CHAPTER 5

CHALLENGES

The southern region is conditioned by its geographical location, hydrological and morphological character and geo-physical and bio-physical characteristics. Proximity to the sea has added further dimensions to its vulnerabilities and opportunities. The region faces many challenges that threaten its eco-systems and production processes. Among major challenges are the emerging threats of climate change, river bank erosion, salinity, water logging and resource degradation.

5.1 Climate Change and Sea Level Rise

Bangladesh ranks fifth most vulnerable to climate change and hunger among 28 developing countries (UNDP, 2011). Sea level rise (SLR) leading to submergence of low lying coastal areas and saline water intrusion in the coastal rivers and into groundwater aquifers reducing freshwater availability, damage to the biodiversity and overall crop production and drainage congestion inside polders will also adversely affect the agriculture sector. Hazard intensity is high in the southern region compared to other areas of Bangladesh (Figure 5.1).

It is estimated that inundated area in the southern region would increase by 14 percent by 2100 with a SLR of 88 cm. Districts of Bagerhat, Barguna, Patuakhali, Khulna and Satkhira will be worst affected (Table 5.1).

Table 5.1 Increase in inundated area under different SLR scenarios

District	Inundated area (%)	Increase in inundated area (%)		
	2000 0 cm SLR	2030 14 cm SLR	2050 32 cm SLR	2100 88 cm SLR
Bagerhat	49	6	16	35
Barguna	35	2	7	29
Barisal	76	1	2	3
Bhola	11	1	2	3
Lakshmipur	6	1	2	6
Noakhali	24	1	3	7
Patuakhali	37	2	4	23
Khulna	39	3	7	19
Jessore	26	1	2	8
Satkhira	36	3	6	15
Total		2	5	14

The adverse impact of climatic events will manifest in lower crop productivity and reduced cropping intensity. Increased frequency of extreme events such as cyclone, storm surge, SLR, soil and water salinity, incidence of pest attack and diseases, erratic rainfall and higher temperature will be observed. Allied to these phenomena, since people do not have sufficient employment opportunities around the year, their food security will be at risk.

The challenge is to develop capacity and resilience to offset negative impacts of climate change.

This needs investment in the construction and maintenance of protective infrastructures, development of climate resilient production technologies and enhancing coping capacity of people and institutions.

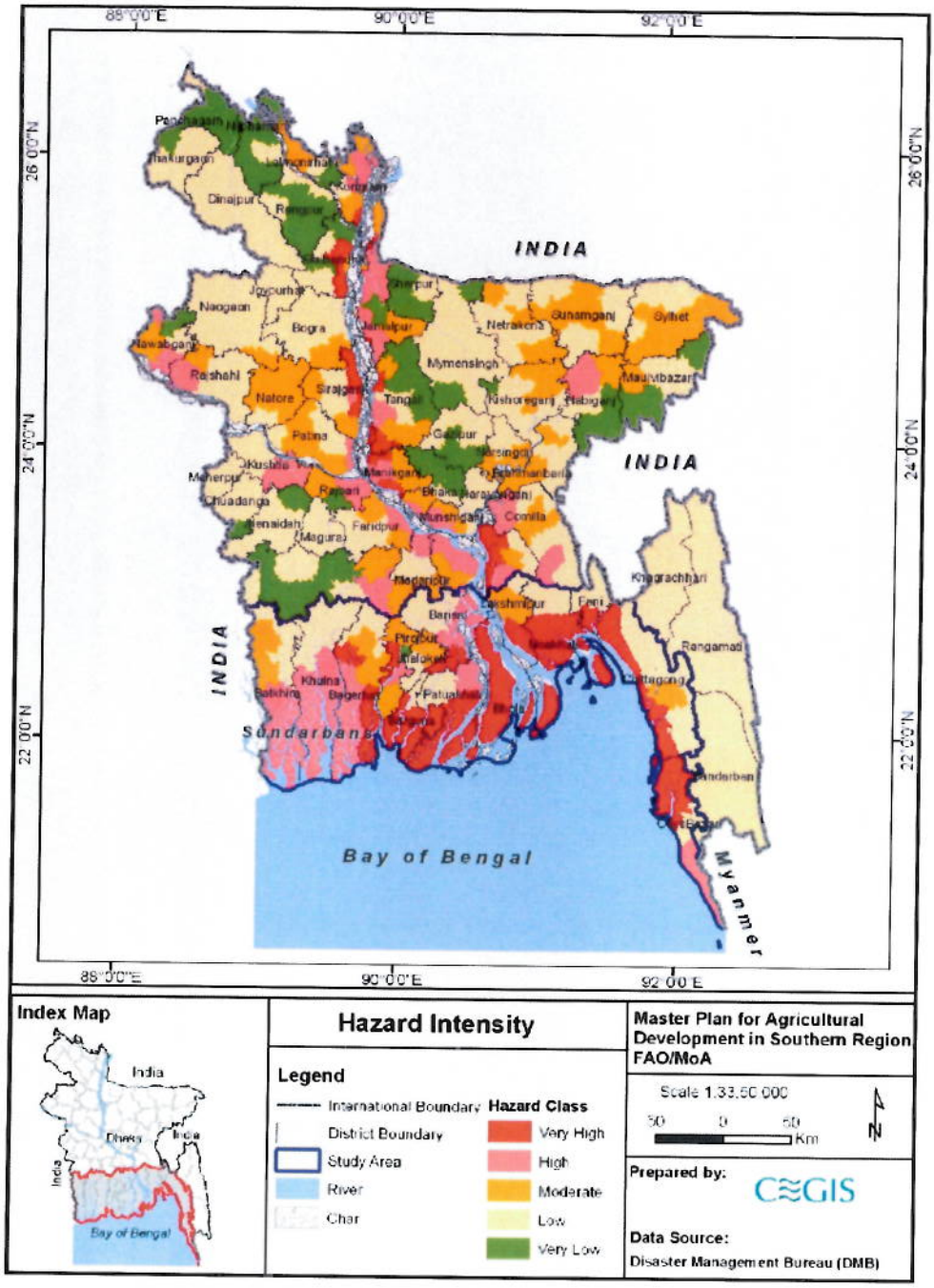


Figure 5.1: Hazard intensity of Bangladesh

5.2 Cyclone

Cyclones, often accompanied by storm surges, are devastating. These cause destruction of life, property, infrastructure and biodiversity. Recent IPCC findings predict increasing severity of devastating cyclones. Cyclones like *Sidr* and *Aila* caused large scale destruction of livelihoods in addition to death of many people. Affected people are yet to recover fully from the effect of these cyclones in 2007 and 2009.

5.3 Erosion

River bank erosion and loss of habitable and cultivable land is another acute problem. It causes huge economic losses. The World Disaster Report 2001 published by IFRCS reveals that, in Bangladesh, annually one million people are displaced and 9,000 ha of land are lost due to river erosion. It is a regular phenomenon in off-shore islands, particularly in Bhola, Hatiya, Sandwip and Kutubdia. Due to bank erosion, Sandwip has lost 180 km^2 in the last 100 years. During last 40 years, Bhola has been squeezed to 3,400 km^2 from 6,400 km^2. Kutubdia, once of 250 km^2 size, lost around its 65 percent during last 100 years and more than 60 percent of its population had to migrate to other areas. Bank erosion adversely affects the ecosystem, navigation, valuable agricultural land and drainage systems.

Though land is eroding, new land is accreting on the other side of the equation. Fertile and mature land is eroded, while new land becomes productive very slowly, taking four to five decades even after empoldering.

The question may arise whether erosion protection is technically feasible in the context of Bangladesh, or whether the people are being given a false sense of security in the guise of 'protective' structures. The associated question is whether a plan should be in place to discourage people from investing in vulnerable areas, and to have a contingency plan for evacuation to safer areas.

5.4 Salinity

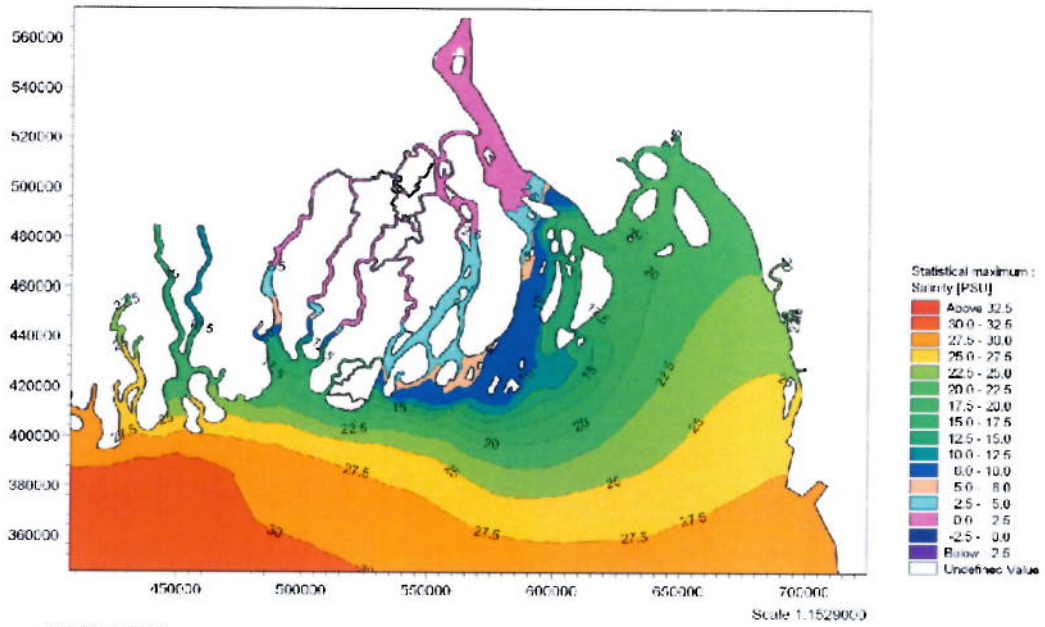
Salinity is a major constraint that hinders production of crops. But all areas are not saline at all times. The lower region of Patuakhali, Barguna, Jhalokati, Pirojpur and Bhola districts are affected by salinity. Embankments and polders are constructed surrounding these areas to protect the agricultural land. But occasionally high tidal surge hits and saline water enters polders and destroys standing crops. Although the lower reach of the drainage system of Barisal district is under influence of tidal effect, saline concentration of water is still less than 1,000 micro-mhos and is suitable for irrigation (Figure 5.2).

Khulna, Bagerhat and Satkhira are the worst hit by water salinity, while Feni, Lakhshmipur and Pirojpur are least affected.

The withdrawal of fresh water from upstream, irregular rainfall, introduction of brackish water for shrimp culture, faulty management of sluice gate and polders, regular intrusion of tidal saline water during high tide in the unprotected lands, capillary rise of soluble salts etc. are the main causes of increased soil salinity in the surface soil. About 1.05 million hectares in the southern region are

affected by soil salinity. Some of the new lands in Satkhira, Patuakhali, Barguna, Barisal, Jhalokati and Pirojpur districts have been affected significantly by different degrees of soil salinity during the last four decades (Table 5.2, Figure 3.4).

A comparative study of the salt affected area between 1973 and 2009 shows that about 0.223 million ha were affected by various degrees of salinity during the last four decades or so. It was also found that about 0.0354 million hectares of new land was affected by various degrees of salinity during 2000-2009.



Source: CEIP, BWDB

Figure 5.2: Salinity contours in the Meghna estuary

Table 5.2: Extent of soil salinity in last four decades (1973-2009) in the region

Salt affected area (000 ha)			Salinity class and area (000 ha)											
			S1 2.0-4.0 dS/m			S2 4.1-8.0dS/m			S3 8.1-16.0 dS/m			S4 >16.0 dS/ m		
1973	2000	2009	1973	2000	2009	1973	2000	2009	1973	2000	2009	1973	2000	2009
833.45	1020.75	1056.26	287.37	289.76	328.43	426.43	307.20	274.22	79.75	336.58	351.69	39.90	87.14	101.92

Source: SRDI, SRMAF Project, Ministry of Agriculture, 2010

The plants cannot absorb sufficient amount of water due to high salt concentration. In this situation, plants actually die from water stress or drought in a moist soil if the soluble salt concentration is high. Plants also suffer from toxicities of specific salt and nutritional imbalances.

5.5 Siltation of Rivers and Channels

Most of the rivers and *khals* in the region are silted up due to accelerated erosion caused by poor management of upper riparian countries and decline in upstream flow due to construction of the Farakkha Barrage. For the past 90 years, the region has depended on fresh water inflows from the Gorai to control the salinity front in the dry season. Since, the end of the 1980s, the flow in the Gorai River has been decreased by the build–up of sediment in the off-take. This reduction in dry season water levels in the Ganges has accelerated the rise of the bed level of the southern rivers. The situation has worsened due to absence of regular capital dredging.

5.6 Water Logging

Water logging, both perennial and seasonal, is a severe problem in the region. Noakhali tops the list of districts in terms of waterlogged area (Table 5.3).

Drainage congestion and water logging is a major problem of the southwest region. The drainage system consists of dense network of different types of natural canals and drains. The system includes the major perennial rivers, such as the Gorai flowing along northern boundary and other rivers marking the eastern boundary, which are either distributaries or tributaries of these rivers and flowing mostly from north to south. Off-take of these distributaries and outfall of the tributaries are silted up causing disconnection of flow in the dry season. As a result of interrupting drainage system and siltation of rivers and canals, permanent water logging in the form of *Beel* has been created in this region. Among the major *beels* are Beel Dakatia (9,000 ha) in Jessore and Khulna (Daulatpur and Dumuria upazila) and Bhutiar Beel (5,330 ha) in Bagerhat (Terokhada upazila).

Table 5.3: Area affected by water logging

District	Water logged area (ha)
Noakhali	31,221
Bagerhat	7,725
Khulna	7,390
Satkhira	6,600
Lakshmipur	4,589
Feni	3,842
Chittagong	1,500
Total	**62,867**

Source: BWDB, CEGIS, field visits

The drainage congestion in the southeast region (greater Noakhali) includes repeated inundation of agricultural land and homesteads in monsoon, which is caused by poor drainage capacity. Total waterlogged area in the region is 39,652 ha. Begumganj Upazila alone has 22,186 ha of waterlogged area (52% of the area of the upazila). Poor drainage is also a major constraint to overall development of the locality.

Noakhali Khal is the main drainage line on which drainage of all upazilas of mainland Noakhali (except Hatiya) are directly or indirectly dependant. This has been silted up for a long time. A long sandbar has formed from about 6 km downstream of Sonapur. This prevents drainage towards the south. Catchments to the north of Sonapur drain northward into Begumganj depression and eventually to Rahmatkhali Khal. Later in the monsoon season, as water level rises, flow passes over the sandbar to the south, though not in significant quantity.

5.7 Vulnerable Polders

Many polders are in dilapidated conditions in terms of breach and slip in the embankment, erosion, neglect in repair works, drainage congestion because of siltation and encroachment of canals and, above all, location in the risk zone. Water control structures in many places are damaged or non-functional. Embankments have also caused subsidence inside polders, thus further causing drainage congestion. The emerging threat of climate change and consequent sea level rise has made many polders more vulnerable. All these factors adversely affect the functionality of the polders.

The BWDB has categorized 51 polders as "most vulnerable" and another 55 polders as "medium vulnerable". To cope with vulnerability, it is necessary to rehabilitate damaged infrastructures of the polders. Productive potential of polders can be harnessed through regular and effective O&M. On the other hand, it is necessary to construct climate-resilient polders with appropriate design so that these can withstand rising water level and storm surges.

5.8 Lack of availability of quality surface water for irrigation

The southern region has a network of rivers and canals and in the main rivers there is plenty of water round the year. But during *rabi* and pre-*kharif* season there is a dearth of quality surface water for irrigation. Most of the rivers are tidally influenced and water salinity is higher than the irrigation threshold level for agricultural crops. Other than some pockets, expansion of surface water irrigation is constrained by poor quality water, mostly brackish and saline. The areas identified for expansion of surface water for *boro* and *T.aus* crops also requires investment for infrastructure development and creation of lifting devices.

5.9 Limited number of stress tolerant crops and cultivars

The NARS system has developed many promising technologies including development of new varieties of crops and management practices for the favourable eco-systems of Bangladesh. However, few salt-, drought- and stress-tolerant cultivars or appropriate management practices to improve cropping intensity for boosting agricultural production have been developed so far for the southern region. The productivity of already developed cultivars is also not promising against the severe stresses faced.

5.10 Resource Degradation

Degradation of natural resources can be in terms of worsening conditions of land, water and air, and may be natural or anthropogenic (human induced).

5.10.1 Land degradation

Main causes of land degradation are as follows:

- Severe soil degradation by erosion, contamination, compaction, losses of organic matter through improper farming practices, salinization and water logging;
- Soil degradation mainly through land transformation and deforestation;
- Deterioration of natural landscape by artificial replacement for cultivation, urbanization, etc;
- Loss of biodiversity and fragmentation of ecosystems by intensive farming methods, urbanization, etc.

Other causes of land degradation include drought, population pressure, poverty, constraints imposed by recent international trading agreements and local agricultural and land use policies. Intensive agriculture along with imbalance in fertilization has degraded lands seriously. Integrated fertilizer use is not only inadequate but also highly erratic because of high price, irregular supply and lack of appropriate knowledge based on soil test values. The improper fertilizer use patterns along with limited use of organic and bio-fertilizer is a major cause of land degradation. An integrated nutrient management approach, would aim at efficient and judicious use of all major sources of plant nutrients, so as to get maximum economic benefit without any deleterious effect on physical, chemical and biological properties.

Salinization refers to all types of soil degradation brought about by the increase of salt in the soil. Even this may be a human-induced process, due to poor planning and management of irrigation schemes. Also covered are saline intrusion and the incursion of seawater into coastal soils arising from over-abstraction of groundwater. SRDI showed that the salinity area has increased to 1.05 million hectares from 0.83 million hectares in 1975 (Asiatic Society of Bangladesh, 2003).

5.10.2 Subsidence

Subsidence remains a challenge for the region. It is to be noted that Dhaka University Earth Observatory (DUEO) in collaboration with Lamont-Doherty Earth Observatory of Columbia University, New York, has installed 18 continuous geodetic GPS in Bangladesh during the period 2003 to 2007. Based on this observation, Dhaka University conducted a study on subsidence of the coastal area and obtained figures of 12 mm/year in Khulna for subsidence and 10 mm/year in Patuakhali.

5.10.3 Water pollution

Industrial effluents and urban sewage, along with agrochemicals used in crop fields, are threats to the coastal-marine water resource. The two seaports, Chittagong and Mongla, along with the industrial cities of Khulna and Chittagong are of highest concern. Out of 720 industrial units in Chittagong, only 20 percent treat their liquid effluents before disposal. Khulna possesses 300 large industrial units, which discharge about 10 million gallons of liquid waste that finally reach the Bay of Bengal through the Sundarbans. Oil spills in the seaports and ships navigating the area are other sources of pollution. Ship breaking along the Chittagong coast adds to the pollution. All these

pollutants seriously affect the aquatic fauna and mangrove vegetations (Asiatic Society of Bangladesh, 2003).

5.10.4 Loss of biodiversity

Environmental degradation, includes loss of biodiversity (disappearance or extinction of indigenous flora and fauna), declining land quality, loss of genetic diversity because of practice of monoculture and so on. Coastal mangrove forests are now threatened by the expansion of shrimp farms. It is reported that a total of 60,000 ha of mangrove forest area was converted to shrimp farms and for other purposes.Loss of biodiversity due to shrimp culture is of high concern. The wild fry is the largest source of the shrimp fry in commercial farming, collected from the river by thick nets. The collection system is such that all collected wild fries including all other fish fry are kept in a jar/pot, and only the shrimp fries are sorted out, while the rest are all abandoned. Thus, thousands of wild fries of many species of aquatic flora and fauna are lost just for one or two shrimp fries. On the other hand, in the shrimp farm areas, selective species of *bagda* and *golda* are cultured intensively and all other natural aquatic species have declined or are already extinct (Roy, 2001).

5.11 Population and Employment

According to projections based on 2001 census data, population of Bangladesh will increase to 172 million in 2021 and 219 million in 2051. This projection is based on the Total Fertlity Rate (TFR) of 2.1% in 2011.[6] It may be mentioned that TFR has been estimated at 2.15 in 2009. If the proportion of the current population in the southern region (21% of the country's population) remains constant over the next decades, the southern region will have a population of 36 million in 2021. If rural-urban population ratio in the region remains similar to that of the country, 37 percent of the population will live in urban areas in 2021 compared to 29 percent in 2011. By 2051, population of the region will increase to 46 million including urban population of 30 million (64%). This means that there will be rural-urban migration to an increasing scale and/or more rural areas will be converted to urban areas (Figure 5.3).

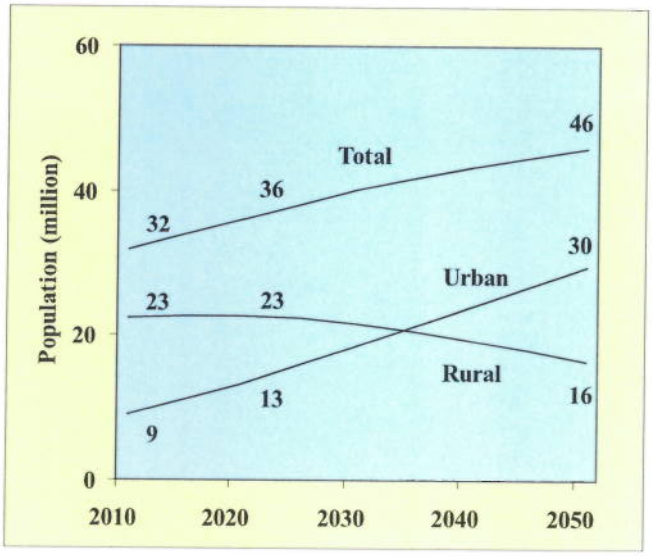


Figure 5.3: Trend of population growth in the southern region

[6] Total Fertility Rate (TFR) is defined as the average number of children that would be born alive to a woman (or group of women) during her reproductive period if she were to live through all her child-bearing years and bear children according to the age-specific fertility rates of a given year.

It is estimated that 46 percent of the population in the coastal zone are below 15 years of age. This is likely to have serious implications as more workers will compete in the job market in the coming years (Ahmad, 2005).

An increase in population will have following implications.

- Per capita availability of land will decline, while the demand for food, water, housing, energy and recreational facilities will increase.
- With increasing population and declining land resources, availability of food will be constrained, resulting in further malnutrition.
- With increasing urbanization and demand for infrastructure, cultivable land will be more and more shifted to other land uses.
- There will be increased pressure on the natural resource base, with risks of further degradation of land and water quality.
- The demand for social infrastructure in the fields of health and education will increase.
- With increasing social mobility, particularly of women, and with increased adult population, the supply of labour will increase.

The current workforce (economically active population) is 54 percent of the total population (Ahmad, 2005). In that sense, there is a need for additional 0.2 million jobs every year to maintain at least the present level of employment, if not more, which is a huge challenge.

5.12 Credit

5.12.1 Need

Most farmers have hardly any investable surplus. They usually borrow money to meet their deficits. In the southern region, 26 percent households resort to borrowing (BBS, 2010). Household borrowing is quite high in Barguna (45%), followed by Bagerhat and Satkhira (40% each) and Patuakhali (39%). About one half of the households borrow for agricultural purposes. Crop sub-sector alone accounts for the highest number of borrowers, accounting for about four-fifths of agricultural credit (BBS, 2010) (Table 5.4, Figure 5.4).

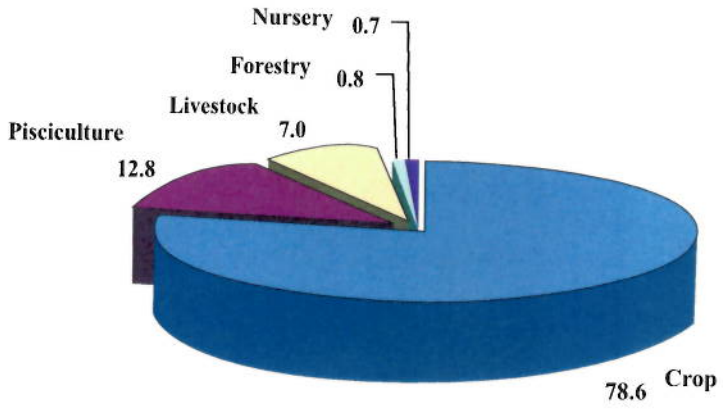


Figure 5.4 Agricultural credit by activity (%)

Demand for credit sharply rises because of sudden 'shock' events like the occurrence of disasters, death of an earner in the family, prolonged sickness of household members, social expenses like marriage or dowry payment, etc. While the affluent families often dispose their savings or assets to overcome such shocks, the poor have to borrow. The situation worsens in the case of recurrent disasters and consequent crop failure, input price hike, downward trend in output price and other forms of market failure. As a result, many farmers are trapped in a vicious cycle of debt.

Table 5.4: Distribution of borrower households by purpose

	All household	Number of borrower households by purpose							
		Crop	Pisci-culture	Live-stock	Forestry	Nursery	Others	Total	%
Barguna	201,929	40,413	3,177	5,882	547	446	41,407	91,872	45
Barisal	482,075	77,040	4,414	4,653	725	624	82,969	170,425	35
Bhola	347,515	60,758	2,226	2,647	264	271	47,966	114,132	33
Jhalokati	133,204	16,392	674	1,641	275	234	22,334	41,550	31
Patuakhali	323,502	57,690	4,324	8,330	534	548	55,256	126,682	39
Pirojpur	243,057	33,778	1,740	2,146	361	673	53,513	92,211	38
Chittagong	1,298,834	33,536	1,394	3,396	704	368	54,875	94,273	7
Cox's Bazar	335,825	24,211	1,965	1,993	409	327	37,222	66,127	20
Feni	237,575	16,322	478	893	145	136	31,661	49,635	21
Lakshmipur	332,818	32,814	1,166	2,047	213	225	45,188	81,653	25
Noakhali	544,943	53,399	2,390	4,308	336	388	63,161	123,982	23
Bagerhat	339,217	31,901	29,232	3,119	525	424	70,246	135,447	40
Khulna	502,835	26,389	17,248	3,321	278	246	59,833	107,315	21
Satkhira	436,178	47,931	19,853	4,552	309	359	102,730	175,734	40
SR Total	5,759,507	552,574	90,281	48,928	5,625	5,269	768,361	1,471,038	26
BD	28,695,763	3,126,194	139,896	323,912	16,774	17,255	3,603,890	7,227,921	25
SR%	20	18	65	15	34	31	21	20	
SR%		37.6	6.1	3.3	0.4	0.4	52.2	100.0	
BD%		43.3	1.9	4.5	0.2	0.2	49.9	100.0	
SR% (agriculture=100)		78.6	12.8	7.0	0.8	0.7			
BD% (agriculture=100)		86.3	3.9	8.9	0.5	0.5			

5.12.2 Credit market

While demand for credit is increasing with the advent of new technologies and high value crops, the supply side has remained largely erratic. Volume of institutional credit is conspicuously low and the proportion of the public sector in the total volume of institutional credit is even smaller. According to data of Bangladesh Bank, total disbursement of rural credit in 2008-09 stood slightly over BDT 279 billion, of which 25 percent was delivered by the public sector. The remaining 75% has been delivered by micro-finance institutions (MFI) including NGOs and the *Grameen Bank* (Planning Commission, 2011). However, the demand for credit is much greater than that met by institutional sources.

According to one estimate, total domestic credit in December 2003 and December 2004 stood at $17.62 billion and $20.77 billion respectively (CDF, 2006). Considering this figure and assuming proportionate share of the southern region, it is roughly estimated that as high as 80 percent of the volume of credit comes from various non-institutional sources largely dominated by *mohajans* and *dadanders* (Figure 5.5). They charge interest on loan at high rates, generally 10 percent per month. Loan conditionality of *dadanders* is quite stringent, as they lend money with the guarantee of repayment in the form of products whose price is fixed unilaterally by them in advance. This is a common practice for fishers who borrow money from *bahadders* before taking the fleet to the estuary or sea and dispose the catch at a price or proportion determined by the *bahadder*. Advance sale of labor in crop fields in exchange of loan (cash or rice) is also common. Use of bonded child labour in fish drying, particularly in Dublar Char, has been widely reported by the mass media.

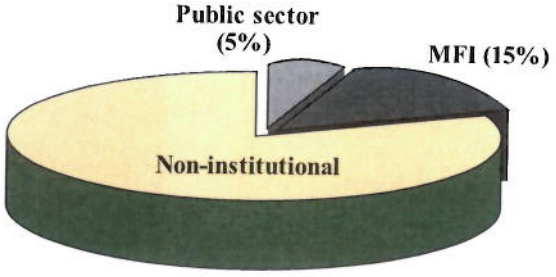


Figure 5.5: Supply of rural credit

5.12.3 Institutional sources

Specialized banks, like the *Krishi Bank*, are a major source of agricultural credit. Two-thirds of the credit from public sector agencies is from specialized banks (Planning Commission, 2011).

According to data of 613 micro-finance institutions (MFI) including the *Grameen Bank*, 125 (20%) are local or regional NGOs based in the southern region (CDF & InM). Besides, many national MFIs, such as the *Grameen Bank*, *BRAC*, *ASA*, *TMSS*, *Caritas*, *RIC* and *Proshika* have outlets in the southern region. Their eligibility criteria and recovery systems often alienate the hardcore poor, or those who are engaged in economic activities with longer gestation period. Repayment of principal and service charge (interest) in weekly installment is mandatory for MFIs. Only those households borrow from them which have multiple sources of income and are in a position to pay back in weekly installments.

As of July 2010, there were 527 NGOs registered by the Microfinance Regulatory Authority (MRA) (Ahmad, 2010). The *Grameen Bank*, however, operates as a quasi-NGO specialized bank outside the orbit of the MRA. They usually cover the landless and poor women who are categorized as "non-farm" households (defined as those who own less than 0.05 acre of land). Average amount of microcredit from MFI sources has been Tk. 7,144 (Planning Commission, 2011). Amount of credit received per person would be higher as people borrow from multiple sources.

5.12.4 Problems of institutional credit

Despite the fast growing microfinance sector, there has hardly been any attempt by public sector institutions, particularly specialized banks, to reform their mode of operation and make them user-friendly. Besides few government projects with credit component, public sector credit agencies are

characterized by the following phenomena.

- Access to credit is impeded by procedural complexities, such as, provision of collateral, filling up forms and delay in approval.
- Farmers often find it difficult to understand procedures.
- Hidden and real costs of credit are high in terms of travel time and obscure payments that discourage farmers to go to the banks for credit.
- Poor farmers do not receive satisfactory client service from banks.
- Women are excluded from the banking service as they can hardly offer any collateral (land).

As total demand for credit far outweighs its supply, private moneylenders dominate. The average demand for agricultural credit is assumed at Tk. 20,000, and total annual demand for agricultural credit stands at Tk. 62 billion. Public sector agencies including specialized banks offer around Tk. 15 billion. Hence there is an estimated annual supply gap of Tk. 47 billion that the institutional credit sources could fill up, freeing farmers from obligations to private moneylenders.

5.13 Market Linkage

Market density in the region is low compared to other areas of Bangladesh. The region produces diversified commodities including crops, fish and livestock products. Post-harvest loss is very high, particularly in the monsoon season, due to absence of market infrastructure and processing facilities. There are few collection centers/packing houses for sorting, grading and packaging. Warehousing facilities at village/union level for perishable commodities are absent, and market places are highly vulnerable to cyclone and tidal surge.

5.14 Institutional Environment

People need services from a host of rural development agencies. But often these agencies are not located at doorsteps of farmers, or farmers have little or no access to services that these agencies are supposed to provide. Even if there are agencies with respective mandates, there is no horizontal coordination among them, despite the fact that farmers need all these services for their production processes and livelihoods. Institutional challenges are summarized as follows:

- Minimum coordination among service providers;
- Conflicting demand for natural resources;
- Narrow project-based approaches;
- Water management organizations have not been developed, or systems collapse after withdrawal of the project;
- Minimum accountability of service providers ;
- Lack of a holistic approach on farming systems;
- Poor access to institutional credit.

All these challenges need to be taken into account so that potential interventions are explored based on the contextual reality.