Chapter 11

Animal Husbandry

LIVESTOCK

Cattle

A surprisingly large number of cattle are reared (Map 11.1). The great pressure of population on the land does not seem to have adversely affected them, for their number too has increased steadily. The total number of bovines (cattle and buffalo) has steadily increased over the past forty years, according to various censuses the most recent being the Agricultural and Livestock Census of 1983 - 84 :

1945	:	14.9 million
1960	:	19.4 million
1977	:	20.9 million
1983-84	:	22.1 million

Over the past three decades there has been abou 1 head of bovine per net cultivated acre (5 heads for every 2 hectares). This exceedingly high density is definitely responsible, in a good measure, for the poverty of the stock. There just is not enough fodder for the teeming millions. The large areas of grazing ground available upto the 1940s in the Southern, Northern and Central Regions have mostly been brought under cultivation. The only substantial grazing ground are the Bhar and the Haor Basins, and that only for four months of the year when the water recedes. In these seasonal pastures, Doob grass *(Cynodon dactylon)* grows profusely in winter and supports large herds which are brought from as far as eighty kilometers. In the other areas cattle are allowed to feed on the small common grounds that still remain. The poor quality of the grass and its limited quantity is a big factor in the under-nourishment of the cattle. In the rainy season they are generally fed from bowls (Chari) inside the shed which houses them. The fodder given may be water-hyacinth, Makra *(Eleusine aegyptica)*, Nena *(Andropogon squarrosus)* or Takri *(Digitaria sanguinalis var)*. At the end of the rainy season,

they are sometimes allowed to graze on the growing Khesari which may be cut for fodder or ploughed back as green manure. The inner stems of banana plants, plantains and leaves of tree such as Jaam, Jack-fruit are also used as fodder.

During the rainy season, the plough cattle have often to work in knee-deep mud. In very low-lying areas, they may be seen working with half their body submerged in the very muddy water. Such conditions are obviously very inimical to their health. Buffaloes put up with these conditons much better than oxen, but as neither their beef nor milk are liked, the farmers do not replace their oxen with them. In general, cattle are not reared as a source of food supply, but as agricultural implements. The primary work of the oxen (bullocks) is to pull the plough, Bida, Moi, etc. They may also be used to haul carts. In the drier areas of the west, oxen are kept separate, for their use is constant. Cows are sometimes used for ploughing, much to their detriment.

There is no breed of cattle indigenous to Bangladesh. There are only certain types slightly superior to the average, which are the grey Madhupur, brown Madaripur, red Chittagong and white Bikrampur and Shahzadpur types. Their yield of milk is said to be generally more than that of the average. The average oxen stands a mere one meter at the shoulder and weigh 90 kg (200 lbs.) only. The average yield of milk per cow per year is only 95 kg (210 lbs.). There have been many attempts at improving the oxen, both by feeding them better and by crossing them with good breeds. Neither method has as yet made much difference. They are mostly of such poor stock that even good feeding does not make much difference ; moreover the average farmer cannot afford to feed them regularly on the 'scientific diets' which are advocated. As for the second method of improvement, there has not been any continued success ; crosses with Hariana, Jersey, and other breeds have proved superior to the local-cattle, but inadequate feeding with poor quality fodder has rapidly led to their degeneration. The crux of the whole problem is that good fodder is not available in large quantities. There are a few small herds of Nagara, Hariana, Kosi, Hissar and Manipuri cattle (all good breeds), but maintaining their purity is difficult. The local oxen, it may be pointed out, are bred mainly from immature bulls and no attempt is made at selective breeding. When there are more than 20 million cattle, a few small herds can hardly improve the average quality. At present there are experiments to improve the cattle by crossing them through artificial insemination, with Red Sindhi or Holstein. Apart from the fact that paucity of trained staff is severely restricting this method of improvement, the whole

scheme may come to nothing if the fodder supply is not increased. Some of the best cattle (often very superior to the average) are sacrificed on Eid-ul-Azha, the Muslim feast commemorating Abraham's sacrifice.

Buffaloes *(Bos bubalus)* are far more suited to the climatic and physiographic conditions of Bangladesh. They are slightly slower than oxen but their traction power is twice as much. They are much bigger and heavier than the local cattle, under the same set of conditions. They average 1.2 metre height at the shoulder and weigh 181 kg. Cow-buffaloes not only produce twice as much milk as cows but their milk has twice as much fat 6-8 per cent as against 3-5 per cent (Wahid 1960a). There are three breeds of buffaloes within Bangladesh. In Sylhet district, there are the Manipuri and the Bangar breeds.

Table 11.1

Number & Distribution of Bovine Animals in 1983-84

Region	Total	Percentage
Bandarban	69	0.31
Chittagong	1,068	4.84
Chittagong H.T.	189	0.86
Comilla	1,508	6.84
Noakhali	742	3.36
Sylhet	1,698	7.70
Dhaka	1,525	6.91
Faridpur	1,126	5.10
Jamalpur	593	2.69
Mymensingh	1,733	7.86
Tangail	723	3.28
Barisal	1,115	5.05
Jessore	1,140	5.17
Khulna	1,167	5.29
Kushtia	527	2.39
Patuakhali	630	2.86
Bogra	844	3.83
Dinajpur	1,289	5.84
Pabna	885	4.01
Rajshahi	1,440	6.53
Rangpur	2,050	9.29
Bangladesh	22,062	100.00

with numerous hybrids from them. The Manipuri is a massive animal with large horns. In the Northern Region, the Bangar and Kachhar breeds are recognised. The Kachhar is probably the same as the Manipuri hybrid. Over the rest of Bangladesh the Bangar predominates.

In the Barind and Madhupur Tracts and the Moribund Delta, buffaloes are largely used for hauling carts. In south Barisal district and in the Meghna Estuarine islands they are used largely for ploughing. In Sylhet and Hill Tract districts, they are kept both for ploughing and dairying. In the north-east of the Hill Tracts, the Lusheis keep some Gayals *(Gavaeus frontalis)* huge animals, much resembling the Asiatic Bison. They are not milked, but kept only for slaughter on festive occasions. Meithuns, which are probably a hybrid of Gayal and hill cattle, are also reared in those remote hills.

The incidence of cattle diseases with worms *(Cestodes, Trematodes, Nematodes)*, Rinderpest, Haemorrhagic septicaemia, Black Quarter, Anthrax, foot and mouth disease and Rickets are very high. Probably as much as half the cattle suffer from Rickets. The work of late Dr. Suleman* suggests that various intestinal worms may prove to be the major cause of low productivity. Preliminary results show that milk yields may more than double after cows are treated for intestinal parasites.

The increase in the number of cattle was 4.5 million in the period 1945-60, but in the period 1960-77 the increase in the number of cattle was only 1.5 million. Thereafter there was an increase of 1.2 million from 1977 to 1984. It seems evident that the growth in bovines has slowed down as the cropping system becomes increasingly unable to feed them. The number of bovines per capita is an indication of cattle scarcity in some areas, as a result of which land is not ploughed in time and yields are reduced. Noakhali, Comilla, Dhaka, Kushtia, Chittagong and Barisal are well below the national average in the number of bovine per capita (Agriculture Census 1983-84).

On the average there is one head of cattle for an acre of cultivated land; their value as implements of agriculture cannot be doubted (Gill 1981, M. N. Islam 1985). Any improvement in their quality must take into account their indispensibility to the farmer and the shortage of fodder. The number of cattle cannot be effectively reduced just to meet the fodder shortage, since most of them are needed for ploughing. It is true that better-fed cattle will be able to plough more land but no farmer can afford to change over from several emaciated animals to

* An Egyptian national who worked for FAO.

a pair of well-fed ones because of the time-lag involved. Possibly only a gradual decrease in number and a fairly rapid increase in fodder production can alter the present situation where millions of half-starved cattle are more a burden, rather than an asset, to the economy. A fairly plentiful supply of hides is one of the assets of having such a large cattle population.

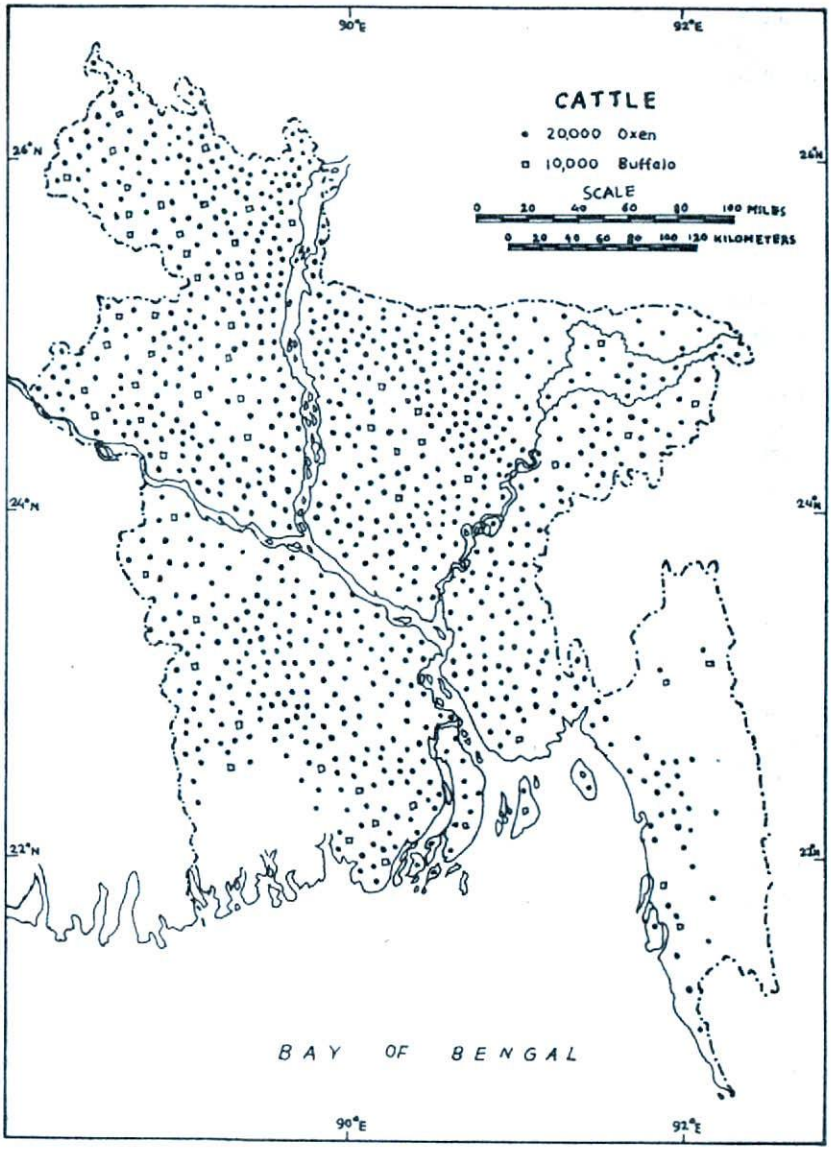
Large annual cattle fairs, at each of which several thousand animals are marketed, are held at several places. The biggest of such fairs are held at Haripur, Nekmard, and Alawakhawa (Dinajpur district), Gangachhara (Rangpur district), Punhat (Bogra district) and Jamalpur (Jamalpur district). There are smaller, and year-round, cattle markets all over Bangladesh. Among the more important of these are :

Old District		
Dhaka	:	Sripur, Atihat, Joydebpur, Munshiganj, Gheor and Jhitaka.
Mymensingh	:	Sambhuganj, Trishul, Balipara and Shaltia.
Barisal	:	Jhalakati, Tokrihat, and Sriram Katihal.
Chittagong	:	Dewanhat and Bibirhat.
Noakhali	:	Jagadanandahat, Santasitorhat and Dattarhat.
Comilla	:	Elliotganj, Gouripurhat and Batakandihat.
Rajshahi	:	Matuapurhat, Matajirhat and Suktigachhahat.
Dinajpur	:	Jashaihat.
Bogra	:	Narurmalahat, Noongolahat and Baradnoyhat
Pabna	:	Edkanitahat, Dogachhi, and Mathurapur.
Jessore	:	Jhikargachha.
Khulna	:	Kapilmunihat, Chitalmarihat, and Kaliganj

Goats (Cha-gal)

A large number of goats too are reared. At the 1945 Census, there were 4 million of them in Bangladesh. The 1983-84 Census enumerated 13.56 million goats and 0.66 million sheep, a total of 14.2 million, as compared to 6.1 million in 1960 and 8.9 million in 1977. The goats reared in Bangladesh are of a stunted breed, but seem to have adapted themselves very well to the climatic conditions. Though merely about half a metre high at the shoulder they do not look degenerated, but are generally sleek. They are rarely milked, being kept mainly for mutton. Goat-skin from Bangladesh are among the best in the

Map 11.1


CATTLE
20,000 Oxen
10,000 Buffalo
SCALE
0 20 40 60 80 100 MILES
0 20 40 60 80 100 120 KILOMETERS
90°E
92°E
26°N
24°N
22°N
BAY OF BENGAL

world and turn in high quality leather in Italy. Four breeds are recognised. Black Bengal, White-bearded Bengal, Jumnapari and Lushai. The Lushai goat is found only in north-east Hill Tracts ; it has a long shaggy coat of white hair. A large breed, known as Ram-chhagol is sometimes kept, when fully grown they are as big as the local oxen, and with large cork-screw-like horns.

Table 11.2

Number & Distribution of Sheep / Goat in 1983-84

Region	Total	Percentage
Bandarban	33	0.23
Chittagong	516	3.63
Chittagong H.T.	115	0.81
Comilla	726	5.10
Noakhali	392	2.76
Sylhet	556	3.91
Dhaka	965	6.78
Faridpur	719	5.05
Jamalpur	465	3.27
Mymensingh	929	6.53
Tangail	449	3.16
Barisal	505	3.55
Jessore	977	6.87
Khulna	632	4.44
Kushtia	581	4.08
Patuakhali	213	1.50
Bogra	778	5.47
Dinajpur	1,078	7.58
Pabna	633	4.45
Rajshahi	1,350	9.49
Rangpur	1,614	11.35
Bangladesh	14,226	100.00

Sheep (Bhaa-ra)

The 1983-84 Census of Agriculture and Livestock found 667,189 sheep being reared. The majority are found in the north-west and

south-east (the chars of Noakhali). Very little wool is clipped from them; it is estimated that less than a kilogram of it is obtained per animal per year. They are kept mainly for mutton.

Pigs (Shu-or or Shukor)

Pigs are reared only by the low Hindu castes, such as the Bagdi and Dom and by the tribal groups such as the Santhals, Garos, Tipras, etc. They are small, black, hairy and very sturdy animals. Whereas the European pigs are *Sus scrofa*, these are *Sus cristatus* and, therefore, differ somewhat in build. According to Hutchinson (1906) those reared in the Hill Tracts strongly resemble the Berkshire breed.

Horses (Gho-ra)

There were only 63,791 horses (or rather, ponies) according to the 1945 Survey. Later estimates are not available, but their number seems to have been reduced with the growth of motorized vehicles. Most of them are used as pack animals. In the Northern Region, several hundred are used to draw the Ekka traps. Very few are used essentially for riding. They are generally 12 hands at the shoulder. Among the sorriest looking animals in Bangladesh are the Tikka-Carriage horses of Dhaka city, who give the impression of being well on the way towards a devolution into the Eohippus.

POULTRY

Large numbers of poultry are reared, but they are characterised by small birds and small and few eggs. The 1983-84 Census estimated the total number of poultry to be 73.7 million, of which 61.1 million were fowls and 12.6 million were ducks. Six breeds of fowls are recognised : Asil, Chittagong, Kabul, Singapuri, Ghagash and Pati. Of these only Asil and Chittagong are distinct : of the rest most are grouped together as Deshi or Pati. The Asil is kept mainly for fighting and is strong and hard. There are three strains of this breed : heavy, medium and light. The average weight of cocks (Mo-rogh) is about 2.7 kg and of hens (Mur-ghi) a kilogram less. This breed is slow maturing. It has been crossed to produce several meat-breeds in England and USA as it is a good table-bird (Wahid 1960). The Chittagong breed is good for meat and egg production. The long-legged Yasin strain is said to be

a comparativley good egg producer. The cocks of this breed are about about 2.5 kg in weight and the hens are a kilogram less. The general run of fowls is poor in meat and egg production. Deshi cock's weight varies from 0.9 to 1.8 kg, and production of eggs (Deem) averages on 80 per year. The weight of the eggs average just over an ounce, which places them in the peewee grade ! Several foreign breeds have been tried out such as the White Leghorn and Rhode Island Red. Their average egg production is 150 a year and the average egg is two ounces in weight. The farmers, however, do not readily take to these breeds for, as they say, they cannot fend for themselves. The local

Table 11.3

Number & Distribution of Poultry in 1983-84

Region	Total	Percentage	Per capita Poultry
Bandarban	252	0.34	1.48
Chittagong	4,713	6.39	1.12
Chittagong H.T.	841	1.14	1.55
Comilla	7,405	10.05	1.08
Noakhali	4,672	6.34	1.23
Sylhet	3,829	5.19	0.67
Dhaka	5,354	7.26	0.80
Faridpur	3,141	4.26	0.66
Jamalpur	1,948	2.64	0.81
Mymensingh	5,375	7.29	0.82
Tangail	1,734	2.35	0.71
Barisal	4,873	6.61	1.06
Jessore	3,238	4.39	0.83
Khulna	2,497	3.39	0.68
Kushtia	1,979	2.68	0.89
Patuakhali	2,577	3.50	1.40
Bogra	3,239	4.39	1.19
Dinajpur	3,254	4.41	1.02
Pabna	2,463	3.34	0.74
Rajshahi	4,542	6.16	0.92
Rangpur	5,789	7.85	0.91
Bangladesh	73,713	100.00	0.91

fowls forage around the homesteads and know how to look after themselves. They are more alert to attacks by jackals, fishing cats, fishing eagles and other animals. However, improvement of poultry production can only come through the spread of hybirds from these better breeds.

Several diseases, such as Ranikhet, Fowl Pox, Infectious Coryza, etc. which are widespread, makes poultry breeding a hazardous business.

There are three indigenous breeds of ducks (Haash) : Nageshori, Sylhet Mete and Indian Runner (Wahid 1960). The colour of the Nageshori is generally black with white breast and throat. Its eggs are pale blue. The Sylhet Mete is the same as the Pati or common duck. Its colour is generally brown with black tips to the feather. Birds of both these breeds vary 0.9 to 1.8 kg in weight and their laying capacity varies from fifty to sixty eggs per year. The Indian Runner is the best local breed, as a table-bird. Its weight and egg-laying capacity is about the same as for the other two breeds. Khaki Campbell, Thai, White Pekin and Muscovy ducks are also bred (Ahmed 1986).

An estimated 20,000 geese are reared. They are probably descended from the wild Barheaded Goose. Guinea fowls are not common, and Turkey are rare. Pigeons (Kobu-tor or Paira) are reared both for sport and for food and young pigeons are often marketed.

Chapter 12

Fisheries

The total annual catch of fish and crustacean in 1987-88 was estimated to be about 837,000 tons, of which 610,000 tons were from inland fisheries and 227,000 tons from the Bay of Bengal. The fisheries can be classified into six groups : (Map 12.I).

(1) Tank ;
(2) Bil-Baor-Haor ;
(3) Riverine ;
(4) Estuarine ;
(5) Bheri and
(6) Marine.

The tank fisheries are very scattered and the least productive. In a survey conducted by the Fisheries Department found fully 20% of them were to be derelict i.e., unsuitable for pisciculture. The reasons are many. Some of the tanks are over-grown with aquatic vegetation due to neglect. Others are overfished because they are jointly owned and the co-sharers want as much as possible. The main reason for the misuse of the tank fisheries is, however, ignorance. Where they are looked after, there is often over-stocking with Catla (Catla). This is the fastest growing of all the carps of Bangladesh. Such stocking is, however, ill-balanced, for the Catla is surface feeder only. When other carps such as Rui *(Labeo rohita)*, Mrigal *(Cirrhina mrigala)* and Kalbaus *(Labeo calbasu)* are stocked with Catla in the correct proportion, the optimum yield is obtained, since these fishes have different foraging zones, and there is better utilisation of the food available. The Rui is a column feeder, moving up and down, while the Mrigal and Kalbaus feed mainly on the bottom.

The usual way of stocking tank is, however, to buy up large numbers of carp frys of different species and introduce them into the tanks, which are full of weeds, such as water-hyacinth, Topa Pana and Chandmala, and harbouring such predaceous fishes as Shole *(Ophiocephalus striatus)*, Boal *(Wallago attu)*, and Chital *(Notopterus chitala)*. It is no wonder that yields from tanks are very low. One of the most difficult problems

in tank pisciculture is the control of weeds. Aquatic weeds can be divided into four categories, viz: floating, emergent, spreading and submerged. Among the many floating weeds are water-hyacinth, Khudi Pana, Guri Pana, Illki Pana, Kuti Pana and Topa Pana. Emergent ones include water chestnut, Susni Shak, lotus, water lilies and various species of smart-weed. Kesardam, Halencha and Kalami Shak are some of the spreading weeds, whilst Jhanji, Jhao jhanji, Pata Shaola and others form submerged weeds. Experiments are being made with 2, 4-D, a herbicide, in controlling these weeds, but the cost is a serious obstacle to its widespread use. Removal of weeds by manual labour seems to be the only cheap solution.

The tanks can be classified according to the colour of their water and the nature of their vegetation. Tanks with greenish coloured water, with permanent planktoon bloom present, can be utilised to yield 1680 kg of fish per hectare annually. Those with clear water but with sufficient higher aquatic plants can yield upto 1120 kg. Tanks with brownish water and sufficient zoo-plankton can yield upto 840 kg. Those with clear water and neither abundance of planktons nor the higher aguatic plants can yield 560 kg while with muddy water and hardly any aguatic vegetation may give upto 280 kg per hectare annually. These figures, it must be remembered, refer to waters well-stocked. The average tank, where fish is reared in the normal way, yields not more than 750 kg per hectare annually.

Tanks are usually stocked with the various species of carps or with such fishes as Magur *(Clarias batrachus)*, Shing *(Hetero-phneustes fossilis)*. Bata *(Cirrhina reba)* and Shor-puti *(Barbus sarana)*. Among these the carps are the fastest growing, and because of their flavour, most in demand. Since none of the many species of carps found in Bangladesh breed in stagnant water, frys have to be caught in the rivers and Bils* and released in the tanks. Trade in fish frys is an important industry in the Bil and Haor areas of Faridpur, Pabna and Sylhet districts, along the Halda river in Chittagong district and the Ganges river in Rajshahi district. They are often transported long distances in earthenware jars with the result that their mortality rate is very high. In an effort to overcome this continual bottleneck in the breeding of good fishes in tanks, the Fisheries Depart-ment imported the fast growing Tilapia *(Tilapia mossambica)* in 1954 and the even faster growing Nilotica *(Tilapia nilotica)* in 1974. They were found to do well in Bangladesh. The common or minor carp *(Cyprinus carpio)*, is also bred successfully in tanks. Silver, Grass Black, and Bighead Carps have also been introduced from China, and the first two have become quite popular.

* Bils, Haors and Baors are here collectively referred to as Bils.

Recently artificial spawning in tanks has been successfully evolved : it should do much to remove the shortage of frys.

One of the drawbacks in getting the optimum yield from the tank fisheries is that they are not property manured. Since the tank waters are used for bathing, washing and drinking, the farmers cannot dream of manuring them with night soil, as is done in Taiwan and Java. However, good results can also be obtained by using rice and wheat-bran as fish food. The Bils, Baor and Haor fisheries are concentrated in the Central Delta Basin, the Haor Basin, the Jessore Baors *(Moribund Delta)* and the Bhar Basin. Bils, of course, are everywhere the source for fishes, but these four areas have a substantial export. In the larger Bils, boats are used and often those fishing on the rivers move into the Bils at the end of the monsoons. The main fishes caught in the Bils are the various carps, Magur, Jagur *(Clarias jagur)*, Shing, Koi *(Anabas testudineus)*, Bacha *(Eutropichthys vacha)*, Chapila *(Gadusia chapra)*, Taki *(Ophiocephalus)*, Shole, Boal, Chital, Kajuli *(Ailia coila)* and Pabda *(Callichrous pabda)*. Prawns and turtles too are netted.

The Bils are generally richer in fishes than the rivers. One of the reasons being the nature of carps eggs. The various indigenous carps breed during heavy showers and in twenty-four hours their eggs hatch (Banerjee 1942). The buoyant eggs are incapable of movement and are carried down in considerable quantity to the sea and thus destroyed. Frys born near the sea are also killed in large numbers by being swept out to sea. The eggs and frys carried into the stiller waters of the Bils are, therefore, safer than those in the rivers. The Kheo system of fishing is common in the Bil area, since the flow of water there is sluggish. 'Brushwood' is surrounded, in a suitable place in the Bil, by bamboos stuck upright in the mud. These Kheos have to be made early in the cold weather. Weeds accumulate among the bamboos and attract fish to their shelter, especially when individual fishermen begin to disturb the cleaner portions. Bamboo pegs are placed in the mud below the brushwood to prevent the fish from burrowing in the bottom and sooner or later the Kheo is surrounded by a Daljal (8 or 10 nets, each of them 36 square metres, sewn together). This is fixed to the bottom of the Bil by bamboo pins (Kamri or Guji), while the surface end is fastened to bamboo posts. A day or two later the Kheo is raised. The brushwood is taken out by hooked bamboo rods, and the nets drawn into the bank or a waiting line of boats. Fifteen or twenty men are required in this operation for each Kheo and five or six Saranga boats. A type of Kheo is also used along the banks of the rivers in Raipur, Rupganj, Dohar, Nawabganj (D) and other Upazilas, where Rui carps are fattened. The main centres of Bil fishing are Sunamganj, Mohanganj, Itna,

Ajmiriganj (Haor Basin), Gopalganj (Delta Bils), Chauhali, Faridpur (P), and Kalam (Bhar Basin).

The riverine fisheries are the most over-exploited of the lot. Indiscriminate fishing, even of frys, has resulted in a rather lean period during the last two decades. Even in the Government "Fisheries" (Jalkars) there is over-fishing, since the lease does not extend long enough to make it "worthwhile" for the lessee to stock it. The fishes of the rivers and Khals are the same as those of the Bils, with the difference that Magur, Shing and Koi are few, and the Ilish (*Hilsa ilisha*), which is not found in Bils, figures prominently. The Ilish is a marine fish, closely related to the Shad, which swims up the rivers to breed. Large shoals swim up the estuarines from May to September, and reach as far as Delhi on the Jamuna, and Jorhat on the Brahmaputra. They return, after breeding, in November and December, in very lean condition. They are mainly caught when ascending, for then they are in prime condition. Most Bangladeshis insist that Ilish from the Padma river are the best, but the reason why it should be so is not known. The returning fishes do not taste good, and formerly were not caught. It is a bad sign, therefore, that fishing for the returning Ilish is becoming an increasingly common practice. Frys are not spared, for the fishermen have become so poor that they make no allowance for conservation.

The important centres of river fishing are Paksey, Goalundo, Aricha, Sirajganj, Bahadurabad, Moinat, Bhaggokul, Naria, Tarpasha, Chandpur, Shaitnol, Munshiganj, Bhairab Bazar, Tatarkandi, Kuliarchar, Madaripur, Barisal and Kawarchar. The best fishes are said to come from Goalundo, Bahadurabad and Kuliarchar.

River fishing is mainly from boats. It is estimated that there are over 70,000 fishing boats in inland waters. Of the large boats, two types are extensively used, the Chandi Nauka and Bachari Nauka. The Chandi nauka varies from 4.6 to 15 metre in length, 0.9 to 2.7 metre in beam and 0.3 to 1.2 metre in depth. Four to six pairs of oars are used. Drift, Drag, Fixed Purse and Stake Nets are used from these boats. Except in the northern parts of the Northern Region, Chandi Naukas are found in all other parts of Bangladesh. The Bachari Nauka is more common. It is longer and narrower than the Chandi, and is worked by two to ten men. The nets described above are also used from these boats. Four main types of dingis are also used : the Bheshal, Patam, Shangla and Tatal. The Bheshal is worked by 2 or 3 persons. It is found mainly in Jessore, Khulna, Faridpur, Barisal, Kushtia, Pabna, Dhaka, Sylhet and Comilla districts. The range of the Patam dingi is similar. The Shangla dingi is used exclusively for Ilish fishing, and is seen in fleets numbering upto a hundred on the Meghna and Padma rivers. The Tatal dingi, strangely enough, is found only in Sylhet and

Khulna districts. The Kosha boat is used often for fishing in the smaller rivers and Bils. Hollowed tree trunks, known as Donga, are often used as dugouts for fishing in the Bils and along weed-choked Khals. Tal-palm and Shimul are the trees used for this. They are common in the Northern Region. Rafts of bamboo, banana or shola are also sometimes used in the smaller Bils and shallow Khals.

According to Dr. Nazir Ahmad, there are 116 types of nets, 26 types of fish traps and 8 types of harpoons and spears in Bangladesh (Ahmad 1958). The main varieties of nets are : Ber (Drift Net), Behundi (Fixed Purse), Tana (Seine Net), Shangla (Clap Net), Khara (Dip Net), Bashari (big cast net) and Charpata (Stake net). Seven types of Bamboo traps : Darki, Beki, Deru, Paron, Dhak, Ahuka and Jhoka, are extensively used in shallow waters. Bamboo barricades, Bana, are often up in the shallow streams and where the water is drained off a rice field, with one of the boxlike traps (e.g. Beki) fitted in the middle. Alternatively or at the same time, the pounded water is searched for fishes with one of the scoop-nets or basket-like traps (e.g. Jhoka), many-headed harpoons such as Tenta, Juti and Konch are used in spearing fishes or chelonias. Rod and line are sparingly used.

The Estuarine fisheries are large, covering a water area of 500,000 hectares, and rich too, with a plentiful supply of fishes, prawns, crabs, turtles and mussels. Both marine and freshwater species are caught. The marine fishes include Bhetkhi *(Lates calcifer)*, which grows upto two meters in length and 90 kg in weight ; the delicious Topshi *(Polynemus paradiseus)* which is plentiful from March to May, Terabhangan *(Polynemus indicus)* and Ilish which goes up the Madhumati. The fresh water species include Koi, Tengra *(Mystus vitatus)*, Rangchgolash *(M. gulio)*, Air *(M. aor)*, Banspata *(Cynoglossus hamiltonii)*, Pangush *(Pangasius pangasius)* and others. In parts of Bagerhat and Narail districts, otters are trained to drive the fishes into the purse net laid out.

The Bheri fisheries are an interesting variation of the estuarine fisheries. Bheries are embankments put around rice fields, into which small channels (Poyans), enter from the river nearby. In the beginning of the monsoons, with every high tide the river water rises and enters into these channels taking with it big fishes and frys. The Poyan mouths are closed when a sufficient number of fish is judged to have entered. With the rainy season, water level rises and water accumulates on the Bheri-enclosed fields, now covered with rice. The fishes come out of the Poyans and fatten in these fields. From October onwards, as the fields dry up, they return to the Poyans, where netting them is an easy matter. An average Bheri field is 1,000 acres (405 hectares) with 66 acres (27 hectares) of channels, from which 40 tons of fishes and shrimps are

the expected yield. The main fishes reared in these Bheri fields are Bhetki, Tengra, Bhangon *(Mugil tade)*, Tarul *(M. parsia)* and Corsula *(M. corsula)*. Nowadays Bheri fisheries concentrate on shrimp production.

Table 12.1

Number of Tanks in 1979

District	Number of Tanks	Acreage
Dhaka	63,000	15,000
Mymensingh*	85,000	27,000
Faridpur	107,000	15,000
Chittagong	96,000	18,000
Hill Tracts	20,000	1,000
Noakhali	129,000	34,000
Comilla	213,000	36,000
Sylhet	88,000	29,000
Rajshahi	65,000	31,000
Dinajpur	67,000	20,000
Rangpur	118,000	21,000
Bogra	38,000	10,000
Pabna	15,000	7,000
Khulna	152,000	14,000
Barisal *	421,000	38,000
Jessore	81,000	14,000
Kushtia	29,000	6,000
Total	1,769,000	336,000

* Mymensingh includes Tangail and Jamalpur
* Barisal includes Patuakhali
Source : Statistical Pocket Book of Bangladesh, 1982, BBS.

Bagda Chingri *(Penaeus semisulcatus)*, Chapda Chinagri *(P.indicus)*, Bagtara Icha *(Parapeneopsis sculptilis)*, Gura Icha *(Leander styliferus)* and Golda Chingri *(Palaemon carinus)* are the commonest of the dozen species found in estuarine waters. As many species are found in the inland waters, among which the Kuncho Chingri *(Palaemon lamarrei)*, and Kaira Icha *(P. dayanus)*, are bred in tanks. These two species and the Goda Chingri are also caught in the rivers and

Bils. In 1957, the total catch of prawns and shrimps was estimated at 6000 tons (Ahmad 1957). This was probably an underestimate. In the 1970's, in response to international demand and newly introduced techniques, there was a rapid expansion of shrimp production. In 1986-87 production from the coastal shrimp farms alone was estimated to have been 22,050 tons. As may be seen from Table 12.2 the four main areas of shrimp production are Cox's Bazar (Chakoria), Bagerhat (Rampal), Khulna and Satkhira districts. While shrimp production in these areas has increased it seems to have declined further inland due to the drainage of Bils for irrigation projects. Trawl fishing in the Bay brings in about 12,000 tons of shrimps. The total shrimp catch is somewhere between 70 and 75 thousand tons.

Table 12.2

Area under Shrimp Cultivation

Districts	Area in Hectare		Percentage of total area under shrimp farms (1986)
	1984-85	1985-86	
Cox's Bazar	21,468	24,114	29.18
Bagerhat	19,955	21,884	26.48
Khulna	12,821	19,934	24.12
Satkhira	13,240	15,673	18.96
Chittagong	875	640	0.77
Jessore	422	327	0.40
Bhola	-	45	0.06
Patuakhali	43	25	0.03
Total	68,824	82,646	100.00

Source: 1984-85 data from Vol. I, National Water Plans, MPO, December 1986.
1986 Data from survey conducted by Ministry of Fisheries and Livestock.

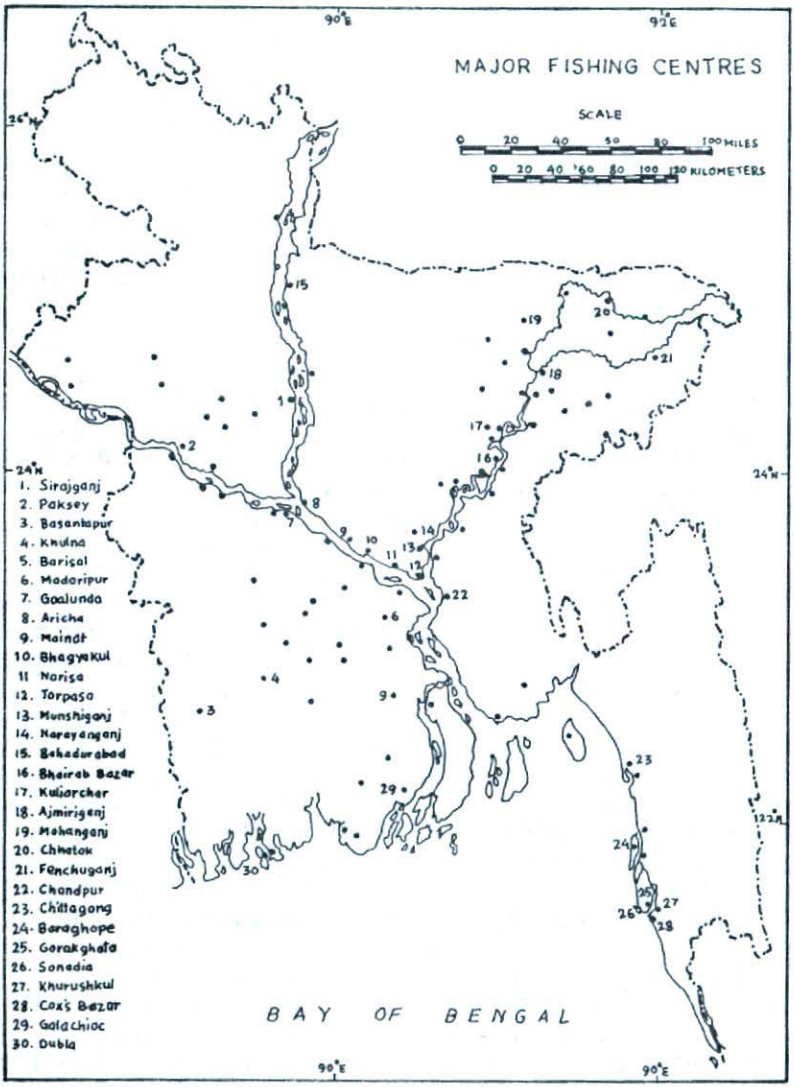
Turtles and tortoises *(chelonia)* are also caught in the inland waters, but in small quantities, since only some of the Hindu castes and the Christians eat them. The freshwater hard-shelled chelonia are called Kattua, and the soft-shelled ones are called Kachhim or Kachhap. They correspond to Boulenger's tortoises and turtles respectively, (Boulenger 1890). Marine chelonia are rarely caught or sold. Of turtles, Khalua *(Trionys gengeticus)*, Dhalua *(T. hurum)*, Jatta *(Pelochelys bibroni)*, Sim *(Chitra indica)*, and Shindi (*Lissemys punctata*) are the

main types caught. Of tortoises, Kali *(Hardella thurgi)*, Haldi *(Morenia petersi)*, and Poro *(Kachuga tectum)* are the common ones. *Kachuga Sylhetensis* is common in Sylhet. Chelonia are often caught by hand, but spearing (with the three pointed Aro) or harpooning is more common. Carcassess are often used as bait. The annual catch of chelonia was estimated to be 13,000 tons (Ahmad 1958), of which Mymensingh and Barisal districts each accounted for about 3,600 tons. Crabs, also are eaten by those who eat chelonia.

Though the Ganges porpoise *(Platanista gangetica)*, is not eaten it has been proposed to net them for their valuable oil. The oil from their jaw bones can be used for the lubrication of delicate instruments (Rahman 1958). They have however declined in numbers and the conservationists would now like to place them in the list of threatened species.

Marine fishery was confined to within 20 miles of the coast till the discovery of rich fishing grounds in the South Patches (Map 12.1) and the mechanization of boats in the 1970's. The continental shelf area (upto 200 metre depth) of Bangladesh is estimated at 66,440 sqkm. (BOBP 1985). Several incomplete surveys have been made of this area, and the estimates of potential yield have varied widely from 200,000 tons to 700,000 tons (BOBP 1985). Production from marine fishery in 1983-84 was 174,000 tons. The two main centres of the marine fishery are Sonadia and Dubla islands. Sonadia, three miles from Cox's Bazar, is the smaller of the two. In winter, fishermen collect there, and at places along that coast, such as Hamidardia, Ghatibhanga, Kutubdia and Shahpuri islands. The boats range as far south as Jinjira island and their catch includes Bhetki, Luckwa *(Polynemus indicus)*, Lotia *(Harpodon nereus)*, Chela *(Chirocentrus dorab)*, Chhurimachh *(Trichinurus haumela)*, Khaibal *(Cromileptes altivelis)*, Khair *(Clupea fimbriata)*, Nurhilsa *(Clupea toli)*, Khanda Magur *(Pristis cuspidatus)*, Julia Magur *(Zygaena blochii)*, the Hammerhead Shark, Dewa-an electric ray-*(Astrpe dispterygia)*, Phodomini *(Petroplatea micrura)*, Fessa *(Eugraulis parava)*, Olua *(Coilia dussumieri)*, Tutia *(Belone choram)*, Datina *(Chrysophrys datnia)*, Bhola *(Scheama semiluctuosa)*, the White Pomfret *(Stromateus sinensis)* and Rup Chanda *(S.Cinereus)*. Chanda and Rupchanda are plentiful in January and February, when large shoals come close to the shore. Along the Sunderban coast are a number of temporary fishing villages, of which that of Dubla island is the largest. Other important villages are at the mouths of the Pussur and Bangara rivers. Fishermen gather there from Chittagong : they are in groups whose contractor or headmen is called Bohoddar and the employees as Ghafurs. Some of them are exclusively for looking after

Map 12. 1


MAJOR FISHING CENTRES
SCALE
0 20 40 50 80 100 MILES
0 20 40 60 80 100 120 KILOMETERS
1. Sirajganj
2. Paksey
3. Basantapur
4. Khulna
5. Barisal
6. Madaripur
7. Goalunda
8. Aricha
9. Maindt
10. Bhagyakul
11 Narisa
12. Torpasa
13. Munshiganj
14. Narayanganj
15. Bahadurabad
16. Bhairab Bazar
17. Kuliarchar
18. Ajmirigenj
19. Mohanganj
20. Chhatak
21. Fenchuganj
22. Chandpur
23. Chittagong
24. Baraghope
25. Gorakghata
26. Sonadia
27. Khurushkul
28. Cox's Bazar
29. Galachioc
30. Dubla
BAY OF BENGAL
90°E
92°E
24°N
22°N

the drying of the catch. Others go out repeatedly 14 to 16 km to mud-soals, where they fix nets for one complete change of tide, and return with the catch. Chhurimach accounts for as much as 30% of their catch (Fawcus 1927). Shrimps such as Bagda, Chapda, Moraney *(Metapenaeus monoceros)*, Opposum shrimps *(Mecropis orientalis)* and also Crawfish *(Panulirus polyphagus)* are also caught.

The Balam is the main type of boat used in the sea. It is spindle shaped, 9 to 24 metre long, 2.4 to 4.3 metre in beam and 1.8 to 2.4 metre in depth ; sixteen to twenty oars are used. It is used to lay out the large Behundi (fixed purse) nets, which is the commonest type used. Hangor boats for Shark fishing are used by the Moghs.

There are several beds of window-pane oysters *(Placuna placenta)* along the coast, of which three of the largest are near Sonadia island. These three are between Sonadia and Moiskhali islands; They total 336 hectares whereas in 1910 they covered 486 hectares (De 1910). An Oyster fishery was started in 1927, but because of its indiscriminate exploitation, it is not being leased out at present. There is a 121 hectare Oyster bed on the mainland foreshore of Gomatali. These Oysters are eaten by the Marma. Pearls are not common: but they fetch a good price. Fresh-water pink pearls are obtained from the mussels of the *Genus Perrysia* and *Lamellidens* (Zobairi 1956); they vary from white to deep pink in colour. The pink coloured ones are most in demand. Banglapara in Sarail Upazila is the centre of this trade. Approximately 900 tons of freshwater mussels are fished annually (Zobairi 1956). Shells are, however, not put to any use, though from them trays, picture frames, fruit dishes, lampshades and other novelties can be made, as is being done in the Philippines. Edible Oysters (*Ostrea virginianas*) have also been found near Cox's Bazar (De 1910), but not in a commercially exploitable quantity.

In certain parts of Bangladesh dried fish is eaten, even sometimes in preference to fresh fish. Fish are cured and preserved by one of these four methods : (1) sun-drying (2) dry-salting (3) wet-salting (4) smoking. Sun drying is the simplest and cheapest method used. The drying season extends from December to March. In the coastal areas and in the Haor Basin, this is the common method followed. The fishes are laid out on mats or hung from bamboo trellises in open 'drying spaces' called Khola. Big fishes are decapitated and gutted and made into fillets. Other types, like the Boal and Chital, are only gutted. Very small fishes (e.g., Puti) are dried whole. Small and lean fishes take a week to dry, while the fillets of the big fishes take twice as long. The water content is reduced in sun-drying from 70-80 per cent to 20-50 per cent. The dried fishes are either stored underground for a few months in earthen vessels well-smeared with fish oil, or else kept

in trenches lined and covered with bamboo mats and earth. The dried fishes, called Shutki, are taken out as and when required. The main types of fishes made into Shutki are Chanda, Lotia, Chhurimachh, Puti *(Barbus stigma, B. puntio, B. sophore)*, Luckwa and Chapila *(Clupea chapra)*.

Shrimps are also dried more or less in the same way. In Khulna district, the shrimps are boiled a few minutes in slightly salty water, then spread out to dry. When fully dry, the shells are removed by beating. In other parts of Bangladesh, the shrimps are not boiled but are dried and shelled in the same way. The shrimp fishing and drying season extends from September to March.

Salting is resorted to only for the Ilish. In dry-salting the fish is either cut along the mid-ventral line to remove the entrails or cut transversely into a number of separate pieces, or pieces joined at the dorsal side. Dry salt is applied both in the body cavity as well as on the outside. The fish is then either buried underground or stored in tin canisters or the wells of boats. This is the method followed in the main Ilish fishing districts of Comilla, Faridpur, Barisal and Khulna. In Khulna, Ilish is also wet-salted (pickled). The fishes are dressed as explained above, and stored in brine in earthen vessels (Matka).

Only shrimps are smoked to preserve them. They are spread thinly on bamboo mats in small closed chambers and smoke from burning hardwood and rice-straw is induced. The smoke dessicates the prawns and the traces of creosote, acetic acid and formaldehyde present in the smoke help to preserve them. The shrimps thus prepared are shelled and exported in baskets and gunny bags.

The fishes marketed in the town come either from local sources (within 8 km) or from the main exporting centres in the surplus areas. (Map 12.1.). Fresh fish is usually sent in crates, packed in ice. The large towns and the northern districts are the main importers. It is estimated that of the fish marketed in towns, 32% are carps, 21% Ilish, 13% shrimps, 10%t cat-fishes (Boal, Vachua, *(Clupisoma garua)*, Air, etc., 10% airbreathers (Magur, Singh, Koi, etc.), 2% Khatki and the rest consisting of more than a 100 different species. There are, it should be mentioned, over 250 species of freshwater and 110 species of marine fishes in Bangladesh.

At present the by-products of the fisheries are small quantities of fish glue, fish manure, fish oil and sharkliver oil. Some 1814 kg of crude shark liver oil is collected in the southern fisheries. A small quantity of fish oil from Puti mainly *(Barbus stigma)* is produced at Daudkandi, on the Meghna (Mannan 1958). The fishery resources, it is obvious, have not been adequately developed. It is possible to

greatly increase the production of Sharkliver oil, Puti-oil, printers' ink from Puti-oil, fish manure, fish meal for poultry, and also vitamin extracts from such fishes as Chanda and Chapila *(Gadusia capra)*. Very little isinglass is produced now, though its manufacture was a thriving industry in mid-19th century.

The greatest danger lies in the destruction of frys and egg-bearing fishes. In mid 19th century, Francis Day (1873) had noted that fish production was steadily decreasing all over the Indian sub-continent. The situation in Bangladesh has not improved since then. More and more immature fish comes in the market each succeeding year, which is a danger sign. It has been found that when the breeding stock of a gregarious freshwater species has been reduced below a certain numerical minimum, the decrease continues automatically. Before that happens to any of the major species, strict control over the fisheries should be imposed. Already there are signs that Ilish (Hilsa) migrating in from the Bay are mostly being netted in the estuaries, before they can come up-river and spawn. This is likely to reduce the stock of Ilish within a decade and create an even larger supply gap. There exists a very large unfulfilled demand for fish at reasonable price and two ways by which this demand can be met are deep-sea fishing and tank (Pond) fishery. The potential exists and should be rapidly development.

Chapter 13

Crop Association Units

The concept of "cropping patterns" seems to differ between geographers and agriculturists and we therefore use the term "crop association". The recent propagation of the idea of farming systems has carried with it the definition of cropping pattern as something that can be applied only to individual plots. To be more specific, cropping patterns are said to be "the crop species grown on a given field during a 12-month period. Cropping patterns include single, multiple, mixed, strip and ratoon cropping".[1] To other scientists this could be better described as the crop sequence. To the geographer all the cropping patterns/sequences of a defined area can be summed up as the cropping pattern of that area.[2] It is, in that sense, the account of annual land utilization through various crops, grown in different combinations, and in a multitude of sequences. This accounting is easiest at the national level and becomes increasingly difficult at every stage below that, till at the level of the individual farm it becomes relatively easy again. The main problem is in deciding how much to aggregate. If it is the national planner, the degree of aggregation will obviously be much higher than if the user is at the upazila level.

Since Bangladesh is not a large country it can be treated as a single agricultural region, with a number of Crop Association Unit (CAU).[3] These units are areas of largely similar landforms and soil associations, with the proportion of crops grown differing from that of other units. Since land capability also varies with landforms and soils, the agricultural potential of these units are also, expectedly, different. To some extent these units are comparable to the agro-ecological sub-zones. They are based on the Cropping Pattern Units (CPU) in the authors' book on the "Geography of Bangladesh" (1977). The CPU were formed on a number of sets of information, the main ones being the complete Enumeration (Census) of 1944-45, the Reconnaissance Soil Survey data

1. W.W.Shaner, P.F.Philipp and W.R.Schmes, "Farming System Reaserch and Development"; Westview Press, Boulder, Colorado, 1982.
2. See, for example, "Agricultural Compendium for Rural Development in the Tropics and Sub-tropics"; Elsevier, Amsterdam, 2 ed., 1985.
3. Termed as cropping pattern units (CPU) in the authors "Geography of Bangladesh" UPL, Dhaka, 1977.

of 1961-69, and the Bureau of Statistics data for the period 1965-70.[4] The CAU are based on an updating of the CPU information, mainly from the 1983-84 Census of Agriculture and Livestock, and BBS annual statistics for the period 1980-90. The 1983-84 Census was the first complete agricultural census since 1944-45, and some field checks [5] seem to confirm that the census information is more accurate than the annual statistics [6]. The cropping percentages are therefore based on the census, with higher proportions of pulses, oilseeds and spices than in the annual statistics. The Aman rice crop, however, posed a special problem. In all the three agricultural censuses (1960, 1977, 1983-84) the area under Aman was found to be less than in the annual estimates. The difference between the latest census and the annual estimates is indeed very large, and it will be difficult to reconcile them, without extensive field checks. Neither of them took account of the over estimation of B. Aman in the mixed Aus - B. Aman area. The really big difference is in the T.Aman area.

The annual estimate has to be reduced by 600,000 to 700,000 acres because B. Aman area has been consistently over estimated. On the other hand, the 1983-84 Census has reportedly under-enumerated holdings by 2.5% and operated area by 2.6%.[7] The under-enumeration by holdings will not add up to 2.5% of the operated area because most of them relate to small holdings. Nevertheless we may assume 5.4% under-enumeration of area. If Aman was under-enumerated by the same proportion, 312,000 acres would have to be added in the census figure. These adjustments still leave 1.5 million acres difference between the two estimates, which is too large to be reconciled without a re-survey of certain areas, such as Sylhet, Comilla and Patuakhali, where the differences are very substantial. In the period 1977-90, Boro has replaced B. Aman in many parts of Tangail, Dhaka, Comilla, Noakhali and other districts. Estimates of this area range from 500,000 to one million acres. (200-500 thousand ha). This would reduce the annual figure by a further half a million acres at least. There is yet another reason why the Aman acreage (especially that of T. Aman)

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4. Op-cit. p.379-80, The letters and numbers in parenthesis refer to the "Land Development Possibilities", Soil Survey Project, Technical Report 2, FAO, Rome, 1971. The Land Resources Appraisal of Bangladesh for Agricultural Development suggests that the new agro-ecological regions supersede the LDUs. They are not necessarily more accurate.
5. By the author and colleagues in PEIT, ASR, POUSH and ZERIN. The author is particularly indebted to Mr. M.S. Ahmed for his guidance in analysing the Cropping Pattarns and CAUs.
6. For a critique of the shortcomings of the annual statistics see also Boyce's "Agrarian Impasse in Bengal" (OUP, 1987).

seems to be overestimated. When the cropping patterns were worked out for the CAUs, it was found that in those very statistical regions where the discrepancy is greatest, further Aman area cannot be easily accomodated. In other words, most of the Aman "niche" has already been filled up and acreage expansion is possible only through multiple cropping. This possibility is open to T. Aman only in those areas where Aus is not followed by T. Aman but by rabi crops. Available information does not show that this has happened

In working out the cropping patterns, the B. Aman area has been estimated at 3 million acres and T. Aman area at 10 million acres. This reconciled figure is, of course, not very satisfactory, but it does allow for workable cropping patterns. Needless to say, better appreciation of the land use patterns and agricultural development possibilities, require further data collection and analysis. To start with, BBS should carry out an Aman area survey. A longer term crop association - cropping pattern survey, possibly on a sample basis, is also needed for a proper appreciation of the agricultural potential.

The figure in parentheses after each crop refers to the percentage of the Net Cultivated Area (NCA) that it occupies. The total percentage will exceed 100 since multiple cropping makes the Gross Cultivated Area (GCA) greater than the NCA. In calculating the NCA, the areas of the larger rivers and that of Reserved forests have been excluded. In several C-P units fish tanks (pukur, dighi) account for 5 to 7% of the total area. This area is not included in the calculation of the NCA but it could well have been. At the end of the description of each unit, the NCA percentage refers to the proportion of the total area that is cultivated. NCA 80%, therefore, means that 80% of the total area of the agricultural region is cultivated. The GCA percentage refers to the proportion of the NCA that is multiple cropped. Thus GCA 150% means that, through multiple cropping, the total area cropped is 50% more than there would have been with a single crop on the cultivated area.

The CAUs can be used for planning intensification of certain cropping patterns and changes in others. The types of changes suggested by Tajul Islam[8] from a study of the available literature, can be fitted into different CAUs on the basis of known cropping patterns. This will provide the spatial dimension required in agricultural planning and indicate the orders of magnitude of proposed cropping systems changes. One word of caution ; detailed planning cannot be done

7. Census of Agriculture and Livestock, 1983-84 BBS, Vol.1, P.8.
8. Tajul Islam "A Review of the Farm Production Technology in Bangladesh", ASR/UNDP, Dhaka, 1988.

without further work, mainly field verification of the CAUs. Information is also needed on yield levels in irrigated and non-irrigated areas in each CAU, so that gross income profiles can be estimated, and on this basis areas of intervention can be prioritized.

Further work will also require a meshing of the information on CAUs with that collected or imputed for the water development planning areas in the National Water Plan. A first step would be the drawing of overlay maps to determine areas of common concern, and the next step would be the collection of field data for use in both exercises. Further work on the agriculture side could be in the form of one or more projects for the collection, collation and analysis of the data or it could be a part of the mandate for a National Agriculture and Land Use Master Plan, which is long overdue, and is now essential in view of the fact that the National Water Plan is well into its second phase.

PIEDMONT ALLUVIAL PLAINS

1. (NW 1) *Tetulia, Pochagarh, n.Thakurgaon, Atwari & Boda.*

The relief of this area is slightly undulating, with entrenched streams. Higher ridges cover about 30 percent of the area. During the monsoon the soils are saturated or shallowly flooded by the raised groundwater table. Rainfall varies from 200 to 400 cm. Drainage is slow during the dry season and depression soils remain moist for most of this period. Higher ridge soils become droughty. Groundwater for irrigation is plentiful and recharge condition is good. T. Aman rice (72) is dominant in the cropping pattern. Aus (33), Wheat (12) and Jute (6) are the other important field crops. The cropping pattern includes Kaun (10), Sugarcane, (7) Potato (1), Mango (1), Betelnut (1), Tobacco (1), Mash (1), Mustard (1) Gram (0.5), and Maize (0.5). This unit is within the Betelnut growing belt of the Northern Region. Big clumps of bamboo (4), mostly *Bambusa tulda*, surround the homesteads.

N.C.A. 80 percent ; G.C.A 153 percent.

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* : n. = Northern ; w. = Western ; e .= Eastern ; s. = Southern ; c . = Central.

Table 13.1

Cropping Patterns
(in orders of magnitude 1980-90)

Sl. No.	Patterns	NCA (Thousand acres)	%	GCA (Thousand acres)	%
1.	Aus - T.Aman - Rabi	127	6.22	381	11.42
2.	Jute - T.Aman - Rabi	374	1.83	112	3.36
3.	*(Aus+B.Aman)-Rabi	428	2.14	875	2.62
4.	B.Aman - Rabi	733	3.59	146	4.40
5.	Jute - T.Aman	93	0.46	18	0.56
6.	Aus - T.Aman	2,444	11.97	4,888	14.66
7.	T.Aman - Rabi	926	4.53	1,852	5.55
8.	Aus - Rabi	2,000	9.79	400	11.99
9.	Jute - Rabi	1,020	4.99	2,039	6.11
10.	Kaun - T.Aman	137	0.67	275	0.82
11.	Mesta - T.Aman	17	0.08	33	0.10
12.	T.Aman - Boro	1,455	7.12	2,909	8.72
13.	B.Aman - Boro	380	1.86	760	2.28
14.	(Aus + B.Aman) *	1,313	6.43	1,313	3.94
15.	Aus	273	1.34	273	0.82
16.	T.Aman	3,301	16.17	3,301	9.90
17.	Boro	1,338	6.55	1,338	4.01
18.	B.Aman	939	4.60	939	2.81
19.	(S.Cane + Rabi) *	82	0.40	82	0.24
20.	S.Cane	318	1.56	318	0.99
21.	Guava	96	0.47	96	0.2
22.	Tea	113	0.55	113	0.3
23.	Pineapple	40	0.20	40	0.12
24.	Coconut	70	0.34	70	0.21
25.	Date Palm	35	0.17	35	0.11
26.	Arhar	7	0.04	7	0.02
27.	Lichi	8	0.04	8	0.03
28.	Jackfruit	50	0.25	50	0.15
29.	Mulberry	1	0.01	1	0.00
30.	Talpalm	14	0.07	14	0.04
31.	Mesta	2	0.01	2	0.01
32.	Banana	11	0.54	11	0.33
33.	Betelleaf	22	0.11	22	0.06
34.	Ginger	15	0.07	15	0.04
35.	Turmeric	54	0.27	54	0.16
36.	Bamboo	226	1.10	226	0.68
37.	Betelnut	114	0.56	114	0.34
38.	Mango	101	0.49	101	0.30
39.	Coffee	0.5	0.00	0.5	0.00
40.	Jhum Crops	67	0.33	67	0.20
41.	Rubber	14	0.06	14	0.04
42.	Others	410	2.08	410	1.27
	Total :	20,423	100.00	33,354	100.00

* Considered as a single crop.

2. (NW 2) *Haripur, Ranisankail & Baliadangi.*

The proportion of higher ridges with droughty soils is greater in this area than in CA unit 3. Transplanted Aman (71) occupies as much area as in that unit. But Aus (45) is a bigger crop. Wheat (29) and Mustard (16) are the main cash crops. Other crops are : Vegetables and spices (7), Kaun (5), Sesame (5), Potato (5), Mash (4), Jute (2), Gram (2), Sugarcane (2), Barley (1), Arhar (0.5), and Mango (0.5). Less Bamboo (2) is grown than in the better soil tracts.

N.C.A. 75 percent ; G.C.A. 198 percent.

3. (NW 2) *Thakurgaon, Pirganj, Debiganj, Bochaganj, Kaharol, Birganj, Dinajpur, Sadar (half), Biral, Khansama, n. Chirirbandar and w. Parbatipur.*

The relief is mainly broad floodplain ridges and shallow depressions. High ridges occupy about 10 percent of the area. Drainage conditions are similar to CA Unit 1, except that in some depressions monsoon flooding is deeper than 1 metre. Ground-water for irrigation is readily available and recharge conditions appear to be good. T. Aman (68) is dominant. More Aus (49) is grown than in CA unit 1, and there is a little Broadcast Aman (1). Boro (5) has increased recently. Wheat (15) cultivation expanded rapidly in the 1970s. Sugarcane (7) is the main cash crop, and in some small tracts it is grown on as much as 30 percent of the land. Jute (5) is the second important cash crop. Main Rabi crops are Kaun (9), Mustard (6), Barley (4), Potato (4), Mash (2), Gram (1), Masur (1) and Sesame (1). Other crops include Mango (2), Tobacco (0.5), Turmeric (0.25), Bamboo (4) are plentiful. There are lots of Shimul (silk-cotton) (*Salmalia Malabarica*) trees.

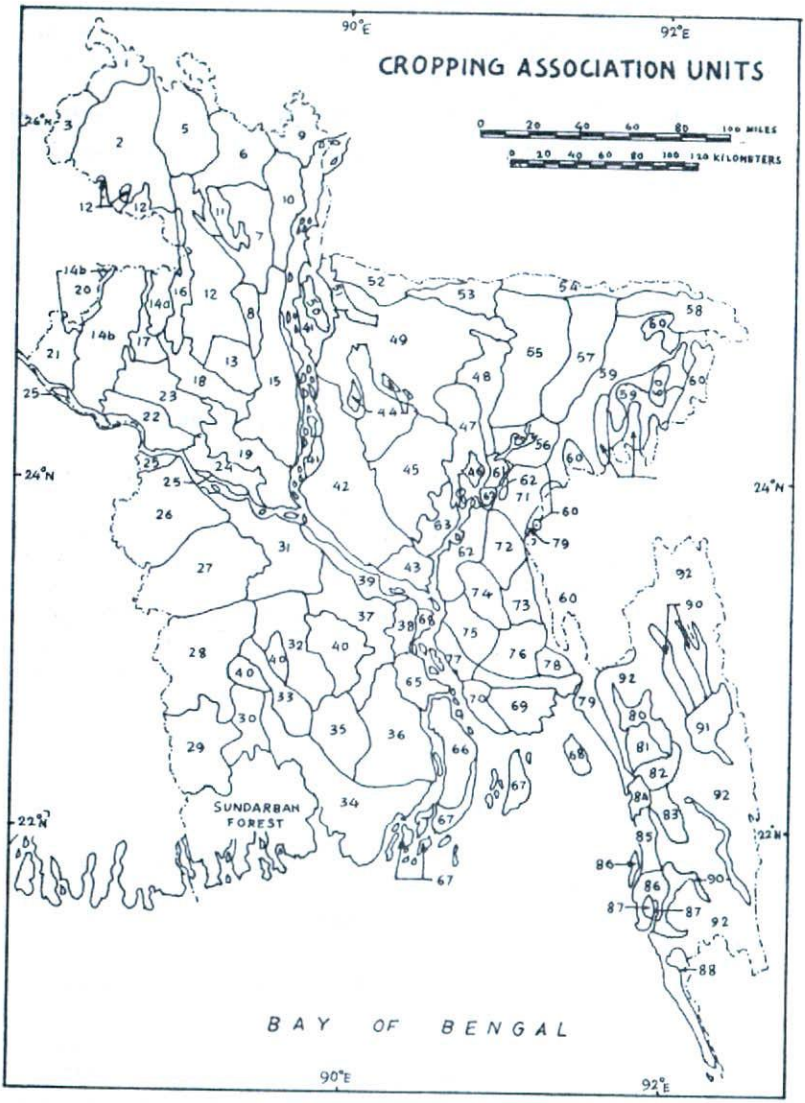
N.C.A. 80 percent ; G.C.A. 184 percent.

4. (NW 3) *Nilphamari, Dimla, Domar, Kishoreganj, Jaldhaka, Taraganj (half) & Saidpur.*

In this part of the northern Tista floodplain ridges occupy more area than in the south. Rainfall varies from 180 to 250 cm. There are 4 important cash crops, Jute (18), Tobacco (10), Turmeric (2) and Ginger (2). Though grown on a small proportion of the land, these 2 spices are important because of their high economic returns. Other crops in the pattern are T. Aman (82), Aus (48), Wheat (7), Bamboo (3), Kaun (3), Mustard (1), Potato (1), Barley (1), Masur (1), Mash (1) and Khesari (0.5), are plentiful.

N.C.A. 80 percent ; G.C.A. 183 percent.

Map 13.1


CROPPING ASSOCIATION UNITS
90°E
92°E
26°N
24°N
22°N
0 20 40 60 80 100 MILES
0 30 40 60 80 100 120 KILOMETERS
SUNDARBAN FOREST
BAY OF BENGAL

5. (NW 3) *Patgram & northern Hatibandha.*

This CA unit resembles CA Unit 1, except that it is in the main Tobacco belt. Transplanted Aman (81), Aus (29), Tobacco (10), Wheat (5), Jute (3), Betelnut (2), Mustard (2) and Kaun (0.5) are the main crops. Some Sugarcane, Barley and Maize are also grown. Bamboo (3) is plentiful.

N.C.A. 75 percent ; G.C.A. 136 percent.

6. (NW 3) *Most of Badarganj, northern Rangpur Sadar, Kaliganj, southern Hatibandha, Aditmari, Lalmonirhat & Kaunia.*

This is the main Tobacco (15) growing area of Bangladesh. Aus (38) is grown on a high proportion of the land, and Aman (70) is mainly transplanted. Boro (7) cultivation increased with the use of STWs. Other crops to note are Wheat (13), Jute (10), Kaun (5), Potato (3), Bamboo (3), Khesari (1), Masur (1) and Mash (1) are plentiful.

N.C.A. 75 percent ; G.C.A. 169 percent.

7. (NW 3/11a) *Bhurungamari, Nageswari, Fulbari, & n. Kurigram.*

This area too is a part of the northern Tista floodplain. On the shallowly flooded land more T. Aman (73) is grown than Aus (61). Boro (5) cultivation increased when groundwater was extensively tapped in the 1970s. Wheat (11) has proved very successful, with yields well above the national average. Jute (13), Mustard (9), are the two main cash crops. A good amount of Kaun (5) and vegetables (3), mostly Sweet Potato, Melon and Brinjal, are grown. Khesari (2), Chillies (2), Tobacco (2), Potato (1), Mash (1), Banana (1), Onion (0.75), and Betelnut (0.25) are other crops. The active floodplains of the Dharla, Dudkumar and Gangadhar rivers cross this CA unit. Some B. Aman (3) and Cheena (2) are grown in these low areas.

N.C.A. 75 percent ; G.C.A. 195 percent.

8. (NW 4a/11a) *Rajarhat, s. Kurigram, Chilmari, Ulipur, Fulchhari, n. Sundarganj & e. Gaibandha.*

This area is mostly in the southern Tista floodplains between the Tista and Brahmaputra rivers. The relief is that of the very gently undulating ridges and shallow basins. The soils are largely gray and dark gray silty soils with a ploughpan. In this fertile area more Aus (58) than

T. Aman (80), is grown, because of the adequate supply of water in the first half of the monsoons, and the excess of it in the second half. Rainfed Wheat (12) cultivation has been spreading. Jute (20), Sugarcane (5) and Tobacco (2) are the manor cash crops. Besides Tobacco, Rabi crops such as, Mustard (8), Khesari (8), Kaun (5), Potato (4), Banana (2), Mash (2), Cheena (2) and Onion (2) are grown around homesteads. There is less Bamboo (0.50) than in CA unit 9. River fishing is of some importance.

N.C.A. 80 percent ; G.C.A. 211.

9. (NW 3/4a) *Pirgacha, Sadullapur, s. Rangpur Sadar, w. Gaibandha, Sundarganj, Gobindganj & most of Mithapukur, Pirganj & Palashbari.*

This big CA unit lies aside both the northern and southern Tista floodplains. The southern Tista floodplain is slightly lower than the northern part and has fewer ridges. In the western part of this area there are big out-crops of the Barind terrace, which are in CA Unit 11. Rainfall varies from 180 to 210 cm. This CA unit is fertile and has a high cropping intensity. Jute (9) is grown on a high proportion of the land. Sugarcane (5) is the second most important cash crop. Rice is double-cropped over much of the area with T. Aman (84) and Aus (62). Some Khesari (5) is sown in Aman fields. Main Rabi crops are Wheat (16), Boro (9), Kaun (4), Potato (3), Tobacco (2), Chillies (2), Gram (1) Masur (1), Mustard (1), Barley (1), Mash (1), Onion (1), Lichi (0.5), Garlic (0.5), and Turmeric (0.5) are important cash crops. Some Betel leaf is grown along the Ghagat river. Bamboo (2) and Betelnut (1) are plentiful around homesteads.

N.C.A. 80 percent ; G.C.A. 205 percent.

10. (NW 3) *Eastern Shibganj, e. Bogra & e. Sherpur.*

This area is an extension of the northern Tista floodplain along the Bogra-Karatoa river. Other Boro (40) cultivation increased ten-fold in the period 1975-85 with the spread of tubewell irrigation. Other major crops are T. Aman (79), Aus (44), Wheat (14) and Potato (10). This is one of the major Potato growing areas of the country. Commercial cultivation of Banana (2) is a growing source of farm income. Vegetables (5) are plentiful. Other crops are Chillies (5), Khesari (3), Masur (2), Mustard (2), Bamboo (2), Mango (1), Jute (1), Mung (1), Onion and Garlic (1), Sugarcane (0.5), Tobacco (0.25), and Betelleaf (0.25).

N.C.A. 85 percent ; G.C.A 215 percent.

BARIND TRACT

11. (NW 12)*Badarganj & Mithapukur (part), Pirganj, Sadullapur, Palashbari, Gobindaganj, Panchbibi, Phulbaria. (D), Parbatipur, Ghoraghat, Nawabganj (D), Hakimpur, s. part of Dinajpur Sadar & outliers in Birol, Bochaganj & Pirganj (D):*

The north-eastern section of the Barind Tract covers parts of the above Upazilas. The relief is that of an almost level highland, with some disected landscape south of Phulbaria (D). The soils of this part of the Barind differ from the other areas mainly in the presence of Deep Red-Brown soils, which have a moderate permeability. There are also Brown Mottled and Grey Terrace soils with compact ploughpans. The soils on terrace interiors are imperfectly drained. Net irrigated area is 21% of the NCA. T. Aman (87) is the major crop in the lower areas, with Aus (26) and Mesta (5) on the higher sites. A fair amount of Jute (6), vegetables (2) and some Rabi crops, such as Kaun (1), Mustard (1), Mung (1) and Masur (1), Tobacco (0.25), are also grown. Bamboo (1) is far less important than in areas to north.

N.C.A. 77 percent : G.C.A. 134 percent.

12.(NW13) *Khetlal, Kalai, Dhubchanchia, Kahaloo, Ghoraghat, south-west Shibganj, west upto 160-190 mm. i sohyet.*

The main difference with CAU Unit 12 is that the net irrigated area is 36% of the NCA, and thus the cultivation of HYV rice predominates. Transplanted Aman (79) is still very dominant, but Aus (27) cultivation has increased rapidly in the 1970s, and with the growth of irrigation by tubewells Boro (29) has become a monsoon crop. Other crops are Wheat (15), Vegetables and Spices (6), Mustard (5), Khesari (2), Jute (2), Masur (1), Mesta (1), and some Potato, Sugarcane, Sesame and pulses. The homesteads have plenty of Tal palm (1) and Bamboo (1).

N. C. A. 87 percent : G.C.A. 173 percent.

13.(NW 13) *Nandigram, n. part of Singra, part of Raninagar & Atrai , w. Sherpur and n.-w. Tarash.*

This CA unit covers the southern part of the Eastern Barind. Despite 150 mm of rainfall the higher parts of the terrace have a very dry look, which is accentuated by the dusty rows of agaves bordering the fields. Groundwater exploitation has increased the net irrigated area to 29% of the NCA. T. Aman (91) is absolutely dominant, and Aus (9) is a minor crop. In the late 1970s, tubewell irrigation spread rapidly and Boro (21) has become an important crop. Hardly any Jute (0.5) or Mesta is grown. Some Rabi crops, Onion and Garlic (0.5) and Potato (0.5), Wheat (3), Mustard (1), Khesari (0.5), Gram (0.5) mainly are grown near the homesteads, which have a scanty cover of Mango, Tal palm, Bamboo and Babla.

N.C.A. 90 percent : G.C.A. 129 percent.

14. (NW 13/14) *(a) W. Dhamoirhat, e. Patnitala, e. Porsha, & most of Sapahar, e. Mohadevpur and parts of Badalgachi, Naogaon and Manda.*

(b) Godagari, Tanor, Nachole, Niamatpur, a small part of Bholahat, e. Gomostapur, Nawabganj (part) & w. Porsha, Mohanpur.

This CA unit has two parts : (a) covers the East central Barind which is separated from the Eastern Barind by the little Jamuna floodplain and from the West-Central Barind by the Atrai river floodplain, and (b) covers West-Central Barind and small section of the southern end of the western Barind. Within section (b) there are also big areas of the Dissected Barind Tract, which has some narrow level summits, but consists mainly of terraced hill sides and valley bottoms. The soils are mainly Grey Terrace with a compact ploughpan, with clays on the rolling hill areas in the south. Rainfall varies from 50 to 55 inches only. Net irrigated area is 5% of the NCA.

T. Aman (95) is practically the only field crop over large areas. Some Aus (13) is grown in depressions and valley bottoms. Other field crops are wheat (3), Mustard (3), Gram (1), Jute (1) and Khesari (0.25). In section (a) (East-Central Barind) and in the northern part of section (b) Tal palms (1) are abundant. In the rest of the unit more of Mango (1). In the hilly areas there is rough grazing on the uncultivated slopes.

N.C.A. 80 percent : G.C.A. 119 percent.

KARATOA-BANGALI FLOOD PLAIN

15. (NW 5) *Saghata, Sonatala, Shariakandi, Gabtali, Dhunot, Raiganj and Kazipur.*

This floodplain is the middle stretch of the right bank floodplain of the Brahmaputra-Jamuna and its tributaries. Reduction of overbank flooding by the Brahmaputra Right Bank Embankment and exploitation of groundwater has increased net irrigated area to 50% of the NCA, and has become the main rice crop, since the early 1980s. Aman (54), Aus (44) and Transplanted Boro (40) are grown, depending on the land level. Both irrigated and rainfed Wheat (20) is grown in this belt. Chillies (7) and Jute (3). Other crops grown include Gram (3), Khesari (2), Mash (2), Masur (2), Potato (2), Sesame (2), Onion and Garlic (1), Linseed (1), Cheena (1), Barley (0.25), Sugarcane (0.5), Mator (0.5) and Tobacco (0.25). Bamboo (1) and Mango (0.5) are plentiful. Fisheries in the Brahmaputra-Jamuna are of some importance.

N.C.A 80 percent : G.C.A. 194 percent

16. *Sirajganj, Kamarkhand, Ullapara, Shahzadpur, Chauhali, Belkuchi and eastern Tarash.*

CA Unit 15 and 16 used to have a similar cropping pattern till the rapid growth of irrigation in the 1970s. At present only 14% of the NCA is irrigated in CAU Unit 16, as against thrice that much in CAU Unit 15. Consequently the proportion of HYV rice is much lower in this unit. Both HYV and broadcast Aus (57) is grown. Due to lower land levels there is more B. Aman (20) than T. Aman (24), Wheat (32) and Boro (10) is not dominant. Wheat, mainly rainfed HYV, has become an important crop in the 1980s. Jute (17) is still the main cash crop. Mustard (26) is widely grown in the early part of the Rabi season. Other crops are Khesari (10), Vegetables (6), Masur (5), Mash (4), Gram (3), Shon (3), Chilies (2), Onion and Garlic (2), Sweet potato (2), Potato (2), Linseed (2), Sesame (2), Cheena (1), Barley (1), Motor (0.5), Sugarcane (0.5), Banana (0.5) and Tobacco (0.25). Bil and river fisheries are of importance.

N.C.A. 80 percent : G.C.A. 201 percent.

LITTLE JAMUNA FLOOD PLAIN

17. (NW4b) *Parts of Phulbari (D) & Hakimpur, w. Panchbibi, Joypurhat, Adamdighi, e. Dhamoirhat, east Badalgachi & easteran Naogaon.*

This valley within the Barind Tract presents a contrast to the drier terraces. Net irrigated area is 37% of the NCA. T. Aman (80) is dominant but Aus (30) and Jute (12) are also extensively grown. Sugarcane (8) is the main crop. A considerable amount of vegetables (9) mainly Melon, Gourds and Beans are grown. Both Sugarcane and Vegetables are cultivated on man-made raised plots. A fair amount of rabi crops are grown. Wheat (10), Potato (8), Mustard (6), Masur (4), Gram (3), Barley (1), Chillies (1), Onion Garlic (0.5) and Tobacco (0.25) are also grown. The fields are often bordered with Banana (1). Bamboo (1) and Mango (0.5) are plentiful around homesteads.

N.C.A. 85 percent : G.C.A. 175 percent.

MIDDLE ATRAI FLOOD PLAIN

18.(NW6/NW2) *Parts of Dhamoirhat, Patnitola, Mahadebpur & most of Manda.*

In Manda Upazila the relief is a complex of narrow ridges and small deep basins. Many basins centers remain flooded throughout the year. Soils are mainly silty in ridges and clays in basin centers. In the rest of the valley relief is mainly a succession of low ridges and shallow basins. Soil patterns are complex, with young alluvial silts predominating, but with as much as 20 % of the area being sandy. Ridges are mainly above normal flood level. Net irrigated area is 28% of the NCA. T. Aman (61), B. Aman (20), Aus (20) and Boro (20) are all grown. Jute (14) is extensively cultivated Main Rabi crops are Sugarcane (5), Mustard (4), Potato (3), Mash (2), Wheat (2), Sesame (2), Masur (2), Gram (1), and Tobacco (0.5). Bamboo (1) is extensively cultivated.

N.C.A. 85 percent : G.C.A. 136 percent.

LOWER ATRAI BASIN

19. (NW8a) *Raninagar, Atrai, part of Manda, s. Naogaon, w. Singra & n. Natore.*

This is the deep Failam area of the Lower Atrai, also known as the Bhar. Relief is almost level. Soils are mainly heavy clays. This area is deeply, and often rapidly, flooded in the monsoon season. The collection of water bodies known as the Chalan Bil is in this CA unit. Deep-flooding makes long-stemmed, floating B. Aman (53) the most extensive crop, but Boro (42) is the main rice crop because of the high yield. Khesari (18), Aus (7), Wheat (6), Mash (5), Mustard (5), Masur (5), Jute (3), Potato (2), Sugarcane (1), Sesame (0.5), and Tobacco (0.5).

N.C.A. 85 percent : G.C.A. 143 percent.

20. (NW10) *N. Gurudaspur, e. Baraigram, Faridpur (P), n. Atghoria, n. Chatmohar, s. Tarash, most of Ullapara, s. Shahzadpur, Santhia & Bera.*

This large CA unit is the southern portion of the Lower Atrai Basin. Net irrigated area is 21% of the N.C.A. Deep and medium-flooded B. Aman (68) predominates in area, but because of higher yields Boro (24) is the major rice crop. On an area basis the other main crops are Wheat (29), Aus (22), Khesari (20), and Mustard (15). The diversified cropping system includes Jute (9) Mash (6), Masur (3), Gram (3), Barley (2), Linseed (2), Sesame (2), and Cheena (2). Aus and medium-flooded B. Aman are usually sown together. The raised homesteads have a fair amount of Bamboo (1) and Mango (0.5). Seasonal grasslands cover about 10% of the area.

N.C.A. 75 percent : G.C.A. 196 percent.

LOWER PURNABHABA FLOOD PLAIN

21. (NW8b) *W. Porsha, Sapahar (west), n. Gomastapur.*

Relief is one of low ridges and broad basins, with permanent bils in many basins. Soils are heavy clays. Nearly 40 percent of the area is in permanent grassland. Boro (16) is grown quite extensively. Broadcast Aman (82) and Mustard (10) are the other major crops. Minor crops include gram (2), Barley (2), Masur (1), Mash (1), Maize (0.25) and Jute (0.5).

N.C.A. 60 percent : G.C.A. 117 percent.

MAHANANDA FLOOD PLAIN

22. (NW9) *Bholahat, w. Gomastapur, a small part of Nachole, n. Shibganj (R) and w. Chapai-Nawabganj.*

Relief is that of broad floodplain ridges and basins, with broad high ridges along the Mahananda and Pagla rivers. Basins and lower ridges have clays, with loams on the higher ridges. In this CA Unit Mango (15) is the major cash crop. More Aus (62) than B. Aman (27) is grown. There is some Boro (7) and T. Aman (5) too. Boro is grown mainly in Bholahat upazila. Wheat (11) cultivation is spreading. Mulberry (1) for rearing silkworms is grown on raised plots. Rabi crops include Mash (15), Mustard (10), Barley (6), Gram (6), Masur (6), Khesari (5), Motor (5), Sesame (4), Onion and Garlic (1), Maize (0.5), Potato (0.5). Vegetables (4) are mainly cucurbitaceae. Along with Mango there are also orchards of Jackfruit (0.5), Lichu (0.5), Guava and other fruits. Bamboo (1) is also grown.

N.C.A. 70 percent : G.C.A. 182 percent.

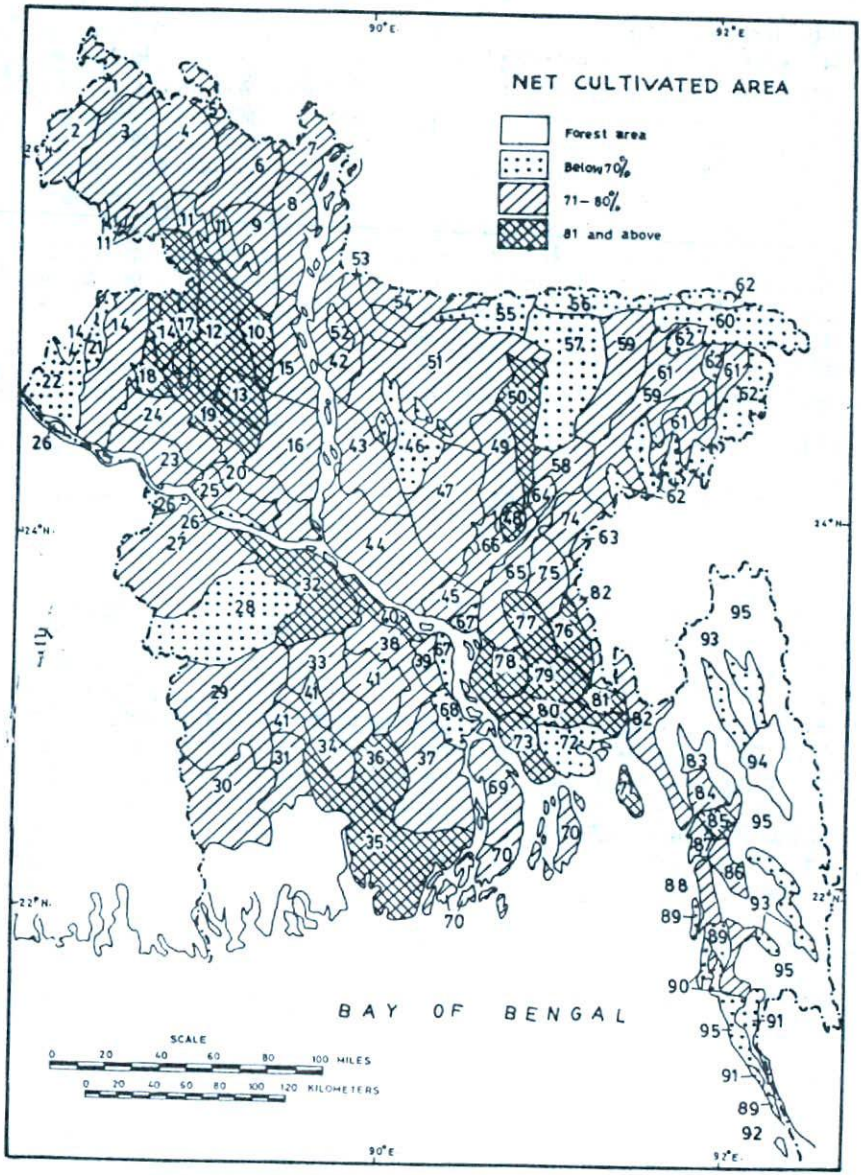
NORTHERN GANGES FLOOD PLAIN & LEVEE

23. (NW9) *Boalia (Rajshahi), southern Paba, Charghat, Lalpur, southern Puthia, Bagatipara & most of & part of Bagha, Durgapur .*

On this levee of the Ganges more Aus (47) than Aman (24) is grown. Four-fifth of the aman is Broadcast on the shallowly flooded (100-150 cm deep) basins. Sugarcane (35) and Mango (6) are the major cash crops. Other major crops are Wheat (15), Masur (15), Mash (9), Mustard (8), Khesari (7), Gram (6), and Vegetables and Spices (5) mainly Brinjal, Turmeric, Ginger, Melon, Watermelon and Beans. Jute (5) cultivation has decreased in the last 15 years. Minor crops include Barley (5), Turmeric (3), Potato (2), Linseed (2), Sesame (2), Chillies (1), Motor (1) and Arhar (0.5). Plenty of Lichi (0.5) and other fruits are cultivated. Fruit orchards and Bamboo (2) surround the homesteads. Khoir (cutch) is collected in this area.

N.C.A. 75 percent : G.C.A. 146 percent.

Map 13.2


NET CULTIVATED AREA
Forest area
Below 70%
71 – 80%
81 and above
90°E
92°E
24°N
22°N
BAY OF BENGAL
SCALE
0 20 40 60 80 100 MILES
0 20 40 60 80 100 120 KILOMETERS

24. (NW9) *Mohanpur, Durgapur, n. Paba, Bagmara, n. Puthia & n. Natore.*

This area are somewhat lower than CA Unit 23. Aus (46) and B. Aman (29) are often grown in the some plot (mixed), in shallower basins and on low ridges. Boro (10) cultivation has increased lately. Little T. Aman (6) is grown, possibly because the crop has to be planted late and the soils become very droughty before the crop can mature. Late planting is necessary because the Ganges flood usually comes in the second half of August. Moreover, the rainfall is only 60 inches and there is not sufficient rainfall till August. Wheat (20) cultivation has increased rapidly. Jute (9) is a major cash crop. Mango (2) and Pan (1) are the two other important cash crops especially in the western part. Other crops include Masur (10), Mustard (10), Mash (8), Khesari (7), Gram (5), Sugarcane (5), Potato (3), Barley (3), Chillies (3), and Linseed (3). Vegetables and Spices (2), Sesame (2), Bamboo (2) and Motor (1) are plentiful in the homestead groves.

N.C.A. 75 percent : G.C.A. 182 percent.

25. (NW9) *Ishurdi, Pabna, s. Atghoria, part of Chatmohar, n. w. Sujanagar, s.-w. Santhia extending in a narrow strip to s.-w. Bera.*

Most of this area is on the high Ganges levee and is not affected by regular flooding, except east of Pabna town. Nearer the Ganges more Aus (56) than Aman (30) is grown but further inland the proportions are reversed. Jute (5) is not a big crop. Vegetables and Spices (10) of which Turmeric (3) is the major cash crop, are extensively grown. Wheat (12) has become an important crop in the past decade. The cropping pattern includes Masur (15), Mustard (15), Gram (10), Sesame (10), Sugarcane (5), Linseed (5), Khesari (4), Barley (3), Mash (3), Chillies (3), Mango (2), Maize (1), Cheena (1), Motor (1) and Arhar (0.25). Bamboo (2) is plentiful. Babla trees and Khejur Palms dot the park-like landscape.

N.C.A. 75 percent : G.C.A. 187 percent.

GANGES ACTIVE FLOOD PLAIN

26. (NW11b / SW1) *S. Shibganj, s. Chapai-Nawabganj.*

This unit includes the active Ganges floodplain along the left bank of the Ganges. This is an area of Chars and Diaras, and only 10% of the cultivated land is irrigated. The soils are mixed sands and silts, with

some friable clays in depressions. Aus (61), B. Aman (28), Wheat (15), Mustard (10), Khesari (10), Vegetables (9), Gram (6), Linseed (5), Cheena (5), Masur (4), Jute (3), T. Aman (3) and Barley (3), are the main crops. There are also some grassland areas.

N.C.A. 60 percent : G.C.A. 167 percent.

27. (SW3) *Bheramara, s. Daulatpur, Mirpur, Kushtia, s. Kumarkhali, Gangni, Meherpur, Alamdanga, Chuadanga & Damurhuda.*

Clays occupy about 50% of the area, mainly in basins and on low ridges. Sandy-loams on high ridges occur on the other half of the area. Rainfall varies from 140 to 165 cm. Most of the area is above normal flood level. Net irrigated area is nearly 25% of the NCA. Aus (58), occupies more area than T. Aman (34). Some B. Aman (3) or Boro (2) is cultivated in basin centres. Sugarcane (10) and Tobacco (3) are the main cash crops. Gram (7) is also a major crop and is exported to other areas. Wheat (20), has displaced Gram and other Pulses in irrigated areas and in some parts it is grown on 40% or more of the cultivated land. Cultivation of vegetables and spices (6), is widespread. Turmeric and Ginger and cultivated extensively in Mango (1), and Jackfruit (1), orchards Khejur palm (1), is grown in small orchards and Guava, Custard apple, Jaam, etc. are plentiful around homesteads. Cultivation of timber trees, such as shishu, in small plots has gained ground recently. Other crops include Masur (12), Jute (10), Mustard (4), Mash (3), Barley (2), Linseed (2), Khesari (2), Arhar (1), Potato (1), Kaun (1), Sesame (1), Motor (0.5), Soyabean (0.5), Banana (0.5), and Chillies (0.25). Bamboo (2) is plentiful around homesteads.

N.C.A. 75 percent : G.C.A. 184 percent.

28. (SW3) *Jibannagar, Maheshpur, Kaliganj, Kotchandpur, Harinakunda, w. Jhenidah & w. Sailkupa.*

This CA unit is in the highest and driest part of the Moribund Delta with a high proportion of sandy ridges. Aus (38) and T. Aman (47) are equally big crops. Wheat (14) has become important in the past decade. B. Aman (3) and Boro (3) are minor crops. Gur made from Khejur palms (2) is the main cash crop. Gram (15), Masur (15), Jute (10), Sugarcane (5), and Mango (2), are the other main cash

crops. Mustard (7), Vegetables and spices (5), Barley (2), Banana (1), Mung (1), Mash (1), Khesari (1), Sesame (1), Linseed (1), Motor (0.25) and Coconut (0.25) are also grown. Homesteads have plenty of Bamboo (2), and fruit trees such as Guava, Jackfruit and Lichu.

N.C.A. 70 percent : G.C.A. 176 percent.

29. (SW3) *Jhikargachha, Sarsha, n. Satkhira, n. Tala, Kalaroa, Jessore, Bagherpara, Salikha, n. & w. Manirampur, w. Keshabpur.*

In this lower and more fertile part of the Moribund Delta, Aus (50) is grown as extensively as T. Aman (50). Some B. Aman (10) is grown mixed with Aus in basin centres. Wheat (20) and Boro (10) are grown mainly with tubewell irrigation. Masur (10) is grown mostly in the western part, Gram (9) in the north-west and Mung (6) in the south. Cultivation of Vegetables and Spices (5) is important. Jute (15) is the main cash crop, and Khejur palm (3), Betelleaf (1) and Mango (1) are also important cash crops. Minor crops include Mustard (7), Khesari (4), Linseed (1), Cheena (1), and Sugarcane (1). Coconut cultivation increases towards the south. Bamboo (2) is plentiful. The Baor fisheries are an important part of the local economy.

N.C.A. 75 percent : G.C.A. 210 percent.

IMMATURE DELTA

30. (SW7) *Debhata, Kaliganj, n. Asasuni, s. Satkhira, s. Tala & n. Paikgachha.*

In marked contrast to CA Unit 29 the cultivation of Aus (1) decreases suddenly, as the influence of the saline tidal flow increases. T. Aman (91) is dominant. Boro (5) cultivation has increased in the recent past. Jute (1) is a minor crop. Vegetables and Spices (2) and rabi crops like Mustard (3), Masur (1), Potato (1), Khesari (1) and Mung (0.5) are not plentiful. The homestead groves contain Mango (0.5), Cocoanut (0.5), Bamboo (0.5), Betelnut, Gaab (Persimmon) Jackfruit, etc. The decrease in Bamboo and the increase in Coconut and Betelnut as one travels south from CA unit 29 is quite marked. Shrimp farms extend over 15,000 ha. This area is used for T. Aman cultivation during August-December, but it is questionable whether this is sustainable in the long run. River fishing is also important.

N.C.A. 77 percent : G.C.A. 111 percent.

31. (SW7) *N. Shamnagar, s. Asasuni, central Paikgacha, n. Dacope & s. Batiaghata (except a strip along the Pussur river).*

The southern parts of Shamnagar, Paikgacha and Dacope are in the Sunderbans forest and therefore do not come into any CA unit. This unit, immediately to the north of these forests, is an area of heavy clays, with tidal flooding except where embanked, and is therefore practically monocultural. T. Aman (96) is the only large scale field crop. On raised plots near the homesteads Sesame (2), Vegetables and Spices (2), Potato (2), Khesari (1), Jackfruit (1), Jute (0.25), Tobacco (0.25) and Aus (0.25) are grown. Bamboo and betelnut are scarce. Despite the estuarine nature of this area even cocoanut is not a prominent crop. There are grass and sedge swamps in some depressions. As in CA Unit 30, shrimp farms are extensive, covering about 20,000 ha. The fisheries of the Sundarbans are also of considerable importance.

N.C.A. 80 percent : G.C.A. 108 percent.

MATURE DELTA

32. (SW4) *N. Kumarkhali, Khoksha, Pangsha, w. Rajbari, Baliakandi, w. Faridpur Sadar, Boalmari, e. Sailkupa, Sripur & Magura.*

This CA Unit contains a number of ridges of intermediate level land, which are the old levees of the Ganges river. The soils are calcareous and sometimes moderately alkaline. The Gorai has also built up levees in the western part of this area. Despite large areas of intermediate-level land most of the Aman is Broadcast (41), because flooding in the swales is up to 1 meter deep and ridge soils become too droughty. T.Aman (20) is grown only on the highest ridges. Aus (52) is grown both singly and mixed with B. Aman. Jute (19) and sugarcane (5) are the main cash crops. The cropping pattern includes Masur (15), Gram (10), Khesari (10), Mustard (8), Barley (3), Sesame (3), Kaun (3), Vetetables (5), Onion and Garlic (2), Cheena (1), Linseed (1), Gujitil (0.5), Banana (0.5) and Jackfruit (0.25). Homestead groves contain plenty of Bamboo (2) and fruit trees such as Mango, Jackfruit, Banana, Sapodilla, Boroi and Papaya. Some Castor is also grown in homestead plots.

N.C.A. 85 percent : G.C.A. 161 percent

33. (SW4) *E. Magura, Muhammadpur, n. Narail, Alfadanga and a strip along the Madhumati river in Gopalganj, Kasiani, Kalia and Mollahat.*

This unit contains intermediate-levees along the Madhumati river, but consists mostly of land that floods to medium-depth (1 to 2 meters) in the monsoon. B. Aman (49). T. Aman (17) is often sown mixed with Aus (32). Jute (20) is the main cash crop. Rabi crops include Mastard (6), Khesari (5), Masur (5), Gram (3), Wheat (3), Sesame (2), Cheena (2), Chillies (1), Mash (1), Onion and Garlic (1), Tobacco (1), Motor (1), Gujitil (0.5), Banana (0.25) and Betelnut (0.25).

N.C.A. 77 percent : G.C.A. 132 percent.

34. (SW3) *Abhoynagar, Phultala, Daulatpur, Rupsha, Dumuria (part), Fakirhat & Bagerhat.*

This is the garden area of the southern Region. Betelnut (5) is grown in orchards, along with Cocoanut (3), Mango (1), Banana (0.5) and fruits such as Pineapple, Jackfruit, Papaya, Jaam, Gaab, Guava, Sapodilla and Custard-apple. Bagherhat Upazila has more area under Coconut than any other Upazila in the country. On raised plots a good deal of Betelleaf (1) is grown. The rice crops comprise of T. Aman (70), Aus (12), B. Aman (10), and Boro (10). Jute (2) is insignificant. Vegetables and Spices (5), Masur (2), Mustard (1), Mung (1), Potato (1), Sugarcane (0.5) and Chillies (1) are also grown. Bamboo (1) is grown around the homesteads.

N.C.A. 75 percent : G.C.A. 118 percent.

35.(NW7) *Mongla, n. Rampal, s. Morrelganj, Mathbaria, n. Sarankhola, s. Bamna, Barguna, Patharghata, Amtali, Kalapara and Galachipa.*

East of the Pussur river, the Immature Delta gives way to the Mature as freshwater flow in the rivers increase. T. Aman is the dominant crop (92), with some Aus (10). After the Aman crop some Khesari (2), Mung (1), Mustard (1), Chillies (1), Sweet Potato (1), Potato (0.5), and Tobacco (0.25) is grown. Very little Jute (1) is grown, and that too along the northern fringes. The homestead groves contain Betelnut (1), Coconut (2), and Banana (0.5). The sudden decrease of orchard crops from CA unit 34, immediately to the north, is very marked. Bamboo is

scarce. Tal palm (0.5) is plentiful, especially along river levees. Estuarine Bheri and foreshore fishing is of considerable importance. In Rampal and Mongla Upazilas about 22,000 ha is under shrimp farms, which operate mainly during the dry season. T. Aman is grown on the same land during the monsoon.

N.C.A. 85 percent : G.C.A. 114 percent.

36. (SW6) *Kachua, n. Morrelganj, Indurkani, Pirojpur, Kaukhali, n. Bamna, Bhandaria, Kathalia & w. Rajapur.*

Though affected by tidal fluctuations, this CA Unit is different from adjacent areas of the coastal plains because of the freshwater flows in the Madhumati, Baleshor and Bishkhali (Paira) rivers. T. Aman (90) is the dominant field crop. Much more Aus (25) and Boro (5) are cultivated than in adjacent units to the south and west. There is a similarity with CA units to the west and east in that Betelnut (3) is the main cash crop. A lot of Coconut (3) is also cultivated. Other crops include Khesari (8), Mung (2), Chillies (1), Banana (1), Turmeric (1), Ginger (1), Betelleaf (0.25) and Tobacco (0.25).

N.C.A. 82 percent : G.C.A. 141 percent.

37. (SW 6) *Jhalakati, Swarupkati, e. Rajapur, Gournadi, Banaripara (east), Barisal, Nalchity, Backerganj, Baufal, Patuakhali, Mirzaganj & Betagi.*

This large CA Unit covers most of the non-saline tidal flood plain of the Podda-Meghna. Since most of the land is intermediate level T. Aman (80) is the major crop, preceded by Aus (50). Boro (3) on more than half the area. The main feature of this unit is the extensive cultivation of Coconut (3) and Betelnut (2). Coconut is abundant in Swarupkati and western Backerganj, where it covers a tenth of the NCA. Other crops include Khesari (15), Masur (3), Moog (3), Sesame (3), Chillies (3), Gram (2), Jute (1), Sweet Potato (1), Turmeric (1), Onion and garlic (1), Mustard (1), Banana (1), Sugarcane (0.5), Khejur (0.5), Potato (0.5), Kochu (0.5), and Betelleaf (0.25). River fisheries is of important here, and fish is exported to Dhaka.

N.C.A. 80 percent : G.C.A. 175 percent.

38. (PW4) *Babuganj, e. Ujirpur, Gaurnadi, Kalkini, w. Palong, e. Rajoir, Madaripur, s. Shibchar, s. Bhanga, Nagarkanda & s.-e. Faridpur Sadar.*

This large CA Unit covers much of the Podda Right Bank floodplain. Flooding is both through the Arial Khan river and overtopping of the bank by the Podda. Most of the land is shallowly-flooded (1 to 1.5 m.) with some basins flooded to medium depth (1.5 to 2.0 m.). B. Aman (46) is the main crop, often sown mixed with Aus (39). There has been an increase in Boro (10) cultivation and Wheat (10) has also gained in the past decade. T. Aman (11) is a very minor crop. Jute (20) is grown on a high proportion of the shallowly-flooded land. Betelnut (0.50) is quite plentiful, but there is nothing comparable to the large orchards of the south. Onion (3) is an important crop. Vegetables and Spices (3). Sugarcane (3) and Sweet Potato (2) are grown along river levees. Rabi crops include Khesari (15), Masur (7), Mustard (5), Gram (3), Barley (2), Cheena (2), Kaun (2), Mung (2), Sesame (2), Chillies (2), Shon (1), Groundnut (0.5) and Tobacco (0.5). Homesteads grow Mango (2) Betelnut (1), Khejur (0.5), Bamboo (0.5) and Banana (0.50). Tal palms (0.25) are scattered along the field boundaries. Betelleaf (0.25) is important along the southern Arial Khan river.

N.C.A. 80 percent : G.C.A. 171 percent.

39. (SW4) *Goshairhat, e. Naria, w. Bhedarganj, Damudya & e. Palong.*

This unit consists largely of alternating intermediate-level and shallowly-flooded land. Along the major rivers there has been some erosion and accretion, and the diaras are shallowly-flooded. Broadcast Aman (44) and Aus (38) are usually grown mixed. T. Aman (20) and some Boro (5) are grown on different levels of land. Jute (12) is the major cash crop, with Chillies (5) second to it. Other crops include Masur (10), Khesari (10), Mustard (6), Gram (6), Wheat (4), Sesame (3), Sweet Potato (3), Sugarcane (2), Mung (2), Betelnut (1), Garlic (1), Shon (1), Banana (1), Betelleaf (0.5) and Potato (0.25). River fishing is important.

N.C.A. 75 percent : G.C.A. 184 percent.

PODDA ACTIVE FLOOD PLAIN

40. (SW1) *Jinjira, w. Naria, n. Shibchar, n. Sadarpur, northern Bhanga, Char Bhadrasan, n. Faridpur Sadar & Goalundo.*

This long strip along the Podda river is known for its extensive cultivation of Onion (8) and Garlic (4). It also grows a high proportion of Jute (19). The Chars and Diaras are used for growing Onion, Garlic, Melon, Cucumber, Potol, Coriander (3), Sweet Potato (2), Groundnut (2), etc. in the Rabi season. The cropping pattern include Broadcast Aman (47), Aus (41), Khesari (10), Masur (10), Mustard (9), Wheat (6), T. Aman (5), Boro (3), Gram (3), Sugarcane (3), Mash (2), Mung (2), Chillies (1), Sesame (1), Motor (1) and Tobacco (0.5). River fishing is important.

N.C.A. 83 percent : G.C.A. 173 percent.

CENTRAL DELTA BASINS

41. (SW5) *(a) E. Manirampur, e. Keshabpur & n. Dumuria.*

(b) Terokhada, Mollahat, Kalia, s. Narail (except the Madhumati levees) & n. Bagerhat.

(c) Nazirpur, w. Kotwalipara, w. Rajoir, Mukshudpur, Kasiani & Gopalganj (except Madhumati levees).

Sub-regions (a) and (b) are seperated by CA Unit 34 and (b) and (c) are separated by CA Unit 33 along the Madhumati river. This is a very low area, with large peat basins which are seasonally deeply flooded with rain-water. During the dry season much of this area remains wet through the tidal back-up of fresh water from rivers. Around the deeper bils Boro (11) is grown. B. Aman (82) is the major crop. Aus (66) is grown mixed with B. Aman on the shallowly-flooded ridges. Sesame (10) and Jute (7) are the main cash crops. Somefruits (1) (Guava, Lime, etc.) and vegetables (2) are grown on floating beds in Kotwalipara and Nazirpur. Khesari (10) is a cash crop on the sides of the bils. River, Bil fisheries are very important.

N.C.A. 75 percent : G.C.A. 133 percent.

BRAHMAPUTRA - JAMUNA LEFT BANK ACTIVE FLOOD PLAIN

42. (C1) *Rahumari, Bahadurabad, n. & e. Dewanganj, e. Islampur, Madarganj, southern Melendaha & w. parts of Sarishabari, Gopalpur, Kalihati, Tangail, Nagarpur and Daulatdpur (D).*

This unit consists of the Diaras along the left bank of the Brahmaputra-Jamuna and the Chars within the river. Soils are mainly silty alluvium, with extensive areas of sand in the Chars. Early Aus (54) and Jute (15). T. Aman (6) are followed by B. Aman (40), which is grown mixed with Aus. Boro (15) and Wheat (10) cultivation have increased rapidly. Other important Rabi crops are Mustard (10), Kaun (6), Sweet Potato (5) and Cheena (5). The cropping pattern also includes Khesari (5), Masur (2), Chillies (0.5), Tobacco (0.5), Barley (0.25), Mung (0.25), Mash (0.25), Sesame (0.25) and Onion and Garlic (0.25). Banana (1) is grown thickly around the homesteads, especially in the newer accretions.

N.C.A. 75 percent : G.C.A. 146 percent.

JAMUNA - PODDA FLOOD PLAIN

43. (C9) *E. Gopalpur, central Kalihati, e. Tangail, w. Basail, w. Mirzapur & w. Kaliakoir.*

This unit is in the northern part of the Jamuna left bank floodplain. The main difference between this unit and the next one is that here 55% of the NCA is irrigated, whereas in CA Unit 44 only 20% is irrigated. Because of the high proportion of irrigated land, Boro (40), mainly HYV, is the main rice crop. HYV Wheat (11) has also become a major crop in the past decade. The traditional crops of mixed B. Aman (31) and Aus (32) have been reduced due to greater reliance on irrigated HYV Boro and Wheat. Jute (10) remains the main cash crop. Rabi season crops include Mustard (10), Khesari (10), vegetables and Spices (3), Barley (2), Masur (2), Mash (2), Potato (1), Sweet Potato (1), Cheena (1), Kaun (1) and Tobacco (0.5).

N.C.A. 80 percent : G.C.A. 145 percent.

44. (C 9 / 10 / 11 / 12) *E. Nagarpur, e. Daulatpur, Saturia, s. Dhamrai, Sibaloy, Ghior, Manikganj, Harirampur, Singair, Nawabganj, Dohar, w. Serajdikhan, w. Srinagar & Keraniganj.*

This large unit contains the southern part of the Jamuna left bank floodplain, remnants of the old Ganges floodplain (along the course of the present Kaliganga river), Arial bil and the Podda left bank levee. There is a similarity of cropping pattern in this big area, except in the Arial bil, which is a distinct sub-region. This 125 sqkm area mainly grows boro. Since it is too small to be a seperate unit it has been included in the bigger one. In this CA unit the soils are mainly loamy on ridges and clays in basins. The Arial bil area has heavy clays and the Podda levee has silty clays. Net irrigated area is 20% of the NCA. Little Boro (12) is grown in the region as a whole, but in the Arial bil area it is grown on three-fourths of the cultivated land. The major crops, over most of the unit are B. Aman (71), Aus (44), Jute (12), Khesari (10), and Wheat (7). Other crops in the cropping pattern are Mustard (5), Vegetables and Spices (3), Barley (3), Mash (2), Gram (1), Masur (1), Cheena (1), Kaun (1), Potato (1) and Sweet Potato (1). Homestead groves contain some Bamboo (0.5), Gab, Madar and other trees. River fisheries are very important, in this unit.

N.C.A. 80 percent : G.C.A. 148 percent.

45. (CI/C8b) *Munshiganj (except eastern Chars), Tangibari, Lohajang, e. Srinagar & e. Serajdikhan.*

There are extensive man-made raised plots in this area on which Sugarcane (2), Banana (1), Betelleaf (1), Vegetables and Spices (4), such as Turmeric, Ginger, Cucurbitaceae, and Brinjal, are grown. Potato (50) is the main cash crop of this area. Jute (17) occupies more land than Aus (15), which is usually grown mixed with B. Aman (63). Both Wheat (15) and Boro (3) cultivation have gained ground in the 1970's. Crops in the Rabi season include Mustard (12), Mash (3), Groundnut (2), Sweet Potato (2), Chillies (2), Onion and Garlic (1), Sesame (1) and Tobacco (0.5).

N.C.A. 77 percent : G.C.A. 195 percent.

MADHUPUR TRACT

46. (C13) *E. Madhupur, e. Kalihati, e. Ghatail, w. Bhaluka, w. Phulbaria (m), w. Sripur.*

In this area Aus (79) is the major crop, with some T. Aman (20), Mustard (10), Mesta (7), B. Aman (5), Sesame (5), Vegetables (4), Jackfruit (3) and Pineapple (2). A substantial portion of these largely level highlands is occupied by scrub and forest.

N.C.A. 60 percent : G.C.A. 135 percent.

47. (C13) *Tejgaon, Savar, n. Dhamrai, e. Kaliakoir, Joydebpur, e. Sripur, e. Bhaluka, s. Kapasia, & parts of Kaliganj & Rupganj.*

This unit has closely dissected highlands, some broad intermediate level land and many valleys (baids). Boro (20) is cultivated in the baids. T. Aman (28), mixed Aus (50) and B Aman (32) are also grown. Jackfruit (5) is extensively grown and is an important cash crop. The cropping pattern includes Mustard (8), Jute (3), Vegetables and Spices (3) Sesame (2), Sugarcane (2), Tal palm (1), Wheat (1) and Pineapple (0.5). There are scattered outliers of the Madhupur forests.

N.C.A. 77 percent : G.C.A. 124 percent.

48. (C13) *N. Monohardi, n. Kapasia, n. Shibpur & small outliers in Narsingdi.*

In these several outcrops of the Madhupur tract east of the Banar-Sitalakha river T. Aman (73), Aus (48) and Boro (28), are extensively grown. Jute (10), Mesta (5) and Jackfruit (5) are the major cash crops. As in CA unit 47 a good amount of Vegetables (8), especially Brinjal and Radish, are grown for the Dhaka market. The cropping pattern includes Khesari (10), Wheat (10), Mustard (6), Sesame (5), Mash (5), Masur (5), Turmeric (1) and Sugarcane (1). Bamboo (1) is more abundant than in other parts of the Madhupur Tract.

N.C.A. 83 percent : G.C.A. 225 percent.

OLD BRAHAMAPUTRA FLOOD PLAIN

49. (C3a/3d/7) *Parts of Narsingdi and Raipura (except Char areas), s. Shibpur, w. & s. Monohardi, e. Kapasia, w. Kuliarchar, Katiadi, Pakunda, Hosenpur, Kishoreganj & w. Karimganj.*

This unit is in the old Brahamaputra floodplain and has rather sandy sub-soil. It is a fertile area growing a large variety of crops. About 24% of the N.C.A. is irrigated. The big rice crops are T. Aman (67), with Aus (50) preceding it. With the expansion of irrigation, Boro (20) has become a major crop, and HYV Wheat (12) is grown mainly under rainfed conditions. Jute (18) and Sugarcane (6) are the major cash crops. Other crops include B. Aman (10), Vegetables and Spices (5), Potato (4), Khesari (3), Masur (2), Mustard (2), Chillies (2), Sesame (2), Tobacco (1), Banana (1), Pineapple (1), Mango (1), Onion and Garlic (1), Lichi (0.75), Sweet Potato (0.5), Jackfruit (0.5), Gram (0.5) and Betelnut (0.5). Most of the Bananas and Pineapple are grown in gardens near Narsingdi, whereas most of the Lichu is grown near Kishorganj. Bamboo (1) is quite plentiful.

N.C.A. 80 percent : G.C.A. 203 percent.

50. (C7) *Tarail, Modan, e. Kendua, s. Atpara, s.-w. Mohanganj, e. Karimganj & western Itna.*

This area is in the low part of the old Brahamaputra floodplain, yet its cropping-pattern is different from that of the Haor Basin immediately to the east. Most soils have a strongly developed ploughpan, impeding internal drainage. Fully 50% of the area is irrigated in the dry seasson. Boro (50) is the major rice crop (most of it is HYV), whereas B. Aman (50), often grown mixed with Aus (25) along basin edges, is low yielding. Aus and Jute (22), Wheat (2) are grown on the broad ridges. Other crops include Mustard (4), Sweet potato (4), Khesari (4), Chillies (2), Masur (2), Potato (2) and Tobacco (2). Bamboo (2) is much more plentiful than in the Haor Basin.

N.C.A. 82 percent : G.C.A. 146 percent.

51. (C3a/3c/5) *Nakla, s. Haluaghat, Khabaura, Iswargonj, Phulpur, Gouripur, Purbadhala, Netrokona, s. Barhatta, n. Mohanpur, n. Atpara, n.-w. Kendua, Mandail, Mymensingh Sadar, Muktagachha, Jamalpur, s. Sherpur, e. Sarishabari, w. Madhupur, w. Ghatail, e. Phulbaria & Gaffargaon.*

This large area is mostly an intermediate-level plain with broad ridges. There is a line of broad basins in the north (Nakla, Haluaghat) and a number of big basins in the south (Gaffargaon). A 15 km wide strip along the left bank (north) of the old Brahamaputra has a complex relief. Rainfall varies from 200 cm. in the south to 375 cm in the north. About 25% of the N.C.A. is irrigated, mainly by ground water. The major rice crops are Aus (56) followed by T. Aman (88), and by Boro (26) in the basins. Some B. Aman (6) is also grown in the basins. This is one of the major Jute (15) growing areas of the country but its importance has diminished with the growth of irrigated Boro and Wheat (13). Cucurbitous vegetables (3). Many types of Vegetables and spices (3) are cultivated. Other crops Mustard (6), Potato (5), Khesari (3), Sweet Potato (2), Masur (2), Chillies (2), Tobacco (2), Sugarcane (1), Mung (0.5), Mash (0.5), Shon (0.5). Bamboo (2) is abundant.

N.C.A. 80 percent : G.C.A. 230 percent.

52.(C3b) *Islampur (except Jamuna chars & the eastern part), s.-w. Dewanganj & Melandaha.*

Cropping pattern here is quite similar to that in Unit 51, except that Sugarcane (11) is the main cash crop and only 10% of the NCA is irrigated. Sugarcane is grown mainly on the Sherpur-Shilmandi soil association, and locally occupies upto 50% of the cultivated area. T. Aman (70), Aus (40), Boro (39) and B. Aman (10), are all grown. The cropping pattern includes vegetables and spices (5), Mustard (5), Wheat (4), Khesari (3), Sweet potato (3), Masur (2), Cucurbitous Vegetables (2), Sweet potato (1), Gram (1), Chillies (1), Tobacco (1), Potato (0.5), Barley (0.5), Mash (0.5), Mung (0.5) and Arhar (0.25).

N.C.A. 80 percent : G.C.A. 199 percent.

53. (C4) *Bakshiganj, w. Sribardi, south-east Dewanganj, part of Jamalpur north of the old Brahamaputra river Sherpur (except the n. e.) & part of Nakla.*

This is the highest part of the old Brahamaputra floodplain, with ridges of various heights and small depressions. Soils are mainly loamy, with sandy soils often on highest ridges. Net irrigated area is about 16% of the N.C.A. Aus (60) is an important crop, followed by T. Aman (76). There is also some B. Aman (10). Boro (9) is grown in the basins. Jute (9) is the main cash crop. Other crops include Mustard (3), Wheat (2), Sugarcane (2), Chillies (2), Sweet Potato (2), Mash (2), Masur (1), Potato (1), Sesame (1), Mung (0.5) and Tobacco (0.25).

N.C.A. 77 percent : G.C.A. 182 percent.

GARO HILLS PIEDMONT

54. (C2/14) *Nalitabari, Jhenaigati, n.- e. Sribardi, n.- e. Sherpur, most of Nakla, n. Haluaghat, n. Durgapur, n. Dhobaura, part of Kalmakanda.*

Relief here is gently sloping, with some extensive basins in the south, especially in Nalitabari (and adjacent part of Nakla). Soils are loamy on ridges, but heavy clays in the basins. Rainfall is high, from 250 to 400 cm and this area is liable to flash flooding. There are intrusions of the Garo hills in low, steep hillocks in north-east Sribardi, northern Jhenaigati, Nalitabari, Durgapur and north-west Kalmakanda. Only 15% of the N.C.A. is irrigated. The main crop is T. Aman (86), preceded by Aus (66), Boro (15) cultivation has expanded in the 1970's. B. Aman (5) is grown in the basins. Other crops include Mustard (6), Jute (3), Wheat (3), Khesari (2), Potato (1.5), Vegetables (0.75), Chillies (0.5), with some Pineapple (0.25) and some Comilla Cotton along the hills. The hills themselves are mostly covered in scrub and forest.

N.C.A. 75 percent : G.C.A. 192 percent.

55. (C6) *S. Dhobaura, s. Durgapur, n. Barhatta, most of Kalmakanda, & a part of Haluaghat.*

This unit has deep basins seperated by ridges of varying heights. Flood levels fluctuate rapidly due to flash floods from the hills. The Kangsha and Someswari rivers affect this area. The soils are mainly heavy clays, with loams on higher ridges and sandy along the Someswari river. Net irrigated area is 28% of N.C.A. The major crop is B. Aman (63), with Boro (31) in the basin centres and Aus (41) and T. Aman (25) on the higher ridges. Other crops include Jute (3), Sweet Potato (2), Khesari (2), Wheat (1), Mustard (1), Chillies (1) and Linseed (0.5). Bil fisheries are important.

N.C.A. 70 percent : G.C.A. 136 percent.

HAOR BASIN

56. (E1) *Tahirpur, n. Dharmapasha, n. Sunamganj, n. Chhatak, n. Gowainghat & s. Jointiapur.*

This is an area of heavy clays, with loams and stands near the foot of hills and along the piedmont rivers. Most of this area is deeply flooded in the monsoon and is subject to flash floods. Some high ridges are shallowly flooded. Over 16% of the area is covered with Ekra reeds. Net irrigated area is 70% of the NCA. The main crops are Boro (69) and B. Aman (25). Some jute (1) is grown, along with Aus (15) mixed with B. Aman. The Rabi crops are Mustard (3), Sweet Potato (2), Chillies (1), Vegetables (1), Tobacco (0.5) and Potato (0.25). Bamboo is scarce. Haor fisheries are much exploited.

N.C.A 65 percent : G.C.A. 108 percent.

57.(E3) *Khaliajuri, Sulla, w. Dirai, Jamalganj, s. Dharmapasha, Itna (except the western strip), n. Nikli & n. Ashtagram..*

This is the heart of the Haor Basin, and in the monsoons it is like an inland sea. Soils are predominantly heavy clays. In the dry season 90% of the NCA. is irrigated, but there are extensive grasslands on the ridges and along the haor margins. The deep and rapid flooding and the waves formed during storms precludes B. Aman (2) cultivation in all but

sheltered areas. Boro (88) is the only crop widely cultivated and is the cash crop of this area. On the levees Aus (7), Sweet Potato (4), Mustard (2), Mash (2), various vegetables (1), Jute (0.5), Chillies (0.5), Potato (0.5) and Sesame (0.5) are grown. Trees are few and Bamboo is almost absent.

N.C.A. 65 percent : G.C.A. 110 percent.

58.(E3) *S. Ashtogram, s. Nikli, northern Baijitpur, n. Nasirnagar, n.-w. Sarail & w. Lakhai.*

This is the southern rim of the Haor Basin, with a larger proportion of ridges than in Unit 57. Boro (77) is still the major rice crop but a fair amount of Aus (10) and B. Aman (17) are also cultivated. This unit is on the edge of the main jute (5) growing area of the Meghna basin. Mustard (5), Sweet Potato (5), various vegetables (3), Mash (3), Potato (2), Chillies (1) and Sesame (1) are crops grown on the levees in the Rabi season. Haor and river fisheries are extensive. Mussels are collected in large amounts, mostly to be burnt for lime.

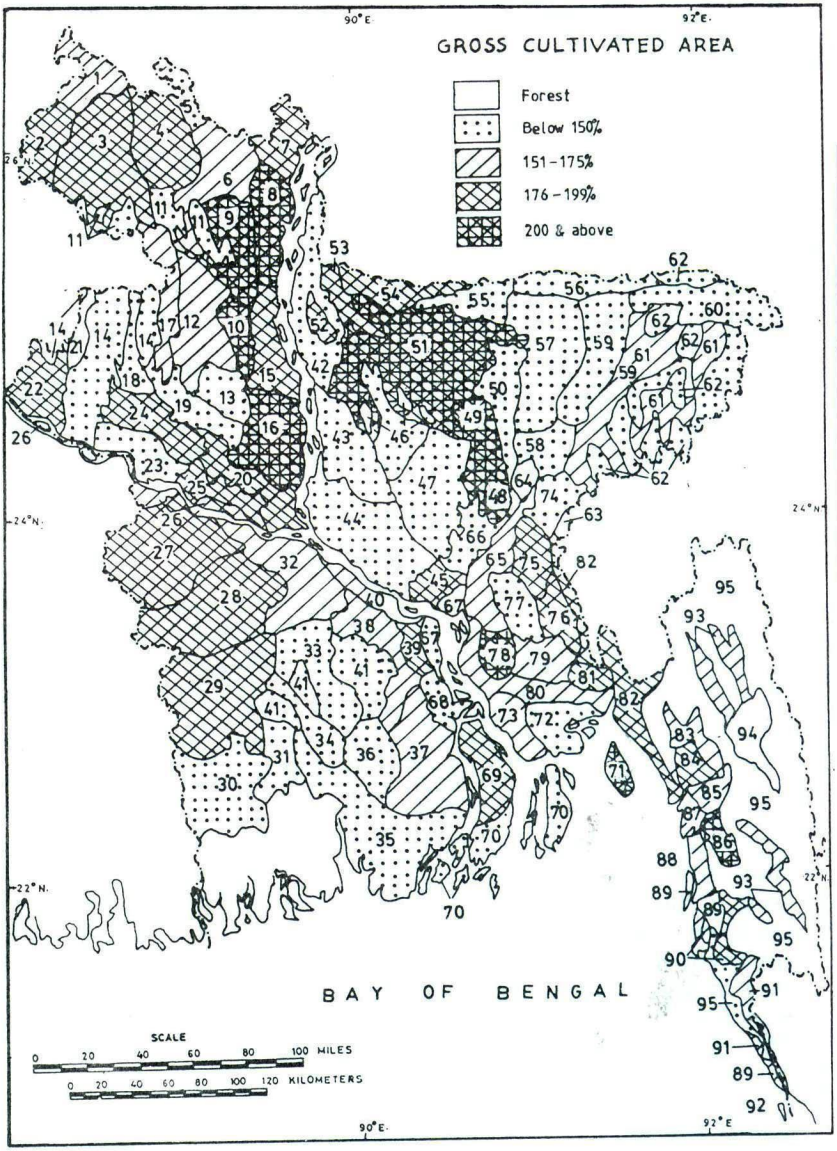
N.C.A. 75 percent : G.C.A. 132 percent.

59.(E3/E2) *Ajmiriganj, Baniachang, n. Nabinagar, e. Dirai, w. Jagannathpur, e. Sunamganj, s. Chhatak, n.-w. Sylhet Sadar, n. Srimangal, w. Maulvi Bazar, n.-w. Rajnagar, e. Balaganj, n. Fenchuganj, s. Golapganj, s.-w. Beani Bazar, w. Barlekha, & n.-e. Kulaura.*

This large unit is in four parts, thinly connected. The eastern rim of the Haor Basin forms the largest part. To the east of it are the lowlands around Hail Haor and Hakaluki Haor in the Kusiyara basin. With comparatively less flooding than in Unit 58, B. Aman (43) occupies slightly more area than Boro (51) but since much of the latter crop is HYV it provides a bigger harvest. Some Aus (12) is grown mixed with B. Aman. Jute (0.5) is a minor crop. Main Rabi crops are Mustard (5), Chillies (0.5), Tobacco (0.5), Sweet Potato (0.5) and Linseed (0.25). The Haor and river fisheries are important.

N.C.A 75 percent : G.C.A. 107 percent.

Map 13.3


GROSS CULTIVATED AREA
Forest
Below 150%
151-175%
176-199%
200 & above
90°E
92°E
26°N
24°N
22°N
BAY OF BENGAL
SCALE
0 20 40 60 80 100 MILES
0 20 40 60 80 100 120 KILOMETERS

SYLHET PLAINS

60.(E2) *Zakiganj, Kanairghat, n. Jaintiapur, s. Gowainghat & n. Beani Bazar.*

This is the lower part of the Sylhet plains. Most of this area used to be swampy, with grasslands and Ekra reed beds, but much of it has been converted to cultivated land. Broadcast Aman (82) is the major crop. Aus (45) is usually grown mixed with it. Boro (14) is a minor crop. A little Transplanted Aman (2) is grown on the higher levees. Rabi crops incloude Mustard (2), Linseed (2), Mash (1), Chillies (0.5), Sweet Potato (0.5), and Potato (0.5). Homestead groves contain a lot of Betelnut (1).

N.C.A. 65 percent : G.C.A. 105 percent.

61. (E2) *Biswanath, Sylhet Sadar (except the n.-w.), n. and e. Golapganj, w. Balaganj, e. Maulvi Bazar, s.-w. Rajnagar, w. Kulaura, Kamalganj (except s.-e.), s. Srimangal, w. Bahubal, Habiganj, s. Nabiganj, e. Jagannathpur, a central strip in Chunarughat (Khowai valley), Madhabpur.*

This string of intermediate level land forms the high plains of Sylhet. T. Aman is the dominant crop (78), with a lot of Aus (40) preceding it. Boro (35) cultivation has increased. Jute (3) has remained a minor crop. Along the rivers some Sugarcane (1) and Betelleaf (0.5) are cultivated. Rabi crops include Chillies (1), Mustard (0.75), Potato (0.5) and Tobacco (0.5). Around the homesteads some Betelnut (0.5) and Patipata (0.25) are grown.

N.C.A. 80 percent : G.C.A. 161 percent.

SYLHET HILLS & AKHAURA TERRACE

62.(E11) *The Tila areas of Sylhet Sadar, Gowainghat, Chhatak, Golapganj, Beani Bazar, Barlekha, Kulaura, Fenchuganj, Rajnagar,*

Moulvi Bazar, Kamalganj, Srimangal, Bahubal, Chunarught, Madhabpur, a small portion of e. Brahmanbaria; & the Meghalaya foothills in Jaintiapur & Kanairghat:

This CA Unit consists of the Sylhet tila ranges and the few intrusions of the rocky Meghalaya mountains. In many places the Sylhet high plains and tila ranges form a complex pattern. On the hills and in the valleys within the ranges 25% of the area is forested, and another 25% is covered by scrub. Of the cultivated area nearly half is under Tea (35). There is a small amount of Coffee (0.25), and an increasing amount of Rubber (0.75). In the valleys Aus (29), T. Aman (10), Jackfruit (3), Betelleaf (1), Potato (1), Chillies (0.5) and Tobacco (0.25) are grown. There are Pineapple (10) gardens and Turmeric (2), Tangerine (2), Lichu (05), orchards on the tila slopes. Bamboo (18) is protected over large areas and often cultivated for the requirement of the tea gardens and are outside the forested areas.

N.C.A. 55 percent : G.C.A. 114 percent.

63. *Eastern parts of Brahmanbaria, and Akhaura, a northern strip in Kasba & a small bit in Madhabpur.*

This small terrace area is similar to the Madhupur Terrace and probably formed a part of it in earlier times. Aus (80) is the main crop, followed by a variety of Rabi vegetables (20). T. Aman (15) and Boro (5) are grown in the valleys. Jackfruit (10) is a major crop.

N.C.A. 75 percent : G.C.A. 130 percent.

UPPER MEGHNA FLOOD PLAIN

64. (C7/E3) *Bhairab Bazar, eastern Kuliarchar & Baijitpur.*

This area is distinctive in that Groundnut (8) is a major Rabi crop, even though its cultivation declined in the early 1970's due to marketing and processing problems. Both Aus (45) and Broadcast Aman (49) are grown. With the growth of low-lift pump irrigation over 55% of the NCA is irrigated in the dry season and HYV Boro (45) is now the

major harvest. Other crops include Jute (9), Mash (5), Sweet Potato (5), Mustard (2), Wheat (2), Onion (1) and Tobacco (1). River fisheries are very important.

N.C.A. 80 percent : G.C.A. 145 percent.

65.(E6) *Banchharampur, Homna, n. Nabinagar, Brahmanbaria, s. Nasirnagar, w. Sarail, Daukdandi, Gazaria, Matlab Bazar (west of Gumti river), northern Chandpur, w. Hajiganj.*

This is the low left bank floodplain of the Meghna. Broadcast Aman (72) is the main rice crop, often grown mixed Aus (26). Over 40% of the NCA is irrigated in the dry season. Boro (15) used to be a minor crop, but because all of it is HYV it now yields the largest rice harvest. The proportion of the NCA under Jute (10) declined substantially in the past 15 years. Wheat (22) has become the major Rabi crop. Other Rabi crops are Mustard (10), Khesari (3), Mash (3), Potato (3), Sweet Potato (3), Chillies (2), various Vegetables (2), Tobacco (1), Masur (1), Sesame (1) and Onion and Garlic (0.5). A little Sugarcane (0.5) is grown on the higher levees. Chilli and Potato cultivation increases southwards. River fishing is important.

N.C.A. 80 percent : G.C.A. 152 percent.

66.(C8a) *Fatullah, Narayanganj, Sonargaon, Araihazar, eastern Rupganj & s.-e. Tejgaon.*

This is the low right bank floodplain of the Meghna before its confluence with the Dholeswari. Though similar to CA Unit 65 in some respects, much less Jute (10) is gorwn. B. Aman (52) is the major crop along the Meghna, but Boro (25) provides the main rice harvest along the Sitalakkha river. Within the poldered area of the Dhaka-Narayanganj-Demra (DND) Project T. Aman (10) has been introduced. Aus (62) is grown by itself or mixed with B. Aman in the DND area and on raised plots near Sonargaon. Wheat (10) and Potato (7) have become major crops. The Rabi cropping pattern includes Khesari (2), Sesame (2), Sweet Potato (2), various Vegetables (2), Barley (1), Gram (1), Masur (1), Onion and Garlic (1), Kaun (0.25) and Cheena (0.25). River fishing is very important.

N.C.A. 80 percent : G.C.A. 140 percent.

ACTIVE DELTA

67.(SW1/C12/C1) *Char areas of Munshiganj, Matlab Bazar, Chandpur, Char Bhadrasan, Shibchar, Janjira, Naria, Bhedarganj, Gosairhat, Hijla and Mehendiganj.*

This CA unit comprises of the newly formed river islands and riverside accretions in the lower Meghna and Padma rivers. On these chars and diaras Aus (40) and Broadcast Aman (60) are often grown mixed. Jute (8) is the major cash crop. After the floods recede Khesari (10), Cheena (5) and Mustard (5) are sown. Mash (5), Vegetables (2), Masur (2), Gram (2), Mung (1), Linseed (1) and Tobacco (0.5). The raised homesteads are thickly surrounded by Bananas (2). There are large stretches of bare sand or sandy soils with grass cover. River fishing is almost as important as agriculture.

N.C.A. 50 percent : G.C.A. 134 percent.

68. (SW2) *Muladi, Mehendiganj, Hijla & eastern Barisal.*

The islands in this area have broken up and reformed several times over the last fifty years. However, there are cores of intermediate-level land around which the islands reform. The major crops the T. Aman (76), Aus (26), Broadcast Aman (10), Jute (5), Chillies (5) and Khesari (5). Sugarcane (3), Betelnut (2), The Rabi crops include Sweet Potato (2), Masur (2), Linseed (0.5) and Tobacco (0.5) is a minor crop. Around the homesteads Vegetables and Spices (3) Coconut (0.5), Mango (0.5) and Banana (0.5) are grown. River fishing is important.

N.C.A. 70 percent : G.C.A. 144 percent.

69.(SW8) *Bhola, Daulatkandi, Borhanuddin, northern Lalmohan & Tajumuddin (except Monpura islands).*

This CA unit covers most of the Bhola island. Much of this area is an intermediate-level stable island, but falls within the active delta as there has been diluvion in the east and accretions in the north-west. The whole island is affected by the movements of the lower Meghna Channel. Betelnut (12), Chillies (5) and Sesame (5) are the main cash crops.

T. Aman (83), Aus (20), Jute (12), Boro (10), Khesari (10), Mung (7), Gram (6), Masur (5), Sugarcane (2), Potato (0.5), Onion and Garlic (0.25), Betelleaf (0.25) and Tobacco (0.25) are also cultivated. River fisheries are important.

N.C.A. 80 percent : G.C.A. 183 percent.

70. (SW9/E10) *Hatiya, Monpura islands, s. Lalmohan, Char Fasion & islands to the south of Galachipa.*

T. Aman (97) is the only crop grown over large stretches. However, over much of the year the flow of the Meghna enables the land to be cultivated to the waters edge. Other crops include Aus (24), Mustard (5), Khesari (4), Mung (3), Chillies (2), Sesame (1), Betelnut (0.5), Coconut (0.5), Banana (0.5), Khejur (0.5) and Potato (0.25). Khejur is plentiful along the sea-shore where it thrives on the sandy soil. Fishing is an important occupation.

N.C.A. 80 percent : G.C.A. 140 percent.

71. (E10) *Sandwip.*

On this fertile island Transplanted Aman (95), Aus (78), Khesari (10), Vegetables and Spices (7), Mung (3), Mustard (2), Betelnut (2), Chillies (2), Jute (1), Coconut (0.5), Banana (0.5), Betelleaf (0.5), Sesame (0.5), Onion and Garlic (0.5) Mango (0.5), and Sugarcane (0.5) are cultivated. This island grows much less Coconut and Betelnut than the mainland areas of Noakhali and Barisal, and in this respect it is more like the northern coast of Chittagong (CA Unit 82). Fishing is an important occupation.

N.C.A. 90 percent : G.C.A. 206 percent.

72. (E10) *Southern Sudharam & southern Companiganj.*

This is the new Char-land to the south of Noakhali. The soils here are slightly calcareous silts. Large areas are still below high tide level. On the higher parts and in sections protected by embankments there is virtual monoculture of T. Aman (98). There is very little Aus (7). Some Khesari (7), Masur (5), Gram (3), Wheat (2), Vegetables (2), Mung (1), Potato (1).

Onion and Garlic (0.5), are grown after Aus crop. On raised plots and around homesteads vegetables. Spices (1), some Betelnut and Banana are grown.

N.C.A. 70 percent : G.C.A. 127 percent.

73. (E10) *Ramgati*

This CA Unit used to be an island. In the 1960's became firmly connected to the mainland through accretion around Crossdam No.1. T. Aman (95), Aus (49), Khesari (7), Mung (3), Chillies (3), Vegetables and Spices (3), Betelnut (2), Jute (1), and Khejur (0.25) are the main crops. This CA Unit is similar to the CA Unit (80) immediately to the north, except that here Jute is grown. There are no large Betelnut gardens. River fishing is an important occupation.

N.C.A. 90 percent : G.C.A. 167 percent.

COMILLA - NOAKHALI PLAINS

74.(E4) *Eastern Sarail, e. Brahmanbria and n. Kasba.*

This is the Titas basin. Aus (27) is sown mixed with B. Aman (77). Jute (12), Boro (10), and T. Aman (5) are the other major crops. Less Jute but more Aus and Boro are grown than in the Meghna floodplain to the west (CA unit 62). Other crops include Khesari (3), Mustard (3), Mash (2), Masur (1), Chillies (1), Potato (1), Tobacco (1), Sugarcane (0.5), Banana (0.5) and Sesume (0.5). Bil and river fisheries are of local importance.

N.C.A. 80 percent : G.C.A. 118 percent.

75. (E4) *Debidwar, Muradnagar, s. Nabinagar, w. Burichang & n. Chandina.*

This is an area of mixed shallowly and deeply flooded land, differing in its cropping pattern from Unit 74 by growing more Aus (51), less Jute (6), and both Broadcast Aman (40) and Transplanted Aman (52). Boro (33) is a major crop in the eastern part, whereas Wheat (15) has become an important component of the cropping pattern all over. Other crops include

Vegetables and Spices (5), Khesari (4), Mash (3), Potato (2), Mustard (2), Masur (1), Tobacco (1),Chillies (1), Mung (0.5) and Mango (0.5). Bamboo (1) is fairly common. There are some tank fisheries.

N.C.A. 80 percent : G.C.A. 190 percent.

76.(E4) *Barura, southern Chandina, western Comilla, northern Laksham & n.-w. Chouddagram.*

This unit has both shallowly flooded and intermediate-level land. Compared to unit 75 the proportion of T. Aman (76) and Aus (63) increases and B. Aman (7) decreases. Boro (26) is a very important crop, especially in Comilla Kotwali Upazila. Wheat (5) cultivation has gained ground. Betelnut (3) is a major cash crop and Jute (5) decreases. Other crops include Khesari (2), various Vegetables (2), Chillies (1), Sugarcane (0.5) and Masur (0.5). Bamboo (1) is also cultivated. Tank fisheries are plentiful.

N.C.A. 85 percent : G.C.A. 190 percent.

77.(E4) *Kachua, n. Hajiganj, n. Shahrasti & s.-e. Matlab Bazar.*

An area of medium to deep flooding. Aus (30) is grown mixed with B. Aman (71). Both Boro (13) and Wheat (10) cultivation is increasing. A larger proportion of land is under Jute (12) as compared to adjacent Unit 76. Since Betelnut (3) has to be grown on man-made raised plots its proportion in the cropping pattern is much less than in immediately adjacent areas to the south and west. Other crops include Vegetables and Spices (5), Mung (3), Khesari (3), Sesame (2) and Chillies (1). Some Bamboo (0.5) is grown.

N.C.A. 85 percent : G.C.A. 137 percent.

78. (E4) *Most of Raipur & Faridganj, s.-e. Chandpur, e. Haimchar, w. Ramganj & n.-w. Lakshmipur.*

This fertile area, most of which is within the Chandpur Irrigation Project, has seven major crops: HYV Aman (91), HYV Boro (64), Aus (22), Chillies (7), Jute (5), Betelnut (4) and Coconut (2). There is a considerable amount of man-made raised plots where Betelnut and Chillies are grown. Some Wheat (6) is grown. Other crops include various Vegetables (6), Khesari (5), Mustard (3), Masur (2), Sugarcane (1).

Gram (1), Mash (1), Sweet Potato (1), Potato (1), and Onion and Garlic (0.5). River and tank fisheries are important. Tank fisheries have increased very considerably due to the extension work of the Raipur Fish Farm.

N.C.A. 85 percent : G.C.A. 220 percent.

79. (E4/E10) *E. Lakshmipur, e. Ramganj, most of Begumganj, s. parts of Hajiganj, Shahrasti & Laksham, s. Nangalkot, w. strip of Chouddogram & w. Senbag.*

This area has some features of the coastal areas and some of the interior. Much of it is medium low land and in recent years waterlogging has increased. The major cash crops are Betelnut (6), Jute (3) and Chillies (3). B. Aman (57) and Aus (25) are usually grown mixed, except where Aus is rotated with Chillies. Boro (60) has become an important crop even though dry season water supply is uncertain. Other crops include Khesari (5), Vegetables and Spices (4), Coconut (2) and Mung (2). Bamboo is sparse. Fish tanks are abundant.

N.C.A. 85 percent : G.C.A. 167 percent.

80.(E10) *Southern Lakshmipur, southern Sudharam, northern Companiganj & southern Sonagazi.*

This strip is transitional between the coastal islands and the interior. Most of the land is intermediate-level. Aus (60), Boro (4), precedes T. Aman (70) over most of the area. Some Broadcast Aman (11) is also cultivated. Here, too, Betelnut (6) is the major cash crop, but Jute (1) becomes a minor crop. Other crops include Khesari (10), Chillies (3), Musur (0.5), Mung (0.5), Sesame (0.5), Sweet Potato (0.5) and Betelleaf (0.25).

N.C.A. 85 percent : G.C.A. 172 percent.

81.(E4/5) *Feni, Dagonbhuiya, e. Senbag, n. Sonagazi.*

Double-cropped rice fields are very extensive here, mainly with Aus (59) preceding Transplanted Aman (81). Boro (14) cultivation has increased, along the Silonia (Little Feni) river and along the Muhuri river (due to the Muhuri Irrigation Project). Cash crops are

Betelnut (2), Chillies (2) and Jute (1), none of which are as plentiful as further west. Other crops include Khesari (5), Mash (3), Vegetables and Spices (3), Ginger (1), Turmeric (1), Masur (1), Motor (field peas) (0.5), Potato (0.5) and some Tobacco. Homesteads have Mango (0.5), Coconut (0.25) and some Bamboo (0.25). Tank fisheries are plentiful.

N.C.A. 85 per cent : G.C.A. 178 per cent

CHITTAGONG SUB-REGION & TRIPURA PIEDMONT

82.(E5/E8) *E. Comilla, s. Burichang, parts of e. Chauddogram, Parshuram, Chhagalnaiya, Mirsarai, Sitakund, Double Mooring & Panchlais.*

This long unit follows the line of hills from Kasba down to Chittagong City. Rainfall averages over 100 inches. Aus (55) is followed by T. Aman (86). Most of the Aus is grown early and its harvest overlaps that of Boro (13). Sugarcane (3) is grown along hill streams. Other crops include Vegetables (5), Chillies (1), Khesari (1), Potato (1), Masur (1), Mash (1), Mung (1), Mustard (0.5), Jute (0.25), Betelnut (0.25) and Banana (0.25). The insignificance of Jute is in contrast to adjacent areas in the Comilla-Noakhali plains. Market gardening of vegetables is important from Mirsarai southwards.

N.C.A. 80 per cent : G.C.A. 176 per cent.

83. (E8/E11) *N. Fatikchari, Feni river valley in Ramgarh, small valleys in Chandraghona, Manikchari, Sealbukka & Ichhamati.*

This unit is consists of the hill river valleys and re-entrants along the Chittagong piedmont. Tea (6) is grown in estates along the valley sides. Transplanted Aman (75), Aus (40), and Boro (15) are grown in valley bottoms. Other crops include Chillies (2), various Vegetable (2), Mung (2), Mustard (2), Sugarcane (1), and Potato (1). Bamboo (6) is abundant along fields and the homesteads skirting the hillocks. There are rubber (3) plantations in the foothills.

N.C.A. 70 per cent : G.C.A. 155 per cent.

84.(E8) *Hathazari, Rauzan (except a strip along the Karnafuli), & northern Rangunia.*

Due to the high rainfall Aus (52) cultivation is as extensive as in Unit 82 It is followed by T. Aman (82) and later by Boro (30). Vegetables (4), mainly for Chittagong city and Chillies (3), are the main cash crops. Other crops are Mung (3), Turmeric (2), Potato (1), Sugarcane (0.5) and Coconut (0.5). Rubber (5) plantations have been established in th e foothills.

N.C.A. 80 per cent : G.C.A. 182 per cent.

85. (E8) *Boalkhali, Rauzan & Rangunia along the Karnafuli river.*

The distinctive crop here is Betelnut (4). Aus (27) cultivation is less important than CA Unit 84 due to early floods. It is followed by T. Aman (74). With the development of irrigation facilities. Boro (25) cultivation has increased very considerably in the past two decades. Other crops include Wheat (5), Vegetables (5), Mung (4), Mustard (4), Chillies (4), Mash (4), Kachu (1), and Banana (0.25). River fisheries a'e important.

N.C.A. 85 per cent : G.C.A. 164 percent.

86. (E8) *S. Rangunia, e. & c. Patiya & Satkania.*

Rice cultivation pattern here is similar to that of CA Unit 82, but with a lot more of Boro (56), moderate amount of Aus (30) followed by T. Aman (86). Wheat (5), Mustard (5), Mung (2), Masur (2), Barley (2). Betelnut (0.5) decreases markedly in comparison to CA Unit 85 to the north. Along the hills there are some Tea (3) gardens and many Betelleaf (0.25) Plots. Vegetables (6) are grown extensively around Patiya, and Dohazari, Guava (1) around Kanchannagar, and Tobacco (1) mainly in the Sangu floodplain. Other crops are Chillies (3), Potato (3), Mash (1) and Sugarcane (0.5).

N.C.A. 80 per cent : G.C.A. 205 percent.

87. (E8) *Anwara & western Patiya.*

This small area grows little else besides rice. Nearly 75% of the land is irrigated in the dry season. Boro (71) and Aus (7) are followed by Transplanted Aman (87). Other crops include Mash (2), Chillies (2), Coconut (2), Mustard (1), Vegetables (1), Wheat (1), Ginger (1), Turmeric (1) and Betelnut (1). River and fore-shore fisheries are exploited.

N.C.A. 80 per cent : G.C.A. 179 per cent.

88.(E8) *Banshkhali & north-central Chakaria.*

Though on the coast, this area is different from nearby coastal islands because of the high proportion of Boro (30) and Aus (28), irrigated mainly by damming the hill streams. Sugarcane (0.5) and Betelleaf (0.5) are also grown along these streams. T. Aman (91) is, of course, the major crop. The cropping-pattern includes Chillies (2), Potato (1), various Vegetables (1), Coconut (1), Ginger (1), Turmeric (1) Mung (0.5), and Tobacco (0.25). Coastal fishing by stake nets is extensive.

N.C.A. 80 per cent : G.C.A. 158 per cent.

89. (E8) *Kutubdia, western and south - western Chakaria, north-western Cox's Bazar, Matarbari island, w. coast of Moheshkhali, e. & s. Teknaf.*

This area has little Aus (23) or Boro (10), and T. Aman (96) is the only crop in many areas. Very little vegetables (1), and fruit are grown around the homesteads. There are extensive salt beds. Along the Moiskhal channel and in the Chakaria Sundarban area. There are over 25,000 hectare of Shrimp farms. Sea fishing and salt making area also important occupations along the Moiskhali channel.

N.C.A. 70 per cent : G.C.A. 136 per cent.

90.(E8/E9) *Cox's Bazar, w. Ramu, south-east Moheshkhali & Chakaria (except north w.est & south-west).*

Boro (72) cultivation has increased very rapidly in the valleys of the Matamori, Idgonj Chhara and Bagkhali rivers and also along the small hill streams. In many areas it has supplanted the traditional early Aus (5).

These crops asre followed by T. Aman (84). Main cash crops are Betelleaf (3), Chillies (3), Tobacco (3) in that order. Other crops include Beansand, other Vegetables (5), Mash (2), Sugarcane (1) and Potato (1). Bamboo (1) is plentiful.

N.C.A. 80 per cent : G.C.A. 182 per cent.

91.(E11) *Ukhia, eastern Ramu, Bagkhali valley in Naikhongchhari, western & northern Teknaf.*

This is an area of alternating hills and valleys, with most of the cultivated land in the Reju valley and the Naaf river plain. The cropping-pattern is T. Aman (88), Boro (37), Aus (9), Chillies (3), Betelleaf (2), Tobacco (1), Turmeric (1), Ginger (1), Betelnut (1), various Vegetables (0.5), and Potato (0.25). Aus and Boro cultivation declines from Ukhia south-wards, and Betelleaf is of increasing importance. A fair amount of Coconut (0.5) is grown at Baharchhara on the coast. Bamboo (2) is abundant around the homesteads. There is a large rubber (5) plantation near Ramu.

N.C.A. 70 per cent : G.C.A. 150 per cent.

92. (E11) *Jinjira Island.*

On this coral island the cropping-pattern is T. Aman (95), Onion (20) and Coconut (5). This CA unit is very small, but in physical and ecological environment it is so distinct from any other part of the country that it justifiably forms a separate unit.

N.C.A. 65 per cent : G.C.A. 120 per cent

93.(E11) *The valleys of Kasalong, Maini, Chengi, Rinkheong, Sangu & Matamori.*

There are patches of cultivation in these valleys. The largest of these is the deforested Pablakhali area in Kasalong valley. Field preparation is by plough or hoe. The cropping-pattern in these valley rice lands consists of Transplanted Aman (67), Aus (49), Mustard (18), Tobacco (6), Sesame (5), Chillies (2), Pineapple (1), Banana (1), Cashew (0.5), Termeric (0.5), Potato (0.5), Sugarcane (0.25) and Ginger (0.25).

N.C.A. 60 per cent : G.C.A. 156 per cent.

94.(E11) *S - e. Rangamati, w. Barkal & n. Chandraghona.*

On the lower hills south-east of the Kaptai Lake there are patches of cultivation, interspersed with scrub-land and high forest. The cropping pattern here is based on horticulture: Banana (50), Pineapple (8) and Cashewnut (1). A little hill Aus (21) is grown by Jhum (Swidden) and there are small plots of a number of crops (15) grown mixed together such as Vegetables, Spices, Maize and Cotton near the homesteads. Fishing in the Kaptai lake is an important occupation.

N.C.A. 30 percent (excluding the lake) : G.C.A. 100 percent.

95. (E11) *Mountain ranges of the Hill Tracts and also low hills away from Kaptai Lake.*

Most of the cultivation on the steep slopes is through Jhum (Swidden). The main crops are Hill Aus (66), followed by other Jhum crops (33) such as Sesamum, Tobacco, Spices, Maize, Cotton and various Vegetables.

N.C.A. 20 percent : G.C.A. 100 percent.

Chapter 14

Transport & Communications

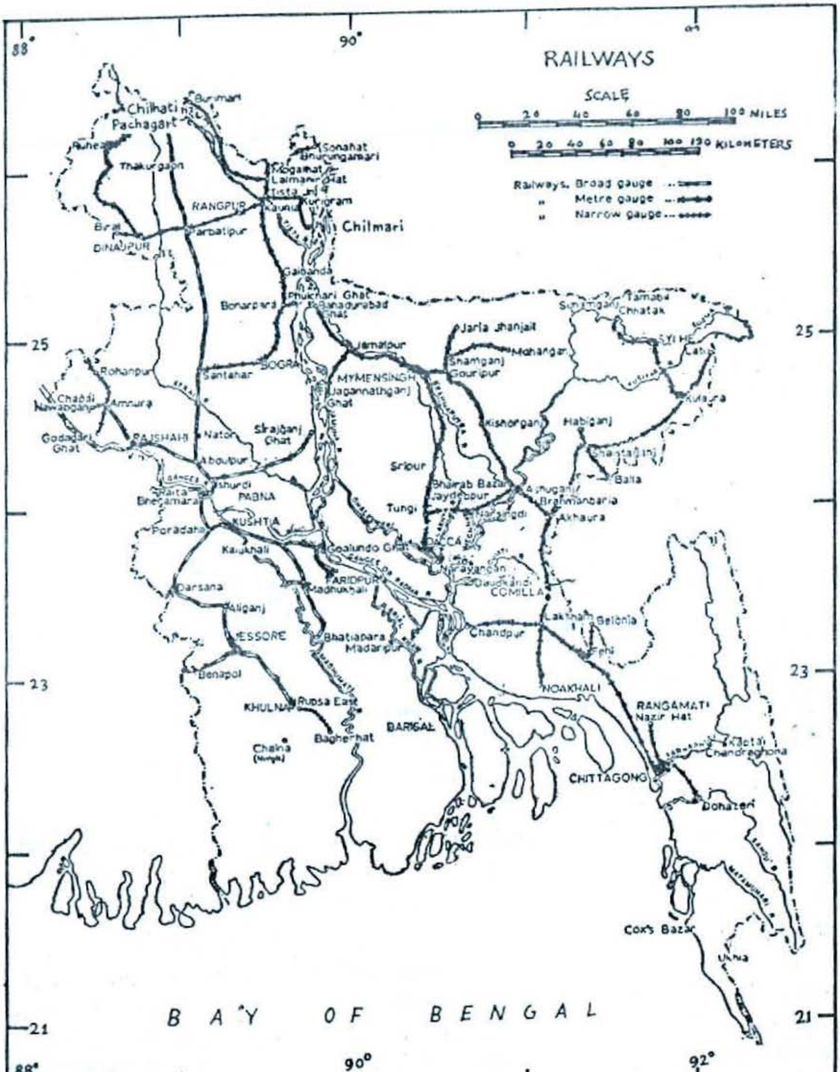
The transport and communications system seriously diserupted during the independence struggle of 1971 and was largely resvored by 1974. Difficulty of communications has been one of the major factors in retarding economic growth. The waterways are a great asset but slow and inadequate transport has been unable to develop them fully. Roads and railways have been hampered by the deltaic nature of the land. The main obstacle to the improvement of communications and transport has however been the paucity of investment. With greater investment in infrastructure, the communications system and the availability of transport should not be a serious constraint to development.

RAILWAYS

The Bangladesh Railways is a Government owned organisation. There are 2746 kilometers. of railways, with trains operating over 63 routes (Map 14. 1) on two different gauges - broad and metre. The broad gauge, 1.67 metre wide, totals 924 Kilometres ; the metre gauge, one metre wide, totals 1822 km. The broad gauge main line is from Khulna to Chilahati, branching out to Benapol, Darsana, Ratia, Goalundo Ghat, Faridpur, Bhatiapara and Kumarkhali Ghats and Sirajganj. The traffic is heaviest on the lines from Khulna to Goalundo Ghat, Khulna to Sirajganj and Sirajganj to Rajshahi. Ishurdi is the focus of most of the traffic. Paksey, nearby, is the centre for the Railway's commercial and transportation district which covers the whole Broad Gauge System. Under Paksey, too, are the metre gauge lines from Amnura to Rohanpur, Chapai Nawabganj and Godagari Ghat, and the narrow gauge line from Rupsa East to Bagerhat. In the North Bengal there is a system of metre gauge lines controlled from Lalmonirhat. These lines run from Lalmonirhat to Burimari, to Moghalhat (and across India to a cut-off section from Bhurungamari to Sonahat), to Kurigram and Chilmari, to Ruhea, Biral and to Santahar, with a side line to Fulchhari Ghat, where there is a ferry which connects this system to the to the Eastern and Central Regions, at Bahadurabad Ghat.

The main metre gauge system is in the Eastern and Central Regions. It is divided between the two railway commercial districts of Dhaka and Pahartali. Railway movement in this respect is controlled from Bhairab Bazaar and Chittagong respectively. The Bhairab Bazaar (Dhaka) Sector includes the lines from Narayanganj to Jagannathganj Ghat, from Jamalpur

Map 14.1


RAILWAYS
SCALE
0 20 40 60 80 100 MILES
0 20 40 60 80 100 120 KILOMETERS
Railways. Broad gauge
Metre gauge
Narrow gauge
Chilhati
Pachagart
Burimari
Thakurgaon
Sonahat
RANGPUR
Kurigram
Chilmari
Parbatipur
DINAJPUR
Gaibanda
Bonarpara
Bahadurabad Ghat
Jamalpur
Jarla Jhanjail
Mohanganj
Shamganj
Gouripur
SYLHET
Chhatak
Kulaura
BOGRA
Santahar
Rohanpur
Amnura
MYMENSINGH
Jagannathganj Ghat
Kishorganj
Habiganj
Shaistaganj
Balla
Godagari Ghat
RAJSHAHI
Nator
Sirajganj Ghat
Abdulpur
Sripur
Bhairab Bazar
Joydebpur
Ishurdi
PABNA
Tungi
Brahmanbaria
Akhaura
Poradaha
KUSHTIA
Goalundo Ghat
DACCA
Narayanganj
FARIDPUR
Madhukhali
Daudkandi
COMILLA
Darsana
Kaliganj
JESSORE
Bhatiapara
Madaripur
Chandpur
Laksham
Belonia
Feni
Benapol
NOAKHALI
KHULNA
Rupsa East
BARISAL
RANGAMATI
Nazir Hat
Chalna
Bagherhat
CHITTAGONG
Chandraghona
Dohazari
Cox's Bazar
B A Y O F B E N G A L
88°
90°
92°
25
23
21

to Bahadurabad Ghat, from Tongi to Chhatak via Akhaura and Kulaura, from Kulaura to Latu, from Habiganj to Balia, from Bhairab Bazaar to Mymensingh, from Gauripur to Mohanganj and from Shamganj to Jharia Jhanjail. South of Akhaura, the lines Chittagong-Akhaura, Laksham-Chandpur, Laksham-Noakhali, Feni-Belonia, Chittagong-Nazirhat and Chittagong-Dohazari, are controlled from Chittagong (Pahartali).

In most areas, the railways adequately serves an area of 8 km. on either side of it. It can, therefore, be surmised that an area of about 43,000 sqkm is well connected by the railways. There are 417 stations in all, 30 of which are railway junctions. The railways have been carrying a steadily increasing amount of goods and traffic since 1947. The amount of goods carried (net freight) rose from 366 million ton-miles in 1947-48 to 1,062 million ton-miles in 1962-63. Thereafter the tonnage seems to have declined (Table 14.1). There are three classes of carriages : Air-Conditioned, First, and Second. More than 100 diesel locomotives operate on the main routes and it is planned to gradually turn over completely from steam to diesel. The average speed of the trains, other than some of the non-stop Inter-City trains, remains rather slow. Including the time of halting at stations, the average speed of Express Trains is 20 m.p.h. and of passenger trains 15 m.p.h. The fastest trains in the East Zone (on meter gauge) is known as the "Mahanagar" which started operating from December 05, 1985 between Dhaka and Chittagong. It covers a distance of 320 km between the two cities in 5 hours and 50 minutes. In the West Zone, the fastest train (on the Broad Gauge) is the "Shimanta". It began operating in April 1988 between Saidpur and Khulna, a distance of 394 km which is covered in nine and a half hours. It is not uncommon for most trains to run an hour or more late. The most punctual of all trains are the non-stop Inter-City trains that run on the Dhaka-Chittagong route. The river ferries at Jagannathganj-Sirajganj and Bahadurabad-Fulchhari are maintained by the Railways. So are the large bridges at Paksey, Bhairab and Mymensingh, and hundreds of smaller bridges and culverts.

There are 7 stations through which one may pass to be connected with the Indian Railways System. They are Benapole, Biral, Burimari, Chilahati, Darsana, Latu, and Moghalhat. By far the major part of the traffic passing to and from India is via Darsana.

Two major repair workshops are operated, at Saidpur and at Pahartali, a suburb of Chittagong. Saidpur, the sixth biggest town in Bangladesh, is a creation of the Railways. Formerly it was on the important Calcutta-Jalpaiguri route and was a somewhat livelier place. At present it has the major workshop for all the broad gauge lines. Pahartali has the major workshop for all the metre gauge lines. There are minor workshop at Jessore, Ishurdi, Parbatipur, Lalmonirhat, Mymensingh, Dhaka and Akhaura.

Table 14.1

Growth of Route Mileage, Rolling Stock & Traffic of Bangladesh Railway (1969-70 to 1981-82)

Year	Route mileage/ (Km)	Locomo-tives	Coaches	Wagons	Passenger miles/ (Km)	Cargo/ton miles (million)	Revenue per passgr/mile Km (Paisa)	Revenue per ton mile/Km (Paisa)	Net operating income (Million Taka)
1969-70	1776	492	1,671	19,628	-	-	4.89	20.8	(+) 50
1970-71	1776	498	1,657	18,979	-	-	4.94	21.7	(-) 8
1971-72	1776	501	1,639	18,720	-	-	5.08	26.5	(-) 28
1972-73	1786	500	1,674	18,667	1,739	408	5.11	28.0	(+) 11
1973-74	1786	516	1,700	18,573	2,070	368	5.66	30.8	(-) 65
1974-75	1786	419	1,615	17,742	2,523	381	6.69	42.5	(-) 4
1975-76	1786	450	1,531	18,903	2,772	456	7.09	46.1	(+) 11
1976-77	1786	445	1,550	19,005	2,879	435	7.32	52.3	(-) 30
1977-78	1786	420	1,512	18,724	3,110	420	7.46	57.3	(-) 33
1978-79	1786	410	1,631	18,585	3,003	512	9.58	76.9	(+) 29
1979-80	1792	389	1,713	18,454	3,180	522	9.55	81.2	(-) 41
1980-81	1792	410	1,682	19,366	3,229	481	9.52	102.9	(-) 186
1981-82	2884 (Km)	417	1,711	19,898	3,334	516	7.39 (Km)	74.9 (Km)	(-) 27
1982-83	2887 "	410	1,732	20,196	3,994	498	7.33 "	88.3 "	(-) 8
1983-84	2892 "	386	1,701	19,892	-----	---	7.39 "	86.6 "	(-) 336
1984-85	2892 "	288	1,637	19,719	6,031 (Km)	813	8.96 "	95.8 "	(-) 317
1985-86	2818 "	290	1,664	19,629	6,005 "	612	10.00 "	107.5 "	(-) 917
1986-87	2792 "	291	1,744	19,545	6,027 "	503	11.38 "	108.7 "	(-) 903
1987-88	2792 "	291	1,795	19,424	5,365 "	678	12.28 "	116.5 "	(-) 1203
1988-89	2746 "	367	1,787	18,461	5,313 "	666	12.80 "	109.9 "	(-) 741

Source : Statistical Yearbook, 1983-84 , 1990 ; B.B.S. Statistical Pocket Book of Bangladesh, 1982

Over 60,000 persons work for the Bangladesh Railways or are dependent on its ancillary services. Urban areas, especially in the Northern Region, are dependent upon the Railways for a good part of their income.

The major crop, jute, is carried to the inland markets and sea-ports mainly by water transport although the railway system does carry a substantial portion of the raw jute and jute goods trade. For urban areas and the many new industries that have grown up, the railways however are more important.

INLAND WATER TRANSPORT

It is natural that with the large network of rivers, Khals, Dons, Bils, Baors and Haors, communications by waterways should be of great importance. When, in the rainy season, the water level rises six metres or more, and large stretches of rice fields are turned into shallow lakes, there seems to be no means of communications except by water. Indeed, that is so in all the low-lying areas, where homesteads on raised mounds are isolated by one to three metres of water for five months at a stretch. In these areas, there is no going out of the homestead periphery except by boat, unless one wishes to wade or swim. Most ponds overflow or are flooded and there is no definite place for bathing, or for drawing water. Such areas total nearly 52,000 sq.km. People living there have no choice but to go by water. Even in other areas, however, where roads exist, the farmers generally prefer to go by water, for the Khals and Dobas (ditches) penetrate deep into the homestead groves and extend to many places where the muddy uneven paths do not reach. Moreover it is easier to carry goods by boats than to have them bumped along by bullock-carts to the market, or even worse, carry them on one's own head. From May to November the waterways are more busy than all the other forms of communication put together.

It is estimated by the Inland Water Transport Authority (IWTA) that there are 8000 km. of waterways during the rainy season, which shrink to 4000 km. in other seasons. They are probably more extensive than that. Those in which boats of 4 tons or more burden can ply in the rainy season total about 6,500 km. Small boats and dugouts, in the rainy season, can navigate another 18,000 km. The total length of the waterways is, therefore, 24,000 km. (or possibly more), but the length that can be navigated by big country boats is not more than half that much, and the large paddle steamers can operate only on routes totalling about 3,200 km. In summer, before the monsoons, of course, the mileage goes down as the smaller streams dry up and the larger ones throw up sandbanks. It is probably not more than 4,800 km., in all, around March.

The scenary along the larger rivers can be very picturesque indeed. Few have equalled Lovat Fraser's description of river life (Fraser 1911). After seeing the other parts of the sub-continent, he was impressed that " The huge rivers, in places two miles wide even in the dry season, have nothing in common with the bare brown plains of the Deccan, the placid luxuriance of Madras or the burning deserts of Rajputana. They have a charm that never fades. In the faint opalescence of early dawn when the great square-sailed country crafts drift past in dim and ghostly silence, they recall memories of unforgettable hours upon the Nile. The vessel seems to be steaming through the morning mists on some illimitable lake. Even in the full glare of noontide, the abiding beauty of the scene remains undiminished. The steamer traverses a flat green land and swings past village after village screened by dense foilage. The shallow side creeks are full of quaint craft. The little shore boats dancing swiftly across the glittering waters are like sampans : the vessels floating slowly down the broad bosom of the stream are like a fleet of junks. Immense unwidely flats, laden with jute, glide slowly by. In winter there is a keen, fresh, wholesome breeze; and even to those who think they know India, the journey is so picturesque and unfamiliar, that is like a voyage into the unknown."

Many different types of boats and dugouts are used, for transporting farm produce, fishing or transporting passengers. The fishing boats have been described in Chapter 12. For trade and travel there are thirty types of boats, dugouts, and coracles most commonly used. The Gach is just dugout, made from the trunk of a big tree. The Kunda of Comilla-Noakhali unlike the fishing Kunda, has pent roofs of matting, but is also a dugout. The Sharanga is one of the commonest boats. It is flat-bottomed, with a pointed prow and rounded stern, and is made in two sizes, the smaller 4.5 metre long by 1 metre wide and the larger 15 metre long by 1.5 metre wide. It has a steering paddle similar to an oar fixed at the stern. The large cargo boats have rudders tied to their stern. The split matting which often forms the deck of the boats is usually detachable in the middle. When planks are used they are not nailed together, it is necessary to remove part of the deck to bail out water from the hold at least once a week.

The Khawai of Sylhet, and the Patam, Tapatua and Morkush are very much like the Sharanga. The Kunda of Sunamganj and North-Sylhet districts, is merely a flat-bottomed canoe of very shallow draught. The Lakhai Paller of Habiganj is a large boat with a distinct prow, capable of carrying a burden of ten tons or more. Most of the large boats built in Sylhet or northern Brahmanbaria district and carrying on inter-district trade are known as Lakhai. The Paller is common to most riverine areas : it is broad and low built for carrying merchandise. The Noakhali Paller is fairly distinctive. The Kosha, Bhedi, Janga, Malungi and Ulakh are all very nearly like each other in shape and size. They have bluff ends, except for the

Ulakh, which has a pointed bow. The bow in all these boats is lower than the stern. They can carry from five to twenty tons, and require from three to ten oarsmen, who in pulling at the long oars, have to walk on the boats mat roofs (Chhai). How much effort is needed for this can scarcely be realised by those who effortlessly sail past these walking oarsmen in one of the paddle steamers. When the stream is shallow or the current or wind is strongly against them, a few of the crew get out on to the bank and tow the boat along by a long rope (Goon) attached to the top of the mast. Large square sails usually white, but sometimes blue or orange-red, are readily used when there is a favourable breeze. On the Ganges rhomboid top-sails are also fairly common. It is indeed fortunate for the boatsmen that while the river generally flow from north to south, the wind for the major part of the year (May-November) is mainly from the south. The Panshi is another common boat with ornamental prow, and outrigged to give more power to the sails, and is used for carrying passengers or jute. Jute is often laden so high that only a few centimetres of the beam remain above water, but they do not swamp easily. The Chhib boat is of a very neat built. The sides are raised up to form a small cabin which occupies half the boat, and the floor is made of polished planks. The cabin is fitted with a small entrance and large windows. The Bajra (Bundgerow) is like a houseboat; its cabin occupies most of the boat and may be divided into two or three compartments. Both these boats are fairly common in the Central Region especially in Tangail district.

The Bhaol, with a tapering prow and broad-stern, and the Mota, a small tub-like vessel, are put to many uses. Most of the ferry boats are Patani broad-beamed and without a hood. The Ghashi (or Ghazi) and Goyna are graceful boats. The former is a small passenger boat, with a roof (Chhai) covering two-thirds of it, and is often fitted with tiny doors. The Goyna, mainly from Dhaka district is a curved boat, also used for carrying passengers. In many places any passenger boat is called Goyna, but the name is strictly applicable only to the high curved Dhaka Goynas. They are among the longest of boats.

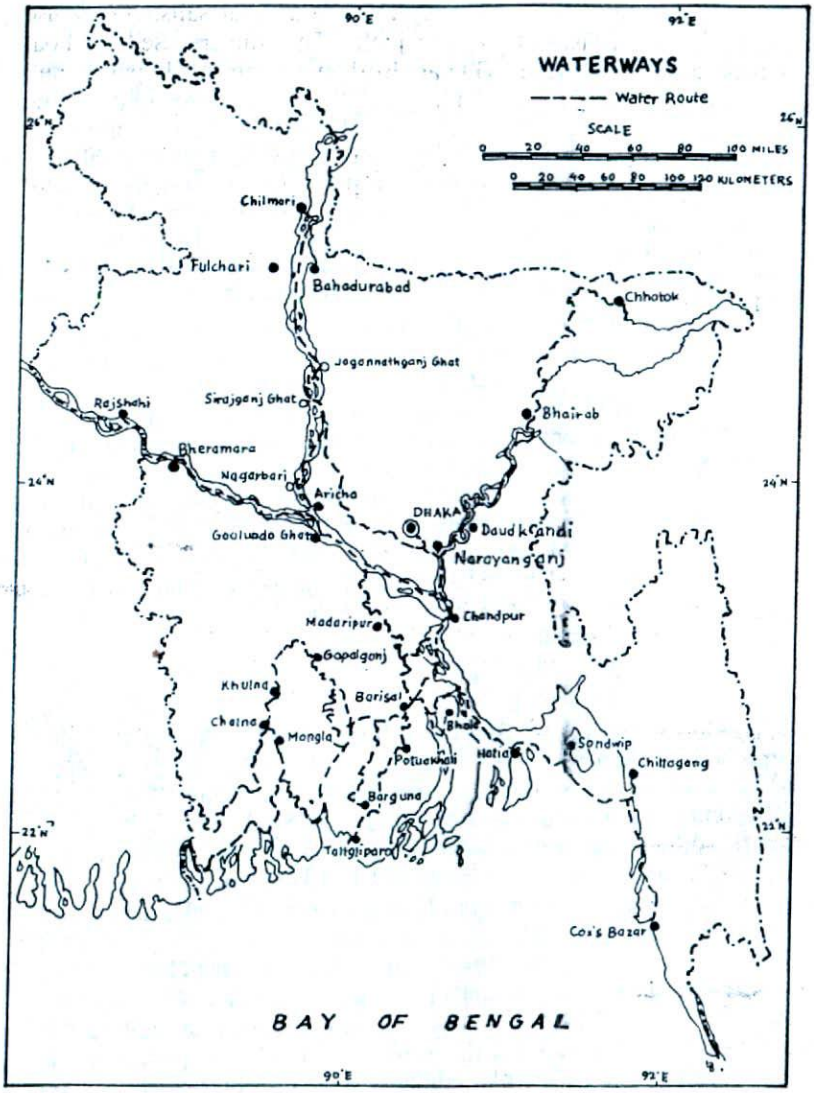
The Dingis on the other hand are among the smallest. They are extensively used for ferrying and for bringing local produce to the Haats. In the Bhar area and in parts of Dhaka and Comilla districts earthenware tubes, called Chari, are used like coracles, to navigate short distances. In the Chittagong region very strong Balam boats with planks sewn together, are still made. These boats are used for fishing or for carrying heavy merchandise along the coasts or in the estuaries. Three other distinctive boats, the Murina, the Golia and the Sampan, are used in Chittagong. The Murina is used mainly for lighterage in the port. The Golia is used for cargo carrying along the coast. The Sampan, a typical Indo-Chinese boat, is also restricted to Chittagong district and the Meghna estuary ; but some go to

Khulna, Barisal and Noakhali for trading. It is extensively used for lighterage, ferrying carrying passengers. Some of them go to the Sundarbans to transport the heavy Sundari logs to markets in Barisal and Faridpur districts and Chandpur. These boats generally triangular sails. A few use square ribbed sails, typical of Chinese junks. The timbers used for boat construction are mainly Jarul, Gamar, Boilam Champa, Chapalish and Telsur. Mango, Koroi, Kamdeb, Uriam and Sundri are also used for the cheaper boats. Oars are made of Jarul or Sundri. Many good Chhib and Bajra boats are made of Teak, but practically none are made of this valuable timber nowadays because of the prohibitive price. In the southern areas of the delta, the wood-cutters carry logs and firewood form the Sunderbans in large open boats known as Baulia. Rafts are also used on these waterways to float merchandise down to the Bazaars. Bamboo for sale are often made into rafts and sailed down the coast to Kutubdia, Moishkhal or Teknaf, where bamboo is scarce, from the upper reaches of the Matamori river.

Jessore, Pabna and Noakhali also have a large number of boats. Surprising contrasts are found in the Boat-density of the districts. Whereas in the low deltaic area of Faridpur district, the number of boats per 1,000 persons is around 45, in the high moribund deltaic area of Kushtia district the corresponding figure is only 2. The Boat-density of Dinajpur district is as low. It is obvious, therefore, that though boats are the chief means of locomotion in the more densely populated parts of Bangladesh, they are of very little importance over considerable areas, e.g., the Piedmont Alluvial Plains, the Barind Tract, the Moribund Delta and the Madhupur Tract. In the hilly areas of the Chittagong Region there are not many boats, but since the valleys are the main lines of communication, and the streams are the easiest routes, water traffic is of special importance.

According to the IWTA, there were 98,000 cargo boats and 183,000 passenger boats in 1982-83. These boats are estimated to have moved nearly 11 million tons of goods in that year (Year-book of 1983-84). During the 1931 Population Census, a boat census was also taken in Bengal. There were then 102,000 boats in the Bangladesh area, excluding Sylhet (Census of India, 1931). During the various District Survey and Settlement Operations, the number of boats in the area now in Bangladesh (excluding Hill Tracts and Sylhet) came to over 600,000. The trend had been for the number of boats to increase, along with the population. In the original Survey and Settlement of Faridpur (Jack 1916), for example, there are were 87,000 boats in that district ; during the Revisional Settlement (Das Gupta 1954), about 30 years later the number of boats had gone up to 129,224 (though the 1931 Census recorded 214,485 boats). It now seems that due to the deterioration of the river system, the growth of road transport and the closure of many rivers through polder embankments, the number of boats on major routes has declined considerably. Even so, country boats account for

Map 14.2


WATERWAYS
Water Route
SCALE
0 20 40 60 80 100 MILES
0 20 40 60 80 100 120 KILOMETERS
90°E
92°E
26°N
24°N
22°N
Chilmari
Fulchari
Bahadurabad
Chhatak
Jagannathganj Ghat
Rajshahi
Sirajganj Ghat
Bhairab
Bheramara
Nagarbari
Aricha
DHAKA
Daudkandi
Goalundo Ghat
Narayanganj
Chandpur
Madaripur
Gopalganj
Khulna
Barisal
Chalna
Mongla
Bhola
Sandwip
Hatia
Potuakhali
Chittagong
Barguna
Taltipara
Cox's Bazar
BAY OF BENGAL

30% of the value added in the Transport, Communication and Storage Sector. The Agriculture Census of 1977 estimated the total number of boats including small Panshis to be 721,000, and the Agriculture Census of 1983 - 84, enumerated 887, 167 boats (Year book 1989) Since 1986 an estimated 60,000 boats have been mechanized using 6-9 HP engines normally used for shallow tubewells.

The core of the organised water transport system is made up of 430 vessels operated under the Bangladesh Inland Water Transport Corporation (BIWTC). These consist of 21 passenger steamers, 26 ferry steamers, 12 tankers, 20 coastal vessels and 157 inland flats including 37 jute barges. These carry a major portion of the kutcha and pucca jute bales to Chalna from the inland river ports, and return with much of the merchandise imported through that port. The organised' (mechanized) water sector moved nearly 8.20 million tons of goods in 1987-88. A fleet of double-decked paddle steamers used to operate on the major inland routes (Map 14.2) but most of the old stately steamers have been scrapped. A bi-weekly fast steamer service, known as the Rocket Service, operates between Khulna and Narayanganj. Inland steamer services call on 97 stations on six routes. These routes are : Narayanganj to Khulna via Chandpur and Barisal; Narayanganj to Goalundo Ghat via Chandpur; Barisal to Charmuguria, near Madaripur; Barisal to Khepupara via Patuakhali; Khulna to Charmuguria (Known as Beel Service); and Dhaka to Manikganj. There is also a weekly service from Chittagong to Barisal, via Shondip, Hatia, Ramgati, Ilshaghat, Patarhat and Bhola.

Since the early 1950s, Motor Launch Services have become popular and in 1986-87 here were an estimated 2446 Launches. They serve 106 stations, with a network of 124 routes. Dhaka, Narayanganj, Khulna and Barisal are the busiest launch stations. Since most of these vessels are top heavy and without adequate life saving devices, launch sinkings are none too rare. During the 1980, the number of steamers and launches has steadily decreased. This is because of the disproportionate large investment in the road system.

The IWTA has classified the river communications system into seven zones, which are :

A - Dhaka,
B - Narayanganj,
C - Barisal,
D - Khulna,
E - Norhtern Zone (formerly Goalundo),
F - Sylhet and
G - Chittagong.

Channel marking with the buoys and channel dredging is also taken care of by the IWTA. They have launched a project to develop the ports of Dhaka, Narayanganj, Tongi, Chandpur, Barisal, Khulna, Daulatpur, Sirajganj, Jagannathganj, Goalundo, Sarishabari, Bhairab Bazaar, Daudkandi, Madaripur, Charmugria, Fenchuganj and Markuli. A workshop for servicing river conservancy equipment has been set up in Barisal. Ferries have been provided between Goalundo-Nagarbari-Aricha, Bheramara-Paksey, Narayanganj-Daudkandi and Magura-Kamarkhali.

COASTAL & INTERNATIONAL SHIPPING

International shipping is not new to Bangladesh. From the Periplus of the Erythraean Sea we have records that Bengal traded with the kingdoms of south India from at least as early as 5 th. century B.C. In the first millenium A.D. there was trade with many south-east Asian kingdoms, notably that of the Sailendras. Ships seem to have plied as far as Arabia in the west and China in the east from quite early days. The accounts of Ptolemy, Pliny, Fa-hien, I-tsing, Ibn Batuta and others mention a flourishing trade. In the 16th century, Caesar Frederic mentions Shondip as a great ship-building centre (O' Malley 1917).

Table 14.2

Traffic through Chalna & Chittagong Ports (Exports and Imports Combined)

Year	Chittagong	Chalna	Total (Thousand Tons)
1974-75	4499	1535	6034
1975-76	4479	1527	6006
1976-77	3447	1085	4532
1977-78	5144	1776	6920
1978-79	4535	1703	6238
1979-80	6234	2269	8503
1980-81	5770	2109	7879
1981-82	5661	1451	7012
1982-83	5417	1902	7319
1983-84	6074	1804	7878
1984-85	7158	2663	9821
1985-86	6152	2323	8475
1986-87	6239	2287	8526
1987-88	7744	2854	10598

Source : Statistical Yearbook of Bangladesh, 1983-84 ; 1986 ; 1990 ; B.B.S

Chittagong has been an important port of the Bay of Bengal for at least a thousand years. Arab dhows called there as early as the 10th century A.D. Portuguese pirates rendered it an unsafe harbour from the early 16th to the middle of the 17th century. In 1666, the Mughals captured it from the Arakanese (Sarker 1919). Thereafter it regained its prosperity, and in 1686 the East India Company tried unsuccessfully to capture it as an alternative to a port on the Hoogly river (Roberts 1951). The rapid growth of Calcutta from the early 19th century was certainly a check to the development of Chittagong. In 1947 its luck turned. At that time it had only four berth and an annual cargo handling capacity of only half a million tons (Bary 1961). After reconstruction it has 22 permanent berths, with a continuous jetty face of 7650 metres, 3 pontoons and 1 light jetties, 7 moorings and 1 swinging buoys. The 16 km. long port is lined with oil storage tanks; a large open coal dump; cold storages, a number of warehouses; and berths with hydraulic cranes besides them. The facilities include two container berths and a multi-purpose berth which is used mainly for containers. These container facilities can now handle about 74,000 Twenty Equivalent Units (TEU) of containers per annum. The handling capacity of the port itself has now increased to 7.9 million tons a year. The working capacity of the large railways marshalling yard is 2,500 wagons per day. The steadily increasing tonnage of cargo handled at port (Table 14.2) reflects the improvement of the facilities available in it. The port installations were damaged and many ships were sunk in the Karnafuli river during the Liberation War in 1971. By 1973, however, the port had been brought back to full operation.

The growth of cargo handling through Chalna, has been more rapid. This port was established only in December 1950. The search for a port in the eastern part of the Ganges-Brahmaputra Delta dates back to 1855 (Pargiter 1885). In that year, the Board of Revenue of Bengal suggested the establishment of a new port on the Baleshwar or Bishkhali river for Eastern Bengal. Soundings made in 1855-56 showed both rivers unsuitable for large craft. Mr. Reily of the Board suggested Sibsha as a better river. In 1860-61 Lt. Sweeney surveyed the Baleshwar as far as Morrelganj and reported favourably. In 1862 the Government asked for a report on the suitability of Kachua or Morrelganj or some intermediate site for this mart. Mr. Caspersz, then Sunderbans Commissioner recommended Kachua, but Mr. Reily favoured Morrelganj. It seems an attempt to avoid this wrangling was made, and in 1863, Pirojpur was recommended. Nothing came of it. By 1949, it was obvious that Chittagong alone could not handle the expanding trade. A search for a port in the same region was felt. Soundings taken by the Navy showed the Chalna-Mongla stretch of the Passur river 48 km south of Khulna to be the most suitable. An anchorage was started there by the end of 1950, and its scheduled target was 500,000 tons of cargo per annum.

By 1956 it had passed that target (Table 14.3). The Mongla (Chalna) Anchorage, though almost 82 km from the open sea, was more successful than expected. It was designed to be the port for the western half of Bangladesh. It was, however, found to be a better outlet for raw jute than Chittagong, because of its inland waterway connection with the main jute marts. In the 1970's a port city was built at Mongla, and later an excellent road was built to connect it to Khulna. This ports main drawback at present is that the railhead is at Khulna and most of the cargo has to be transhipped by barges to and from this place. Nevertheless, it now handles nearly 60% of the total jute export. Mongla port has now six general berths and a seperate container berth (multi-purpose jetty) ; twelve moorings and, in an average year, handles about 2.7 million tons of cargo, as compared to over 7 million tons by Chittagong.

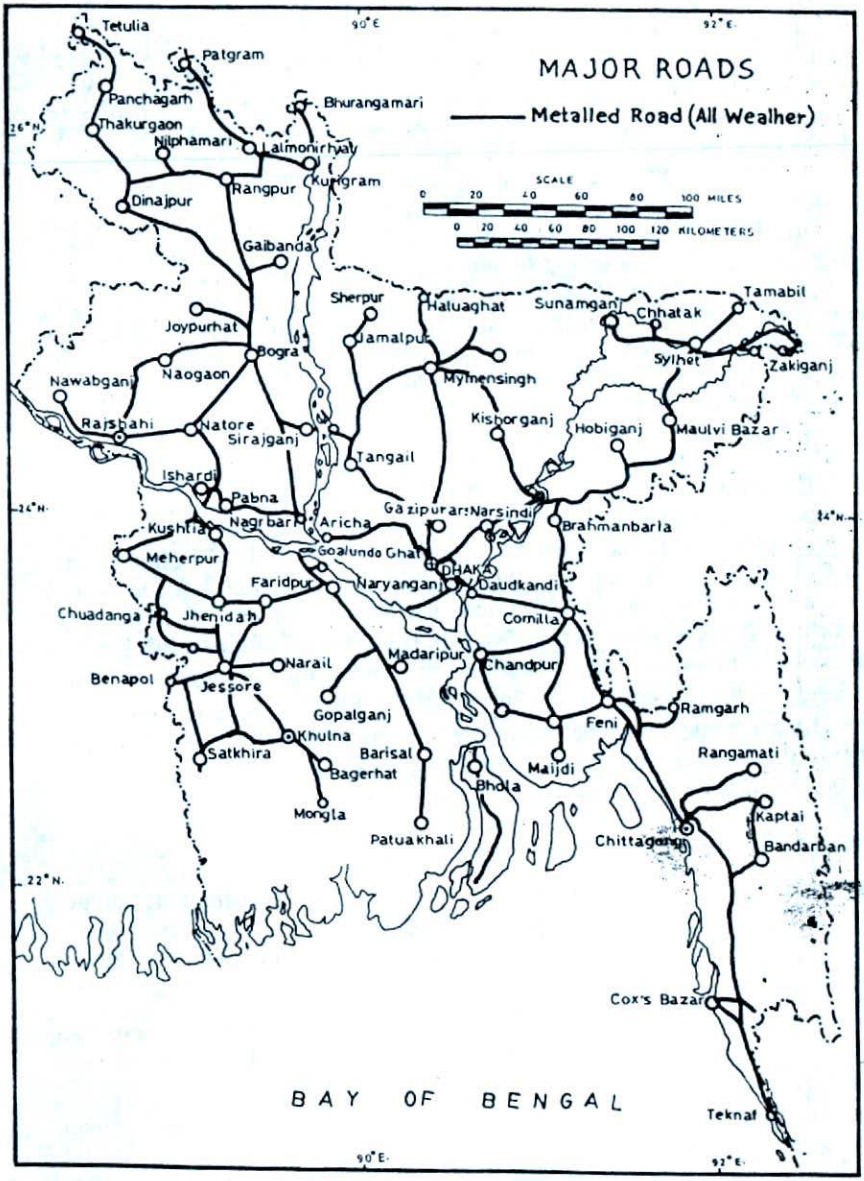
Table 14.3

Tonnage Handled at the Chalna Mongla Anchorage

Year	Import	Export	Total (Thousand Tons)
1967-68	710	969	1679
1970-71	851	692	1543
1973-74	701	683	1284
1974-75	1041	494	1535
1975-76	900	627	1527
1976-77	402	681	1083
1977-78	1122	654	1776
1978-79	1026	676	1702
1979-80	1469	675	2144
1980-81	885	992	1877
1981-82	920	707	1627
1982-83	1098	802	1900
1983-84	1104	700	1804
1984-85	2086	577	2663
1985-86	1561	762	2323
1986-87	1557	730	2287
1987-88	2228	626	2854

Source : Statistical Pocketbook of Bangladesh, 1982.
Statistical Yearbook Bangladesh, 1983-84 ; 1986 ; 1990 ; B.B.S.

Map 14.3


MAJOR ROADS
Metalled Road (All Weather)
SCALE
0 20 40 60 80 100 MILES
0 20 40 60 80 100 120 KILOMETERS
Tetulia
Patgram
Panchagarh
Thakurgaon
Nilphamari
Lalmonirhat
Bhurangamari
Kurigram
Rangpur
Dinajpur
Gaibanda
Sherpur
Haluaghat
Sunamganj
Tamabil
Chhatak
Joypurhat
Jamalpur
Sylhet
Zakiganj
Bogra
Naogaon
Nawabganj
Mymensingh
Rajshahi
Natore
Sirajganj
Kishorganj
Hobiganj
Maulvi Bazar
Tangail
Ishardi
Pabna
Gazipur
Narsindi
Brahmanbaria
Kushtia
Nagarbari
Aricha
Goalundo Ghat
DHAKA
Meherpur
Faridpur
Naryanganj
Daudkandi
Chuadanga
Jhenidah
Comilla
Madaripur
Chandpur
Benapol
Narail
Jessore
Gopalganj
Ramgarh
Feni
Khulna
Satkhira
Barisal
Rangamati
Bagerhat
Malidi
Bhola
Mongla
Patuakhali
Kaptai
Chittagong
Bandarban
Cox's Bazar
Teknaf
BAY OF BENGAL
90°E
92°E
26°N
24°N
22°N

ROADS

Since independence the development of roads, and the enormous increase in truck and bus traffic, has been one of the most marked features of economic development. In 1947 there were only 462 km. of metalled roads, which is an index of the neglect shown to this part of Bengal. By 1960 road mileage was 1600 km., by 1970 it was 3857 km. and by 1988-89 it had risen to 7217 km. These new roads have made an impact far out of proportion to their length and area covered. Together with the new bridges over the Buriganga at Dhaka (March, 1989) ; Meghna on the Dhaka-Chittagong Highway (May, 1990) ; Karnafuli at Kalurghat near Chittagong (May, 1990) and Tekarhat on the Faridpur to Barisal Highway (Nov. 1990), the entire character of the road system has been changed and travel time through this vast deltaic basin has, in many cases, been reduced by two to three hours at the least. Through un-metalled feeder roads these arterial highways have brought thousands of square kilometres of remote countryside closer to the urban centres. They are making conditions for a revolutionary change in the economy and way of life of rural areas. Trucks, buses, auto-rickshaws and cycle rickshaws have penetrated to areas where, till recently, bullocks carts were the only wheeled vehicles. Considerable quantities of jute, fish and rice are already being transported over fairly long distances by trucks, whose numbers have risen from 17,637 in 1975 to 33,800 in 1988. The heaviest trucking is between Chittagong and Feni. Feni-Comilla-Daudkandi, Tangail-Dhaka, Pabna-Ishurdi, Natore-Rajshahi and Jessore - Khulna are other comparatively busy routes. Trucking along the Dhaka - Aricha, Rangpur - Saidpur, Feni - Choumohani and Cox's Bazar - Chittagong routes is also rapidly increasing. As for bus passenger traffic, the five busiest routes are Dhaka-Mymensingh, Noakhali-Dhaka, Chittagong-Noakhali, Dhaka-Tangail and Dhaka-Faridpur. Due to its nodal location, Feni has more through passenger traffic than any other town (Transport Study 1985).

The tea estates of Sylhet have a good network of roads (mostly shingly surfaced). The metalled Brahmanbaria-Sylhet road has made these 650 km of roads accessible to the national network.

The main highways, by Regions, are as follows :

Northern Region ... From Tetulia to Nagarbari via Dinajpur, Saidpur, Rangpur and Bogra.
From Nagarbari to Nawabganj via Pabna, Ishurdi, Natore and Rajshahi.

Southern Region ... From Khulna to Barisal via Jessore, Jhenaidah, Chuadanga and Faridpur. There is be a link with Ishurdi via Kushtia.

Central Region ... Dhaka to Aricha.
Dhaka to the bank of the Meghna river opposite to Daudkandi : on to Comilla ; Feni and Chittagong.
Dhaka to Brahmanbaria via Narshingdi and Bhairab : and on to Sylhet via Moulvi Bazar.
Dhaka to Haluaghat via Tangail and Mymensingh and to Jamalpur / Sharpur also.

Eastern Region ... Teknaf to Tamabil via Cox's Bazar, Chittagong, Feni, Comilla, Brahmanbaria, Moulvi Bazar and Sylhet. Sylhet to Zakiganj.
Comilla to Chandpur.
Feni to Chandpur via Choumuhani.
Chittagong to Rangamati and Chittagong to Kaptai.

The road system has been linked up within the frame of five major routes :

Route	1	(580 km) ...	Teknaf-Cox's Bazar-Chittagong - Comilla-Daudkandi-Dhaka-Aricha.
Route	2	(357 km) ...	Comilla-Brahmanbaria-Moulvi Bazar - Sylhet-Sunamganj.
Route	3	(302 km) ...	Nagarbari-Bogra-Rangpur - Dinajpur - Tetulia.
Route	4	(336 km) ...	Khulna-Jessore-Kushtia-Ishurdi - Natore-Rajshahi-Nawabganj .
Route	5	(298 km) ...	Barisal-Faridpur-Goalundo-Jhenaidah - Chuadanga -Meherpur.

All the big towns and the three cities have extended their metalled roads. Most of these roads, whether in the urban area or outside, have a metalled top only 2.5 metre in width. Within urban areas the open space on either side varies from a few centimetres to several metres. On the highways there is usually an open space (shoulders) of 2.5 m. on either side of the top.

There about 40,000 km. of major and 53,000 km. of minor unmetalled roads of which about 2835 km is classified as National Highways. A few of these major unmettalled roads have regular bus services plying on them. Nearly all of these unmetalled roads are dusty in the drier months and very muddy in the wetter ones. All the major roads, metalled or unmetalled are tree-lined. The common species so used are Mango, Jack fruit and Jam,

Table 14.4

Number of Transport Vehicles in Bangladesh

Year	Motor Cars (private)	Taxis	Buses	Trucks	Jeeps	Station Wagons	Auto Rickshaws	Motor Cycles	Others	Total
1970	17,097	879	5,879	9,608	5,275	1,416	7,750	20,525	1,657	70,086
1971	9,198	805	3,812	6,344	2,682	759	5,062	11,226	912	40,800
1972	9,847	847	4,497	7,278	3,177	950	5,206	12,996	947	45,745
1973	10,413	928	6,030	8,440	3,521	1,201	7,375	15,264	1,367	54,539
1974	11,160	904	6,207	9,380	4,100	1,360	8,424	17,026	1,358	59,919
1975	11,882	815	5,223	9,457	4,112	1,583	7,398	21,094	1,403	62,967
1976	12,409	837	5,264	9,469	4,570	1,586	7,486	22,605	1,753	65,979
1977	14,869	836	5,494	9,757	5,828	2,015	7,953	26,739	3,263	76,754
1978	16,692	881	5,773	10,871	6,354	2,385	8,762	31,705	3,561	86,984
1979	18,868	906	6,044	11,894	6,793	2,855	9,316	35,355	3,615	95,646
1980	21,685	1,100	6,457	12,522	7,185	3,557	11,465	40,183	3,829	105,747
1981	23,100	1,112	7,183	13,496	7,727	3,549	11,990	46,336	3,747	118,240
1982	23,723	1,184	7,710	14,486	7,936	3,808	12,870	47,587	3,848	123,152
1983	24,363	1,226	7,918	14,738	8,150	3,911	13,217	48,872	3,952	128,147
1984	25,020	1,250	8,171	15,132	8,370	4,316	13,574	50,192	4,059	130,084
1985	25,675	1,293	8,350	15,537	8,596	4,126	13,941	51,548	4,169	133,235
1986	26,388	1,325	8,589	15,950	8,828	4,235	14,316	52,339	4,282	136,252
1987	27,120	1,359	8,827	16,375	9,066	4,349	14,702	53,142	4,398	139,338
1990	83,655	3,000	11,585	23,008	10,100	11,912	24,739	1,161,486	10,188	339,673

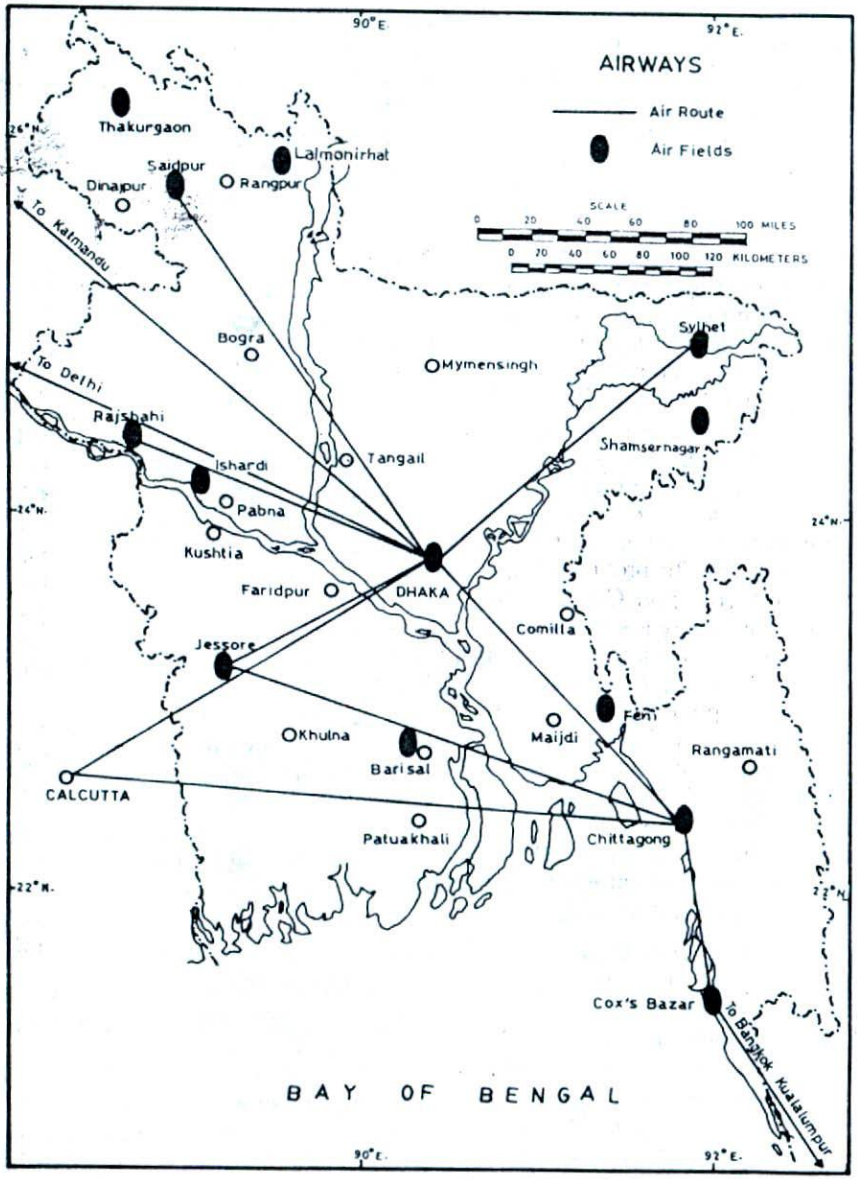
Source : Statistical Yearbook of Bangladesh, 1982 ; 1986 ; 1990 ; B.B.S.

with Banyan and Pipal at intervals. Some of the finest avenues, particularly on streches betwenn Jessore and Jhenaidah and also between Jessore and Benapole, are lined by large rain-trees planted by Hindu zamindars, who took an active interest in improving the local communication system, during the late 19th century. A number of the new roads, such as the Feni-Choumohani stretch, have been lined with *Acacia richardiana* : these light-foliaged trees are, however, not as preferable as the thicker-foliaged Mango, Jack, Pipal, etc., because of the strong sunshine over the greater part of the year.

A variety of vehicles use these roads. Cycle-rickshaws are the most common. They have greatly increased in numbers in the last two decades: in the densely populated areas they are to be found in every little market. Their range steadily increased as their numbers grew, and now in many places they ply between points fifteen or more kilometres apart. Their passenger capacity is two, but on busy days they may take on three or four persons. Though rickshaws are plentiful, buses still carry the major part of the traffic. Most of them have imported engine and chasis and a reckety body built in one of the tiny motor workshops around the country. Their passenger capacity varies from 25 to 50. Large Mercedes and Bedford buses were introduced on Dhaka and Chittagong districts routes in 1961. These better built and larger buses will increase in number as the mileage of metalled roads extends. To provide adequate bus service in and between urban areas the Road Transport Corporation was set up in 1961. Small buses (micro-buses) have become common since 1975. Bus services are most plentiful in Sylhet, Comilla, Chittagong, Dhaka, Rangpur and Jessore districts. Taxis are available in the cities and a few of the larger towns. Outside these urban areas, taxis ply only in a few places ; their two most important routes are Ishurdi-Pabna and Feni-Choumohani. Pabna and Barisal are the only big towns which are not on railway routes. Pabna's railhead is Ishurdi, 32 kilometres to the west. The growth of road transport vehicles in the period 1975-90 is shown in Table 14.4. Due to destruction in the War of Liberation, it is estimated that half the buses and trucks were rendered unusable. By 1974, most of the damaged vehicles had been replaced.

Other vehicles used commonly are bicycles, Ekkas (tom-toms) and bullockcarts. Bicycles are obviously ubiquitous. Ekkas are two-wheeled horse-drawn carts, common in the Northern Region, west of a line drawn through Hilli-Talora-Pabna. Outside that area they are very rare. Bullock carts were the principal means of conveyance before the advent of the motor car and remain as such over large areas. They are most common in the drier areas of the Northern, Central and Southern Regions and strangely enough in Noakhali district, though both in Comilla and Chittagong districts they are rather scarce. Half the total number are in Rajshahi, Rangpur and Dinajpur districts. There, one of the most familar sights, is the long lines of cartsalong

Map 14.4


AIRWAYS
Air Route
Air Fields
SCALE
0 20 40 60 80 100 MILES
0 20 40 60 80 100 120 KILOMETERS
90°E.
92°E.
26°N.
24°N.
22°N.
Thakurgaon
Lalmonirhat
Saidpur
Rangpur
Dinajpur
To Katmandu
To Delhi
Bogra
Mymensingh
Sylhet
Rajshahi
Shamsernagar
Ishardi
Tangail
Pabna
Kushtia
Faridpur
DHAKA
Comilla
Jessore
Feni
Khulna
Maijdi
Rangamati
Barisal
CALCUTTA
Patuakhali
Chittagong
Cox's Bazar
To Bangkok Kualalumpur
BAY OF BENGAL

country roads, almost hidden in clouds of dust. Buffalo-drawn carts are common only in the Barind Region. The total number of bullock and buffalo carts is estimated to be about 530,000.

AIRWAYS

During the Second World War, a number of aerodromes were constructed. At present there are seven operational airports and four airstrips which can be made operational when required. The main airport of the country is in Dhaka (Zia International) whose primary runway is 10,500 ft. and is capable of handling aircrafts of all sizes and capacities. It was formally opened on Dec. 28th, 1979 and steps are being taken to increase and improve the facilities. In 1990, ZIA handled over 28,700 air movements. During the same period, 1.03 million international passangers and 388,000 domestic passangers used its facilities. Also during this same period, 37,300 mt. of international cargo and 2,900 mt. of domestic cargo was handled at this airport.

It was not till 1947 that the first regular commercial airline operated to Calcutta and Karachi. Gradually the network expanded. Bangladesh had been the first large area to have had introduced an extensive passenger helicopter service in 1963. After operating over a year, the helicopter service had to be discontinued due to servicing difficulties and high operating costs. Commercial civil aviation, under the aegis, of Bangladesh Biman began in early 1972 within a few months of Liberation. Biman's current fleet consists of four McDonald-Douglas DC-10-30 widebody aircrafts ; two Fokker F-28 aircrafts ; two British Aerospace ATP aircrafts. The airline goes to 25 foreign destinations from Narita (Japan) in the east to Heathrow (U.K) in the west. During the period 1989-90, they handled 386,000 passangers on the domestic routes and 621,000 passangers on the international flights. Biman's inland flights link Dhaka with Jessore, Sylhet, Cox's Bazar, Chittagong, Saidpur and Rajshahi. There are regular Indian Airlines flights to Calcutta. Among the other international airlines who operate regular flights to Dhaka are : Thai Airlines flights from Bangkok ; Royal Nepal Airlines flights from Katmandu ; British Airways link to London ; Saudia to Riyadh ; Gulf to Dubai ; Emirates to Bahrain ; Aeroflot to Moscow ; Druk to Bhutan and Dragonair to Hongkong.

The internal routes have greatly contributed to the opening up of remote areas. The Dhaka-Rajshahi flight, for example, takes only one-twentieth the time taken by the railways (and the Brahmaputra ferry crossing) to cover the distance. The Bangladesh Flying Club, based in Dhaka, operates an air ambulance service and a charter service, on a 'demand' basis, to Barisal and Cox's Bazar and the tea gardens in Sylhet.

POST & TELEGRAPH SERVICES & TELEPHONES

The Post Office Department is one of the oldest, continously operating government offices and, in relation to the facilities they have to work with, perhaps one of the more efficient ones. In 1965 there were 5238 Post Offices which by June 1990 had increased to 7982. This includes four GPOs and 401 Upazila Post Offices. Together all the post offices sorted and distributed 323.3 million inland and 55 million foreign letters / postcards in 1989-90. They also handled 12.5 million internal and 800,000 foreign parcels / packages in this same period. Other services offered by the Postal Department to facilitate fast internal movement of letters etc. is the Guaranteed Internal Postal (GIP) Service which was started in February, 1984 and now extends to 50 towns in the country. For speedy dispatch of mail to foreign countries, there is the Express Mail Service (EMS) which was started in July 1984. Under the EMS, mail usually takes no more than three days to reach the designated foreign destination. This EMS facility can be availed of from twelve major Post Offices mainly in Dhaka, Chittagong, Khulna, Sylhet and Rajshahi towns where letters are received for dispatch to 35 countries. The upward trend of the Postal Services operations can be seen from Table 14.5.

The tele-communication system in Bangladesh is fairly advanced when compared to the facilities in many developing countries. Subscribers Trunk Dialing (STD) has been set up with all important urban centers since 1964. Nationwide direct dialing facility, which now connects 64 towns, was first inaugurated in October, 1983. Two months later, on December 03, the ISD facility was also inaugurated and international direct dialing from designated telephones to 198 countries (or centers) can be made from Dhaka, Chittagong, Sylhet and Khulna. During the period January 1988 to December 1990, over 3 million calls were handled through this ISD facility. Digital exchanges started operating in January 1990 and is available only in Dhaka. Needless to say, telex and fax facilities are now widely available throughout the country. As of December 1990, over 210,000 telephones have been installed in the country - more than 60% are in the Dhaka region.

Very High Frequency Wireless Stations have been installed at Chittagong, Mirsarai, Begumganj, Chandpur, Dhaka, Faridpur, Pangsha, Kushtia, Bhatiapara, Khulna, Sripur, Kishoreganj, Habiganj, Sylhet, Mymensingh and Jamalpur. These VHF Stations provide multi-channel telephone communications over most of the country and are of great help in maintaining a link with more remote areas of the country. Wireless telephone communication exist between Chittagong and Kutubdia, in Moishkhal, Ukhia, Shondip, Hatiya and Ramgati, and between Khulna-Mongla and Khulna-Barisal. A teleprinter exchange has been set-up at Dhaka.

Table 14.5

Postal Service Operations

Year	No. of Registered Letters Booked			No. of Registered Parcels Booked			Money Orders Issued (Number in '000)	
	Insured	Ordinary	V.P.	Insured	Ordinary	V.P.	Number	Value (million Tk.)
1970-71	90	4600	136	17	500	115	4000	350.8
1971-72	34	3300	21	7	200	31	2600	274.9
1972-73	30	6042	97	27	363	114	3796	431.8
1973-74	20	6016	100	23	385	114	3571	453.4
1974-75	11	6785	109	50	391	104	3698	542.5
1975-76	5	7338	118	41	441	115	3543	554.6
1976-77	10	7572	110	35	446	134	2089	544.1
1977-78	18	8412	162	46	531	139	3968	688.0
1978-79	9	9033	207	29	643	166	4070	744.6
1979-80	9	9014	160	37	676	157	4011	790.1
1980-81	8	9028	147	38	724	153	3705	791.1
1981-82	9	10038	126	41	737	146	3755	842.1
1982-83	11	10050	106	47	895	153	3588	929.0
1983-84	12	11187	125	52	848	186	3505	972.0
1984-85	15	12599	205	53	141	184	3662	1074.5
1985-86	16	15469	198	53	1283	228	3467	1178.0
1986-87	17	14483	245	70	1212	211	3433	1561.7
1987-88	8	12910	155	45	912	176	3000	1523.0

Source : Statistical Yearbook of Bangladesh, 1982 ; 1986, B.B.S.

RADIO BROADCASTING & TELEVISION

Regular radio broadcasting, of the All-India Radio, began in Dhaka on December 16th, 1939 from two tiny studio rooms and a transmitting station at Mirpur (10 km. to the north) powered by a 5 kw. medium wave (MW) transmitter. By 1949, a 7.5 kilowatt transmitter had been set up but this was still inadequate.

During the War of Liberation, Bangladesh Betar (later to be renamed Radio Bangladesh) was to play notable and glorious role in preparing and transmitting (under very difficult circumstances) patriotic programs, to a captive nation, from Mujibnagar. Since Liberation the radio transmission facilities has increased tremendously and today they have fourteen medium wave(MW) transmitters totalling 1590 kw : five short wave (SW) transmitters totalling 707 kw and fourteen FM transmitters totalling 14 kw. These facilities are located around Dhaka and there are five regional stations in Chittagong, Khulna, Rajshahi, Rangpur and Sylhet.

At present most of the programmes are in Bengali, with a few in English. News Broadcasts too, are both in Bengali and English. Since the 1960-61 typhoons, news broadcasts about the weather conditions of the Bay of Bengal have been made frequent, and large numbers of transistor radios were distributed free to the Union Councils of the coastal areas so as to enable them to know, as early as possible, about impending cyclonic storms.

Television was first introduced in Dhaka on December 25th, 1965. It began operation, with a 300w transmitter whose coverage was only about 16 km. in radius. Programs were broadcast daily, in B & W only, for about three hours in the evening. A more powerful transmitter (6 kw) was installed in 1968, increasing the coverage radius to 90 km around Dhaka. In 1975, the Television Office (which is entirely state-owned and is now called BTV) was to move to its own large, new studio complex at Rampura in Dhaka. Since December 1980, BTV have been able to switch to colour transmission on the PAL system. With the help of the T & T Department's microwave link, they are able to relay programs through eight stations (and two re-broadcast stations) and are now covering 112,500 sqkm (79%) of the country and to reach about 80% of the population. Programs (some in English) are transmitted for about seven hours every evening except on Fridays when there is, in addition, a five hour morning and a three hour afternoon transmission. Weekly transmission is for about 54 hours. In 1988, there were over 339,000 B & W and 81,500 colour television sets in the country.

PRESS

The Fourth Estate is one of the most potent means of mass communications and in Bangladesh it has had an active and prominent role in shaping political and social issues. The number of publications (newspapers, news-magazines, etc) and their periodicity is :

Daily Newspapers	-	75
Weekly	-	280
Monthly	-	123
Three Monthly	-	40
Annual	-	8
Others	-	40
Total	-	566

Among the Bengali newspapers, the most widely read are the Ittefaq (cir. over 200,000 - Jan / June '89) : Inqilab (cir. over 170,000 - Jan / June '89) : Banglar Bani (cir. over 98,000 - Jan / June '89). English daily newspapers circulate mainly in the urban areas and the most widely read is The Bangladesh Observer (cir. over 42,800 - Jan / June '85). Others which are also prominent and whose circulation is rapidly increasing are 'The Bangladesh Times', 'The Morning Sun' , 'The New Nation' and 'The Daily Star'. A number of weekly news-magazines also circulate from Dhaka and are widely read. In Bengali, there is the 'Bichitra' : 'Aurana' and 'Jogajog Barta' (the latter two are monthly magazines) while in English the most popular are 'Holiday' and 'The Courier'. Total news paper circulation is estimated at about 850,000. The numbers of books being published annually varies from 500,000 to over 1,200,000 of which, about 10 to 15% are in English.