

**NATIONAL REPORT ON
IMPLEMENTATION OF UNITED NATIONS CONVENTION
TO COMBAT DESERTIFICATION**

BANGLADESH

**GOVERNMENT OF THE PEOPLES REPUBLIC OF BANGLADESH
MINISTRY OF ENVIRONMENT AND FORESTS
DHAKA**

JULY 2001

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Abbreviations

ADAB	Association of Development Agencies in Bangladesh	IEG	International Expert Group
AIC	Agriculture Information Centre	IPCC	Inter-governmental Panel on Climate Change
AIS	Agriculture Information Service	IPM	Integrated Pest Management
APN	Asia Pacific Network	IPNS	Integrated Plant Nutrient System
APT	Agricultural Planning Tools	ISNAR	International Service for National Agriculture Research
B. Aman	Broadcast Aman	JBMP	Jamuna Bridge Multipurpose Project
BAEC	Bangladesh Atomic Energy Commission	LGED	Local Government Engineering Department
BAMWSP	Bangladesh Arsenic Mitigation and Water Supply Project	LGP	Length of Growing Period
BARC	Bangladesh Agricultural Research Council	logframe	Logical framework
BBS	Bangladesh Bureau of Statistics	LRIS	Land Resources Information System
BCAS	Bangladesh Centre for Advanced Studies	MIS	Management Information System
BCSIR	Bangladesh Council for Scientific and Industrial Research	MOA	Ministry of Agriculture
BEMP	Bangladesh Environmental Management Project	MoEF	Ministry of Environment and Forests
BFRI	Bangladesh Forest Research Institute	MOL	Ministry of Land
BIADP	Barind Integrated Area Development Project	MOFLS	Ministry of Fisheries and Livestock
BIDS	Bangladesh Institute of Development Studies	MORDM	Ministry of Relief and Disaster Management
BINA	Bangladesh Institute of Nuclear Agriculture	MOWR	Ministry of Water Resources
BMD	Bangladesh Meteorological Department	NAEP	New Agricultural Extension Policy
BMDA	Barind Multipurpose Development Authority	NAIS	National Agricultural Information System
BRRI	Bangladesh Rice Research Institute	NAP	National Action Program
BWDB	Bangladesh Water Development Board	NARC	National Agriculture Research Centre
BWFMS	Bangladesh Water and Flood Management Strategy	NARS	National Agricultural Research System
CBD	National Coordination Body	NCB	National Coordination Body
CBMS	Community Based Monitoring System	NCS	The National Conservation Strategy
CBO	Community Based Organization	NEC	National Economic Council
CCD	Convention to Combat Desertification	NEMAP	National Environment Management Action Plan
CEPs	Community Empowerment programme	NEP	National Education Policy
CERP	Coastal Embankment Rehabilitation Project	NGO	Non Governmental Organization
CHT	Chittagong Hill Tracts	NWMP	National Water Master Plan
CHTDB	Chittagong Hill Tract Development Board	NWP	National Water Plan
DAE	Department of Agriculture Extension	PRA	Participatory Rural Appraisal
DEM	Digital elevation model	RAP	Regional Action Programme
DMB	Disaster Management Bureau	RBPP	River Bank Protection Project
DoE	Department of Environment	RIMS	Resource Information Management System
EAP	Environmental Assessment Programme	SAARC	South Asia Association of Regional Countries
EIA	environmental impact assessment	SACEP	South Asia Cooperative Environment Programme
ERD	Economic Relations Division	SALT	Sloping Agricultural Land Technology
ESCAP	Economic and Social Commission for Asia and the Pacific	SDNP	Sustainable Development Networking Programme
FAP	Flood Action Plan	SRDI	Soil Resources Development Institute
FD	Forest Department	SEMP	Sustainable Environmental Management Programme
FEJB	Forum of Environmental Journalists in Bangladesh	SOE	The State of the Environment
FFS	Farmer-Field Schools	SPARISO	Space Research and Remote Sensing Organization
FFYP	Fifth five-year Plan	SRDI	Soil Resources Development Institute
FLIS	Fisheries and Livestock Information Services	SWMC	Surface Water Modeling Centre
FRMP	Forest Resource Management Project	T. Aman	Transplanted Aman
FSP	Forestry Sector Project	TNO	Thana Nirbahi Officer
FSR	Farming System Research	TPN	Thematic Programme Network
GEF	Global Environment Facility	UNCCD	United Nations Convention to Combat Desertification
GIS	geographic information systems	UNCED	United Nations Conference on Environment and Development
GM	Global Mechanism	UNDP	United Nations Development Programme
GSB	Geological Survey of Bangladesh	UNEP	United Nations Environment Programme
HPSS	Health and Population Sector Strategy	UNFCCC	United Nations Framework Convention on Climate Change
HRIS	Human Resource Information System	WARPO	Water Resources Planning Organization
HYV	High Yielding Varieties	WATMANET	Watershed Management Network
ICIMOD	International Centre for Integrated Mountain Development	WSIP	Water Sector Improvement Project

1. Summary

Bangladesh is a signatory to the United Nations Convention to Combat Desertification (UNCCD). It was signed in January 1996 and after ratifying the convention the country became a party to it. The convention came into force in 1997. Among many environmental issues facing Bangladesh, land degradation due to aridity and loss of crops due to droughts have caused more sufferings to human population than any other problem in the concerned area. It is feared that desertification process may have started in some vulnerable areas. Therefore, participation of the country in this convention will benefit the country in solving many problems related to it.

Bangladesh comprises of the floodplains of the Jamuna, the Padma, the Meghna and some smaller rivers. The Madhupur Tract, the Barind Tract, and the Akhaura Terrace stand slightly above floodplain level and the Hills lie to the East and the North. The western-northwestern part of the country is generally considered as the drier region. The total precipitation in the dry regions is low but the rainfall often occurs in sudden heavy storms, which sometimes lead to flooding and soil erosion. During the dry season (7 months) in some regions the evapotranspiration exceeded the amount of rainfall by an amount of more than 0.5 times the rainfall.

Between 1960 and 1991, droughts occurred in Bangladesh 19 times. Very severe droughts hit the country in 1951, 1961, 1975, 1979, 1981, 1982, 1984, and 1989. Past droughts have typically affected about 47 percent area of the country and 53 percent of the population. An analysis of the relative effects of flood and drought on rice production between 1969-70 and 1983-84 shows that drought is more devastating than floods to aggregate production.

According to the criteria set by the Convention to Combat Desertification (CCD) for defining a dry region (the ratio of annual rainfall \otimes to potential evapotranspiration (ET_o) may be a maximum of 0.65) no region within Bangladesh can be termed as dry region. But Bangladesh experiences long spell of dry months (7 months) and moderate to severe droughts are spread over a region of 5.46 M ha. Based on annual rainfall, dry season net evapotranspiration and excess evapotranspiration (ET_o-R), and dry season R/ ET_o ratio value, a dry region is delineated and a map is prepared.

The extent of land degradation estimates that 6.0 million hectares in Bangladesh falls below the minimum threshold for sustainable cultivation. In drier parts of Bangladesh low soil fertility is recognized to be at the root of the land degradation spiral leading to desertification. Land degradation in Bangladesh may be considered as temporary or permanent lowering of the productive capacity of land. Natural processes that lead to land degradation in Bangladesh can be considered part of the ongoing land formation process. During 1983-84 and 1997 period, a 11 percent decline in total cultivable area, and specifically a 14 percent decline in cultivated area is observed.

The groundwater table goes below 8.95 m to 18.56 m in dry season in and around Shibganj, Chapai Nawabganj and Iswardi. It indicates that most of the shallow tubewell goes below the suction lift capacity in the peak irrigation period. The ground water levels beneath Dhaka City have fallen steadily over the last twenty-five years in response to continuously increasing abstraction. Water levels have dropped and reached a maximum depth of 20 meters below ground surface in 1989 (from about 3 meters in 1965).

Degradation of soil fertility due to indiscriminate and inefficient use of chemical fertilizer and pesticides and river erosion are posing threats for both sustainability of agricultural and human habitation in Bangladesh. It was found that total economic cost of land degradation exceeded US \$ 2000 million per year.

Earlier Imagery indicated a definite change in vegetation cover and soil moisture in the Barind Tract, which resembles an arid zone during the months of April. Now, Space Research and Remote Sensing Organization (SPARRSO) using computer and Geographical Information System (GIS) technique on the satellite imageries prepare land degradation map. This mapping will facilitate understanding of the land degradation status and making assessment of measures to be taken to improve the status.

The vulnerable area includes the greater districts of Rajshahi, Kushtia, northwestern Jessore, Pabna, western Bogra and southern Dinajpur. The area includes the largely monocultural Barind Tract, the fast shrinking (due to human intervention) Chalan Beel wetlands, and densely populated adjoining regions. Several parts of the vulnerable area (western Bogra, Pabna, Kushtia and northwestern Jessore) having population density as high as the national average of 900 persons per sq. km are causing immense pressure on the fragile ecosystem.

The lowering of the water table, the general lack of tree cover and over utilization of biomass has triggered a process of land degradation in parts of west-northwest Bangladesh. The problem is compounded by reduced water volume in most of the rivers of northwestern Bangladesh in the low flow season due to upstream utilization withdrawal at increasing rates, which has also adversely affected groundwater recharge potential.

Agricultural intensification and the increase in irrigated area have led to a number of environmental problems i.e., loss of bio-diversity through the conversion of forest land into agricultural land, abandonment of many indigenous crop varieties in favour of High Yielding Varieties (HYV) leading to irreversible loss of the country's genetic resources, depletion of soil nutrients and organic matter due to intensive cropping.

A net erosion loss in the Brahmaputra-Jamuna basin of 34,120 hectares of “mainland” acreage has occurred for the period 1992-2001, an area similar to what had eroded in the 12 years previous to that time.

Adverse conditions that may result from desertification process and possible steps to combat the situation from it have been discussed. Efforts to combat desertification must be integral components of national development strategies and national environmental planning. Development of comprehensive action programmes to combat desertification should include strategies for alleviating poverty because these two goals complement one another.

In order to combat land degradation and to attain sustainable land management and development, it is very urgent to build institutional capacity to conduct field level research and apply the results through extension programs along with enabling policy makers to take necessary decision and to undertake appropriate mitigation measures. Afforestation programmes were initiated in these potential areas of denuded Forest Department (FD) land, and of Khas and strip or marginal land controlled by a variety of other government agencies. To check the desertification of the Barind region and to retain the environmental balance, the government in 1985 had taken the Barind Integrated Area Development Project (BIADP) later renamed as Barind Multipurpose Development Authority (BMDA) covering Rajshahi, Naogaon and Nawabganj districts.

The national plans and strategies cover the general social and economic areas. The strategies relevant in the context of community development/ uplift and rehabilitation in the dry region of the country are outlined. The policy thrust and key elements of growth and conservation strategy in development process to prevent land degradation and improve the capacity for sustainable development in the dry region are enumerated.

Soil conservation and watershed management is one of the major components of the fifth five-year Plan (FFYP). The Plan also emphasizes to halt further degradation of the land system and desertification process. The National Conservation Strategy (NCS) lays down the guidelines for integrating environmental concerns with development imperatives. Some of the longer-term measures that have been suggested under National Environment Management Plan (NEMAP) have relevance to combating desertification.

The Agenda 21 recognizes the problems of droughts and desert-like conditions, particularly due to land degradation process, and calls for adopting and/or strengthening information sharing, launching afforestation and soil conservation activities, and expanding conservation areas (protected areas) in the representative ecological zones.

National plans or strategies in combating land degradation, drought/ desertification developed prior to the convention are: (i) The National Environment Policy; (ii) NEMAP; (iii) Bangladesh Forest Policy; and (iv) the National Water Master Plan (NWMP). These strategies laid the foundation for promotion of homestead and social forestry, agro forestry and reforestation of degraded Sal Forest regions. Bangladesh promoted irrigation facilities to the vulnerable land and identified desertification process through survey and implemented programs to rehabilitate such land.

The strategies and priorities applied previously in combating land degradation, drought/ desertification continued after the implementation of the convention. Policies are also formulated to maintain a link and network related sectors such as forestry, agriculture, fisheries, water and land resources to combat the problems of land degradation and increase agricultural production.

Bangladesh is yet to develop a separate National Action Program (NAP) in the spirit of the convention. Under the existing policies and programs the contents of the NAP will aim for resource management and poverty alleviation. The MoEF in consultation with the Department of Agriculture Extension (DAE) fix targets for afforestation/ tree planting activities annually. These afforestation activities are taken up under various schemes/ programmes of different Ministries/ Departments of the Governments. Under the Forestry Sector Project (FSP) plantation of 40,000 ha of Sal Forest are planned during 1997- 2003. Other Programmes/ Projects include BIADP and Sustainable Environment Management Plan (SEMP).

A programme named “Eco-system management in the Barind area” was designed to improve the ecosystem of the dry and degraded-Barind land through community based sustainable environmental activities. The Environment Management Action Plan for Barind Area aimed at Combating Desertification, environmental awareness; social mobilization and motivation type of activities is yet to be implemented by the civil society bodies, research organizations and Non Governmental Organizations (NGO).

SEMP, as the follow-up implementation of National Environment Management Action Plan (NEMAP), addresses the major environmental priorities identified by people through NEMAP. It consists of 26 projects (components). It is being executed by the Ministry of Environment and Forest and implemented by 21 government/non-government agencies throughout Bangladesh. SEMP will benefit grassroots level people, particularly women, in eco-specific intervention areas.

Other programme that has relevance to land degradation and environmental and sustainable development of natural resources has been initiated. Some of the major programmes are: (i) Forest Resource Management Project (FRMP);(ii) Bangladesh Environmental Management Project (BEMP); (iii) Water Sector Improvement Project (WSIP); (iv)

Follow-up on River Bank Protection Project (RBPP); (v) Follow-up on Jamuna Bridge Multipurpose Project (JBMP); (vi) Bangladesh Arsenic Mitigation and Water Supply Project (BAMWSP).

The government of Bangladesh is actively considering forming a National Coordination Body (NCB) under which formal institutional measures for implementing the convention will be undertaken. Six ministries with their associated department and directorate along with non-government organizations could be the party of NCB to implement the obligation and activities drafted under the convention. The Department of Environment (DoE) is presently the implementing organ of the Ministry of Environment and Forests and is responsible to carry out the mandates of the UNCCD.

Bangladesh Agricultural Research Council (BARC) has electronic database on agro-ecological and drought prone areas of the country. The data base which contains information on the country's land resources including physiography, soils, climate, hydrology, cropping systems, and crop suitability. The Agricultural Research Management Project supports strengthening of the management of the national agricultural research institutes and the promotion of research by private organizations.

In the National Action Plan (NAP) process, the key actors and/or stakeholders have been identified and comprise government organizations (ministries, departments), NGOs working in the field of soil conservation, forestry, federation of NGOs and Community Based Organizations (CBO), private sector representatives. The NEMAP process involved - a series of workshops with people from all walks of life including local officials, local people's representatives, academics, farmers, fisherfolk, women and the poor.

Besides, occasional programs are launched on television to telecast episodes, news and spots to create public awareness on natural resource and environmental management. Ministry of Agriculture and Forest Department have launched these programs. A leaflet published by FD Extension project in Rajshahi contains a slogan "There is no alternative to afforestation in combating desertification".

Adaptive measures developed by Bangladesh Forest Research (BFRI), DAE and BARC are communicated to the stakeholders through posters, pamphlets and brochures published by the respective Departments. It has been considered that these initiatives will produce knowledge-based and skill manpower on environment management in near future. Some NGOs are launching programs on environment, gender and community forestry separately.

A two-day national seminar on "Combating land Degradation and Desertification in Bangladesh" in 1998 was attended by over 70 participants representing governmental, educational and research institutions, local bodies, specialized NGOs and CBOs, journalists and donor agencies. This seminar was instrumental in exchanging information and experiences on land degradation and desertification and effectiveness of existing policies and programs, in raising public awareness on the importance of land improvement and its contribution to food production and natural resource management, and in deriving a set of priority program areas for National Action Plan (NAP). The seminar recommended, *inter alia*, various actions for the NAP process, which are related to the identification and assessment of hot spots and rehabilitation of degraded land. A programme of corrective or remedial measures for combating degradation/ desertification in west-northwest Bangladesh has been outlined.

A bottom up approach would be used for drafting the NAP involving stakeholders and people affected at the grass root level, similar to those used for NEMAP. The priority areas have been identified/ considered in formulation of the action programs with regard to the implementation of the UNCCD.

Bangladesh will join the Thematic Programme Network (TPN) and expects active cooperation from the regional countries. The Ministry of Environment and Forests is facilitating establishment of TPN-2 "Agro-forestry Management and Soil Conservation in Dry areas" through the United Nations Development Programme (UNDP) in collaboration with BMDA, Bangladesh Centre for Advanced Studies (BCAS) and other main institutions involved in these areas.

GEF has recently approved to finance a project with land degradation component entitled "Coastal and wetland Biodiversity Management at Cox's Bazar and Hakaluki Haor". The threats of excessive cutting of mangrove, fuel wood, beach compaction by vehicles used in tourism, will be addressed through land protection measures, village conservation and sustainable use, and integrated management plans.

The CCD Trust Fund will be mobilized through partnership arrangement, Ministry of Environment and Forests (MoEF) providing funds to selected activities, and the recipient NGOs implementing the activity. Some NGOs are also implementing natural resource conservation programs through partnership arrangements.

Bangladesh will start the NAP process and explore possibilities for mobilizing the national resources. Once the background information is prepared based on the on-going studies as a part of the NAP process, efforts will be made to explore possibilities for external resources. Bangladesh expects that developed country Parties will provide necessary funding for the preparation and implementation of NAP. Bangladesh is collecting necessary information for NAP preparation. During the NAP process, Bangladesh expects technical and financial assistance from the developed

country Parties and multilateral donor agencies to prepare NAP through extensive consultation, and also to implement it with people's participation. International University of Business and Technology, Dhaka submitted a proposal for UNDP-GEF funding for "Reversing Desertification in the Barind Tract of Bangladesh through Integrated Eco-system and Resource Management" which is under consideration.

Programmes that were initiated in the 1980s have since been evaluated and modifications made. The programmes, policies and institutions are already in place. This may be taken as an expression of the government's desire to combat desertification. Under this circumstance, some tasks are identified which are to be performed to face the problem:

2. Background Information

2.1 Physical Environment

2.1.1 Physiography

Bangladesh occupies about 147,570 sq. Km with a climate, which allows tropical to sub-tropical crops to be grown throughout the year and temperate crops in winter months. About 80% of the country is occupied by the floodplains of the Jamuna, the Padma, the Meghna and some smaller rivers together with estuarine and tidal floodplains. The Madhupur Tract, the Barind Tract, and the Akhaura Terrace stand slightly above floodplain level, occupy about 8%. Hills occupy about 12% and lie to the East and the North. Some hill terrace regions include significant proportion of valley land. Much of Bangladesh is still going through active land building. Sedimentation on the floodplain, tidal flats, and delta front and accompanying channel shifting are all part of this process.

2.1.2 Soil

There is a broad range of agro ecological environment in Bangladesh, which is classified into 30 major agro ecological regions with about 88 sub regions (Chowdhury, 1993). The classification is adopted from the report of the study on the Land Resources Appraisal of Bangladesh for Agricultural Development conducted by GOB in collaboration with UNDP and FAO in 1988. The report describes broad agro ecological conditions, which occur in each region and sub region, and how these conditions influence crop suitability, development and possibilities and research needs. Each regional description contains physiography, drainage, climate, soils, water resources, present land use, development constraints, ecological hazards and agricultural research needs (UNDP-FAO, 1988).

There is a great diversity of soil. Typically floodplain regions have a close pattern of permeable, loamy soils low in organic matter on the highest parts, grading into impermeable clays with moderate or high organic matter contents in adjoining depressions.

The Madhupur Tract has particularly complex relief and soil patterns, with mixtures of level and dissected upland relief and intricate valley patterns, and with soils ranging from deep to shallow, loams to heavy clays and well drained to perennially wet. The Barind Tract has similar kinds of relief and soils to the Madhupur Tracts, but in very different proportions: level, poorly drained, upland soils predominate (World Bank, 1991).

In hill regions, alternating beds of little-consolidated sands and shales provide complex mixtures of deep and shallow soils. Hill soils are located in the south and southeast of the country, and are often located on tracts susceptible to erosion and difficult to irrigate

Eight categories of problem soils covering a total land area of about 5.10 M ha significantly limit crop production in the country (having net cultivable land of about 9.09 M ha). These are: i) soils on the step slopes (1.23 M ha); acid sulphate soils (0.23 M ha); iii) peat (0.10 M ha); iv) coarse textured soils (0.40 M ha); v) shallow soils (1.64 M ha); vi) poorly drained soil (3.06 M ha); vii) Severe fertility Limitations (1.10 M ha) and viii) saline soils (1.30 M ha) (Chowdhury, 1993).

2.1.3 Climate

The country belongs to sub-tropical regions where monsoon weather prevails throughout the year. The average temperature ranges from 7.22⁰ C to 12.79⁰ C during winter and 23.88 to 31.11⁰C during summer. The average annual rainfall varies from 1229 to 4338 mm (WARPO, 2000). The total precipitation in the dry regions is low but the rainfall often occurs in sudden heavy storms, which sometimes lead to flooding and soil erosion.

Rainfall is observed at 327 stations in the country, 31 by BMD and 296 by BWDB. The observation have been collected from both organizations and entered on the NWRD. Rainfall (R) is based on the monthly averages for a standard 30-year period. Dependable rainfall (DR) is the rainfall that is exceeded four years out of five for any month. Evapotranspiration (ETo) is the evapotranspiration from grass. Data for estimating ETo has been collected at 30 stations since about 1960 and entered on the NWRD (WARPO, 2000).

The pattern of rainfall excess and deficit –the difference between rainfall @ or dependable rainfall (DR) and reference crop evapotranspiration (ETo) (in mm) is tabulated by season and by the hydrological region. The annual dependable rainfall exceeds the reference ETo except in the NW and SW hydrological region (WARPO, 2000). Rainfall (in mm) in Bangladesh by hydrological region is given in the following table:

Table 1: Rainfall (in mm) by Hydrological Region

Hydrological Region		Rainfall	Dependable Rainfall (DR)	Evapotranspiration ETo
South East	SE	2271	1746	1275
North West	NW	1739	1332	1332
North Central	NC	1956	1529	1316
Rivers & Estuary	RE	2318	1810	1325
South West	SW	1665	1259	1381
North East	NE	3194	2595	1233
South Central	SC	2307	1793	1287
Eastern Hills	EH	2445	1733	1360
Bangladesh		2360	1725	1320
MPO 1991				1553

P = Rainfall; DR= Dependable Rainfall; ETo= Evapotranspiration

Source: WARPO, 2000

Seasonal Balance of Rainfall and Potential Evapotranspiration is given in the following table:

Table 2: Seasonal Balance of Rainfall and Potential Evapotranspiration (in mm)

Hydrological Region	Monsoon June- October					Dry Season (November -May)				
	R	DR	ETo	R- ETo	DR- ETo	R	DR	ETo	R-ETo	DR-ETo
SE	1909	1161	551	1358	610	588	200	724	136	524
NW	1539	852	581	958	271	346	131	751	405	620
NC	1550	901	568	982	333	511	206	748	237	542
RE	1972	1169	564	1408	605	516	174	761	245	587
SW	1469	872	572	897	300	365	101	809	444	708
NE	2511	1535	534	1977	1001	896	417	699	-197	282
SC	2016	1222	537	1479	685	485	144	750	265	606
EH	2241	1280	566	1675	714	512	148	794	282	646
Bangladesh	1901	1124	559	1342	865	527	140	759	227	564

P = Rainfall; DR= Dependable Rainfall; ETo= Evapotranspiration

Source: WARPO, 2000

During the dry season (of 7 months) in some regions the evapotranspiration exceeded the amount of rainfall by an amount of more than 0.5 times the rainfall. They are Northwest, Southwest. North central and South central hydrological regions. So, for that duration within a year these regions may be considered as dry region. Seasonal Variation of Rainfall and Evapotranspiration contributes to the Rainfall/ ETo as is shown in the following table:

Table 3: Contribution of Seasonal Variation of Rainfall and Evapotranspiration

Hydrological Region		Rainfall/ ETo (Year)	P/ ETo Monsoon 5-months	P/ ETo Dry season 7-months	Dependable Rainfall/ ETo (Year)	P/ ETo Monsoon 5-months	P/ ETo Dry season 7-months
South East	SE	1.78	3.46	0.81	1.37	2.11	0.28
North West	NW	1.30	2.65	0.46	1.00	1.47	0.17
North Central	NC	1.49	2.73	0.68	1.16	1.59	0.27
Rivers & Estuary	RE	1.75	3.50	0.68	1.37	2.07	0.23
South West	SW	1.20	2.57	0.45	0.91	1.52	0.12
North East	NE	2.59	4.70	1.28	2.02	2.87	0.60
South Central	SC	1.79	3.78	0.64	1.39	2.27	0.19
Eastern Hills	EH	1.80	3.96	0.64	1.27	2.26	0.19
Bangladesh		1.79	3.4	0.69	1.31	2.01	0.18

P = Rainfall; DR= Dependable Rainfall; ETo= Evapotranspiration

The net evapotranspiration values for dry season (November- May) totals vary between 300 to 700 mm.

2.2 Delineating Dry Regions of Bangladesh

Attempts were made to identify the aridity in Bangladesh using meteorological data. It was observed that Bangladesh does not fall within the annual aridity limit of 20 according to Martonne Indices. However, if the monthly data were used seasonal aridity could be observed (Jabbar, 1990). The seasonal aridity increases from 4 months (November-February) in the northeast/ southeast regions to 6 months (November-April) in the northwest region. WARPO advocates dry month periods of 7- month duration (November - May).

On the basis of annual rainfall frequency of rainfall (25mm, 50 mm), maximum, minimum and frequency of temperature (25⁰C, 30⁰C and 35⁰C), clear days, cloudy sky and first available rain of the season, Bangladesh has been divided into 7 seven agro climatic zones (Jabbar, 1990). Out of these, the zones E, F and G possibly be considered as relatively dry zones. These would be part of the agro ecological zones of the Barind and Madhupur Tract and the Ganges Floodplains.

Occurrence of rainfall in the Barind area has been analysed to compare the amount and distribution during 1975-93 with those of the period 1902-74 (Ahmed, 1997). The mean annual rainfall of the Barind Area has changed from 1374.6 mm in the past (1902-74) to 1491.1 mm in recent areas. There are incidences of no change and even a decrease in rainfall southwestern, southeastern and western parts. The Monsoon season (June- October) received 83.3% of the mean annual rainfall. The pre-monsoon season of March- May received 14.3% (213.1 mm) while the bone-dry season of November- February got only 2.4% (35.2 mm).

Although the mean annual rainfall in this area has gone up in recent years, the increase has almost entirely been occurred during the monsoon (1278.5 mm vs. 1389.4 mm). The rainfall in the dry months, when it is really needed, remained the same (101.2 mm in the recent years vs. 96.1 mm in the past).

According to the data registered by Bangladesh Water Development Board (BWDB), the annual evaporation of the area ranges from 370 mm to 1120 mm. The ratio of annual rainfall to evaporation for this area is 1.33 but considering the dry months the ratio of rainfall to evaporation would be 0.18.

According to the Length of Growing Period (LGP) concept advocated by FAO, areas with an LGP of less than 1 day are hyperarid (true deserts); less than 75 days arid, 75 to less than 120 days (dry) semiarid, 120 to less than 180 days (moist) semiarid. These areas together correspond closely to the areas denominated as Drylands. The length of the rainfed growing season ranges from 170-180 days in the west- central west to 280- 290 days in the extreme north east (Brammer, 1999).

The humid climatic situation due to monsoon rainfall, regular flooding and 170-290 days of annual growth period are viewed as conditions where desertification is unlikely to occur (Hussain, 2001) where as Rasheed (1998) and Huq (1995) advocated in favour of desertification using the term synonymously with land degradation. Considering the lower rainfall and its distribution Hussain proposed that areas lying west of the longitudinal line of 89.5⁰E might be described as dry regions of Bangladesh (Hussain, 2001). A region that has annual annual average rainfall much lower than the national average of 2200 mm may be considered a vulnerable area for occurrence of drought and land degradation (Rasheed, 1998).

According to the criteria set by the CCD for defining a dry region the ratio of annual rainfall to potential evapotranspiration may be a maximum of 0.65. Taking into consideration of annual rainfall and corresponding evapotranspiration data no region within Bangladesh can be termed as part of dry region. But Bangladesh experiences long spell of dry months (7 months) and moderate to severe droughts are spread over a region of 5.46 M ha. Since Bangladesh has two distinct periods of Dry season and the Monsoon having duration of seven and five months respectively, seasonal influence may be given emphasis in outlining dry regions. The value of the ratio of annual rainfall to potential evapotranspiration (a maximum of 0.65) may be extrapolated for dry seasons and used to delineate a dry region. For a spell of 7-month dry season, the threshold may be approximated to 0.38. For example, though the R/ ETo values in favour of the SW and SE hydrological regions for the whole year is much above the threshold value of 0.65, the same for the dry period (of 7 months) is in the range of 0.17-0.45. These two regions also have the least annual rainfall and falls within the moderate to severely affected area of the Drought Map of Bangladesh.

Considering the distribution of rainfall and evapotranspiration regimes and the drought condition in the country, it is proposed that the regions fulfilling the following conditions may comprise dry regions in Bangladesh. The conditions are: (i) annual rainfall @ should be less than 2000 mm; (ii) dry season (November – May) Excess Evapotranspiration (ETo-R) should be more than 400 mm and (iii) dry season R/ ETo ratio value should be less than 0.65.

With this assumption made and applied on the rainfall and evapotranspiration data available for the agro ecological zones of Bangladesh (tables- 1, 2 and 3), the Northwest, Southwest and North central zones can be considered as dry region of the country. It may be seen that the drier agro climatic zones E, F, G falls into the dry regions as defined

above. It is further proposed that the dry regions may be divided into two sub regions on the basis of severity of dryness as below:

Table 4: Severity of Dry Regions

Severity	Conditions/ Criteria Defined
Moderate	Annual Rainfall @ less than 1600 mm Dry season (November-May) Excess Evapotranspiration (ETo- R) - more than 400 mm Dry season (November-May) R/ ETo ratio value less than 0.4
Slight	Annual Rainfall @ 1600-2000 mm Dry season (November-May) Excess Evapotranspiration (ETo- R) - 200-400 mm Dry season (November-May) R/ ETo ratio value 0.4 - 0.65
Non dry	Annual Rainfall @ more than 2000 mm Dry season (November-May) Excess Evapotranspiration (ETo- R) – less than 200 mm Dry season (November-May) R/ ETo ratio value more than 0.65

Considering the rainfall and evapotranspiration data available in WARPO a map is prepared to show the severity of dryness in the dry regions. A map of the dry regions of Bangladesh has been prepared and is given in figure- 1. The Rivers and Estuary hydrological region; the coastal region and the Sunderbans are considered as non-dry.

The dry map of Bangladesh shows that the dry zones are extended over an area of 6.442 M ha. The extent of the dry zones are given in the following table:

Table 5: Extent of Dry Zones of Bangladesh

Dry Zones	No. of Thanas occupied	Area covered (M ha)	Percent of total land
Moderate	64	2.015	14.37
Slight	163	4.427	31.56
Nondry	263	7.585	54.07

2.3 Economy

Bangladesh's economy has grown by about 4% per annum in recent years; inflation rate has been low (2%); foreign reserves have been reasonable; and GOB's domestic resource position has been favorable. GOB introduced a broad program of structural adjustment in 1993/94 to achieve macroeconomic stability. The structural reforms include trade liberalization to remove anti-export and anti-private sector bias, deregulation of private investment, relaxation of exchange controls, and reform of business laws (GOB. 1997).

Agriculture dominates the economy of Bangladesh, generating about 1/3 of GDP, providing 60% of employment and accounting for about half the value of export earnings. The country is among the poorest of the world (per capita GDP about \$ 350/ year). Over half the households live in moderate or extreme poverty, with a significant proportion of the remainder only marginally above the poverty line and vulnerable to falling into poverty in case of unfavourable developments.

2.4 Definition of Desertification/ Land Degradation

Desertification was earlier considered as the spread of desert-like conditions in arid or semi-arid areas. It is now seen as a process of degrading or changing the land use to another category and ultimately reducing the productive potentials of land. *Desertification is defined as: "Land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities"* (Chapter 12 of UNCED's Agenda '21). The various elements of desertification may be quantified in terms of the causes, general extent and physical consequences of the process.

According to terminology accepted by CCD, "Land degradation" means reduction or loss, in arid, semi arid and dry sub-humid areas, of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as: (i) soil erosion caused by wind and/ or water; (ii) deterioration of the physical, chemical and biological or economic properties of soil; and (iii) long-term loss of natural vegetation

Further the CCD defines "arid, semi-arid and dry sub-humid areas" as areas, other than polar and sub polar regions, in which the ratio of annual precipitation to potential evapotranspiration falls within the range of 0.05 to 0.65.

Degradation of land involves the reduction of the renewable resource potential by one or a combination of processes acting upon the land. The resource potential relates to agricultural suitability (rainfed or irrigated arable cropping, animal husbandry, forestry, inland fishery), primary productivity level, and natural biotic functions.

More recent data on the extent of land degradation estimates that about 5 million hectares, or 33 percent, of total land acreage in Bangladesh falls below the minimum threshold for sustainable cultivation. In drier parts of Bangladesh low soil fertility is recognized to be at the root of the land degradation spiral (Zuberi, 1998):

low fertility → low water use efficiency → low biomass production → decline in biological activity → low availability of energy & materials → poor soil cover → run off → soil erosion → land degradation → drought → desertification

Deforestation leads to increased water erosion with an indirect impact on water resource development, depletion of soil fertility, disappearance of many plant and animal species, local aridification, etc. In addition, flooding, accelerated runoff, droughts, more sedimentation in rivers and reservoirs and depleted groundwater become more severe because of deforestation, with adverse consequences for agricultural production and human life.

2.5. Droughts in Bangladesh

According to definition of CCD "drought" means the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resources production systems.

Drought is a "creeping phenomenon," The effects of drought accumulate slowly over a considerable period of time, and may linger for years after the termination of the event. Drought impacts are spread over a larger geographical area than are damages that result from other natural hazards. Like floods, Bangladesh is also vulnerable to recurrent droughts. After 1971 Bangladesh has experienced droughts of major magnitude in 1973, 1978, 1979, 1981, 1982, 1989, 1992, 1994, and 1995. Although droughts are not always continuous in any area, they do occur sometimes in the low rainfall zones of the country. As listed above, Bangladesh experienced consecutive droughts in 1978-1979, 1981- 1982, and 1994-1995. The droughts of 1994-95 in the northwestern districts of Bangladesh led to a shortfall of rice production of 3.5 million tons (Paul, 1995).

Two critical dry periods are distinguished (Karim et al., 1990). Rabi and pre-Kharif drought (January - May), due to: (i) the cumulative effect of dry days; (ii) higher temperatures during pre-Kharif (> 40 degrees Celsius in March-May); and (iii) low soil moisture availability. This drought affects all the Rabi crops, such as HYV Boro, Aus, wheat, pulses and potatoes especially where irrigation possibilities are limited. It also affects sugarcane production. Kharif droughts in the period June/July to October, created by sub-humid and dry conditions in the highland and medium highland areas of the country (in addition to the west/northwest also the Madhupur tract is drought prone). Shortage of rainfall affects the critical reproductive stages of transplanted Aman crops in December, reducing its yield, particularly in those areas with low soil moisture holding capacity.

Considering the Agro ecological Zones (AEZ) database and land resources inventory map at 1:1,000,000 scale, BARC has identified and mapped drought prone areas of Bangladesh for Rabi and Pre-Kharif seasons (WARPO- EGIS, 1996). Recently BARC has reviewed this concept and produced three different maps for Rabi, Pre-Kharif and Kharif seasons (BARC, 2001). The drought maps has been revised by BARC to produce three maps for Rabi, Pre-Kharif and Kharif seasons. The drought severity classes defined in the maps are slight, Moderate, severe and Very severe related to the yield losses of 15-20%, 20-35%, 35-45%, and 45-70% respectively for different crops (Karim and Iqbal, 2001). Areas (in M ha) affected by drought in different crop seasons are given in the following table.

Table 6: Summary of Drought Severity Areas in Bangladesh by Crop Season (in M ha)

Drought Class	Rabi	Pre-Kharif	Kharif
Very Severe	0.446	0.403	0.344
Severe	1.71	1.15	0.74
Moderate	2.95	4.76	3.17
Slight	4.21	4.09	2.90
No Drought	3.17	2.09	0.68
Non-T.Aman			4.71

After Karim and Iqbal, 2001

The northwestern part is prone to drought mainly because of rainfall variability in the pre-monsoon and the post-monsoon periods. Inadequate pre-monsoon showers, a delay in the onset of the rainy season or an early departure of the monsoon may create drought conditions in Bangladesh, and adversely affect crop output. Since it puts severe strain on the land potential, it acts as a catalyst of land degradation through reduced soil moisture and water retention, increased soil erosion, decline in soil organic contents and overexploitation of sparse vegetation. Human interventions in the form of land abuse and mismanagement have exacerbated these actions during the spells of periodic droughts. An analysis of the relative effects of flood and drought on rice production between 1969-70 and 1983-84 shows that drought is more devastating than floods to aggregate production (World Bank, 2000 a).

2.5.1 Mitigation of Drought

In the early 1970s and 1980s in the drought-prone areas of northern Bangladesh the agricultural development projects were developed to provide ground irrigation through thousands of Shallow and Deep Tube Wells. Since scarcity of water was the main obstacle against intensive agriculture pumping up groundwater helped grow crops year round. Through thousands of Shallow and Deep Tubewells HYV paddy was introduced to hundreds of acres of marginal and sloped lands.

Since land is being over used / degraded due to pressure of population, effective population control, judicious land use and sustainable agricultural practices are urgently required to mitigate droughts. The carrying capacity of the land resource in Bangladesh has been critically surpassed. Use of land for production of two or three crops a year may be limited. Because of this soil is not getting sufficient rest to recover its health. The marginal lands should not be used for agricultural purposes. Public awareness is needed to handle land degradation and to protect land from misuse and over use. Agrochemicals should be carefully used.

The problem of land degradation may be studied to develop sustainable land use. A national land use policy is urgently needed to utilize land in judicious manner. Rehabilitation programmes should have effective mechanism to minimize the impact of drought.

Steps are required to develop national programmes for drought preparedness (similar to flood and cyclone preparedness). Early-warning schemes have to be undertaken to inform the population of drought-prone areas and introduce drought-relief measures for the affected people as part of the national planning strategy/ national programme for drought preparedness (similar to flood and cyclone preparedness).

2.6 The Causes, General Extent and Physical Consequences of the Process of Land Degradation

The vulnerable area includes the greater districts of Rajshahi, Kushtia, northwestern Jessore, Pabna, western Bogra and southern Dinajpur. The area includes the largely monocultural Barind Tract, the fast shrinking (due to human intervention) Chalan Beel wetlands, and densely populated adjoining regions. In fact, several parts of the vulnerable area (western Bogra, Pabna, Kushtia and northwestern Jessore), the population density is as high as the national average of 900 persons/ sq. km causing immense pressure on the fragile ecosystem.

The dry region of Bangladesh has a high population density, which ranges from 500 persons per km² in Dinajpur to 900 persons per km² in Kushtia, as against 755 persons per km² for the country (GOB, 1997). The Barind Area covers 15 thanas of Rajshahi and 29 thanas of Bogra, Rangpur, Dinajpur and Pabna district with a population of 5.038 million. There prevails a special kind of weather having high temperature from mid June to October. Virtually there is no rainfall from November to February. Soil of the area becomes hard like iron during dry season whereas it melts like wax with a very little rainfall. The Madhupur Tract is spread over Dhaka, Tangail, Jamalpur and Mymensingh districts. During 1983-84 and 1997 period, an 11 percent decline in total cultivable area, and specifically a 14 percent decline in cultivated area is observed (World Bank, 2000 b). The level of land degradation and its extent vary seasonally and yearly and by region as well as the pressure on the land are not the same either. In the whole of Bangladesh, the degradation status is revealed as light - 42%, moderate - 48% and strong - 10%. (BARC, 1998, p.24)

Using extensive soil sampling the nutrient grades of different agro-ecological zones (AEZs) was established on the basis of the levels of various nutrients (N, P, K, S, Zn, Mg) present. It was observed that there was only one AEZ, Young Brahmaputra - Jamuna Flood Plain, which could be classified as good. There were thirteen AEZs with fair nutrient status, while the rest (18) fell in the grades of poor and very poor (World Bank, 2000 a). A good soil should have organic contents of more than 3.5%. But in Bangladesh most soils have less than 1.7%, some soils have less than 1% organic matter. In Bangladesh, the average organic matter content of top soil (high land and medium high land situation) have declined by 20 - 46% from about 2% to 1% over the past 20 years of intensive cultivation.

Considering National Agricultural Research System (NARS) database, organic matter content of the soils of dry region has been summarized as follows (BARC, 1998):

Table 7: Status of Organic Matter in the Soils of the Dry Regions

Class of soil organic matter	AEZ	Main Location	Total Area (Mha)	% of Net Cultivated Area
Very low (< 1.0)	1,7, 8, 10, 11, 16, 25, 26, 29, 30	Dinajpur, Sherpur, Jamalpur, Tangail, Nawabganj, Rajshahi, Pabna, Kushtia, Bogra, Naogaon, Rangpur	4.05	44.5

After BARC, 1988

Barind Tract are deficient in P for HYV rice (about 0.77 M ha). Medium level response was also observed in soils of Madhupur Tract having a total area of about 0.42 M ha. Barind and Madhupur Tract area deficient in K for HYV rice having a total area of about 1.20 M ha. Soil fertility decline has occurred due to removal of nutrients as well as uneven fertilizer application without accounting for soil characteristics.

Some area affected by wind erosion mainly in the district of Rajshahi and Dinajpur region during drier months of the year. Most of the topsoils in the cultivated/ deforested areas of the terraces, and floodplains are acidified to a variable extent. Intensive acidification is also identified in the heavy clays in the Lower Atrai Basin and in some broad valleys within the Barind and Madhupur area (Dowlah, 1998).

2.6.1 Lowering of Groundwater Tables

The groundwater table goes below 8.95 m to 18.56 m in dry season in and around Shibganj, Chapai Nawabganj and Iswardi. It indicates that most of the shallow tubewell goes below the suction lift capacity in the peak irrigation period. The trend of groundwater flow in Chapai Nawabganj and Rajshahi is to the southeast. The groundwater moves towards east and southeast in Pabna, Meherpur and Kushtia area.

Recharge to groundwater in the northwestern part varies from 210 mm to 445 mm. It is observed that the loss of groundwater takes place from October to December. In the western and central part, the river is gaining from the surrounding aquifer in all the period except the wet season (IAEA-BAEC-BWDB, 2000). With ever increasing ground water extraction for irrigation in this region during the dry season in recent years and no increase in rainfall in that period, the groundwater level may fall to the extent of not getting fully replenished in the recharge season causing overdraft. The groundwater levels beneath Dhaka City have fallen steadily over the last twenty-five years in response to continuously increasing abstraction. Water levels have dropped and reached a maximum depth of 20 meters below ground surface in 1989 (from about 3 meters in 1965) (World Bank, 1996).

2.6.2 Degradation of Soil Fertility

Flooding leading to inundation of the plain lands is a major factor in retaining and enhancing soil fertility in the deltaic country. Soil degradation is said to be occurring in Bangladesh due to the intensification of crop cultivation and the advance of monoculture rice and providing imbalanced nutrient base to their crop. Soil fertility is degraded due to indiscriminate and inefficient use of chemical fertilizer and pesticides. Soil fertility decline has occurred due to removal of nutrients as well as uneven fertilizer application without accounting for soil characteristics. The degradation results in a gradual decrease of soil quality.

River erosion are posing threats for both sustainability of agricultural and human habitation in Bangladesh. Population increase puts pressure on non-crop ecosystems such as forests and wetlands to convert them to croplands. The sharply reduced flow below Farakka indiscriminate withdrawal of water at Farakka during the lean period creates a serious water crisis in the affected areas and aggravates salinity in the entire Khulna -Jessore region. Saline intrusion has degraded soil and ecosystem, leading to decreased agricultural production and increased poverty (World Bank, 2000a).

2.6.3 Extent of Land Degradation in Bangladesh

The general extent of land degradation in Bangladesh is given in the following table:

Table 8: Extent of Land Degradation in Bangladesh

Types of land degradation	Total area (M ha)	Dry region (M ha)
Water erosion	1.7	0.10
Bank Erosion	1.7	0.10
Soil Fertility Decline	8.0	1.84
P deficient (for HYV rice)	8.5	5.89

Types of land degradation	Total area (M ha)	Dry region (M ha)
P deficient (for upland crops)	5.6	0.95
K deficient (for HYV rice)	7.4	4.82
K deficient (for upland crops)	7.5	0.95
S deficient (for HYV rice)	7.7	2.86
S deficient (for upland crops)	8.7	
Soil organic matter depletion	7.5	2.9
Water logging	0.7	
Salinization	3.05	
Pan formation	0.06	
Acidification	0.6	
Deforestation	1.5	0.10

Source: BARC, 1999; SOE, 2001; Chowdhury, 1995; Karim and Iqbal, 2001

The economic implications of land degradation are tremendous. An assessment has been made in terms of production loss of crops, and additional agricultural input necessary to maintain soil nutrients. It was found that total economic cost of land degradation exceeded to 2000 million US \$ per year as presented in the following table (GOB-BCAS-SACEP- NORAD- UNEP, 2001).

2.6.4 The Driving Forces behind Degradation

The driving forces and pressures, state, and impact related to land degradation, and responses to address the problems (GOB-BCAS- SACEP- NORAD- UNEP, 2001). (i) Improper Cultivation in Terrace Land, Floodplains and Piedmont Plains; (ii) Faulty Irrigation; (iii) Imbalanced Fertilizer Use; (iv) Plough pan; (v) Improper Use or Pesticides; (vi) Over Exploitation of Biomass from Agricultural Fields; (vii) Unplanned Rural Infrastructure; (Road Embankment, *FCD/I*); (viii) Salinization; (ix) Brickfields and Biomass; (x) Use Unplanned Industrial Development; (xi) Mining of Sand and Gravels from Agricultural Land; (xii) Land Ownership and Tenure; (xiii) River Bank Erosion and Sedimentation; (xiv) Sandy Over-wash on Agricultural Land; (xv) Salinity.

2.7 The Effects of Climatic Change

The IPCC reports that under some scenario of climatic change for late in the 21st century, Bangladesh would remain a savanna/woodland. The availability of winter water will decrease, and irrigation will be more dependent on groundwater withdrawal. Under such a condition, it would be quite difficult to control salinity intrusion, to keep navigational routes functional, and to ensure environmental and ecological harmony in various places --especially in the Ganges, Atrai and Teesta dependent areas of the country (World Bank, 2000c).

At present, western parts of Bangladesh are periodically being affected by droughts in winter. With temperature rise the winter precipitation might decrease further, and the moisture content of topsoil would decrease substantially leading to severe moisture stress. Rabi drought would severely affect wheat and Boro crops at vegetative growth stages. Increased drought will increase salinity build up in the topsoil (World Bank, 2000c).

There is a need to develop drought-tolerant crop varieties and drought- mitigation technologies that will make maximum use of the land resources, of the rain fed farming system and the limited rainfall in the region. Complementary concerns include appropriate water storage and rainwater harvesting technologies, supported with packages of agronomic practices to increase productivity of the Kharif crops and vegetables.

2.8 Desertification in Bangladesh

Though Bangladesh is predominantly a riverine country, northwestern region is threatened by desertification. The ratio of cultivable land to rural population (acre/ person) has decreased in the northwestern region (Rajshahi Division) by 23.2% as compared to a decreased ratio of 17.2% in the whole of the country (GOB- World Bank, 2000). Some geographers and ecologists claims that there is evidence of desertification from the very dry soil conditions in the Barind Tract region and the white reflectance of the soil surface on air photos and satellite imageries (Jabbar et al., 1982).

Landsat imageries of the Barind Tract have been interpreted as a pronounced change in vegetation cover and soil moisture. This change has been attributed to a desert-like condition prevailing during the dry season.

The FAO experts had somewhat different view. They hold that the characteristic Grey Terrace Soils of the Barind Tract were soils, which developed in response to a hydromorphic weathering process (ferrolysis). The soils presumably always were dry in the dry season because of the very low moisture holding capacity of their silty upper layers and the heavy clay substratum (FAO-UNDP Report, 1988, p. 449).

Disaster Management Bureau (DMB) of the Government of Bangladesh is monitoring drought and other hazardous events. Bangladesh Meteorological Department (BMD), SPARRSO, BWDB, Bangladesh Agriculture Research Council (BARC) also collaborate with BMD by providing necessary information on weather, water and soil condition and suggesting appropriate action for mitigating the effects of drought and desertification.

Attempts were made to study the seasonal aridity using meteorological data. It was observed that Bangladesh does not fall within the annual aridity limit of 20 according to Martonne Indices. However, if the monthly data were used seasonal aridity could be observed (Jabbar, 1990). The seasonal aridity increases from 4 months (November-February) in the northeast/ southeast regions to 6 months (November-April) in the northwest region. WARPO advocates dry month periods of 7 months duration (November-May).

From examination of the classification of the soils of the South Asian region made on the basis of US Soil Taxonomy the soils of Bangladesh have not yet been affected in any significant way by desertification process (Soil Survey Staff, 1998). In Bangladesh, the process is probably at the very incipient stage.

The Farakka Barrage has restricted fresh water flows during the dry season and caused serious problems in southwest of Bangladesh. The diversion of Ganges water by the Farakka barrage in India has contributed to the reduction of surface water availability and aggravated the desertification process in the western part of the country. The decreased stream flow also affects river morphology, salinity, ecosystem, etc., in addition to causing large-scale expansion in groundwater irrigation in the affected areas

2.8.1 Monitoring Degradation of Terrace Area Using Remote Sensing

The agricultural status and vegetation cover of the Terrace area in the Northwest Bangladesh was studied using Remote Sensing and GIS Technology by SPARRSO. The study monitored the development stage of dry season irrigation using three Landsat images (date 20.10.90; 30.01.90; and 11.04.90), which revealed the agricultural and related information. With respect to the Aman Paddy (October) to irrigation crops in January and April were only 20% and 27% (SPARRSO, 1996 b).

For studying the gradual changes of forest ecosystem of Madhupur Tract, topographic map, old vegetation map, Colour infrared (CIR) aerial photograph (1983) and Landsat TM data (1988, 1991 and 1997) had been used. A change detection map was prepared by using GIS and CIR aerial photographs of the area taken on 1983/84 (SPARRSO, 1998). Interpretation of Landsat TM imagery of 1988, 1991 and 1997 showed a gradual deterioration of forest cover and density. Examination of the imageries showed that the western part of the main land forest has almost completely been cut and rubber plantations has been established.

Land degradation map are being prepared using computer and GIS technique on the satellite imageries (SPARRSO, 1993). Considering the physiography and vegetation coverage of the country, Nachol thana in the northwest and Hathazari in the south west of the country were selected for the land degradation mapping High, medium and low hills, piedmont plain and flood plains were identified and digitized. Vegetation index, vegetation status, buffer zone and erosion hazard maps were prepared. From these maps, 23% area was found in the high hazard category due to deforestation and erosion. On the other hand, 35% area was found in the category of low vegetation. The degradation map prepared for Nachol area identified degradation processes like water erosion, loss of topsoil, physical and chemical deterioration, surface scaling and crusting and soil compaction (SPARRSO, 1998, p.3).

2.8.2 Causes of Desertification in Bangladesh

The general problem of dry regions with large populations is essentially one of human ecology. Mismanagement of resources has been a prime source of desertification, which is accelerating in many areas. Erratic rainfall results in widely fluctuating production leading to scarcity, which imposes stress on these populations. As population increases, the demand on natural resources is further magnified. The consequence is an imbalance between the human and animal population, on the one hand, and plants, water, and land resources on the other. As the demand by the first persists and increases, the resources tend to become depleted and, as depletion proceeds, the stress upon them becomes even greater. As a result the ecological foundation, life support system as well as habitat are going to be lost. Thus, a process of progressive degradation of resources is set into operation, which intensifies with every famine and the period following it. If not checked timely and effectively, it leads to permanent damage in the form of loss of valuable plant

species through excessive grazing or cutting for fuel; vegetal cover gets replaced by bare land or, at best, less useful plant communities. About 2.3 million ha is estimated to be prone to severe drought.

Having no alternative to fuel other than natural vegetation and gradual increase of fuel demand and economic depression of the region accelerated rapid destruction of forests/ plants, which resulted environmental imbalance in nature. Less rainfall than needed created havoc of drought year after year and rapid destruction of forest brought inevitable consequence of desertification.

2.8.3 Extent and impact of Desertification in Bangladesh

About 6.0 M ha, or 43.0 percent of the total geographical area is affected by various forms and degree of degradation. The extent of various types of land degradation in the dry region of Bangladesh is given in table- 8. About one fourth of the total cultivable land is affected by drought in every year with different intensity. The recovery of such land depends upon its resilience, which, however, may be lost completely if the land is not treated in time with care. Frequent droughts, through its short-lived but recurrent stress, can aggravate the adverse impact and, if not checked properly, can interfere with the natural capacity of land to recover and advance the process of desertification.

Agricultural intensification and the increase in irrigated area have led to a number of environmental problems i.e., loss of bio-diversity through the conversion of forest land into agricultural land; abandonment of many indigenous crop varieties in favour of HYV 's leading to irreversible loss of the country's genetic resources; depletion of soil nutrients and organic matter due to intensive cropping; and deprivation of soil from organic content due to use of crop residue as fuel. Other environmental degradation includes loss of wetland habitats through abstraction and drainage resulting in depletion of aquatic fauna and flora and reduction in water availability to the rural population, increased use of agro-chemicals raising the pollution potentials of surface and ground water.

Adverse conditions resulting from desertification process are: (i) deterioration of the natural resources adversely affecting the socio-economic condition and livelihood support systems; (ii) reduction of irrigation potential; (iii) diminishing of the food security base of human beings and livestock; (iv) scarcity of drinking water extraction and depletion of ground water, interference with spacing of tubewell, including hand tubewell, shallow and deep tubewell; (v) health and nutrition status of the population, arsenic contamination in ground water, contamination due to disposal of waste and inadequate sanitation; (vi) reduced availability of biomass for fuel; (vii) loss of bio-diversity; (viii) impoverishment, indebtedness and distress sale of assets of production.

2.8.4 Options and Measures Needed to Combat Land Degradation/ Desertification

A comprehensive study at the country level on land degradation/ desertification, covering all its aspects ranging from the physical to economic, is absent. However, it is clear that the quality of land has deteriorated, and its impacts are visible. Over the last decade, crop yield has declined due to deterioration of physical and chemical properties of land and soil. It would be useful to establish a baseline survey on which future monitoring and assessment or further deterioration or improvement could be based. The country has a number of policies to deal with land degradation, but with limited implementation. The existing policies must be implemented, and a number of new activities should be undertaken in the immediate future to address land degradation.

The Convention (UNCCD) states that efforts to combat desertification must be integral components of national development strategies and national environmental planning. Development of comprehensive action programmes to combat desertification should include strategies for alleviating poverty because these two goals complement one another. The country has identified the factors that contribute to desertification in the relevant socio-economic, biological, and geophysical context; and called for practical measures for combating desertification in the following priority fields (Rasheed, 1998; Jalil, 1998; Zuberi, 1998):

(i) combating land degradation through, inter alia, intensified soil conservation, afforestation and reforestation activities; (ii) encourage the creation of large scale reforestation and afforestation schemes, vegetation retention schemes and community-based agro-forestry schemes; (iii) promote in-situ protection and conservation of special ecological areas through legislation, while ensuring the protection of biodiversity; (iv) promote and encourage investment in forestry development through various incentives, including legislative measures and their implementation; (v) Ecosystem Management of drought prone areas i.e. Madhupur and Barind Tract, and other areas; (vi) development of water catchments, water harvesting and rainwater harvesting in the vulnerable areas; (vii) undertaking of silvo-agroforestry program for regeneration of degraded land, prevention of land degradation, seasonal harvesting of vegetation etc. in the dry region; (viii) improvement of ground water system through wetland conservation and management in the Chalan Beel area; (ix) Sustainable management of natural resources which may include promoting improved management of water resources and appropriate water saving technologies; (x) Establishment and preservation of grassland in the marginal areas as part of the soil conservation measures; (xi) Development of ecologically sustainable agricultural practice to introduce appropriate; environmentally sound and economically feasible agricultural techniques; (xii) Improvement of the framework for poverty reduction and food security; (xiii) Harnessing and efficient use of various energy sources; (xiv) Creation of favourable institutional and

legal frameworks; (xv) Strengthening of facilities for systematic monitoring and evaluation of desertification process; (xvi) strengthening the knowledge base and developing information and monitoring systems for regions prone to desertification and drought, including the economic and social aspects of these ecosystems; (xvii) promotion of research on desertification control and management of the effects of drought; (xviii) Promote understanding and arrangements among neighbouring countries which shares common rivers so that as a downstream country Bangladesh gets her due share of water for her economic use as well as for prevention of land degradation, drought, desertification and loss of biodiversity; (xix) Encouraging and promoting popular participation and environmental education.

There are two major constraints in preventing land degradation. The first one is the high population pressure on land, especially in the west and northwest parts of the country. In these regions, the exploitation of biomass due to a prevalent energy crisis appears to have exceeded the carrying capacity of the land, and led to encroachment on natural forests in the Barind and Madhupur Tracts. The second constraint is the absence of a comprehensive national land use policy. However, a draft land use policy has emerged as the follow-up program of NEMAP, is in place for wider discussion and government approvals. It needs to be emphasized that a plan to prevent land degradation must begin, strengthening of knowledge regarding the susceptible areas.

3. The Strategies and Priorities within the Framework of Sustainable Development Policies

The people of Bangladesh has the tradition of living in harmony with the environment while utilizing natural resources to meet their requirements. This harmony is upset due to the expanding population, the growing demand for resources and the increase in rural poverty. The Government is concerned about environmental issues in general and land degradation in particular over the past two decades. This concern is reflected in the different policy initiatives that have been taken by the government. The major policy initiatives, strategies and plans emphasized environment and natural resource management, land management, and forest development with a view to achieve sustainability in resource conservation and utilization. These policies and strategies have relevance to measures to be taken to combat land degradation.

3.1 National Plans and Strategies in other Social and Economic Areas

The national plans and strategies, which cover the general social and economic areas, are also relevant in the context of community development, uplift and rehabilitation in the dry region of the country.

3.1.1 Planning for Development

The National Economic Council (NEC), which is headed by the Prime Minister and consists of the Central Cabinet Ministers, guides the planning process. Bangladesh has had two and a half decades of development efforts at lifting the economy out of its abject poverty. Every plan targeted at an average annual GDP growth rate of above 5 per cent but achieved about 4 per cent. Plan size and actual expenditure (in million Taka) and GDP growth rate of past plans (at respective base year prices) are shown below:

Table 9: National Five-Year Plans and Their Growth Rate

Plan	Plan Size	Actual Expenditure	Growth Target (%)	Realized Growth (%)
1	2	3	4	5
First Five Year Plan	44,550	20,740	5.50	4.00
Two Year Plan	38,610	33,590	5.60	3.50
Second Five Year Plan	172,000	152,970	5.40	3.80
Third Five Year Plan	386,000	270,110	5.40	3.80
Fourth Five Year Plan	620,000	598,480	5.00	4.15
Fifth Five Year Plan	1969,521		7.00	

The Fifth Five Year Plan placed emphasis on poverty alleviation, increased self-reliance and meeting the basic needs of the people with particular focus on human resources development, women in development and environmental sustainability. The policy thrust and key elements of growth and conservation strategy in development process to prevent land degradation and improve the capacity for sustainable development in the vulnerable areas are: (i) Conservation of land, water and biological resources; (ii) Assessment of drought condition; (iii) Arsenic mitigation and water supply; (iv) Development of rainfed agriculture; (v) Appropriate agricultural/ farming systems which economize on water-use; and (vi) Rural infrastructure development.

3.1.2 The Master Plan for Forestry

The Master Plan for Forestry Sector (ADB-UNDP-GOB, 1996) aims to protect land against degradation by soil erosion, floods, landslides, desertification and other effects of ecological imbalance, conserve ecosystems and genetic

resources, promote sustainable use of non-timber forest products, and contribute to the growth of local and national economies by managing forest, developing forest-based industries and creating opportunities for income generation and employment. Soil conservation and watershed management is one of the major components of the Plan. The Plan also emphasizes to halt further degradation of the land system and desertification process. The National Conservation Strategy lays down the guidelines for integrating environmental concerns with development imperatives. Bangladesh Wildlife Preservation Act, 1983 incorporates provisions of buffer zone management, and allocates some revenue, which is generated in the protected areas for community development.

3.1.3 Formulation of National Environment Action Plan (NEMAP)

The formulation of the National Environment Management Action Plan (NEMAP) in 1995 is the major policy document used by the Government for environmental activities in the country. With the formulation of the National Environment Action Plan (NEMAP) the government's strategy now recognized the inseparable links between environmental degradation, poverty, and population growth and the implications for natural resource management.

Longer-term Measures under this plan include (NEMAP, 1995): a) Design and implement a comprehensive program on environmental research, data collection, analysis and dissemination; b) Review selected policies and regulations to favor private sector involvement in environmental management; c) Provide proper incentives for private afforestation activities by enhancing wood prices progressively to world market prices; d) Strengthen Environmental Forest Divisions to demarcate and protect reserved forests.

3.1.4 Agenda 21 Implementation Plan

The Agenda 21 recognizes the problems of droughts and desert-like conditions, particularly due to land degradation process, and calls for adopting and/or strengthening information sharing, launching afforestation and soil conservation activities, and expanding conservation areas (protected areas) in the representative ecological zones. It also calls for implementing integrated resource management programs in the ecologically sensitive areas, integrating desertification combating policies in the national development plans, developing an early warning system, expanding watershed conservation activities with people's participation and continuing forest management through users' participation.

Bangladesh recently formulated its National Agenda –21 programme in line with UNCED Agenda-21 where provisions had been kept for action plans related to land degradation and desertification”

In pursuance of this, country-specific programmes of action have been proposed for channeling investment resources (both internal and external) into ecologically compatible projects. The Ministry of Environment and Forests (MoEF) is the nodal agency for coordinating the environment related action programmes constituted by NEMAP.

3.2 National Plans or Strategies in Combating Land Degradation, Drought/ Desertification Developed Prior to the Convention.

3.2.1 National Strategies

The National Environment Policy sets the policy framework for environmental action in combination with a set of broad sectoral guidelines. NEMAP calls for improving forest management by continuing community forestry schemes, improving rangelands, and implementing efficient and cost-effective structural techniques for watershed protection with a view to reduce soil erosion and downstream sedimentation. The plan also provided a basis for expanding alternative energy use to reduce dependence on biomass sources. NEMAP further proposes programs to address cross-sectoral issues on biodiversity. It is hoped that the implementation of the proposed programs through stakeholder participation will ensure the conservation and sustainable use of biodiversity, and have positive impacts on soil and water conservation and poverty alleviation.

The government has adopted the policy of social forestry and agro-forestry as a part of poverty alleviation and environment protection. Increasing social forestry, in addition to increasing the availability of biomass and other forest products, would also provide employment for the rural poor, particularly women, in planting, nursery development and husbanding trees.

3.3 Strategies and Priorities Available in Combating Land Degradation, Drought/ Desertification after the Implementation of the Convention.

Bangladesh recognized the problems of soil erosion and fertility decline in many vulnerable areas. The policy focus is on proper land use, rehabilitation of degraded areas. Policies are also formulated to maintain a link and network related sectors such as forestry, agriculture, fisheries, water and land resources to combat the problems of land degradation and increase agricultural production. Recently, policy directives have also been issued to enact legislation, and develop procedures for the implementation of the Conventions to which Bangladesh is a Party, including the UNCCD.

Although Bangladesh has yet to develop a separate policy and program for the implementation of the UN Convention to Combat Desertification in a comprehensive manner, some policies which relate to soil and water conservation and forest emphasize public awareness and facilitate people's participation, including that of women and youth to minimize the land degradation process in order to halt further degradation of the land and water system.

3.3.1 Development of the Country's Water Resources: The National Water Plan (NWMP) and Bangladesh Water and Flood Management Strategy (BWFMS)

GOB is preparing NWMP extending to the year 2025 on the basis of National Water Policy (1999). The primary issues are how best to manage the annual floods during the monsoon and how to allocate scarce water resources in the dry season, with or without augmentation. The planning has been undertaken through a participatory process to identify key water resources issues and policy recommendations, along with strategies to improve water resources management and identification of the institutional requirements for their initiation. The preparation of a National Water Management Plan has contributed to the rational economic development of the country's water resources, while protecting the natural environment and improving the quality of life of the people of Bangladesh. The plan has addressed the following problems (WARPO, 2000): i) Flooding and drainage congestion (WARPO, 2000); ii) Drought; iii) Siltation; iv) River bank erosion; v) Salinization; vi) Pollution of surface and groundwater.

The NWMP study will build on the findings of recently completed studies under the Flood Action Plan (FAP) and National Water Plan (NWP) and will aim at further developing and strengthening the change of focus that dates to the government's "Bangladesh Water and Flood Management Strategy" (BWFMS) of November 1995 (World Bank, 1999). FAP includes drought mitigation and water quality regulations as an important aspect of the plan.

3.4 Afforestation Programmes

The Government of Bangladesh imposed a moratorium on tree felling in 1989 and declared that it would increase the protected area from 5% of total forest area to 10%. It envisages raising forest area to 20% within the next 15 years.

The Ministry of Environment and Forests in consultation with the DAE fix targets for afforestation/ tree planting activities annually. These afforestation activities are taken up under various schemes of different Ministries/ Departments of the Governments. Under the Forestry Sector Project (FSP) plantation of 40,000 ha of Sal Forest are planned during 1997- 2003. The progress of activity of the forestry sector in the dry region is shown in annexure-I

3.5 Other Programmes/ Projects

3.5.1 BMDA

To retain the environmental balance and to check the desertification of the Barind region, the government in 1985 had taken the Barind Integrated Area Development Project (BIADP) later renamed as Barind Multipurpose Development Authority (BMDA) in Rajshahi, Naogaon and Nawabganj districts.

Before the project activities started in the region, Barind Tract was the most unfavourable agricultural section of the country with rainfed local T. Aman as the dominant crop. The ensured supply of DTW irrigation has fundamentally changed the agricultural scenario in the Barind. In place of single crop, now multiple crops are grown with higher agro-economic productivity. This transformation to multiple cropping has resulted in productive cropping patterns and increased cropping intensities.

Construction of cross-dams, water control structures, re-excavation of canals and ponds have contributed to improve surface water augmentation. This is reflected in satisfactory command area development, ecological balance and pisciculture.

Due to non existence of good road network, the slow moving Bullock cart was the main transport used for carrying goods and passengers. Construction of feeder and rural roads has changed the status of rural livelihood through uplift of rural economy by BMDA. The objective of the project and the progress of its activities are shown in annexure- I

3.5.2 Sustainable Environmental Management Programme (SEMP)

SEMP, as the follow-up implementation of NEMAP, addresses the major environmental priorities identified by people through NEMAP. It is the first programme approach initiative of the country office as well as the Government of Bangladesh, consisting of 26 projects (components) being executed by the Ministry of Environment and Forest and

implemented by 21 government/non-government agencies throughout Bangladesh. Focus areas relating to the environment are Policy and Institutions; Participatory Eco-System Management; Community-based Environmental Sanitation; Advocacy and Awareness; and Training and Education. SEMP will support community capacities for sustainable management of environmental resources and strengthen the capacity of the public sector to develop new framework for policy development in support of enhanced community participation, protection of the environment, and sustainable management of the country's environment and natural resources. SEMP will benefit grassroots level people, particularly women, in eco-specific intervention areas (Jilani, 1998).

3.5.3 *Ecosystem Management in the Barind Area*

As an important component of SEMP, the programme named "Eco-system management in the Barind area" was designed to improve the ecosystem of the dry and degraded-Barind land through community based sustainable environmental activities. The Environment Management Action Plan for Barind Area aimed at Combating Desertification, environmental awareness; social mobilization and motivation type of activities is yet to be implemented by the civil society bodies, research organizations and NGOs.

3.5.4 *Protected Areas*

There are seven national parks, eight wildlife sanctuaries and one game reserve, covering a total of 244,175 hectares (less than two percent of the total land area); separate conservation principles have been established for each, but the resources, management and staffing needed to implement these principles are lacking. A further eight wetland areas in Sylhet and eastern Mymensingh, and three wildlife sanctuaries, are proposed as conservation area. Together with the existing parks they would expand the conservation area to 700,000 hectares (5 percent of the total land area). The wetlands support a rich diversity of species, including an estimated minimum of 330 species of plant, 270 species of birds, 120 species of commercially important fish, 50 species of reptile, 42 species of mammal and 8 species of amphibians. The Sundarbans support the Royal Bengal Tiger and the estuarine crocodile. These are not only repositories of natural biological diversity but have also helped in combating desertification.

3.5.5 *Forest Resource Management Project (FRMP)*

Under ongoing FRMP, the following could be achieved in the next three years: Forestry Management Information System (MIS) to additional four Forest Divisions established; additional 200 ha participatory forestry development program with landless poor and destitute women completed; about 60,000 ha forest resources expansion and mangrove plantation programs established; forest management and conservation plans finalized; mangrove research and professional forestry education for technology generation and human resources development operating effectively (ADB-UNDP-GOB, 1996).

3.5.6 *Bangladesh Environmental Management Project (BEMP)*

Bangladesh Environmental Management Project (BEMP) is going to be implemented by Department of Environment with three demonstration projects (DoE, 2000) such as: (i) Design and demonstrate models of sustainable environmental management; (ii) Develop environmental management tools and techniques and provide practical training opportunities for DoE technical and managements and participants in industry and local communities and (iii) Raise environmental awareness among wide and varied.

3.5.7 *Water Sector Improvement Project (WSIP)*

The project is aimed to improve the performance of the water management systems in Bangladesh and ensure their sustainability through improved operation and maintenance, appropriate institutional reforms, assist GOB in implementation of its National Water Policy. This objective would contribute significantly in promoting agriculture production and flood plain fisheries, improving local navigation, mitigating adverse environmental effects of past interventions, and ensuring environmental protection (World Bank, 2000 c).

3.5.8 *Follow-up on River Bank Protection Project (RBPP)*

This project aims to reduce vulnerability of the poor by more extensive implementation of river training techniques developed under RBPP to mitigate against further river bank erosion which leads to disastrous loss of land, crops and property every year (World Bank, 2000 c).

3.5.9 *Follow-up on Jamuna Bridge Multipurpose Project (JBMP)*

The project is expected to make a positive contribution to the reduction of economic damages caused by erosion in the project areas by preventing the loss of about 7,800 ha of riparian land - including about 1,500 ha of urban area in Sirajganj - and protect about 1,000 people from loss of livelihood, displacement and impoverishment. By preventing

perennial flow into the Bangali River from the Brahmaputra River, the project would prevent potential incremental flood damage to crops, property and infrastructure over an area of nearly 300,000 ha populated by more than two million people (World Bank, 2000 c).

3.5.10 *Bangladesh Arsenic Mitigation and Water Supply Project (BAMWSP)*

Bangladesh Arsenic Mitigation and Water Supply Project (BAMWSP) aims at alleviating the adverse impacts of arsenic contamination of drinking water. The components of BAMWSP include on-site mitigation by the installation of deep tubewells and improved understanding of the arsenic problem through study of detailed hydrology characterization in the affected areas.

3.6 **Other initiatives:** *Domestic Energy Needs, Development and Conservation*

The Energy Perspective Plan has established a linkage between the process of land degradation and energy consumption pattern, particularly the biomass fuel. This plan emphasizes the need for switching over the use of biomass fuel to clean energy, which is likely to contribute to increase the green cover and minimize the loss of nutrient rich soil.

The 1991 census also confirmed that, of the 19.98 million households in Bangladesh in 1991 (consisting of 3.97 million in urban areas and 16.01 million in rural areas), a great bulk of these population were dependent on bio-fuels. Bangladesh Council for Scientific and Industrial Research (BCSIR) has adopted a Biogas Pilot Project. The project is to install 5000 biogas plants, one in each municipal ward or union. The gas will provide a family of 8-10 members (owning 5/6 cows) to cook its two meals and light one gas lamp. The National Programme of Improved *chulas* (Clay Stoves) is also being implemented since 1994 to improve energy conservation. The thermal efficiency of these *chulas* is about 60-65 percent as compared to 5-15 percent in the traditional *chulas*. So far, over 67 thousand improved *chulas* have been supplied to the rural and semi-urban households in 105 thanas of 35 districts; this is against an estimated potential of over 10.0 million households (SEHD, 1998; Government of Bangladesh, 1997).

3.7 **Measures Taken to Mitigate the Effects of Drought**

In the event of drought the Government undertake relief measures by providing drinking water, foodgrains fodder, food subsidies to special groups and employment through food-for-work-programme. The Disaster Management Bureau coordinates drought relief works with local governments. The activities of the Bureau also comprise human resource development, research case studies, database and information services, and documentation on disaster management.

Rural Works programme of the GOB provides employment to the population affected by drought and helps to mitigate the severity of the drought wherever it may occur.

3.8 **Lessons Taken from Practices of Indigenous Systems**

The indigenous knowledge of the local population regarding land management may be encouraged as these are generally environment friendly. In Sal Forest Region of the Madhupur Tract, tree species like mango, Mahogany and Jackfruit grow in upland (*chalias*) around homestead where lower slopes (*baid*) are used for growing paddy. Sometimes gentle slopes and *chalias* are used for growing vegetables, maize etc. (NEMAP, 1995). This practice increases moisture retention, improves soil fertility and crop yield; and reduces surface runoff and thus halts soil erosion.

Home garden system provides healthy ecosystem for humans, animals, birds, livestock, and miscellaneous flora and fauna. Homestead bamboos are planted because these develop rapidly and are good soil binders. Use of homestead ash is done to supplement k and organic matter in the soil and to keep insects away from insects. Banyan trees are considered as a symbol of preservation of ecosystem because through its extensive root systems it holds large chunk of soil and provides shelter and food for birds and other wild animals.

Khari development is encouraged in the Barind area to make storage of water by making embankment in some segments of a drainage/ irrigation channel. Trees and shrubs are planted to reduce further evaporation (Zuberi, 1998). Pond digging in is done to facilitate judicious use of storage water for domestic and agricultural purposes. People of the entire village or community decide where to dig the pond and entire operation and digging and maintenance thereafter are being done on a cooperative basis. In the past, such ponds were also used as storage of rainwater. These days they don't get sufficient water in the dry season as ground water recedes further below. We have to improve upon this technique to include arrangement of rainwater harvesting and storage.

Cropping pattern and choice of crops and cereals in some areas are adjusted keeping conformity with the water balance of that area. The dry areas are now looking for suitable alternative cash crops like cotton, maize, sunflower, melon etc.

The practice of agro-silviculture creates a favourable environmental condition that reduces evapotranspiration and produces fuelwood, timber and fodder.

Many indigenous systems are practiced in the hilly regions to facilitate various local problems related to watershed management and utilization of natural resources. Use of bamboo in earth dam construction; use of brushwood and waste woody material for soil conservation; harvesting of forest product by skidding; and production of various useful tools and implements are good examples of application of the indigenous system in the Hill Tract region

3.9 Community Based Efforts for Rural Development

The policy of empowerment of village communities and their involvement in developmental activities including natural resource management has been strengthened through the national perspective plan. A host of subjects such as agriculture, land improvement, implementation of land reforms, land consolidation and soil conservation, water management and watershed development, animal husbandry, firewood and fodder, social forestry has been included.

The UNDP supported Community Empowerment programme (CEPs) supports, through several projects, the Government of Bangladesh's poverty alleviation efforts. The different CEP projects are pursued as pilot schemes with an underlying long-term objective of replicating a successful model at the national level. Strategic linkages will be developed with other service providers that are institutionally appropriately placed to provide sustainable support to the target clients in meeting their social, economic and infrastructure needs.

3.10 Policies

The National Conservation Strategies, the Environment Policy, the NEMAP, the Forestry Master Plan, the Flood Action Plan are significant component of an overall environmental strategy for sustainable development in Bangladesh (Jalil, 1988). The review made during the NEMAP process showed that, as far as specific sector and cross-sector policies are concerned, several of these have only come into existence in the last few years; and that most of them do not discuss desertification *per se*. During the National Awareness Seminar on Land Degradation and Desertification it was realized and suggested that these policies required being revised/ updated in the light of the provision of the UNCCD (Haque, 1998). The policies that have significance of an overall environmental strategy for sustainable development in Bangladesh are listed below: (i) The National Water Policy; (ii) National Agriculture Policy, 1999; (iii) New Agricultural Extension Policy (NAEP); (iv) Draft Land Use Policy; (v) National Forest Policy, 1994; (vi) National Policy on Environment, 1992; (vii) National Safe Drinking Water and Sanitation Policy; (viii) Pesticide regulations Act 1997; (ix) Health and Population Sector Strategy (HPSS); (x) Draft National Education Policy (NEP); (xi) Integrated Pest Management Policy, 2000; (xii) Integrated Plant Nutrient System (IPNS).

4.0 Institutional Measures for Implementing the Convention

4.1 Formation of a National Coordination Body (NCB)

The government of Bangladesh is actively considering forming a National Coordination Body (CBD) under which formal institutional measures for implementing the convention will be undertaken. The following government and their associated department and directorate along with non-government organizations could be the party of NCB to implement the obligation and activities drafted under the convention; (i) Ministry of Environment and Forest with associated Department and Directorate; (ii) Ministry of Agriculture with associated Department and Directorate; (iii) Ministry of Water Resources with associated Department and Directorate; (iv) Ministry of Land with associated Department and Directorate; (v) Ministry of Fisheries and Livestock with associated Department and Directorate; (vi) Ministry of Defense (SPARRSO and BMD); (vii) NGOs; and (viii) Research Organizations

4.2 Implementation of the mandates of the UNCCD: Need for a National Action Program (NAP)

Many programmes/schemes related to natural resources implemented under the Five Year Plans have relevance to land degradation/ desertification and droughts. National Conservation Strategy (NCS), national Agenda-21 implementation programme and NEMAP deal with issues covering land degradation/ desertification. Some of the environment related programmes reviewed here shows that the existing mechanism of their implementation will be effective in coordinating actions to combat desertification. So, Bangladesh is prepared to meet the obligation to "establish strategies and priorities, within the framework of sustainable development plans and/ or policies, to combat desertification and mitigate the effects of drought".

Bangladesh has not designed a separate National Action Program (NAP) to combat desertification. The programmes/schemes related to natural resources implemented under the Five Year Plans may be considered as complementary to NAP. This implies that a framework of sustainable development including the linked policies/strategies does exist in the country and the NAP may be linked to it.

Based on the evaluation of on-going strategies and programmes and the assessment of current and future needs to combat desertification and mitigating the effects of drought, programmes would be taken up with a thrust on meeting needs of food, fodder, firewood, drinking water of rural population and to improve their quality of life.

The existing sectoral policies, strategies and action plans do give serious consideration to the principles of participation, partnership and involvement at the grass-root level, particularly of women, poor and the rural population. This is in conformity with the UNCCD principles.

Bangladesh is required to develop a separate National Action Program (NAP) in the spirit of the convention. Under the existing policies and programs the contents of the NAP will aim for resource management and poverty alleviation. Implementation of these policies and programs clearly indicate that people-oriented activities are successful and emphasis has to be given to enhance people's participation in all sectors of community development and natural resource management.

The Department of Environment (DoE) is presently the implementing organ of the Ministry of Environment and Forests and is responsible to carry out the mandates of the UNCCD. Bangladesh Environment Management Project (BEMP) is now under implementation with objective of strengthening the capacity of the Department of Environment for accomplishing institutional planning to enable DoE to fulfill its legislated mandates inclusive of GOB and donor projects.

4.3 Creation of Data Banks

The Department of Environment (DoE) is also developing environmental database and information system on various aspects of environment and management practices, which could be used to address the requirement of UNCCD amongst others. Bangladesh Agricultural Research Council (BARC) has electronic database on agro-ecological and drought prone areas of the country. The data base which contains information on the country's land resources including physiography, soils, climate, hydrology, cropping systems, and crop suitability. The database may be used to generate readily accessible information on the physical land resources of the country for use by researchers, extension workers, and decision makers in land and agricultural resources management as well as agricultural development planning. The Land Resources Information System (LRIS) includes additional databases and procedures, in particular data on socioeconomic and demographic factors influencing agricultural production. With the present facilities, dynamic multi-layered GIS database may be created in which the component layers are modeled as variables that change over time. A user-specified digital elevation model (DEM) has been developed with the national (reconnaissance level) soil association layer to create a more detailed Soil/ Inundation Land Type layer (BARC brochure, 2000).

Meteorological station data is analyzed at BARC using the Agricultural Planning Tools (APT) calculator, and the resulting data is then used to create GIS surfaces showing important climatic properties related to plant growth by season as well as the variability of these properties. Study is made to improve the assessment of single crop and cropping pattern suitability in individual inundation land types. Suitability for various cropping patterns is rated using a database of known and potential cropping patterns (BARC brochure, 2000).

In addition to that Department of Agricultural Extension is also preparing electronic database on drought-affected area chronologically. Forest Department in collaboration with the Department of Agricultural Extension is working on drought and tree plantation, which could be treated as measures for reducing land degradation as well as combating desertification. Water Resources Planning Organization is also preparing electronic database, which includes crop agriculture and their water requirement from both ground and surface sources. Moreover, there is a large number and non-government organizations are working to improve quality local environment and resource management.

4.4 Strengthening Facilities for Monitoring and Evaluation of Desertification

The Agricultural Research Management Project supports strengthening of the management of the national agricultural research institutes and the promotion of research by private organizations to generate profitable and sustainable agricultural technologies for Bangladeshi agricultural producers. This will enhance the knowledge base and develop information and monitoring systems for regions prone to desertification and drought, including the economic and social aspects of these ecosystems. Bangladesh Environment Management Project (BEMP) will also improve DoE's infrastructure capability to formulate environmental regulatory instruments and will help implement their procedural and enforcement applications.

4.5 Promotion of Research on Desertification and Management of the Effects of Drought

For the whole of the Ganges belt including the Barind and Madhupur Tracts no crop cultivators or rainfed farming practices specially suited to the prevailing soil and agro-climatic conditions have been developed yet. There is thus an urgent need to develop drought-tolerant crop varieties and drought-mitigating technologies that will make maximum

use of the land resources of the rainfed farming systems and the limited rainfall in the region. Complementary concerns include appropriate water storage and rain water harvesting technologies, supported with packages of agronomic practices to increase productivity of the Kharif crops and vegetables strengthening of the agricultural research and extension systems in order to develop new technologies relating to crop varieties, integrated farming system, organic farming, improved agronomic and agro-processing technologies, and for diffusion of the proven technologies; restoration/improvement of soil fertility through better management of the organic matter of soil to improve yields of crops; towards this end, production and use of bio-manure will be encouraged; development and dissemination of post-harvest technologies for reduction of post-harvest losses and the removal of transport bottlenecks (Chowdhury, 1993).

4.6 Functional Legal and Regulatory Framework

The Constitution of Bangladesh asserts that 'it shall be a fundamental responsibility of the state to attain, through planned economic growth, a constant increase of productive forces and a steady improvement in the material and cultural standard of living of the people (Article-15). With this commitment of enhancing productive forces of nature, Bangladesh has so far signed, ratified and acceded to 22 international conventions, treaties and protocols related to environment including the UNCCD. Bangladesh signed the UNCCD on January 1996 and after ratifying it came into force in 1997. Bangladesh is committed to implement these conventions and treaties, which have provisions to frame and implement rules and guidelines on the environment.

No separate legal measures have been initiated to implement the provisions of the Convention. But legislations existing in the country support the strategies and policies aimed at conservation and management of natural resources and preservation and protection of the environment. Legislation facilitating community forestry activities exists in the country in order to carry out effectively extension programmes and developing forestry. Bangladesh Environment Conservation Act, 1995, Environment Conservation Rules, 1997 and the Bangladesh Forest Act, 1927 will ensure protection and development of forests and controls conservation and improvement of environment.

The Groundwater Management Ordinance, 1995 and the Groundwater Management Rules, 1997 regulates the suitability of sites for installation of tube wells and concerns irrigation water required for agricultural production There are also laws governing particular aspects of water use such as water rates that needs to be consolidated (World Bank, 1997).

During the process of preparation of NAP, existing legislation will be further reviewed, and gaps and the enforcement status will be identified. After reviewing measures may be recommended to ensure functional legal and regulatory framework which will prompt the development of natural resource management capacity and CCD implementation.

5. Participatory Process for Preparation and Implementation of the Action Programme

5.1 Effective Participation of Actors Involved in Defining NAP Priorities

The UNCCD calls for effective participation of key actors in its implementation. In the NAP process, the key actors and/or stakeholders have been identified and comprise government organizations (ministries, departments), NGOs working in the field of soil conservation, forestry, federation of NGOs and CBOs, private sector representatives particularly the land owners, academia, media, youth and women. Efforts are made to involve them in information sharing and consultative process in UNCCD related activities to the extent possible.

Gram Parishads have been set up at village level with elected permanent committees. The Parishads have been entrusted with responsibilities of managing water and sanitation requirements. They may also be involved in making assessment of land degradation/ desertification and drought conditions and suggesting appropriate measures to combat the situation.

5.1.1 Peoples Participation in Formulation of NEMAP

National Environment Management Action Plan (NEMAP) is the first national environmental plan prepared through participatory process and follow-up of NEMAP, SEMP Projects are being implemented involving various government and non-government organizations through community participation. The NEMAP process involved - a series of workshops with people from all walks of life including local officials, local people's representatives, academics, farmers, fisherfolk, women and the poor. Data for this consultative process were collected over a period of 8 months using multiple data collection techniques which included Exploratory Study, Secondary Sources of Data, Hydrological Study, Biological Study, Women and Environment related Activities, Participatory Rural Appraisal (PRA) and holding of a series of workshops with people's participation from all walks of life and discussion with all the stakeholder groups. A number of public awareness programs have been launched through governmental and non-governmental organizations. Information is collected, processed and disseminated through the media or through official channel.

5.1.2 Methods of and Participation of Various Actors

An approximately one-hour program is aired once a week through national radio on State-managed forests and environment management. A number of TV filler (1-3 minutes duration) have been made on the management of agricultural practices and broadcasted. A 30-minute agriculture program is also aired daily to provide information on soil fertility, farming technologies and other agriculture practices. Besides, occasional programs are launched on television to telecast episodes, news and spots to create public awareness on natural resource and environmental management. Ministry of Agriculture and Forest Department have launched these programs. There are a number of leaflets, brochure, posters on IPM techniques and a handbook in Bengali on beneficial insects. A leaflet published by FD Extension project in Rajshahi contains a slogan “ There is no alternative to afforestation in combating desertification”.

The Integrated Pest Management (IPM) project has created great awareness on IPM among the farmers, policy makers, politicians, researchers and the general public (UNDP, 1999). This resulted in getting a tremendous support for IPM from farmers, politicians, donor agencies and others. In many places in the country, the IPM trained farmers have started IPM clubs where the members meet periodically and discuss IPM practices. In many places, impressed by the IPM training at the FFS, the members of the parliament and other local elites have come forward to donate money to build a clubhouse, to buy a TV and radio sets. In other places, the Thana Nirbahi Officer (TNO) has willingly provided financial support from agricultural development program fund for the club to start more FFS and train farmers. Women participation in IPM clubs is also widely seen as a very positive step in many ways.

MoEF, LGED and Ministry of Agriculture have started the publication of their respective newsletters twice every month. These contain valuable information on natural resource management and environment conservation and status of the development programmes undertaken in the respective sectors. GOB has included environment course in the formal education in primary, lower secondary and secondary education throughout the country. The environment and science courses include some information on problems of land degradation and corrective measures. Universities have begun to teach Environmental Science as a separate faculty.

BFRI has developed a simplified field manual on land capability assessment and site-specific selection of the species. The manual gives a ready-made information for species selection by the foresters as well as villagers. Easy and workable field identification keys have been developed for various timbers, forest trees, bamboo and canes. Brief description, occurrence and uses of these resources are also available (BFRI, 2000). An easy and inexpensive preservative technique has been devised by the institute for extending the service life of rural housing materials such as bamboo, wood, sungrass and straw. This technique extends 3-5 times the service life of the materials. Such adaptive measures are communicated to the stakeholders through posters, pamphlets and brochures published by the Forest Department. It has been considered that these initiatives will likely produce knowledge-based and skill manpower on environment management in near future.

NGOs are equally involved in launching public awareness activities at the grass root level for natural resource management. Some NGOs are launching programs on environment, gender and community forestry separately.

Land degradation and environmental issues are regularly telecast through documentary films. Besides, a number of NGOs also publish and distribute newsletters and journals to let the people know about their activities on resource management.

5.1.3 National Awareness Seminar

In the process of CCD implementation, MoEF organized a two-day national seminar on “Combating land Degradation and Desertification in Bangladesh in 1998 in collaboration with the UNCCD Secretariat. The seminar was attended by over 70 participants representing governmental, educational and research institutions, local bodies, specialized NGOs and CBOs, journalists and donor agencies (M.K. Farooque, 1998). The main issues discussed in the national seminar include the identification of problems encountered in land and water resource management, development of a framework for NAP and for improving productivity of different land uses, and recognition of the roles of different stakeholders for the preparation and implementation of NAP. This seminar was instrumental in exchanging information and experiences on land degradation and desertification and effectiveness of existing policies and programs, in raising public awareness on the importance of land improvement and its contribution to food production and natural resource management, and in deriving a set of priority program areas for NAP.

5.1.3.1 Priority of National Action Plan (NAP)

The priority in an action program to combat land degradation / desertification should be to: a) control the process in already degraded areas and (b) monitor and implement prevention measures in lands that are not yet degraded, but are

vulnerable. In both efforts the participation of local communities, governmental agencies, NGOs and regional and international organizations is essential

In the context of west-northwest Bangladesh, a series of priority measures for combating degradation/ desertification may be outlined here: (a) Introduce methods of land use planning in ecologically sound ways; (b) Rehabilitate degraded lands and sustain their productivity for farming and agroforestry through soil and water conservation; (c) Protect existing trees and other vegetation cover and improve management of forest resources; (d) Increase the vegetation cover through such activities as afforestation/ reforestation, agro forestry and social forestry; (e) Establish woodlot as sources of fuel wood, and encourage the development and use of other sources of energy along with the use of energy-saving cooking stoves; (f) Manage surface and ground water use in environmentally sustainable ways; (g) Introduce and encourage vigorously the measures to control population growth; (h) Assess the impact of urbanization and industrial expansion of land degradation / desertification ; (i) Create and develop awareness among the local population about the problem, motivate them to take combat measures, promote partnership between government agencies, non-government organization and affected land users and ensure fullest possible public participation of local communities in measures against land degradation; (j) Strengthen national institution capabilities to combat degradation/ desertification, and build regional and international cooperation for combating desertification.

Parallel to control measures a plan is needed for monitoring degradation/ desertification in Bangladesh. This monitoring and surveillance plan would be based on the recognition of desertification indicators and the establishment of standard for comparison and evaluation.

5.1.4 Community Based Beel and Floodplains Resource Management

Implemented by the Ministry of Environment and Forest and funded by UNDP, IUCN-Bangladesh has been assigned to execute Community Based Haor and Floodplains Resource Management in selected wetlands sites. BCAS has been appointed to undertake the initiative in the Chanda Beel area as a part of the Madhumati Floodplains system. As a part of its awareness campaign, the project has launched several initiatives that include bringing out a local Bengali monthly wall magazine named *Jolabhumi Barta* (Haque, 1999)

5.1.5 Strengthening of Environmental Assessment and Monitoring Capabilities (SEAMCAP)

In response to the recommendations contained in Agenda 21 of the Earth Summit, the Environmental Assessment Programme (EAP) of United Nations Environment Programme (UNEP) took the opportunities to review the activities of its several components. The EAP established certain principles, which would underlie its activities in developing countries and countries with economies in transition. As part of Strengthening of Environmental Assessment and Monitoring Capabilities (SEAMCAP) for Bangladesh, SoE Data Collection and Reporting Project, a national training workshop was held in Dhaka. The training workshop was jointly organized by the DoE, MoEF, BCAS, SACEP and UNEP (Alam and Jilani, 1998).

5.2 Gender Balance of Actors Involved in Defining NAP Priorities

Women contribute to 45.6 per cent of labour in agricultural production (FAO, 2000). Realizing it, women involvement has been institutionalized in natural resource management through user group mobilization approach. GOB has enunciated policies to involve women and other sections of the society to enhance their participation in all types of national development activities including resource management. In order to enhance their access to economic activities, saving and credit programs have been launched in selected areas and/or integrated as an integral part of community development programs.

In the social forestry projects the number of women participants are rather low. For instance, in Jessore Forest Division there were 732 female participants out of 18,581 numbers, which was only 4%. There will be an increase of women members from 3.9 percent to at least 50 percent in the new groups.

Projects carried out by NGOs and women farmers, promotes mulberry tree plantings and cocoon production to boost domestic silk production. In recent years, women have also been encouraged to manage forests and implement soil conservation activities through women community user groups. GOB is furthering this process by providing additional incentives.

However, gender imbalance has been noticed in land ownership, and women participation has been limited due to low level of education, traditions, practices and cultural barriers. Efforts are underway to increase the participation of women, and some NGOs are also working to increase women participation in community development activities. The

organizations where women are working will further be encouraged to organize public awareness programs and participate in the Convention matters.

5.3 Representation of Various Actors in the National Priorities Identification Processes

The consultation process has been started at different levels to identify issues and priorities for public awareness. NGOs are also very active in raising issues for public debate and in providing suggestions for natural resource management. The draft national policies are made available for public review. This process has approached to seek the participation of various actors in national environment related policies and programs. The district level organizations involved in natural resource management and the local bodies also conduct a series of consultations with stakeholder and this process has enhanced the understanding that public consultation will lead to the successful participation of activities designed for natural resource management with people's participation. Hence, various actors and/ or stakeholders participate and provide suggestions and comments on priority issues and public participation process is on-going. The participants of the National Awareness Seminar on Land Degradation/ Desertification emphasized that a bottom up approach would be used for drafting the National Action Plan (NAP) involving stakeholders and people affected at the grass root level, similar to those used for NEMAP. It was also advocated to form a body named as "NAP Implementation Cell" composed of technical experts from concerned technical departments/ agencies and members of the civil society (Haque, 1998).

5.4 Nature and Scope of Information, Education and Communication Actions

Governmental and non-governmental organizations, research and academic institutions are involved in collecting and disseminating various types of information related to natural resources management. Soil conservation and watershed management information, particularly on the implication of soil erosion and landslides, off-farm techniques, biotechnological aspects etc. are communicated through the mass media and official publications. Consultative workshops and seminars are frequently organized by the governmental and non-governmental organizations to promote information exchange at the national and local levels. The national and regional workshops are organized, as and when necessary, for program selection.

The Ministry of Environment and Forests, the Ministry of science and Technology and the Ministry of Agriculture organize many workshops to seek additional inputs from the local level organizations. Although they are not directly related to CCD implementation, the programs identified in annual planning workshops at the district and regional levels contribute to land improvement and resource management.

Bangladesh celebrates World Environment Day, Desertification Day, Earth Day and Biodiversity Day including other international events to raise public awareness on the theme of each Day. At national level, tree plantation week is celebrated to enhance public awareness on the forest and soil conservation. Every year the Ministry of science and Technology observe a Science Week where symposiums are held on subjects related to various aspects of environment. Information is also made available through media or publication and dissemination process.

5.5 Extent of Uptake of Local Concerns at the National Level, and of Results of National Consultation at the Local Level

In view of the nature of the problems of land degradation and natural resource depletion, the participation of the actors are duly acknowledged in the decision-making process and are considered by the policy-makers and legislative bodies. For example, introduction and understanding of the benefits of community forestry programs in the Barind area led to expansion of the provision of involving the community users in the early 1981 by reflecting them in the national development plan.

The present top down service-driven system in the social forestry programme may be changed to a bottom up demand driven system where the group member will accompany the planning, implementation and management. The government agency and NGO may function as facilitators on the demand of the group. Farmer –led management will ensure timely harvest of forest produce and distribution of benefits to the participants, including reforestation of the area.

In 1993, Chittagong Hill Tract Development Board (CHTDB) in collaboration with the International Centre for Integrated Mountain Development (ICIMOD), Kathmundu, Nepal launched a programmed for the promotion of Sloping Agricultural Land Technology (SALT)- a participatory farming system approach to soil conservation extension in Chittagong Hill Tracts (Khisha et al., 1998). The project will create awareness among the policy makers, development workers, extension staff and the hill farmers about the danger and consequences of soil erosion, deforestation, loss of biodiversity and environmental degradation.

6. The Consultative Process in Support of the Preparation and Implementation of the NAP and the Partnership Agreement with Developed Country Parties

After the NAP document is finalized, appropriate programmes identified and prioritized, the line ministries and departments for mobilization of the much-needed resources in combating desertification problems will carry out consultation with international donors.

Bangladesh has welcomed international partners in many fields of activities earlier, as evidenced by the following projects: (i) IDA is assisting GOB in the Water Sector Improvement Project (WSIP) to improve the performance of the water management systems in Bangladesh; (ii) IDA is also expected to finance foreign exchange cost tentatively of about 105.7 million US\$ for the Bangladesh River Bank Protection Project initiated by BWDB; (iii) IDA would finance about 46.0 million US \$ equivalent, the European Community (EC) 17.0 million US \$ for the Bangladesh Coastal Embankment Rehabilitation Project initiated by BWDB; (iv) The GEF supported ADB- Sunderbans Biodiversity Project, undertaken by FD, is currently under implementation.

Participation of donor communities has been instrumental in natural resource management and in the process for poverty alleviation. Various actors participate in government-launched programs by attending the working groups, workshops and seminars or by providing necessary fund.

MoEF has recognized the importance of cooperation and partnership building through informal consultation and exchange of information. During the national awareness seminar in 1998, UNCCD, UNDP and other donor partners were invited to participate in the seminar and valuable inputs were received from them that would help in formulating the NAP.

GOB in collaboration with the World Bank and the UNDP, has undertaken a two-year program to develop environmental management guidelines to strengthen the environmental management capacity of the government agencies and provide a sound technical basis for assessing proposals and applications, determine the technical requirements, make statutory decisions and monitor and regulate the sectoral performances.

7. Measures Taken or Planned to Enhance Knowledge on Desertification and its Control and to Monitor and Assess Desertification and Drought

7.1 Adequate Diagnosis of Past Experiences

7.1.1 Synthesis and Evaluation of Activities Undertaken in the Field of Combating Desertification and Mitigating Drought

Issues of land degradation, particularly soil erosion and watershed, and soil fertility conditions, were identified during the preparation of the Master Plan for Forestry Sector in 1995 and NEMAP in 1995. Since then, studies have been conducted and information updated as part of the planning process. However, no specific study has been carried out at the national level to identify the problems of land degradation in the recent years in the spirit of the Convention. Experiences gained in soil and water conservation, and forest management and conservation of agricultural land, demand for launching land improvement programs with people's participation. There is also a need for involving the local people for community development works.

The Ministry of Environment and Forests intends to conduct a special study to collect information and develop broad-based programs with regard to the implementation of the UNCCD. This study would be funded through regular national budget. The study should enumerate the state of desertification and drought problems in Bangladesh, elaborate efforts on sustainable natural resource management and identify priorities for national plan of action. NEMAP/ SEMP interventions included the planning, implementation and operational elements including awareness raising, training and capacity building, communication and participatory processes, emergency preparedness etc.

7.1.2 Experience from the National Awareness Seminar

In the light of the NEMAP/ SEMP interventions and to initiate a program of action to combat desertification and drought, MoEF organized a national seminar on “ Combating Land Degradation and Desertification” in 1998. The seminar was conducted to create public awareness on the causes and consequences of land degradation and emergence of desert-like condition, and seek inputs for the preparation of NAP. The recommendations of this seminar would form the basis of the strategies and priorities of the draft action program. Information generated under these initiatives, studies and proceedings has been the basis for expanding public awareness programs and NAP formulation.

The National Awareness Seminar stressed the need for preparing and implementing the National Action Programme (NAP) for combating land degradation, drought and desertification under the UNCCD as a national obligation. The following priority areas may be considered in formulation of the action programs with regard to the implementation of

the UNCCD: (i) Strengthening the knowledge and information base; (ii) Expansion of intensive soil and water conservation and afforestation activities; (iii) Development and promotion of agro-forestry system and sustainable alternative livelihood; (iv) Development of comprehensive anti-desertification program integrated with national environment and development plans; (v) Development of drought preparedness and drought relief and self-help schemes; and (vi) Launching public awareness and promotion of popular participation programs.

7.2 Established Technical Programs and Functional Projects to Combat Desertification

7.2.1 Inventory, Adaptation and Integration of Projects Underway within the NAP Process

On-going projects and programs in relation to CCD priorities have been reviewed to derive a set of activities to integrate in NAP process. The review indicates that consultation in the NAP process could be integrated in soil and water conservation and forest management projects in broader perspectives.

The BIADP-I has been completed and BIADP-II is under implementation in three administrative districts (one- seventh of the total districts of Bangladesh) can play an instrumental role in generating public awareness and rehabilitate the degraded lands. A total of 289.7 million Taka has been utilized up to May 2001 has been allocated for the project which will be completed by the year 2002. This project is likely to empower the local people in managing natural resources.

The Social Forestry initiated by FD has been implemented with the objective of forestation and enhancement of natural resources in the whole country except the Hill Tracts and will be completed by the year 2003.

The project named "Eco System Management in Barind Area" has been initiated under SEMP in 1999 with the objective of soil conservation and afforestation work and preparation of environment management plan for the Barind area. The project will be completed in 2003.

These field-based projects and programs focus on soil and water conservation and forest management with people's participation. The farmers are the target beneficiaries of these projects, which continue assisting the local people in increasing the agricultural production and natural resource management through public awareness, and technology modification and transfer. Although these projects are not directly related to CCD implementation, the successful implementation of the components included in these projects will contribute to land and water conservation and empower CBOs. The experience gained in implementing these projects will also be a cornerstone to build up NAP.

7.2.2 Identification of New Actions and Planned Measures

Bangladesh has continued its effort to encourage the project proponent to include the issue of land degradation and sustainable management of water resources during project implementation, particularly in road and flood control projects. This has been made possible through the integration of the environmental impact assessment (EIA) system, which should be carried out legally as per the environmental legislation. During the approval of the EIA report of development projects and programs, MoEF is making every effort to include mitigation measures and environmental monitoring priorities for the management of natural resources.

Some projects are under implementation after the approval of EIA reports. Environmental auditing will be carried out in the near future in order to document the effectiveness of the mitigation measures adopted for soil and water conservation. In a broader sense, land and water conservation issues have been integrated and will be continuously integrated in development projects through the EIA system.

7.2.3 Specific Actions to Strengthen National Capacity to Combat Desertification, in Particular at the Local Level

Skills enhancement trainings are organized by governmental and non-governmental organization for the conservation of soil and forests. Quite a few trainers' training programs are being organized on natural resource management. The Ministries of Environment and Forests, Local Development, and Agriculture frequently organize local level training and public awareness programs to strengthen local capacity in resource management and community development, develop skills and enhance knowledge and know-how.

During the NAP process, the sectoral organizations, which have the networks of local organizations, will be encouraged to organize training and capacity building programs at the grass-root level. MoEF is also encouraging the local NGOs and CBOs to launch programs for capacity building by providing seed money through the Trust Fund. It has been suggested that the programmes developed through innovative approach like Khari development and big pond digging in the Barind area may be supported from this Trust Fund to be created with the help of the convention Secretariat (Reazuddin, 1998).

7.3 Action Program Implemented in Compliance with Priority Fields Set out in the Convention

7.3.1 Measures for Natural Resource Conservation

The priority areas for actions identified during the national seminar and on-going studies will provide a basis for furthering the step of identifying the action programs. The Government of Bangladesh has undertaken a two-year program to develop environmental management guidelines for eighteen industry and activity sectors in the country. The program is aimed at providing technical information and recommendations to guide, promote and facilitate improved environmental performance by the relevant sectors including the government agencies.

7.3.2 Measures to Improve the Institutional Organization

GOB has established a functional network of district level organizations for the implementation of forestry and agriculture related activities. In addition, the federation of the NGOs and CBOs and other NGOs are also strengthening their institutions to ensure information sharing and to raise public awareness at the local level, and to implement activities that conserve natural resources. It is also planned to develop and increase the number of knowledge-based human resources in the existing institutions to provide technical assistance to NGOs, CBOs and the local people. These institutions will be involved in the NAP process at the field level. However, there is a shortage of financial resources to mobilize the local level institutions and improve efficiency.

7.3.3 Measures to Increase the Knowledge of Desertification as a Phenomenon

Local level organizations are involved in sharing information and experiences and documenting traditional knowledge for soil and water conservation and forest management. Although they are not directly related to the desertification process, it is envisaged that this will provide a basis for halting further degradation of the land and forest resources. Land degradation and forest depletion issues are in the forefront of public awareness programs. Information sharing has been started through national and the local radio, print media and other electronic media. A number of newsletters, posters and pamphlets also carry the message of land degradation. Each organization is encouraged to impart and share information related to land degradation and desertification at the national and local levels. This information will be useful for the NAP process.

7.3.4 Monitoring and Evaluation Measures for the Effects of Desertification

Bangladesh has included the provision of monitoring and evaluation programs as in-built mechanisms for monitoring in project implementation. The environmental auditing which shall be carried out in future will provide a basis for the identification of impacts of the development projects and its contribution to improve the conditions of land and water systems. Information generated through this process will also provide a basis for developing monitoring and evaluation mechanisms to know the effects of desert-like condition in the selected areas. At present, soil conservation and watershed demonstration and research plots have been used to monitor the process of land degradation on regional basis. Some such demonstration plots are also established and monitoring is on going to generate information on nutrient loss in selected ecological regions.

7.3.5 Measures to Improve the Economic Environment

Income generating activities have recently been introduced in natural resource management programs in view of the fact that the conservation programs take time to pay back and local people below the poverty line face difficulty in getting involved in natural resource management programs. At present, the social forestry user groups involved in forest management are legally entitled to manage and use the forest resources at a sustainable basis. After commissioning of these deep tube wells, about 1.10 million tons of excess food grains are being produced annually.

Local bodies are also empowered to collect revenue and generate fund. These measures are expected to improve the economic conditions of the local people. The government is also expanding the integration of income generating activities as an integral part of natural resource management to ensure sustainability and this issue will be analyzed in greater depth during the NAP process.

7.4 Linkage Achieved with Sub-regional and Regional Action Programs

A number of meetings have been held during the past few years to chalk out a programme for regional cooperation in Asia under the aegis of the UNCED with support of UNCCD Secretariat. The First Regional Conference on implementation of UNCCD for Asia was held in New Delhi in August 1996, which agreed upon the establishment of network of regional cooperation. The Conference also helped in identifying the major cross cutting elements for combating land degradation/desertification. Second Ministerial Level Regional Conference at Beijing followed this in May 1997. The Ministerial Conference conceptualized a framework for the formulation of the Regional Action Programme (RAP) and development of National Action Programme (NAP). RAPs will support the NAPs through the establishment of Thematic Programme Network (TPN) for cooperation among the affected countries. The Beijing Conference identified the following TPNs:

TPN1- Desertification Monitoring and Assessment

TPN2 -Agroforestry and Soil Conservation in Arid, Semi-arid and Dry Sub-humid Areas

TPN4- Water Resources Management for Agriculture in Dry Areas

TPN5 -Strengthening Capacities for Drought Impact Mitigating and Combating Desertification

An International Expert Group (IEG) meeting on RAP for Asia was held at ESCAP, Bangkok, Thailand from November 10-13 1998 on the preparation of RAP for Combating Desertification and Drought in Asia and the Pacific. It was decided that the TPNs would be formulated and implemented building upon existing knowledge and experience as well as strengthening partnership. Flexible modalities for partnership were acknowledged as guiding principles to develop TPNs. These thematic programmes being regional in nature, it was recommended that international organizations, particularly the Regional and International financing institutions lend their technical and financial support to the preparation and implementation of RAP. The network is expected to help the member parties to strengthen their existing infrastructure for tackling the problems they face in combating desertification.

The Ministry of Environment and Forests is trying to establish and function of TPN-2 named "Agro-forestry Management and Soil Conservation in Dry areas". This will be facilitated through the UNDP in collaboration with BMDA, BCAS and other main institutions involved in these areas. The overall objective of TPN-2 is to curtail the process of wide-scale deforestation and watershed degradation through the development, dissemination and promotion of traditional and new technologies, which are economically sound and socially acceptable while complementing national efforts under the respective National Action Programmes in the countries member of the network. Bangladesh has initiated to prepare national action plan (Nuruzzaman, 2000).

The Ministry of Agriculture will consider participation in the TPN4- Water Resources Management for Agriculture in Dry Areas.

GEF has recently approved to finance a project with land degradation component entitled "Coastal and wetland Biodiversity Management at Cox's Bazar and Hakaluki Haor" under DoE. The threats of excessive cutting of mangrove, fuel wood, beach compaction by vehicles used in tourism, will be addressed through land protection measures, village conservation and sustainable use, and integrated management plans.

7.4.1 Development, at the National Level, of Programs of a Sub-regional or Regional Character

Bangladesh is proposing an action program to implement the SAARC Regional Action Plan on Environment. This action plan outlines activities related to strengthening institutions and further halting of natural resource degradation processes through the integration of resource management into development projects and programs. Bangladesh also participated in the SAARC initiatives on programs to control the process of land degradation Bangladesh has also joined the Asia Pacific Network (APN) on climate change which focuses the study of climate change and forest degradation issues in the sub-region. However, specific projects of sub-regional character have yet to be developed and implemented for the Convention matters. In future, there are possibilities to develop and implement plans and programs of regional character while implementing the Asian Thematic Network programs.

The Asian WATMANET facilitates farmers' organizations for watershed management at small watersheds, promotes exchange of experiences at farmers to policy maker level and exchanges information among the participating countries (Afghanistan, Bangladesh, Bhutan, China, India, Indonesia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam) for sustainable natural resource management in the fragile watersheds in Asia. The experiences gained through this project will also be equally useful for the NAP process.

In 1993, Chittagong Hill Tract Development Board (CHTDB) in collaboration with the International Centre for Integrated Mountain Development (ICIMOD), Katmandu, Nepal launched a programme for the promotion of Sloping Agricultural Land Technology (SALT)- a participatory farming system approach to soil conservation extension in Chittagong Hill Tracts (CHT).

7.4.2 Strengthening the Efforts of Technological Advancement

Through SDNP efforts are underway to undertake capacity/need assessment and identify the nodal institutions as well as modus operandi of establishing electronic networking in the country. New technologies should be economically profitable, socially acceptable and technically sound. A wide gap exists between potential yield and what farmers are getting out of the new technologies. The national average of improved rice, wheat, potato and mustard varieties are far below their achievable potential yields. Rice, potato and what fields could be increased by 3, 4 and 2 times, respectively.

Technological advancement is crucial to sustainable agriculture. Appropriate application of modern technologies need to be developed locally. At present, major emphasis is given by BARC to develop technologies in the following areas of agriculture (Chowdhury and Dasgupta, 1993): (i) Biological nitrogen fixation; (ii) Bio-technology; (iii)

Enhancement of photosynthetic activity; (iv) Water harvesting technology (including irrigation); (v) Multiple cropping systems; (vi) Erosion control and soil management; (vii) Integrated farming systems; (viii) Waste utilization and organic matter recycling; (ix) Post-harvest technology.

The farmers of Bangladesh are used to living with nature. Farmers adapted drought tolerant varieties of Aus and B. Aman and flood tolerant varieties of B. Aman rice. A further risk aversion technology is the mixed cultivation of Aus and B. Aman. The local plough, minimum tillage, traditional cultivation of sugarcane, mixed cropping of vegetables, etc. are some examples of farmers innovative technologies. These technologies require almost no or very low input and their productivity is also very low, but they are well adapted to local conditions.

The Bangladesh Rice Research Institute (BRRI) has developed 26 modern varieties of rice which cover at present 35 percent of the total rice cropped area (Chowdhury and Dasgupta, 1993). A major breakthrough has been achieved in wheat production. At present, 95 percent of total wheat area are covered by modern varieties, developed/adapted by BARI are now grown in 64 percent of the potato area and contribute to 70 percent of total potato production in the country. Some improved varieties of pulses, oilseeds, tubers and vegetables have also been developed.

Technologies on bamboo propagation and preservation have been developed and strong location-specific agro-forestry programmes are in progress. It is not sufficient to seek self-sufficiency in food production. It is also essential that food quality is improved to maintain normal health. There is need for crop diversification integrating the crop component with livestock, poultry and fisheries. This means that traditional commodity research needs will have to be balanced with a farming systems research/whole farm approach.

Bangladesh is involved in technical committees of SAARC on environment and establishment of SAARC Agriculture Centre. However, there is still a need for establishing a linkage with the scientific community in the region to implement the Convention.

7.5 Effectiveness of Measures in Local Capacity Building

In spite of the focused in-service and local capacity building efforts, which have been made by the concerned Ministries as well as by the local Governments and non-governmental agencies, local level actors have not yet been reached to the extent desired. A lot remains to be done in terms of capacity building, particularly at the grass-root level, for the efficient implementation of the NAP.

7.5.1 Degree of Responsibility in Natural Resource Management on Local Communities

Introduction of community forestry programs in the late 1980 has been instrumental in developing the capacity of local people in the management of community forests. Introduction of the leasehold forestry has also been effective to bring the poor farmers and disadvantaged groups of people into the mainstream of forest conservation and income generation. The effort to empower the local people in managing natural resources, the soil, forest and water through the users group concept has increased the degree of responsibility among the people.

The IPM project has been giving emphasis upon a more participatory, decentralized community based approach termed as 'community IPM' in which farmers become the instigators and not just the recipients of IPM. One of the important activities of community IPM is farmer-farmer training; the project has already completed some Farmer-Field Schools (FFS) run by farmers and is currently training 640 farmers to become farmer trainers. These farmer trainers will in turn train as many as 25,000 farmers. In addition to farmer-farmer training, the project has also facilitated starting of many IPM clubs. In many places in the country, the IPM trained farmers have started IPM clubs where the members meet periodically and discuss IPM practices.

Local capacity building and utilization of indigenous technologies have further been enhanced through the involvement of NGOs and CBOs in managing the natural resources in rural areas. This process has also enhanced the mobilization of local women to work in groups in areas of saving and credit, soil and forest management. These activities have promoted local communities to assume their responsibilities for management and introduce best method for a sustainable use of resources. A feeling of ownership over the natural resources has also been developed which will have long-term effects on its management.

7.5.2 Involvement of Actors in Monitoring and Evaluation Process

Monitoring and evaluation has been a crucial part in the development projects. Actions implemented by the governmental organizations are monitored and evaluated by the concerned agencies. For example, in the implementation of Coastal Embankment Rehabilitation Project (CERP) an agreement with the Forest Department (FD)

is made to cover FD provision of technical services and training for the afforestation component. FD would also be represented within the Project Implementation Unit.

Funding agencies also monitors NGO activities. The present practice of involving the community groups has emphasized self-monitoring and evaluation. In case of funding provided by MoEF from Environment Protection Fund, the monitoring and evaluation is done by MoEF itself and the local bodies. It is also planned to involve NGOs and CBOs in monitoring the activities funded by MoEF. This mechanism will further strengthen local governments and organizations for monitoring NAP programs. It has also been realized to form monitoring and evaluation committee having representation from different stakeholders in the process of implementing the Convention.

Department of Agricultural Extension and Forest Department is working on drought and tree plantation, which could be treated as measures for deducing land degradation as well as combating to desertification. Bangladesh Agricultural Research Council (BARC) has electronic database on agro-ecological and drought prone areas of the country. In addition to that Department of Agricultural Extension is also preparing electronic database on drought-affected area chronologically. Water Resources Planning Organization is also preparing electronic database, which includes crop agriculture and their water requirement from both ground and surface sources.

The Agricultural Research Management Project supports strengthening of the management of the national agricultural research institutes and the promotion of research by private organizations to generate profitable and sustainable agricultural technologies for Bangladeshi agricultural producers.

7.6 Monitoring and Information Systems

Extension workers and farmers along with researchers are involved directly in the on-farm testing activities to keep all concerned abreast about the merit of the technology. Besides this, Agro-business newsletter, slide-films with sound, fact-sheets etc., are being used for the rapid dissemination of technology. Bangladesh has a strong FSR (Farming System Research) programme. At present, 20 FSR sites are functioning across the country.

An Agriculture Information Centre (AIC) has been established at BARC with a modest capacity. This is linked to NARS institutes by a network called National Agricultural Information System (NAIS). Besides these, BARC has a computerized database on agro-ecological zones, climate, temperature and rainfall of the country. This information is used frequently in technology transfer activities. Agriculture Information Service (AIS) and Fisheries and Livestock Information Services (FLIS) of the Government of Bangladesh are also functioning to provide information in their respective areas.

Management Information System (MIS), an integral part for management planning, has been developed at BFRI with the assistance of BARC/ ISNAR. It includes a computerized modeling system for estimating allocations of personnel (technical and supporting) as well as funds to different research programs of the institute. The Human Resource Information System (HRIS), a sub-set of the MIS, also maintains the personal information for the professional staff. The documentation is being updated annually since 1988. The MIS will eventually lead to a larger Resource Information Management System (RIMS) of the institute in particular and NARS in general. This will help the institute to keep pace with the global information systems in near future.

Since several Ministries are involved in land-based programmes it is proposed that NAP is monitored by the Planning Commission with the active support of DoE and the MoEF. The objective of the strategy would be to develop a user-friendly monitoring and evaluation system, incorporating the relevant indicators, base line data, targets, data source and collection methods. In order to ensure that the data provided on implementation of the NAP activities are reflective of the opinions and realities of local populations, periodic local level consultations shall be provided in the strategy. This would help in developing a Community Based Monitoring System (CBMS) at the local level.

7.6.1 Sustainable Development Networking Programme (SDNP):

SDNP is located at BIDS. A national steering committee for SDNP will be formed with participation of GOB, NGO, civil societies, media agencies, academic/ research institutions, UN System and existing Internet service provider organizations. UNDP will provide technical assistance of US\$ 1.4 million for 5 years program leading to develop a self-sustain national programme. Main activities proposed under the SDNP (UNDP, 2000) are:

- (i) institutionalize SDNP with the participation of government, NGOs, civil societies, media agencies, academic/research institutions;
- (ii) capacity/ need assessment by type of institutions and by level of existing and potential users;
- (iii) setting up of the technological framework at the central hub and develop at least 5 regional (administrative regions in Bangladesh) nodal points;
- (iv) develop/ connect 500 active users (each nodal point will be enable to link 100 users);
- (v) impart massive training to the users and monitor usage of network and follow up services;

(vi) motivate, mobilize, disseminate and advertise specialized information on SHD, poverty alleviation, disaster management, agriculture/food security, health, education as well as Agenda/ Capacity 21 related information (it will also cover R & D). The installation of equipment will be done at four levels: (a) Local Area Networking (intra-office), (b) Wide Area Networking (intra and inter cities), (c) microwave links (coastal and other area) and (d) on-line networking.

7.7 Mechanism of Partnership Agreements

7.7.1 Functioning of Internal Partnership Agreements

The Convention emphasizes partnership arrangements for the implementation of land improvement and desertification control programs. This process would help in building the local capacity for combating desertification and make the program sustainable. This will also avoid or minimize duplication of works and ensure best use of limited technical and financial resources. Cost sharing for irrigation development and on-farm conservation has been made through formal partnership arrangement.

The CCD Trust Fund is also mobilized through partnership arrangement, as MoEF provides funding to selected activities, and the recipient NGOs implement the activity. Some NGOs are also implementing natural resource conservation programs through partnership arrangements. For example, the Environment Trust Fund supported micro-funding is designed to support the local NGOs and CBOs to implement environment and natural resource conservation programs through a kind of partnership agreement between the host NGO and the local NGOs and CBOs.

7.7.2 Consultation and Coordination Process

Almost all policies and programs related to natural resource management emphasize public consultation during program design and implementation. This consultation process has been ensured in collecting relevant information for NAP. Once background information is collected, the consultation process will be started to accommodate the concerns and opportunities of the people, NGOs, CBOs and the donor community. Furthermore, efforts are underway to develop coordination mechanism by constituting a Coordination Committee for the relevant Conventions such as UNCCD, UNFCCC and NCB to furthering consultation process.

7.7.3 Resource Made Available for NAP Implementation and Partners Involved

Bangladesh has allocated 0.275 million Taka for the collection of background information for the implementation of the Convention. Bangladesh has received technical and financial assistance in a number of natural resource management programs through multilateral and bilateral funding. International partners have yet to be contacted for the NAP process under the Convention.

8. Financial Allocation from National Budget in Support of the Implementation as well as Financial Assistance and Technical Cooperation Needed

8.1 Adopted Financial Mechanism

The major actors in the sphere of sustainable natural resource management and desertification control are the Ministries and Environment and Forests, Agriculture, Water Resources, Local Government, and Relief & Rehabilitation. The sources of funding available to these agencies for implementing their sustainable development programmes including desertification control are the national budgets, dedicated sectoral funds and external assistance. Assistance has been received in soil conservation and watershed management activities, forest management, and soil fertility improvement programs.

Budget planning is done for a fiscal year (July 1 – June 30). The current mechanism of funding of sectoral plan projects/schemes would be followed for NAP. Under this mechanism the local governments in partnership with village communities would prepare projects within the NAP framework and forward it to the National Committee for CCD for technical scrutiny and the Executive Committee would release funds for implementation. However, funding procedures need to be streamlined so that (i) funds are made available on time to state governments/project implementation authorities, and (ii) carry over unspent funds and advance authorization for expenditure during the early part of the fiscal year is facilitated.

Through the Economic Relations Division (ERD) of the Ministry of Finance, the Government has the primary responsibility for coordinating its foreign aid receipts from initial proposals through negotiations to utilization. According to ERD guidelines, efforts for securing external assistance will be made only for those projects formally approved in principle by the Government. Care is taken so that external aid proposals do not disrupt budgetary discipline or the planning process. ERD approaches development partners for assistance to a project/ programme only

when appropriate, having evaluated the preference, priority, accompanying terms and conditions of the development partners.

8.1.1 Measures to Facilitate the Access of Local Actors to Existing Sources of Funding

In order to increase access of NGOs and CBOs, GOB intends to establish a Land degradation Trust Fund for channeling the financial resources. The NGOs and CBOs may submit technical and financial proposal to secure funding from these sources, and the Executive Committee would select the proposal and allocate necessary funds. Although the CCD Trust Fund would be a legal funding mechanism, it would depend on national budgets. So, it may have limited fund.

Local actors are aware of the availability of funding and would be consulted for submission of proposals within a specified time. However, these sources have limited funds and are unable to meet the demand of NGOs and CBOs. Besides, local actors may receive some funding through the government program for joint implementation and management. These sources may be designed for environmental and resource management which contributes to combating desertification process.

MoEF will review, in the near future, the administrative procedures and organizational set-up of the Trust Fund, and will develop new sets of rules for the administration of the fund. This study will also explore possibilities and ways and means for fund raising through internal and external sources. Bangladesh would welcome any offer to strengthen this Fund as a financial mechanism for desertification control and natural resource management programs.

8.2 NAP Financing

The programmes that will be integrated in the NAP framework will be funded from Plan Budget of the concerned Ministries. However, the resources that have been made available are not adequate to match the enormity of the problem. Projects will, therefore, be posed to multi-lateral and bilateral agencies, and international donors for financial assistance.

8.2.1 Mobilization of National and External Resources

Bangladesh is collecting necessary information for NAP formulation; a strategy has yet to be developed for accessing the national resources. After the middle of 2001, Bangladesh will start the NAP process and explore possibilities for mobilizing the national resources. Once the background information is prepared based on the on-going studies as a part of the NAP process, efforts will be made to explore possibilities for external resources. Bangladesh expects that developed country Parties will provide necessary funding for the preparation and implementation of NAP.

8.2.2 Contribution from Global Mechanism and Other Partners

It is expected that Global Mechanism (GM) would support Bangladesh in the NAP process including public awareness programs. The UNCCD Secretariat assisted Bangladesh in organizing a national seminar in 1998 and it has also provided seed funding to prepare this report. Bangladesh is in the process to invite the donor community to participate in the process of NAP formulation and its implementation. International University of Business and Technology, Dhaka submitted a proposal for UNDP-GEF funding for "Reversing Desertification in the Barind Tract of Bangladesh through Integrated Eco-system and Resource Management" which is under consideration (Nuruzzaman, 2000)

8.2.3 Amount of Financial Resources Available/ Received

Bangladesh has received a total of US\$ 5,000 to organize a national seminar on desertification and the preparation of this report.

8.3 Technical Cooperation Needed

8.3.1 Priority Needs in Technical Assistance

Having understood the obligations and responsibilities of a country Party Bangladesh has initiated Information collection for NAP formulation and implementation. Since Bangladesh has accorded high priority to poverty alleviation the budget allocation from internal resources is very low for the implementation of the UNCCD. In the beginning, Bangladesh requires technical and financial assistance in the formulation of NAP, public awareness, capacity building and information exchange. Similarly, technical assistance would be required to prepare inventories of traditional knowledge, know-how, practices and technologies. Partnership building and private sector involvement represents other priorities for technical cooperation. Technical assistance is also required to strengthen the process of community empowerment in the field of forestry, soil conservation and watershed management.

BMDA has utilized investment cost of Taka 4290 million up to May 2001. In order to implement activities that are in conformity with the spirit of the Convention, BMDA would require about 33.3 thousand US \$. Besides this, at the national level, SEMP, BEMP, IPM and SDNP would require 18.555, 10.664, 3.708 and 1.40 million dollars respectively from various donor agencies. These will also help in providing technical and financial assistance to strengthen community groups, regulate unsustainable use of natural resources, and also strengthen traditional practices of resource management.

9. Identification of Indicators for Evaluation of Land Degradation/ Desertification

9.1. Criteria for Selection of Indicators

Despite the seriousness of the environmental and socio-economic impacts of desertification, few efforts have been made to devise diagnostic and monitoring techniques for appraising the status and trend of desertification. Integrated information that can provide data on threshold levels, status and evaluation of relevant physical, chemical and biological processes are generally considered as indicators. It is, therefore, necessary to use indicators to develop a system for evaluation of land degradation and desertification as applicable to Bangladeshi conditions. Indicators can be easily communicated to the public or policy-makers. And they can be used as reliable information in geographical information systems (GIS) to determine spatial extension and geographic distribution of degraded areas and to relate direct and indirect causes and impacts. For all these purposes selection of complementary indicators reflecting different aspects of environmental stress is necessary.

A reconnaissance survey was conducted in Godagari thana of the Barind area to determine the level of preliminary information obtained through interviewing 120 household heads. The study (Rasheed, 1998) revealed an awareness of the problem among 87 percent of the correspondents. The indicators they cited include decrease in soil fertility, decline in the quantity of both surface and ground water, decrease in the tree cover and biomass; and increased soil erosion.

9.2 Operational Mechanisms for Monitoring and Evaluation

9.2.1 Establishment and/or Strengthening of National Environmental Monitoring and Observation Capacities

Bangladesh has recently introduced environmental monitoring as an integral part of program monitoring. As per the National Environment Policy, 1992 the concerned line ministries are responsible for monitoring impacts on project activities on the environment. However, MoEF is made legally responsible for environmental impact auditing. The line ministries have established a monitoring and evaluation division or unit to monitor the project performance and its impact on the environment. The monitoring depends on indicators listed in the EIA report and the project document. In general, project specific indicators are developed, monitored and evaluated through the system specified for the concerned project.

The DAE, SRDI and NARS are also involved in monitoring nutrient loss from agricultural land. Sectoral agencies have developed information systems to disseminate knowledge and experiences. Bangladesh is also in the process of establishing a national environmental information data bank and this would be developed by the year 2003. This data bank will also include information on the status and trend of natural resources.

9.2.2 Information System on Desertification at the National Level

The State of the Environment (SOE) Reports published previously contain information on the status and trend on natural resources, their utilization and land degradation process including desertification conditions in Bangladesh. The SOE report to be published in 2001 will also contain elaborated information on these subjects at the national level. The proceedings of the national seminar on "Combating Land Degradation and Desertification in Bangladesh" also contain a good amount of information in this area. A number of publications of the Department of Environment, the Ministry of Agriculture, the Bangladesh Agricultural Research Council and some NGOs also contain information on the status and trend of land degradation in the country. Some information is disseminated through print media. It is planned to share the environmental information including the desertification process through electronic media.

9.2.3 Main Actors' Access to Available Information

As per the Constitution of the Peoples Republic of Bangladesh, 1990, every citizen has the constitutional right to be informed and has access to public information. Furthermore, the information flow should be transparent, and people seeking information should get it at the earliest possible. Hence, there is no barrier to available information. Organizations are also involved in developing websites to share information and experiences with other actors.

9.2.4 Mechanism for Consultation Concerning the Analysis of Results

In general, various organizations hire the consultants to conduct studies. The reports prepared by consultants and consulting firms are generally discussed in the seminars and workshops, which shall represent sectoral organizations and NGOs. Once the report is finalized, it is published and disseminated. EIA reports are available at the Department of

Environment are open for public review. During the preparation of NAP, it is planned to consult different stakeholders through workshops, seminars and local level interaction meetings in order to provide the people an opportunity to give their opinions and suggestions.

9.2.5 Regular Production of Reports

Bangladesh has so far produced a proceeding of the national seminar on "Combating Land Degradation and Desertification in Bangladesh" organized in 1998. Other studies conducted so far on desertification issues have yet to be updated, refined and published. Research findings are generally published in technical journals and newsletters. Regular publication of the desertification information has yet to be institutionalized. However, environment related journals, newsletters, posters and pamphlets are regularly published and distributed to create public awareness.

9.2.6 Participation of Scientific and Technical Institutions in Monitoring and Evaluation

At the national level, the academic, scientific and technical institutions participate in the seminar, workshops and interaction meetings. Research institutions such as the BFRI, NARCs, Bangladesh Atomic Energy Commission (BAEC), Bangladesh Institute of Nuclear Agriculture (BINA), SRDI etc. are particularly involved in scientific studies and monitoring of natural resources. Some institutions like SPARRSO and Geological Survey of Bangladesh (GSB) are also involved in macro-level monitoring by using satellite imageries. At the project level, academic and research institutions are sometimes involved in monitoring and evaluation activities.

9.2.7 Feedback on Evaluation for Program Management

After the preparation and implementation of the NAP and other activities under the Convention, the monitoring and evaluation of the activities will provide a basis for refining the activities and programs with people's participation. Monitoring and evaluation information will be provided to concerned agencies through regular channels. At present, there are no established functional mechanisms for feedback on program management under the Convention.

In brief, Bangladesh is collecting necessary information for NAP preparation. During the NAP process, Bangladesh expects technical and financial assistance from the developed country Parties and multilateral donor agencies to prepare NAP through extensive consultation, and also to implement it with people's participation. Existing environmental policies and programs are geared to alleviate poverty, which is one of the major thrusts of the Convention.

9.3 Implementation Indicators

Bangladesh has gone through the preliminary stage of the implementation of the convention. Necessary background information has been gathered related to land degradation in the dry regions. Monitoring and evaluation process may begin only after pilot projects are initiated. Bangladesh will follow the logical framework (logframe) approach for proper monitoring and evaluation of projects related to implementation of the Convention to Combat Desertification (CCD) as advocated in the UNCCD guideline for country report. This approach comprises of preparation of a list of different components *viz.*, output and activities, indicators of achievements, actual achievement, source of verification and responsible unit. For example, CCD implementation processes are (i) awareness creation about the Convention and identification priorities, (ii) formulation of National Action Programme (NAP) and (iii) implementation of field projects/activities within the framework of NAP.

10. Tasks Ahead

It would be seen from the foregoing account that excessive pressure of an ever-increasing human and animal population and their consumption needs has taken a heavy toll of the country's renewable natural resources in the dry regions of Bangladesh, causing widespread land degradation/ desertification and accentuating the effects of drought. The Government is aware of the magnitude of the problem of desertification and drought and has since 1985 taken several measures to combat it.

Programmes that were initiated in the 1980s have since been evaluated and modifications made. The programmes, policies and institutions are already in place. This may be taken as an expression of the government's desire to combating desertification. Action in the following areas is required to combat the problem. Programmes that were initiated in the 1980s have since been evaluated and modifications made. The programmes, policies and institutions are already in place. This may be taken as an expression of the government's desire to combating desertification. The following tasks are required to be performed to combat the problem:

- Ongoing programmes may be continued and consolidated. New initiatives and more focused programmes need to be formulated and implemented in the context of CCD. Forest protection and development in the dry region may be continued through both conventional forestry operation and a vigorous pursuance of people participation. Education and training programmes on forest, land and water sustainable management may also be continued. Programme on drought forecast and prevention may be taken up. Programmes may be initiated

- on pollution control in urban and industrial zone and those will have long-term impact on desertification control
- Tapping of underground water has to be regulated and farmers must not be allowed to use it so extensively that it goes on progressively lowering water table. It has to be recognized that water is a precious and scarce resource, which has to be conserved and used for maximum good. Water harvesting with involvement and participation of local communities may be practiced
 - Both at the local community level and the national level measures may be initiated to ensure that land is used according to its capability. Proper land use will go a long way in combating desertification and mitigating the effects of drought. Since natural resources such as land, water, forestry and fisheries are interlinked, any approach for a selected natural resource without letting care of other resources, does not work. A proper management of these resources need to integrate the idea of a multiple use, and balanced long-term socio-economic, and ecological approach to natural resources management.
 - Participatory management and policy system formulation on harvesting, utilization of water, land and forests will be promoted. Communities are the best resource managers and are to be involved in local renewable natural resources (viz., soil, water and vegetation) projects so that they realize how critical it is for their own survival and develop a stake in conservation measures of renewable natural resources. Since natural resources such as land, water, forestry and fisheries are interlinked, any approach for a selected natural resource without letting care of other resources, does not work. A proper management of these resources need to integrate the idea of a multiple use, and balanced long-term socio-economic, and ecological approach to natural resources management.

The National Action Programme (NAP) will comprise the above tasks and is aimed at supplementing government resources with external assistance available within the CCD framework for a more comprehensive, coordinated and participatory programme of action to combat desertification and mitigating the effects of drought. The action programme will be targeted to also provide an institutional mechanism in terms of achieving better natural resource management.

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Annexure- I

Progress of activities under Barind Integrated Area Development Project (BIADP)*Progress of activities under BIADP*

Project Activities	1990-97	1997-2001	Total
Deep tubewell (nos)	3195	302	3497
Electrification of irrigation equipment (No.)	2353	677	3030
Water Distribution System	1986	67	2053
Afforestation plantation (million)	7.95	0.47	8.42
Road construction (km)	81		81
Re-excavation of ponds	538	222	760
Re-excavation of canals (km)	12.5	27.5	40
Cross dam (No.)	23	7	30
Utilization of GOB fund	3486.6	1037.5	4524.1
Green Manu ring (ton)		1.48	

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SEMP- Eco System Management in Barind Area (1999-2003)

The followings works will be undertaken in programme on pilot basis:

(i) Soil Conservation and afforestation; (ii) Ponds & canal re-excavation; (iii) Water control structures: Low cost water control structures of appropriate design may be build across the re-excavated canals for conserving water which will be used to supplemental irrigation of rain fed paddy and for low water consuming crop cultivation; (iv) Construction of mini pond/ ditch on farmland having no source of irrigation water for harvesting rainwater and use the same for supplemental irrigation; (v) Demonstration of improved fuel use for women in rural areas and introduction of renewable energy; (vi) Community based awareness programme for checking environmental degradation; (vii) Create Barind Environmental Fund to support and promote innovative sustainable environmental projects and (viii) Prepare Environment Management Action Plan to combat desertification in the Barind Tract.

Project Activities	Progress in 1999-2000
Afforestation plantation (million)	0.09
Excavation of ponds for rain water harvesting (No)	09
Excavation of mini ditch (No)	150
Compost preparation demonstration (No.)	56

Social Forestry Activities Carried out by Rajshahi Forest Extension Division

Forests created by Rajshahi Forest Extension Division are tabulated below:

Year	Woodlot Forest (ha)	Agro forestry (ha)	Strip Plantation (km)	Seedling Distributed (million)	Training of participant (nos)
Forests Created under Community Forestry					
1981-87	792.91	12.15	286.74		2682
Forests Created under UANDP					
1987-90	190.28	73.28	103.15	0.001	250
Forest Created under Thana Afforestation					
1990-95	493.72	127.19	1376.68	0.59	6106
Forests Created Extended Social Forestry					
1995-97	10.60	61.00	342.51	0.13	2075
Total	1487.51	273.62	2109.08	0.721	11113

Source: Nur Nabi Mridha, Personal Communication, 2001

Social Forestry Activities Carried out by Tangail and Mymenshingh Forest Extension Division

Forest lands of Tangail and Mymenshingh Forest Divisions under Madhupur Tract once covered by vigorous sal has slowly converted to scattered stand with small coppice sal that shows poor regeneration capacity indicating the effect of recurring felling of trees, burning and soil erosion mostly caused by local inhabitants and encroachers. To recover forestland and to rehabilitate the degraded forest land social forestry programmes had been initiated through Thana Bonayon and Nursery Development Project since 1988-89. Woodlot, agroforestry and strip plantation have been raised involving local landless poor people within these divisions through benefit sharing mechanism. Following table will give brief idea about the success of rehabilitating the degraded land through the social forestry programmes.

Plantation raised under social forestry programme:

Forest Division	Woodlot (ha.)	Agro-forestry (ha.)	Strip plantation (km)	Remarks
Mymenshingh	6017.10	1799.43	1373.00	
Tangail	7025.46	1408.44	363.41	

Plantation area harvested (raised under social forestry programme):

Forest Division	Woodlot (ha.)	Agro-forestry (ha.)	Strip plantation (km)	Remarks
Mymenshingh	570.85	43.22	-	
Tangail	441.69	161.93	-	

Forest Products after harvest :

Forest Division	Round log (cft.)	Balli (poles) (number.)	Fuelwood (cft)	Remarks
Mymenshingh	2,07,463.20	1,47,013	1,69,634.35	
Tangail	3,37,138.63	1,52,104	3,47,589.46	

Beneficiaries involved in social forestry programme:

Forest Division	Number of beneficiaries		Remarks
	Male	Female	
Mymenshingh	6782	264	
Tangail	7643	477	

Plantation raised in Jessore, Faridpur, Kushtia Forest Divisions

Division	Block/Woodlot (ha)	Agro-forestry (ha)	Strip Plantation (km)	Char Plantation (ha.)
Jessore	50.00	16.00	1866.56	35.0
Faridpur	81.78	15.00	1874.30	35.0
Kushtia	130.12	-	1495.06	-
Total	261.90	31.00	5235.92	70.0

Source: M. Nuruzzaman, Forest Department, Dhaka

Annexure- II**National Awareness Seminar on Combating Land Degradation Desertification in Bangladesh from April 21-22, 1998**

In order to create a public awareness, ensure inter-sectoral discussion on preliminary issues, causes and consequences of land degradation, drought and desertification and derive a set of priority actions as guiding indicators for the preparation of the National Action Programme (NAP), the first ever National Awareness Seminar on the formulation and implementation of the National Action Programme was organized from April 21-22, 1998 in Dhaka by the Ministry of Environment and Forests in collaboration with and financial assistance from the Secretariat of the of the United Nations Convention to Combat Desertification (UNCCD) and the UNDP country office, Dhaka

There were five technical sessions where Key- notepapers were read by invited resource persons/specialists. Group discussions were held in five groups with 70 participants from various departments/ agencies/ educational institutes/ journalists' forum.

Key Note Papers

1. Status of Land Resource Use and Desertification, Drought and land Degradation in Bangladesh: Obstacles and Effective Policy Options and Measures for Sustainable Use of land Resources -Dr. K.B. Sajjadur Rasheed, Professor of Geography and Environment. University of Dhaka.
2. Role of Forestry and Biodiversity Conservation in Combating Land Degradation and Desertification in Bangladesh- Mr. S.M. Jalil. Acting Chief Conservator of Forest, Department of Forest. Government of Bangladesh.
3. Combating Desertification in Bangladesh: Case Studies, Lessons Learned from Experiments, Constraints and Opportunities -Professor M.I. Zuberi. Team Leader, Department of Environmental Science, Gono Bishwabidhyalay. Dhaka.
4. National Action Programmes (NAPs) to Combat Desertification, Drought and Land Degradation in Bangladesh -Dr. Mahfuzul Haque. Chief Instructor, Academy for Planning and Development. Dhaka
5. Catalytic Schemes and Innovative Approaches for Utilizing Financial in Kind and Technical Support in the Context of an Integrated Programming Framework. for Sustainable Development -Mr. Md. Reazuddin. Deputy Director. Department of Environment. Govt. of Bangladesh.

This working session was divided into five groups having a number of 12 participants in each group with different topic. Dividing all the participants on the basis of their expertise and experiences in the subject matters constituted the groups. Each of the group after a long brain storming identified issues, developed strategies and recommended actions with the inclusion of different stakeholders i.e. Implementing and collaborating agencies.

GROUP RECOMMENDATIONS

Following are the major recommendations of the different groups:

Group. A.

Status of land resource use and measures for sustainable use of land resources

1. Bring all land under vegetative cover and undertake appropriate research programmes for controlling soil erosion.
2. Introduce appropriate horticulture practice in the hilly areas.
3. Introduce appropriate crop rotation and location specific balanced use of chemical fertilizers with organic mineral and green measures.
4. Stop deforestation or the removal of natural vegetation, overgrazing, agricultural and bio-industrial activities to combat land degradation (marginalisation of agricultural land and productivity decline).
5. Introduce agro forestry/ social forestry / home stead forestry involving local people and protect existing forests and forest resources from overexploitation.
6. Harness alternative source of energy and enforce existing laws to stop fuel wood in brick kiln. Use solar energy/ improve stoves of BCSIR.
7. Encourage the use of other construction materials as a substitute of wood.
8. Formulate proper land use policy and monitor and evaluate physical biological and socio-economic component of land use.
9. Formulate and maintain policy on cropping pattern and cropping intensity.
10. Encourage alternate orchard cultivation and rehabilitate Jhum cultivators through providing alternate source of income.

11. Initiate target oriented research programme on land use/ land management/ land resource issues such as drought / salinity resistant crops and interrelation between terrestrial and aquatic ecosystem.

Group -B:

Topic - Land erosion/ degradation and process of desertification in Bangladesh -Strategy and effective policy options within the purview of national, regional and international partnerships.

1. Strengthen capacity building through awareness of local people in combating land degradation and desertification.
2. Massive afforestation with fast growing drought resistant preferably indigenous species involving local community.
3. Develop a national land use plan and decentralize land responsibilities to local bodies.
4. Improve policy framework and institutional capacity for land management by strengthening land use planning, soil and agro forestry.
5. Encourage people's participation in soil conservation and watershed management ensuring the role of women as an effective agent for resource conservation, who is involved in fetching firewood, fodder and drinking water.
6. Focus future actions on the assessment and mapping, development of an integrated approach for natural resource management on watershed basis. more research and extension, and integrating poverty alleviation programme for halting further land degradation and resource depletion.
7. Develop and monitor action plan for environment protection, land use institution, legislation, policies and programmes.
8. Implement Ganges Barrage project and rehabilitate the Gorai river in order to increase dry season water flows in the southwest region to combat salinity intrusion.
9. Develop and utilize in stream storages of water and static water resources
10. Increase river flows and reduce siltation of riverbeds through augmentation and trans-boundary co-operation.
11. Emphasize the need for international cooperation to pursue sustainable development objectives relating to combating desertification and mitigating the effects of droughts and land degradation.
12. Undertake survey to assess causes and con-sequences of land degradation, drought and desertification and determine priority areas for action.
13. Give particular attention to the implementation of preventive measures for lands that are not yet degraded or which are slightly degraded.
14. Enhance nation-based climatological, meteorological and hydrological capabilities and the means to provide for drought early warnings.
15. Promote policies and strengthen institutional framework to develop cooperation and coordination among the donor community, governments of all levels, local populations and community groups and facilitate access by local populations to appropriate technology.
16. Establish and or strengthen food security systems including storages and marketing facilities particularly in rural and drought prone areas.
17. Train local people to the drought prone areas to adaptation and enhance professional education in natural resource management, protection and management of degraded agro-ecological resources.
18. Develop sustainable irrigation programmes for both crops and livestock.

Group- C.

Topic- Scientific studies, research and lessons learned from experiments and opportunities with regard to combating land degradation and desertification.

1. Contain the downward spiral of land degradation, manifested in soil erosion and deterioration of its physical, chemical, biological and economic properties with concerted actions in scientific and technological frontier by pooling together all the resources available -scientific and technological,
2. Explore new opportunities and identify the organizations institutional requirements as well as areas of studies wanting additional attention and diversify a mechanism for such mechanism
3. Identify the relevant organizations dealing with studies/research/ survey related to the problems of land degradation and desertification and make those available in easily accessible format (Directory/ CD RoM/ web site in the internet).
4. Compile the list of local and international resource persons working on the different aspects of land degradation and desertification as well as land management practices.
5. Strengthen Institutional capacity, human resources development, and promote and encourage indigenous knowledge and technology.
6. Commission study/ research/ survey to combat land degradation, drought and desertification with the creation of National Trust Fund. Initially with seed money/ block grant from the National Government. The fund may be additionally buttressed from sources like UNCCD and other UNA-Agencies, International organizations, any other sources (like donations, fund raising lottery etc.). The fund may be operated by an Executive

Committee comprising representatives of appropriate level from all the stakeholder of both the public and private non-governmental set up and shall be subject to financial accountability under the established rules and regulations.

7. Develop national information data-base related land degradation, drought and desertification in any existing organization/ ministry working in the forefront of environment.
8. Assess land degradation through practical and initiative research and development programmes and re-package the information and appropriate technologies and disseminate to the needy local people.
9. Launch immediate actions to receive data from the satellite, install upper air observation and radar to monitor the movement of the storm in order to better ensure early warning system.

Group -D:

Topic- Institutional Requirements for formulation, implementation and evaluation of national action programmes in combating desertification (NAPCD)

1. Prepare and implement a participatory and comprehensive National Action Programme (NAP) under the broad framework of the issues, strategies and recommended actions with the active involvement and participation of different stakeholders.
 2. Encourage utilize and activate existing institution rather than creating new ones.
 3. Formulate three-tier body for national action programme, existing national environment committee (NEC) headed by the Hon'ble Prime Minister be the apex body for formation, implementation and evaluation of NAP for combating land degradation drought and desertification. The executive committee of the NEC headed by the Hon'ble minister for environment and forests (MOEF) with MOEF and the department of environment as implementing agency. Since NEC and ECNEC meeting cannot be held frequently, national committee for convention to combat desertification (NCCCCD) held by the secretary, ministry of environment and forest be set up with all stakeholders (NGO/ civil society) as members and the director general of the department of environment shall be member secretary who will take actual charge of activities. The NCCCCD will report to the ECNEC and the ECNEC subsequently to the NEC.
 4. Composition of the NCCD shall comprise representatives of the ministries/ department s/ agencies like Ministry of Environment and Forests (MOEF), Ministry of Agriculture (MOA), Ministry of Land (MOL), Ministry of Water Resources (MOWR), Ministry of Relief and Disaster Management (MORDM), Ministry of Fisheries and Livestock (MOLLS), Department of Environment (DOE), Department of Agriculture Extension (DOE), Department of Forest (DOF), Soil Resources Development Institute (SDRI), Bangladesh Agriculture Research Council (BARC), Water Resources Planning Organization (WARPO), Disaster Management Bureau (DMB), Space Research and Remote Sensing Organization (SPARRSO), Bangladesh Meteorological Department (BMD), Bangladesh Water Development Board (BWDB), Local Government Engineering Department (LGED), Bangladesh Bureau of Statistics (BBS), Surface Water Modeling Centre (SWMC), NGO Affairs Bureau, Association of Development Agencies in Bangladesh, Forum of Environmental Journalists in Bangladesh (FEJB) and Academic Institutions
 5. The TOR of NCCCCD to be formed later on.
 6. Create a cell in the office of DOE to monitor and evaluate the problem of land degradation drought and desertification comprising of 10 personal having appropriate equipment and logistic support, financial and technical support may be sought from the CCD secretariat and other relevant international organizations.
 7. DOE may keep contact with SAARC countries as well as other countries of the world for exchange of experiences information technological issues ad development of management information system (MIS) on CCD.
 8. Exchange of visits of officials/ experts of the concerned countries on CCD.
- CCD and other international organizations in this regard may provide necessary support.

Group -E:

Topic- Role of Forestry and Biodiversity conservation in combating land degradation/ erosion and desertification in Bangladesh.

1. Introduce proper land use planning and environment friendly programmes in respect of forestry, pasture, agriculture, fisheries and water management
2. Utilize soil conservation measures such as terracing, contour cropping, check dams in hilly areas
3. Adopt integrated participatory approaches for eco-system management
4. Encourage homestead and village forestry.
5. Facilitate increased use of improved stoves to reduce pressure on forest resource
6. Increase fuel-wood and timber supply for increasing population and use solar, water and biogas energy for generation of electricity.
7. Increase carbon-di-oxide sink by planting trees.
8. Provide incentives. Grants, subsidies, credits for proper land use, watershed management and forestry activities.
9. Protect the loss of vegetative cover from population pressure, overgrazing and unplanned development of projects, township etc.
10. Prohibit misuse of land affecting ecosystem by filling up ponds, canals, beels, haors, baors etc

There was a field trip to (a) Barind area and (b) Gorai off-take and its adjacent area. The visit to the Barind area included two places namely Adda and Parbatipur. Adda represented an area where land is significantly damaged by recurring and insufficient land management. In contrast, Parbatipur is a place where canals and reservoirs integrated in farmlands through Barind Integrated Area Development Project (BIADP) has brought tangible results.

The Gorai river is a tributary of the Ganges River used to supply abundant water resources to local people. The flow at the Gorai off-take area was almost totally eliminated by a large deltaic bar changing the Gorai to a completely dry river. Small irrigation projects such as installing reservoirs and rehabilitating degraded riverbeds and sides can be undertaken to supplement the activities under implementation of the Gorai River Rehabilitation Project.

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Figure - 1

88° 89° 90° 91° 92°

MAP OF DRY REGIONS OF BANGLADESH

Dry regions outlined on the basis of

Moderate : Annual Rainfall (R) less than 1600 mm;
Dry Excess Evapotranspiration more than 400 mm;
Dry (R / ETo) ratio value less than 0.40

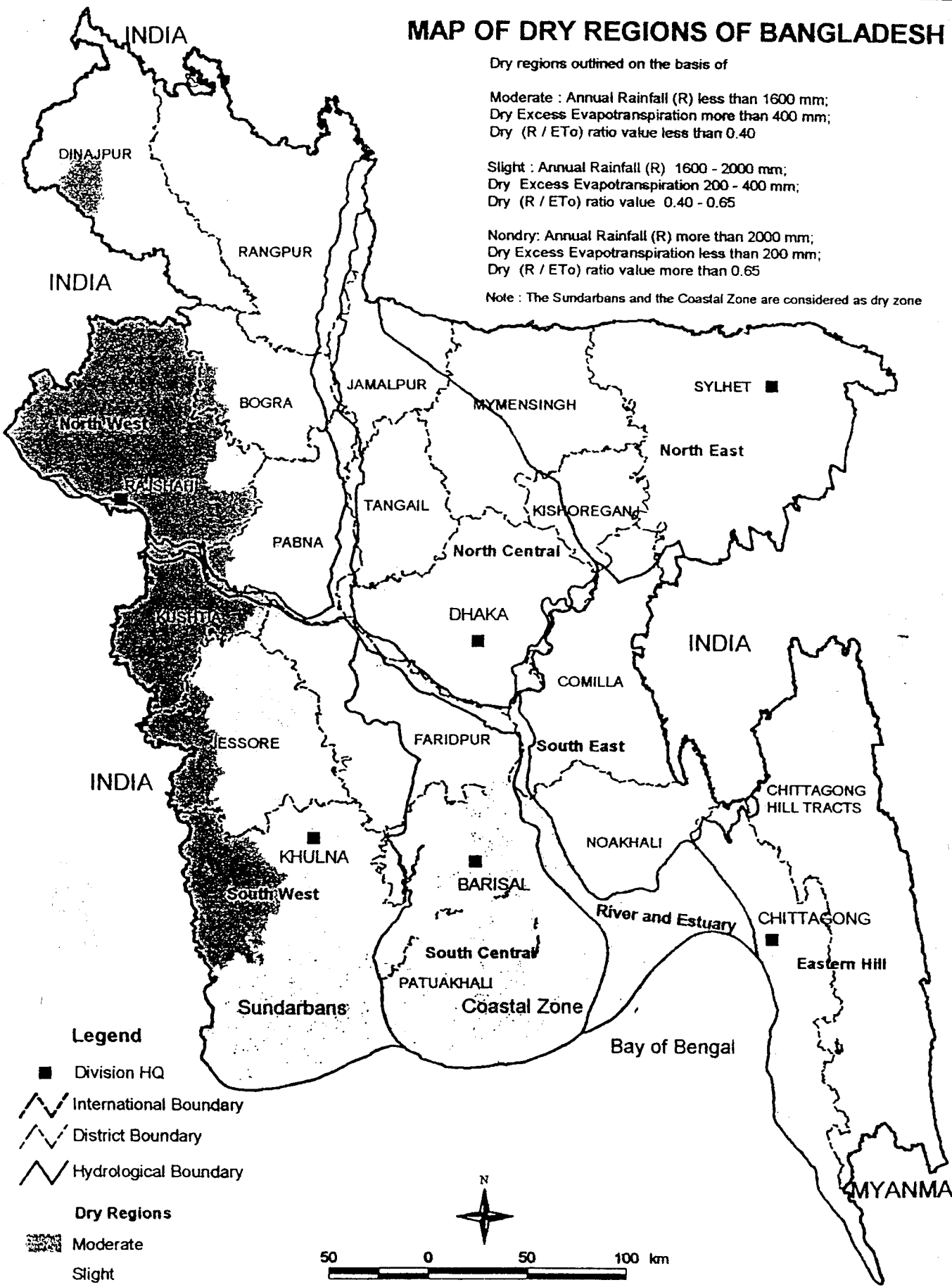
Slight : Annual Rainfall (R) 1600 - 2000 mm;
Dry Excess Evapotranspiration 200 - 400 mm;
Dry (R / ETo) ratio value 0.40 - 0.65

Nondry: Annual Rainfall (R) more than 2000 mm;
Dry Excess Evapotranspiration less than 200 mm;
Dry (R / ETo) ratio value more than 0.65

Note : The Sundarbans and the Coastal Zone are considered as dry zone

26°
25°
24°
23°
22°
21°

26°
25°
24°
23°
22°
21°

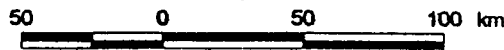


Legend

- Division HQ
- International Boundary
- District Boundary
- Hydrological Boundary

Dry Regions

- Moderate
- Slight
- Nondry



Scale 1 : 2,750,000

89° 90° 91° 92°