People, Policy, and Perpetuity: Sustainability Indicators of Bangladesh Forestry

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This article presents the status of Bangladesh forestry explaining the needs of forest products and the efficiency of forest policy and management practices, and relates sustainability with scarcity situations. The status of forestland use was explained by compartmentalization of indicators into resource factors and social factors. Three indicator groups were used to present the resource and social factors of Bangladesh forestry. The findings suggest that forest sustainability depends not only on resource criteria but also on social criteria. The study also explores how resource and social factors need to be explored for sustainable practices.

Introduction

Sustainability is a burning issue in the forestry sector around the world. Explaining sustainability is also a critical question. Williams (1994) explained that biased policies (biased towards forest cronies) are critical to resource sustainability of developing countries. Bryant (1998) considered that the emergence of sustainability problems is predominantly a social process and remains socially embedded. The works of Guha (1989) and Peluso (1992) outlined that the problem in forest sustainability is primarily due to poverty. Within scarcity, poverty is a common phenomenon of society and could be one of the important reasons of forest degradation. However, in policy evaluation poverty is generally considered as an economic indicator. Therefore, poverty, as an embedded element of society, does not induce the policy discourse of resource scarcity but of economic paucity.

Poverty could occupy many dimensions in space (resource, economic, cultural), in persistence (periodic, fluctuating and lifelong) and in its identity (child, woman and poverty of elders). Peluso, Humphrey, and Fortmann (1994) explained the sustainability issues as a condition of resource poverty, and coined the term natural resource dependent areas (NRDA) to address

the unsustainable situation of resource abundant and resource scarce areas together. By NRDA the authors meant the places where natural resources either account for a substantial part of the local economy or attract population. The NRDA concept reiterates that even if resources are there, the nature of the policy may influence the availability of resources to ordinary people, and could influence the poverty. Therefore, sustainability evaluation may need to address different forms of policy measures explaining how they influence resource availability and poverty.

The approach of sustainability indicators considered here is compartmentalization of policy evaluation. By compartmentalization of policy this article emphasizes particular issues like the nature of resources, market oriented investment and commitment to sustained supply (*e.g*. Gaventa, 1980; Marchak, 1983; Peluso et al., 1994). However, natural resource dependence is not a prior cause of poverty and hence sustainability. There are some other causes, such as centralized economic structure (Bunker, 1984), technological inability (Blaikie, 1985; Freudenburg, 1992) and concentration of ownership and control (Marchak, 1983; Freudenburg, 1992) that may bring a sustainability risk to NRDA countries. Thus, policy discourses inevitably become linked with control of resources, such as, resource dependence, resource use, resource waste and nature of capital. Taking the present land use as the end result of past policies, an attempt is made to track the past social indicators of policy discourses. This study presents the resource scarcity situation of Bangladesh as links to those issues of sustainability indicators.

Methodology

The key point of the study method is how to present the forestry information to establish the link between resource scarcity and the policy discourses of sustainability. According to Culyer, Lavers, and Williams (1972) presenting the forestry statistics, as circulars in recording the state and progress of policy need to satisfy three conditions, each of which is complementary to others but serves different requirements. The three conditions are:

a. a measure of the output of policies
b. a measure of deriving the social valuation placed upon different outputs
c. a measure of technical possibility of increasing output

Adequate information on each of these conditions would be necessary to satisfy the following requirements of policy discourses:

i. the units in which the policy objectives are to be defined

ii. values/ increments in each objectives in terms of social worth
iii. specification of physical possibility

Corresponding to each of these requirements, the following three groups of indicators are proposed here to present the information on resources sustainability:

i. measure of state of forest resources (SFR indicators)
ii. measure of the need for forest resources (NFR indicators)
iii. measure of effectiveness of policy resources (EPR indicators)

Each of these indicators can be used at an aggregate level for explaining and for comparing policies but there could be some ambiguity particularly in conceptualising the kind of indicators applicable for different countries. However, some efforts were taken to determine the indicator that would be more practicable to explain than to what is ideally required for sustainability evaluation. The indicator groups mentioned here are used to present the forestry situation of Bangladesh.

SFR Indicator

SFR indicators, proposed in this article, are not to relate any specific forestry input rather to place arguments of the status of objects that are affected by inputs. The practical events to which the indicators may be used include quantitative expression of the choices that are available to decision makers, making a better comparison or testing to see whether forestry processes of a particular country in general are conducive to sustainability requirements. The approach of SFR indicator may be utilised to present the condition of forest space (area) and the stocking of resources and the characteristics of their changes. The SFR indicators of Bangladesh are presented in the following paragraphs to see how they indicate the performance of forest sustainability.

Eco-Space of Forest Resources

In Bangladesh about 16% of the land area is legal forest but mostly located in south-west (SW) and south-east (SE) corners of the country (Map 1) . Bhuiyan (1994) reported that out of the forest areas, actual managed forest was only 9.2% (1.32 million ha) and Unclassed State Forest (USF) was 6.9% (0.99 million ha) in early 90s. Using the figure from the Forest Department, the forest area distribution of previous greater civil divisions is shown in Table 1.

The table shows that two of the divisions (Dhaka and Rajshahi, mainly plain

land) have minimum forest. More than 49% of the people live in these divisions (calculated from Bangladesh Bureau of Statistics, 1998). Even in major forested regions, per capita forestland (0.04 ha) is not adequate to meet the demands of fuel wood and building materials (Table 1). Bangladesh Bureau of Statistics (1998) reported that average fuel wood supply from the forest was only 0.7 million cum. whereas the demand was ten times higher, to the tune of 7.0 million cum. For the case of timber average supply situation was 1.09 million cum., whereas the demand was 2.42 million cum. The details have been discussed later in demand and supply situation. However, occasionally the forest statistics of Bangladesh include village forests. The village forest here means the tree cover of rural areas. Including those village forests the revised status of eco-space of Bangladesh is shown in Table 2.

The total forest area in Table 2 is increased from 2.3 to 2.6 million ha covering about 17.62% of total land. Plantations on marginal and coastal lands increased the managed forest areas from 1.3 (Table 1, RF+PF+AF) to 1.5 million ha (Table 2). Thus, the managed forest statistics rose from 9.4% to 10.37% of the total land. However, an FAO (1999) estimate shows that the forest area of Bangladesh is lower than that of the government estimate and was only 1.01 million ha in 1995 covering only 7.8% of the total land area. This figure includes plantations as well. The natural forest shown in the report was only 0.7 million ha.

WRI/CIDE (1990) estimated that the forest area would be only 1 million ha or 6.9% of total land area. Moreover, the cover intensity is different in different forest types (Table 2). An early report of Gittins and Akonda (1982) estimated remaining natural forest cover to be only 3.3% of total land, which is less than 0.5 million ha. Other than the mangroves and salt forests the distinct area patterns of forest ecotypes of Bangladesh are not well marked. Therefore, the spatial status of Bangladesh forests is often classified under legal types rather than ecotypes. A legal type may include different ecotypes and may be adjusted with the need of administration. As a result often there is a change in the space status of forests of Bangladesh. The following section presents the situation of changing forested space of Bangladesh.

However, the most recent figure is stated by Muhammed, Koike, Sajjaduzzaman, and Sophanarith (2005) from unpublished data of the Forest Management Planning Database Survey 2003 . They mentioned that the estimated forest area of the country is about 2.53 million ha and this is about 17.5% of the total land base of Bangladesh. But it differs with the figure stated in Forest resource Assessment 2000 (FAO, 2001) which indicates only 10.2% of the land area of Bangladesh as forest. This figure is

lower than that of Government estimate. The main reason is the FAO estimate considered only the designated government reserve forests, protected forests and unclassed state forest while the Government estimate included the figures of Village and private forests also. At the same time estimates of forest plantations were 625,000 ha and this is also much lower than the forest statistics of Bangladesh (Muhammed et al., 2005) . According to Iftekhar (2001) 40% of the forest encroachers settle in the vicinity of the forest and certainly it would increase the rate of forest area reduction.

Changing Space

Changes in the eco-space over the period are also the concern of sustainability situation. Figure 1 shows the total forest area and the legal types of forests available in Bangladesh. The trend of forest area after 1990-91 shows a slight increase. This may be the effect of a logging ban in 1989 and the plantation activity conducted by the Forest Department. Despite this, the FAO (1999) figure shows that between 1990 and 1995, the forest area of Bangladesh was decreased by 9,000 ha per year. These areas could have been lost by illegal felling and unauthorized cultivation. Hussain (1992) has shown the total forest area destroyed by illegal felling and unauthorised cultivation (Table 3). The table shows that the highest destruction occurred in the plain land forests of the central area where forest area is barely at a minimum (Table 1). In the plain land area total forest is only 0.12 million ha (Table 2). In addition, a large area of Unclassed (legal status of u nclassified forestland) State F orests (USF) in the hills (Table 1) was vacant for a long time. Including USF areas, overall about 54% of the hill forests have no tree cover (Government of Bangladesh, 1993).

Figure 1 suggests that the total forest area decreased from 2.2 million ha in 1985-86 to around 1.8 million ha in the following year. A major decrease took place in reserved forest and USF forest but this dramatic decrease was not supplemented by the increase in other forest types. An explanation was not provided in the source. Perhaps, those lands have been taken out of forestry use. Parts of the reserves were de-reserved for rehabilitating shifting cultivators and a large chunk of USF forest was brought under rubber plantation. If the early figures of forest area reported by Rashid (1967) are considered, the reserved forest area was 1,137,000 ha which is almost the same as the 1991 figure shown in Table 1. USF forest and protected forest in 1967 were 894,000 ha and 35,500 ha. But Table 1 shows the figures as 650,000 and 63,500 ha respectively. This shows that there was a significant decrease in USF area. It is expected that a very small part of the lost USF went to protected forest but most went to Kaptai Lake (for producing hydro-electricity, about 300,000 ha, Kamal, Kamaluddin & Ullah,

1999), rubber plantation, and jhumia rehabilitation. It should be mentioned here that a fter independence in 1947 the Pakistan Government prioritized industrial development over agriculture. In the early 1960s, the government constructed a hydroelectric power plant at Kaptai on the Karnafuli River to meet the increased demand from industry and urban areas for electricity. The reservoir inundated about 40% of the Chittagong Hill Tract's (CHT) best arable land (some 22,000 ha) and displaced about 100,000 people, 55% of whom were plough cultivators (Rasul, 2005). Some of the displaced people, those with permanent land titles, were resettled in reserve forests. However, the rehabilitation program was inadequate and compensation insufficient (Roy, 2002). Muhammed et al. (2005) claim that rural agrarian peoples around the forests depend heavily on forests for their livelihood. Agrarian rural people around the forests heavily depend on forests for their livelihood. As a result of the tremendous demographic pressure, 975 people km - 2 (FAO, 2003), for both housing and agriculture, use of the land between and within forested areas is accelerating the rate of deforestation. From another data of GOB (2001) the deforestation rate in Bangladesh was 0.9% in 1970, but rose to 2.7% in 1984-1990. Forest Management Planning Database Survey 2003 indicates that a total of 61.3 thousand ha (excluding the USF figure) area have been encroached so far but the fact is that this figure also underestimates the true extent of encroachment. Besides the degradation fact of Sundarbans is also supported by Iftekhar and Islam (2004), IUCN-Bangladesh (2001), and Siddiqi (2001).

Changing Stock

In addition to the space status, variation in the stock status of resources is also important for describing a sustainable situation. The stock of forests in Bangladesh is reduced to such a level that the forest is practically unproductive (Table 4). The table shows that stock in the USF area is negligible. But the timber sale proceeds from the USF area in earlier periods (i.e., Government of Bengal, 1897) show that the area once was covered with a productive and luxuriant tropical forest. Table 4 shows an alarming decrease of growing stock from 3.4 million cum. (*e.g.Chittagong Hill Tracts*, 1966) to a present stock less than 1.4 million cum. (Ahmed, 2000). This is a massive 58.8% decrease. Eventually it was depleted to such an extent that biological repair of those areas would be very expensive.

Canonizado and Hossain (1998) reported stock depletion of Sundarbans and illegal felling of major tree species. Though population density of the administrative districts covering the forest (Satkhira, Khulna, and Bagerhat) is much lower than the national average, it is growing rapidly (Bangladesh Bureau of Statistics, 2001). The increased population with few alternative livelihood opportunities poses a serious threat to the Sundarbans as it is the

main cause of mangrove destruction (Ong, 1995; Waggoner & Ausubel, 2001; FAO, 2003). Moreover, dependence of local people on the forest is high (18% of the households in the impact zone are dependent on the forest) and in the future this dependence will increase (*Report on socio-economic baseline study*, 2001) and ultimately it will cause more stock depletion. Because of heavier exploitation and negligence in restocking, there has been an overall depletion of growing stock of other forest types as well (Table 4). The growing stock of the Sunderbans forest has depleted from 20.3 million cum. in 1960 (*Inventory of Sunderban forests*, 1960) to 10.6 million cum. in 1984 (Chaffey, Miller & Sandom, 1985), roughly a 48% decrease of tree resources over a period of 25 years (Ahmed 2000).

Similarly the stock of managed forests of Chittagong Hill Tracts was depleted from 23.8 million cum. in 1964-65 (*Chittagong Hill Tracts*, 1966) to less than 19.8 million cum. in 1985 (Chaffey et al*.,* 1985). Although the extent of depletion is low (16.8%) compared to mangrove forests, in practice the depletion of hill forest stock was heavier in the accessible area. For example, Ahmed (2000) cited that there had been 61% depletion in growing stock at Raengkheong reserved forests in Chittagong Hill Tracts between 1963 and 1983. The area was opened for supplying bamboo and pulpwood for Karnaphully Paper Mill (KPM) since 1953 (GOB, 1992).

Data for village forests are available only after the 1981 village forest survey. The GOB (1991) estimate of the stock in homesteads of villages is almost the same as the other figures, which is 54.7 million cum. (Table 4). The government estimates for other forests are higher than the previous estimate. The information presented in the above paragraphs shows the SFR and changes in the SFR but do not confirm the sustainability situation. The sustainability situation may be clearer if the social valuation could be placed upon different outputs. A display of social needs of forest produce would display the social valuation. The following sections present the indicators to explain the social needs. These indicators are mainly based on scarcity situation.

Status of NFR Indicators

The purpose of NFR indicators is to express the needs in terms of a target level that a particular SFR indicator should take up. Alternatively, they may be expressed as the difference between the policy target and the current level of SFR indicator. This approach appears to have some difficulties since it is not clear in developing countries how the targets are decided. For discourse evaluation of the forestland use and environment, targets may be fixed in quantitative (*e.g.* national targeted area) or qualitative terms (dimension of stocking or vegetation density). Choudhury (1977) suggested

that Bangladesh needs at least 25% of its land as forests for environmental reasons, but enough land is not available to increase the forest stock horizontally. In spatial terms the practicable needs of land for food, fuel and accommodation for a huge population of about 112 million (Table 1) are difficult to be met from small disaster-prone territory of Bangladesh. The practical situation is presented in the following paragraphs.

Demand and Supply Situation

The extent and stock of the existing forest areas are so low that the supply of fuel wood and timber from the forest area decreased alarmingly. Systematic study has not been done to understand the scale of the problem and what would be the growth required for the sustainable supply of forest produce in Bangladesh. Based on the estimated consumption, GOB (1992) predicted that by the year 2013 the round-wood requirement would be 14.3 million cum. That could be attainable if annual growth rates for short, medium and high rotational species would be 15, 12.5 and 7.5 cum/ha/yr respectively provided the proposed areas of plantations are not encroached. But the depletion of present stocks in different forest types, quoted in Ahmed (2000) (also Table 4), does not show the prospect. The Mean Annual I ncrement (MAI) was only 2.5– 4.0 cum/ha/yr (GOB 1992). However, it was expected that with genetic improvement and proper tending and thinning operations, the MAI would be much higher. In addition, if sawmill conversion factor is improved, the savings could be equivalent to 1.5 to 2.0 million cum/year.

The reports of FAO (1981) and Douglas (1982) predicted that the gap of supply and demand was widening in the 1980s and beyond. GOB (1992) estimated the consumption and supply of timber and fuel-wood of the year 1991-92 were 13.5 and 7.9 million cum. respectively. Although the supply estimate was considered high, even then the estimate shows a 41% deficit. This was happening while Bhuiyan (1984) and FAO (1981) reported that fuel-wood consumption in the country has been falling progressively since 1960s. However, the fall was not because there was less demand, but was due to short supply and increase of price. Arnold and Jongma (1977) cited an estimate of 1975 that the use of per capita fuel-wood was 0.012 cum., while minimum per capita energy use was equivalent to 0.5 cum. fuel-wood. The balance of fuel was met from the burning of cow dung, agricultural residue, fuel-wood from the homestead and from illegal head load harvest (bunch of woods/sticks a person can carry) from the forest. Bangladesh Bureau of Statistics (1997) shows that from 1985 to 1990 average official fuel-wood supply from the forest was only 0.7 million cum., whereas the demand was about 7.0 million cum. The case for timber was also similar. The average supply from the forest was 1.09 million cum., whereas the

demand was 2.42 million cum.

Issues of Resource Allocation

The status of NFR indicators also depends on the nature of resource allocation. An equitable distribution and rational allocation of resources are important for the success of resource sustainability. In other words, policy formulation should consider the quantity as well as timely availability of resources. It is not necessary that a sustainable policy has to be technologically superb; a socio-culturally integrated attempt motivated for possible better out-turn would pertain to driving forces for pursuing sustainability. On the other hand, if technological skills were adopted in the policy without training the manpower it would result in policy failure or very expensive policy implementation. For example, in 1982 demand for fuel-wood in Bangladesh was 8 million cum. per year (Forest Department of Bangladesh, 1982). In terms of regular forestry plantations, about 1 million ha of plantation would be needed to satisfy that demand. But in 1980-81 the total plantation area was only 0.167 million ha (Forest Department of Bangladesh, 1980). The plantation status reveals that even if all the plantations were devoted to solve the fuel-wood crisis, the production would not meet one-sixth of the total demand.

Kamal et al. (1999) show that total plantation area of Bangladesh is only 0.332 million ha, which is 17% of the total forest area, but the plantations in the hill areas are only 0.197 million ha. Most of the plantations are of fast growing species. Unfortunately, the growth of plantations was so poor that there was no significant out-turn from the plantation forests in the recent past. Under the circumstances, consideration should be given across the tradition of resource use. Therefore, effectiveness of skills is also important for sustainability. The following section presents the status of effectiveness of Bangladesh forestry.

Status of Effectiveness of Policy Resources (EPR) Indicator

Effectiveness of Policy Resources indicates the resource sustainability by indicating the changes in the resource status, but in this case policy measures are highlighted more than the resource status. For example, quoting the FAO (1982) statistics on global forestry Waggener and Lane (1997) stated that about 11 million ha of land per year are passing out of forest use. Most of these transformations were happening in developing countries and were caused by the implication of wrong policy. In the case of Bangladesh, although there was a logging ban since 1989, about 44,000 ha of forestland were changed (FAO 1999) between 1990 and 1995, which is about 0.08% of forestland per year. Hussain (1992) estimated such loss in

Bangladesh was about 77,000 ha (Table 3). The remaining forests are also so much burdened by demand, and the environment is depleted so fast that positive forestry measures are an immediate need in Bangladesh.

Besides, Bangladesh is a small country of 144,000 sq. km supporting over 120 million people; therefore, the scopes for horizontal expansion in Bangladesh are very poor. Most land in Bangladesh is used for cultivation. However, land under homestead and underwater covers a large part of the country. Utilization of those lands in a useful way could help the improvement of the general economy of the country. Bangladesh Bureau of Statistics (1998) data shows that about 5% of land underwater was reclaimed and added to the agriculture, as a result of which arable land has been increased from 63% to 67%. In the 16% forest land (Figure 1) about 7% is almost bare land (USF). The remaining 9% of the managed forestland is directly controlled by the Forest Department. About half of this area lacks tree cover (Kamal et al*.,* 1999).

Figure 2 shows the status of space availability for forest expansion. In the figure the axes are shown as dotted lines radiating away from the centre. The area of land use types of each year is pointed out on the axis of the corresponding year on the basis of a scale. Dotted circular lines show the secondary axes. The points of corresponding land use types of each year are then joined forming a rounded shape. Thus, the comparative size of the rounded shapes gives the contrasting notion of land use and the eccentric nature of the shape gives the changes of land use in respective years. The area within boundary line of the figure shows the total land area of the country in thousand hectares. As the total land is not variable, it gives a smooth circular shape. The circular line immediately inside the boundary line shows the status of total used land (sum of forest, unavailable and cropped land) in different years. The gap between these two lines represents the land not used or available for further use.

Figure 2 indicates that almost all the land of Bangladesh is used. There is little land left for horizontal expansion of forest. The shape shows that availability of land decreased gradually from the year 1990 onwards. During these years projects for major expansion of communication and barrage/dam constructions for flood control were undertaken. Presently Bangladesh can expand its forest only to marginal areas like roadsides, dams and homesteads where forestry programmes need to be integrated with other development work. However, land tenure and land suitability were the other problems, which perhaps limited the expansion of forest in such marginal areas.

The very central boundary area of Figure 2 represents the situation of total

forest area in Bangladesh. It shows an eccentric figure signifying forest areas were gradually decreasing from 1971 to 1972 and were at a minimum in 1989 to 1990s. After that the Forest area is increased a little, perhaps resulting from the incorporation of village forests in the total area. This demonstrates that raising plantations in marginal areas and harvesting them regularly to support the demand could help in reducing pressure on natural forest. This was something that required vigorous innovation in the forestry administration but had happened very little over time.

Conclusions

The above discussion shows that the forest areas of Bangladesh are shrinking and that the forest resource stock is declining. But those SFR indicators do not say whether the resource is sustainable or not unless compared with the needs of the society. The social need presents how people are hit by the shortage of forest products. The magnitude of social problems needs to be addressed by taking into account society's preferences and the opportunity cost to satisfy them. That is why the NFR or EPR indicators should not be subsumed under SFR indicators. Policy values may enter into indicators either directly (*e.g.* NFR indicator valuation) or indirectly (*e.g.* relative value of change in SFR indicator to the change in some social indicators like education or income). They signify that though the evaluation is about the sustainability component of forest policies, its relevance to other social factors can hardly be avoided.

Solemn characterization of some indicators, such as evaluative as opposed to informative characters, or their scientific use as opposed to social use, cannot be considered very helpful in sustainability evaluation. If society's preference remains constant, the value of a given change in a SFR indicator will depend on the level of resource indicator as well as on the level of other social indicators. Even if a high value is placed on a given change in SFR indicators, identification of NFR indicators would be necessary along the line of policy targets before the change in the SFR indicator could be adopted as goal. From the discussion it is clear that forest sustainability not only depends on the resource criteria but also on social criteria, of which both policy and people are integral part. However, this discussion was not extended to suggest how people adjust their requirements and try to use substitutes under scarcity situations, but to say encouraging peoples' participation in managing scarce situation often brings good results.

The conspicuous point of analysis is that under the scarcity situation although the state forest was degraded rapidly, people have maintained their homestead forests promisingly. It suggests that ownership of resources was an important factor. People could not think that the state forests were

their own and thus did not hesitate to degrade the resources. Therefore, the degradation of state forest can be considered as a policy failure in that the policies failed to invite the participation of people. If appropriate policy arrangements were possible for meeting peoples' needs, people would be willing to participate for forest extension.

In general, the productivity indications show that the capability of the forest ecosystem of Bangladesh is already overloaded. The decrease in the forest area can be taken as the footprint of increased population and their desperation for forest encroachment. As the prospect for horizontal expansion of forests is very limited, the eco-space concerns of forest sustainability can hardly be maintained. Thus, the eco-efficiency concern of sustainability does not show promising prospect unless participations are spontaneous. However, the statistical information is old and repetitive in different literature. Real study on the abundance of resources and their supply situation is poor or much localized. Under these circumstances, appropriate policy is mandatory to organise the forestry discourses of people towards forest sustainability.

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Table 1: Distribution of forest area (000 ha) under civil Divisions till 1991

Name of Division	Land Area	Pop. mill.	RF	PF	AF	USF	Total Forest	% Area	Per Cap
Dhaka	3112	33.9	24.0	19.1	36.2		79.3	2.5	negl
CTG + Sylhet	4637	28.8	499.4	41.7	71.3	650	1262.4	27.2	.04
Rajshahi	3451	27.5	6.0	2.7	6.1		14.8	0.4	negl
Khulna + Barishal	3557	21.0	601.1		16.1		617.2	17.4	.03
Total	14757	111.2	1130.5	63.5	129.7	650	1973.7	13.4	.01

Source: Department of Forestry, Hussain (1992), BBS (1997)
Key: CTG for Chittagong, Pop. for Population, RF for Reserved Forests, PF for Protected Forests, AF for Acquired Forests and USF for Unclassed State Forests

Table 2: Areas under different forest land use types of Bangladesh (mill. ha)

Forest types	Sub- -types	Under F. Dept.	Others	Cover %
A. Mangrove	Sunderbans	0.57		75
	Coastal forest (manmade)	0.13		---
B. Hill Forests	Managed forests	0.67		50
	Unmanaged forests (USF)		0.73	---
C. Plain land	Sal Forests	0.12		25
	Plantation on marginal land	0.04		---
D. Private	Village forests		0.27	80
	Tea and Rubber garden		0.07	---
Total		1.53	1.07	

Data source: GOB (1987), GOB (1995), Ahmed (2000)

Table 3: Destruction of reserved forest areas of Bangladesh until 1992

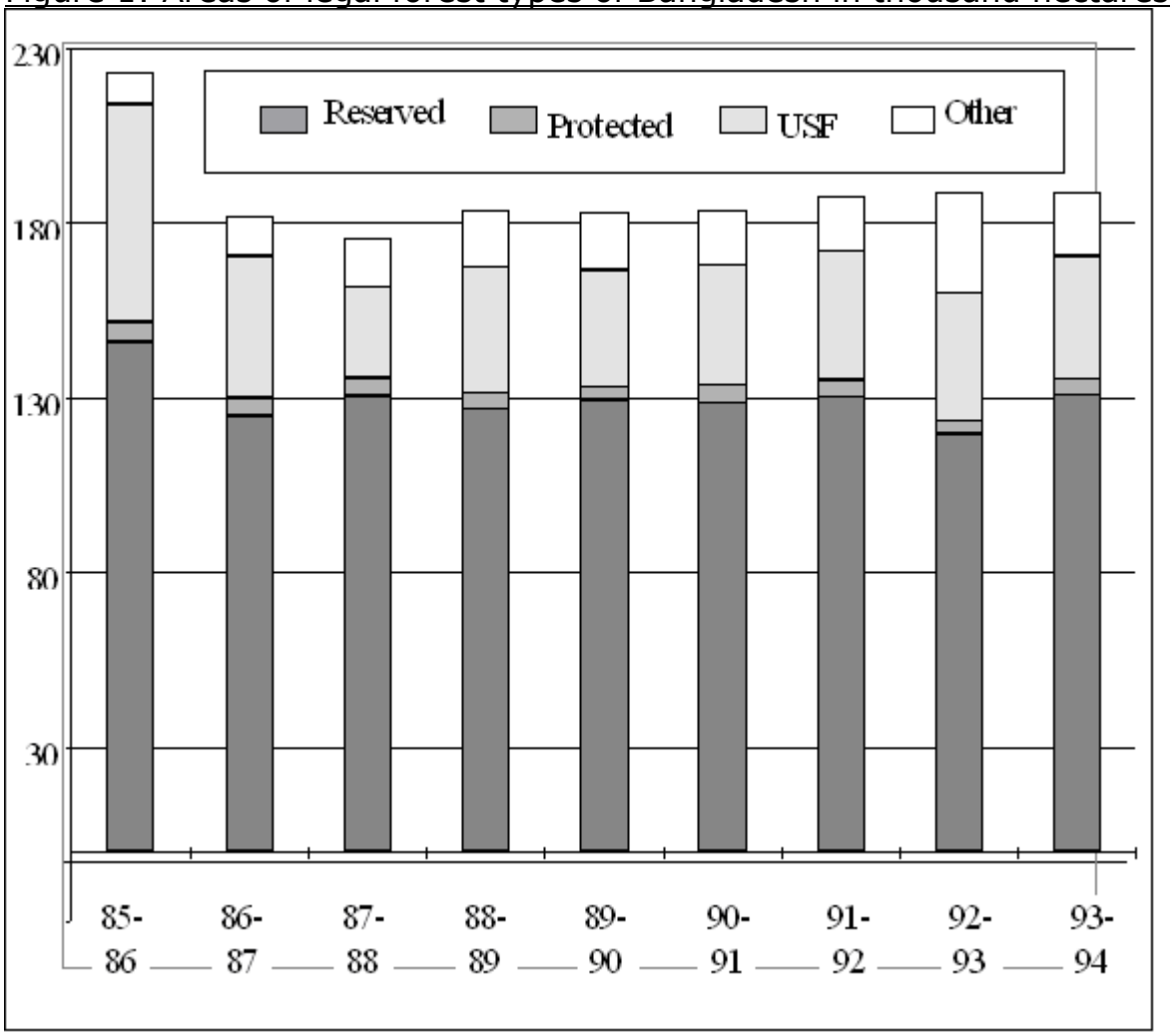
Types of forests	Area destroyed (in ha)	% total destroyed area	% of forest types
Hill Forests	34593.29	45.2	05.2
Mangrove Forests	2966.64	03.9	00.5
Sal Forests (Plain land)	39029.29	50.9	32.5
Total	76589.22	100%	

Table 4: Trend of growing stock of different forest types

	Stock in million cum		Govmnt. estimate of stock	
Forest types	Prior 1960	After 1980	Mill. cum	Source of est.
Hill forests of CTG & CHT	23.8	19.8	28.33	not mentioned
Sunderbans mangrove	20.3	10.6	16.01	1985 inventory
Plainland forests			1.14	not mentioned
USF	3.4	1.4	Negligible	
Village forests		54.7	54.7	1981 VF survey

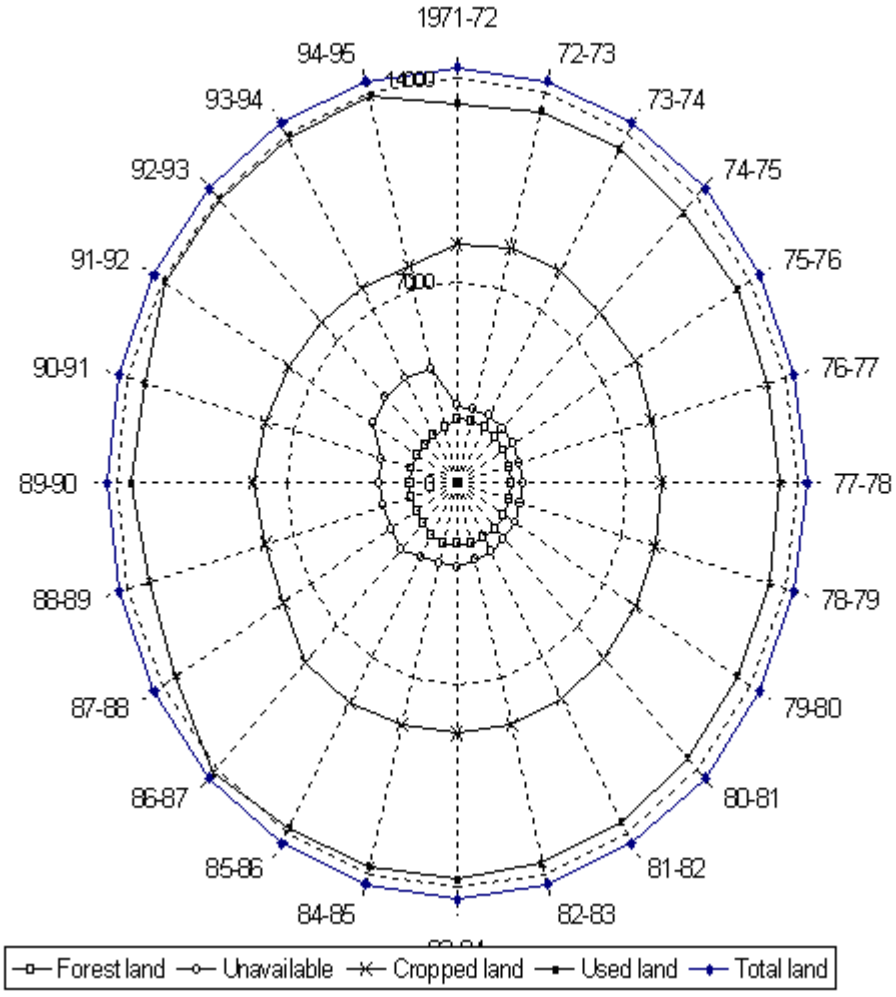
Source: *Inventory of Sunderban Forests* (1960), *Chittagong Hill Tracts* (1966), Chaffey, Miller & Sandom (1985), GOB (1991), and Ahmed (2000)

Figure 1: Areas of legal forest types of Bangladesh in thousand hectares



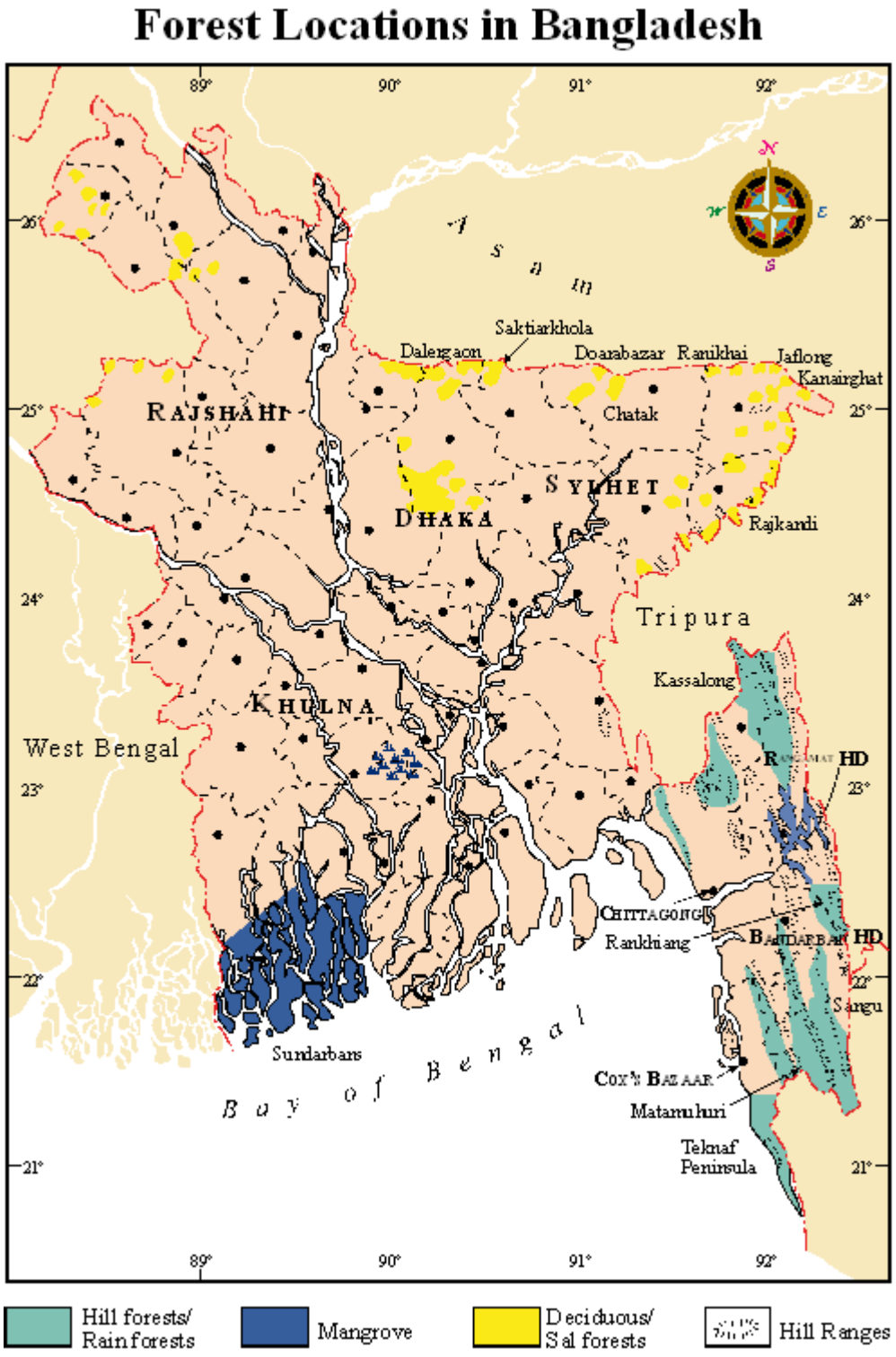
Data source: BBS (1992; 1996) (Other forests include acquired and vested forests).

Figure 2: Major land use types of Bangladesh.



Data source: BBS (1997)

Map 1: Bangladesh showing the distribution of forest ecotypes



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