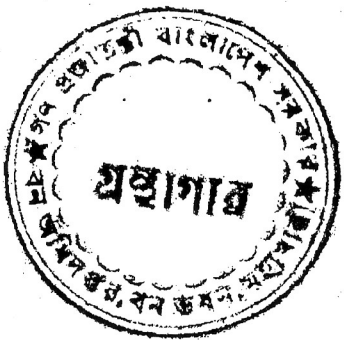
NO Scan

Overseas Development Administration

A forest inventory of the Sundarbans, Bangladesh

Main Report



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estimate of age. Observations were confined to discs and sections of discs where rings were clearly visible. Discontinuons rings were not included in the count.

A small proportion of the trees felled were in permanent sample plots or in areas replanted by KNM. For trees in permanent sample plots a comparison was made between estimates of increment based on ring counting and estimates based on successive measurements of stem diameter. Trees planted by KNM are of known age. Total ring counts on discs from them could therefore be validated by a comparison between the known age and the apparent age estimated by ring counting.

Volume regressions

Volume regressions for sundri, gewa and keora were computed from measurements of trees felled for the purpose of increment studies (see Plate 18). For other species volume regressions were derived from those used by Forestal (1960).

Timber volume was measured to a 10 cm top diameter underbark. Two methods of measurement were used for each tree, one identical with that used by Forestal and the other an alternative method.

Forestal measured trees for volume in 4 ft (1.2 m) log lengths, this being the size of material used by KNM. While appropriate for gewa this method is less so for species which are not used as pulpwood. For these other species the actual length of logs extracted is determined by the form and quality of the stem. Loggers cut the stem into whatever lengths are most practicable and least wasteful of timber.

Felled trees were therefore measured in 1.2 m lengths and, as a separate operation, were measured again in lengths chosen so as to minimise loss of volume through defect. The incidence of defect was recorded under both sets of measurements, using the standards similar to those defined by Forestal. A log was classified as being defective if it had

a) a crook or sweep, such that its axis deviated from a straight line by more than 12 cm and/or

b) a bark seam more than 60 cm long and at least one quarter of the top underbark diameter in depth

The diameter of any internal rot was also recorded, as the mean of two measurements taken at right angles.

Under the Forestal system, the diameters of the 1.2 m logs were measured at each end and there were thus two diameters recorded for each log. Under the alternative method the diameter of each potential log was measured at each end and in the middle of the log. There were thus three diameters and a length recorded for each log.

Crownwood of diameter underbark 5 cm and above but less than 10 cm was measured using the same methods as that used for measuring timber volume.

PLATE 17. A diameter gauge used for sampling small stems

PLATE 18. Inventory team measuring a felled tree for volume

Tree volumes from commercial felling

In order to compare estimates made of tree volumes with those obtained in commercial exploitation, data relating to felling in 1982-83 were collected from all operational coupe offices in the Sundarbans.

The principal species of interest was sundri and for each of the three quality classes recognised in the working plan (Choudhury, 1968) approximately five sets of measurement, i.e. data relating to five different trees, were collected. Quality class was assigned on the basis of compartment, by reference to the working plan.

Field accomodation and transport

Transport used for fieldwork in the Sundarbans comprised three 39 ft launches, one 21 ft launch, one 49 ft water-carrying barge and eight 18 ft, outboard-powered dinghies. The launches were used to transport equipment and as accomodation for senior staff. The water barge carried supplies of fuel as well as its main cargo of fresh water and the dinghies were used to transport field teams on a daily basis. Junior field staff were accomodated partly in forest stations ashore and partly in eight unpowered, accomodation boats.

Data processing

Inventory data were processed using a Research Machines 380 Z microcomputer having 64 kilobytes of memory and a double disc drive. Data and programmes were recorded on 5.25 in floppy discs. The microcomputer functioned also as a word processor and was used for the preparation of draft and final reports.

MEAN VOLUME

Estimates of mean volume per ha underbark, by 5 cm diameter classes, are given in Table 26 in respect of sundri, gewa and all species combined. They are given by block and for the forest as a whole and refer to sound trees only, after the deduction of totally defective stems. Detailed estimates by species, forest type and sampling block are given in Appendix 7.

Estimates of mean merchantable volume are given in Table 27. These estimates refer to merchantable material comprising the following:

a) timber volume underbark to a 10 cm top diameter underbark, in respect of commercial timber species of exploitable size, after deduction for partial defect in usable stems

b) fuelwood from the crownwood of timber-sized sundri, gewa and keora, to a 5 cm diameter underbark; volume calculated underbark

c) fuelwood from the wholly defective stems of all species, d.b.h. 10 cm and above, calculated as 70% of the underbark volume of equivalent, sound stems

d) fuelwood from goran, kalshi, kirpa and shingra, d.b.h.less than 10 cm; volume calculated overbark

Although included in the fuelwood estimates in Table 27, the crownwood figures for sundri, gewa and keora can also be used to assess the extra timber volume which could be obtained by cutting to a smaller top diameter than 10 cm. Overbark volume estimates of crownwood to top diameter underbark of 7.5 cm and 5.0 cm respectively are given in Appendix 7 by forest type and blcok.

The estimates shown in Table 27 are taken from the more detailed figures given in Appendix 8 by forest type and block. The only merchantable or potentially merchantable material not included in these estimates is the crownwood bark of sundri, gewa and keora, which is a component of fuelwood, and the crownwood in its entirety (d.u.b. less than 10 cm) of species other than those three. The volumes involved in such material are unlikely to be large enough to have much practical importance.

Allowance for defect

Allowances made in Appendix 8 and Table 27 for partial defect in sawlog-quality stems are based on collected data in respect of sundri, gewa and keora. For other species, defect allowances are calculated as 50% of those used by Forestal. The 50% reduction in the Forestal defect allowance is to take account of the fact that in the present inventory, but not in the previous one, wholly defective stems were excluded before calculating volumes and thus only partial, within-tree, defect has to be allowed for.

TABLE 32 Volume regression equations for calculation of stem volume underbark (m-3) from d.b.h. overbark (cm) and forest height class

Species	Height class*	Ln volume underbark, m-3**	Remarks
Sundri	1	1.51076 - 65.9963 x D	
	2	10.2821 x LnD - 0.37283 x D - 25.1612	If D>28 volume = 0.263
	3	(12.2165 x LnD) -(0.5125 x D) - 28.3046	If D>24 volume = 0.169
Gewa	1	4.4314 x LnD - 0.073475 x D - 13.9498	
	2 and 3	5.96108 x LnD - 0.15932 x D - 16.8329	If D>37 volume = 0.300
Keora	All	5.11582 x LnD - 0.0707 x D - 15.9104	If D>72 volume = 2.407
Passur and dhundal	1 and 2	3.08019 x LnD - 0.03026 x D - 10.3302	
	3	Ln (0.001056 x D - 2 - 0.023601 x D + 0.17149)	If D<12, Height class 1 table applies
Kankra	1 and 2	1.48179 x LnD + 0.02088 x D - 6.63463	
	3	1.71691 x LnD + 0.01095 x D - 7.48278	

* 1 ⩾15.2m
2 <15.2 ⩾10.7m
3 <10.7 ⩾6.1m

** D = d.b.h overbark (cm)
Ln = logarithm to base e

Regression equations for sundri, gewa and keora calculated from felled tree measurements; equations for other species derived from those given by Forestal (1960) modified from Curtis (1933)

TABLE 32 continued

Species	Height class*	Ln volume underbark, m-3**	Remarks
Baen and jir	1	2.61014 x LnD - 0.01155 x D - 9.42143	
	2	2.91335 x LnD - 0.02254 x D - 10.2624	
	3	2.83575 x LnD - 0.01932 x D - 10.2715	
Misc. species	-	3.28405 x LnD - 0.05561 x D - 10.8153	If D>59 volume = 0.494

TABLE 33 Volume regression equations for calculation of crownwood volume underbark (m-3) for three species*

Species	Height class*	Ln volume underbark, m-3**	
		d.u.b. ≥7.5 <10.0 cm	d.u.b. ≥5.0 <10.0 cm
Sundri	1 and 2		0.8007 x LnD - 5.8992
	3		(-5.7605/D) - 3.4196
	All	(-11.0395/D) - 3.5730	
Gewa	All	(-4.9573/D) - 4.1797	(-4.2572/D) - 4.1205
Keora	1 and 2	0.0342D - 4.6729	1.2163 x LnD - 7.0462

* 1 and 2 >10.7m
3 <10.7 >6.1m

** D = d.b.h. underbark, cm
Ln = logarithm to base e

TABLE 47 Relationship between overbark and underbark diameters (cm) for three species

Species	Diameter underbark, cm
Sundri	(0.9574 x diameter overbark) - 0.57342
Gewa	(0.9454 x diameter overbark) - 0.7102
Keora	(0.9715 x diameter overbark) - 1.3738

TABLE 48 Bark thickness (mm) for three species by overbark diameter class*

D.b.h. class, cm	Bark thickness, mm		
	Sundri	Gewa	Keora
5	4.5	5.6	7.9
10	5.5	7.0	8.6
15	6.6	8.3	9.4
20	7.7	9.7	10.1
25	8.7	11.1	10.8
30	9.8	12.4	11.5
35	n.d.	13.8	12.2
40	n.d.	n.d.	12.9
45	n.d.	n.d.	13.6
50	n.d.	n.d.	14.3
55	n.d.	n.d.	15.1
60	n.d.	n.d.	15.8

* Bark thicknesses are given for d.b.h. classes for which bark thickness data were collected; n.d. = no data