may be adapted in an innovated way for sustainable crop production and environmental conditions of Gangni Upazila:

- Biodynamic/eco-friendly agriculture,
- Rice and non-rice crops integrated farming,
- Grow vegetables predominantly,
- Fruit tree based Agro-forestry system,
- Integrated pest management,
- Adapt organic farming system,
- Natural disasters adaptive, rain fed and resilience farming
- Perennial wetland should be preserved for open water fisheries and ecological balance must be maintained.

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, village improvement act and increase awareness among the local peoples 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 Gangni Upazila. There is a need to develop vegetables wholesale commercial market and improvement of communication system different Unions to Upazila. Farmers need modern organic 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. Establish soil testing laboratory which will be helpful for use of balance or recommended dose of chemical fertilizers. Construction of potato and vegetables spices & 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 high value different crops such as Maize, Jute, oilseeds, fruits, vegetables and spices as commercial basis to export.

However, alike other parts of the country, the area of agricultural land of Gangni Upazila is declining gradually because of growing pressure of population and also unplanned industrial & market development. To ensure food supply to an increased population of the country these lands should be protected from being converted to other land uses. Protection of present triple and double cropped land is the top priority issue. Agricultural land identified in the present study should be protected by taking

relevant administrative measures. Integration of people's participation and effective monitoring, evaluation, logistics through institutional frame work are essential for successful implementation of **"Preparation of Development Plan for Fourteen Upazilas**" Package 03 (Faridpur Sadar Upazila, Bagmara Upazila, and Gangni Upazila) as a versatile tool to conserve and right uses of agricultural land.

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Annex- 1

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 (.05-.50 acre)		
2.	Marginal (.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. Present Land Use under Union

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

Sl No.	Type of Land use	Present land used	
		Area (ha)	%
3.	Cropping intensity		

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

Sl No.	Land type and Flood Depth. (cm)	Present	
		NCA (ha)	%
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

4. 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-OctoberMid March)	
Kharif-I (Mid March- Mid July)	
Kharif-II (Mid July- Mid October)	
Name major cropping patterns	1. 2. 3. 4.

5. 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:		

6. 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			Sugarcane=		

Crop Area(ha)	Yield/ha	Total Production(MT)	Crop Area(ha)	Yield/ha	Total Production(MT)
potato=					
Bamboo =			Betel nut=		
Betel vine(Pan)=					

7. (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 ploder

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

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

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

Government of the People's Republic of Bangladesh

Ministry of Housing and Public Works

Urban Development Directorate

Preparation of Development Plan for Fourteen Upazilas

Package-03

(Bagmara Upazila, Rajshahi District;
Faridpur Sadar Upazila, Faridpur District and Gangni Upazila, Meherpur District)

Draft PRA Report

Of

Gangni Upazila, Meherpur

May, 2017

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