REPORT
ON THE
DEVELOPMENT PLAN OF
THE FOREST RESOURCES

PAKISTAN

MARCH 1964

OVERSEAS TECHNICAL COOPERATION AGENCY OF JAPAN

F O R E W O R D

The Government of Japan, in respond to a request from the Government of Pakistan, entrusted to the Overseas Technical Cooperation Agency (OTCA) the task of conducting a preliminary survey in Pakistan to help the implementation of the Development Plan of the Forest Resources. The OTCA, fully realizing the importance of its Development Plan of the Forest Resources, organized a five-member team of experts and dispatched it to Pakistan on December 15, 1963 for about 1 months on-the-spot survey under the leadership of Dr. S. Hirai, Professor of Tokyo University.

The OTCA which was established on July 1, 1962, serves as an executing agency of the Japanese Government to conduct Japan's Government-level technical cooperation to Asia, Near and Middle East, Africa and Latin America. Its principal activities are acceptance of overseas trainees, assignment of technical experts, establishment of overseas technical cooperation centers and conduction of preliminary surveys for development projects.

It is my sincere hope that this report will prove to be useful in the field of the Development Plan of the Forest Resources in Pakistan and will also help to foster closer technical ties and better understanding between Pakistan and Japan.

Lastly, on behalf of the OTCA, I wish to take this opportunity to express our greatest appreciation and sincere thanks to the various agencies of the Pakistan Government for their Precious help and cooperation given to the Survey Team, without which it would not been possible for the Team to conduct smoothly the survey on the spot.

March 1964

Shin-ichi Sibusawa

S. Shibusawa

Director General
Overseas Technical Cooperation Agency

R E P O R T

ON THE

DEVELOPMENT PLAN OF

THE FOREST RESOURCES IN PAKISTAN

C O N T E N T S

DATA ON THE DEVELOPMENT OF WOOD AND PULP AND PAPER INDUSTRY IN PAKISTAN

This paper is based on the investigation conducted by the survey team sent to Pakistan from December 16th, 1963 to January 21st, 1964, for the development plan of the forest resources.

The following five persons have participated in this survey work and the writing of this paper.

Dr. Shinji HIRAI (Head of the mission, Tokyo University)

Dr. Hisashi FUKUI (Member of the team, Tokyo University of education)

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Further, we wish to mention the deep appreciation and gratitude of the whole hearted cooperation extented to the team by the officers concerned in Pakistan, especially, Mr. S.S. Nahri, of W.P.I.D.C. and Dr. M.A. Saboor of F.I.D.C. (East Pakistan) whom the team had direct contact.

C o n t e n t s

A. Karachi-Hyderabad Wood Industry Complex Plan

(1) Objective

The purpose of this paper is to offer information for the First Five Year Plan for the industrial development in Pakistan.

(2) Raw Materials

Timbers produced at Indus River area and at Irrigated plantation, Riverain Forest located at the lower terrain of its subsidiary, and 6,000 cubic meters of imported yearly from East Pakistan, will be used as raw materials.

(3) Combination

a) sawmill
b) seasoning factory
c) woodworking factory
d) bobbin factory
e) shuttle factory

(4) Location

Locations under consideration are Karachi or Hyderabad. However, Lahore may be added in possible locality, depending on the availability of wood.

a) Sawmill

1. Outline

1) Objective

The mill is to produce market lumber as well as supply raw material for wood working, bobbin and shuttle factories.

2) Raw Materials

Raw materials will be supplied by timber produced at the near-by Irrigated plantation, Riverain forest and 6,000 cubic meters of imported wood from East Pakistan. Main species of locally produced wood are shisham, babul, and mulberry.

3) Equipments

The main equipment will be 48" band saw with automatic feed carriage.

4) Products

The main products will be lumber for building, construction, furniture and building materials, and plates for flooring as well as base material for bobbins and shuttles.

2. Size of the enterprise

1)	Annual sales	Rs. 533,304
2)	Annual expenditure	Rs. 525,168
3)	Mill compound	4,000 M^2
4)	Floor place	750 M^2
5)	Investment for Construction	Rs. 439,000
6)	Working Capital	Rs. 131,292
7)	Number of employees	32

3. Production plan

1) Production by use

Purpose	Volume of raw log (m3/year)	Yield (%)	Volume of products (m3/year)	(m3/year) Items of products		Yield of kiln drying	Volume of kiln dried lumber	Supply to
				for air reasoning	for kiln drying			
construction, civil engineering, packing	1,000	60	600	600				market
furniture, fitting	2,000	50	1,000	200*	800	70	560	wood working factory
flooring	1,000	45	450		450	70	315	
bobbin, shuttle	2,000	40	800		800	70	560	bobbin and shuttle factory
Total	6,000		2,850	800	2,050		1,435	

* Actually, yield of air seasoning (yield of lumber suitable for furniture and fitting) will be 85%, which will be sent to wood working factory, remaing 30 cubic meters will be sold in the market for building, construction and packaging.

4. Details of construction cost

1) Site

area	4,000 m^2 (land)
unit cost	1 R (cost of readjustment)
sum	4,000 Rs

2) Buildings

I t e m	a r e a (m2)	unit cost (Rs)	s u m (Rs)
manufactory	500	200	150,000
warehouse, adjunct buildings	200		
office	50		
T o t a l	750		150,000

3) Machinery and other equipments

i t e m	quantity	unit cost (Rs)	s u m (Rs)	power (KW)
48 in band saw mill with automatic feed carriage	1	70,000	70,000	40
42 in roller feed band resaw	2	13,000	26,000	30
edger	1	10,000	10,000	5
cross cut saw	2	6,000	12,000	4
sawfiling equipments	1 set	20,000	20,000	10
conveyor	1	20,000	20,000	15
forklift	1	17,000	17,000	
other machines and equipments			10,000	5
dust collecting system	1 set	20,000	20,000	15
installation cost	12		40,000	
cost of electric works			30,000	
the others			10,000	
T o t a l			285,000	124

Grand total of construction cost Rs. 439,000

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments Rs. 43,500

6. Personnel expenses

1) Personnel disposition

i t e m		senior staff and technical employee	junior staff and technical employee	w o r k e r
office workers	director, vice-director	2		
	general affairs		1	1
	accounting, materials supplying		1	1
manu-facturing workers	raw log		1	4
	sawing	1	1	8
	sawfiling	1	1	1
	warehouse		1	4
	the others		1	2
t o t a l		4	7	21

grand total 32

2) Sum

270 Rs/month for each person (average)

total personnel expenses (annual) Rs. 270x12x32 = Rs 103,680

7. Details of annual expenditure

1) Unit power required for 1 m^3 of raw material wood and total power required for one year

unit power ----- 10 kWh total power ----- 60,000 kWh

2) Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)
raw log	6,000 m^3	50	300,000
subsidiary materials (10% of sum of raw log)			30,000
power	60,000 kWh	0.07	4,200
personnel	32	3,240	103,680
t o t a l			437,880
costs of operation (10% of above total)			43,788
depreciation amount			43,500
grand total			525,168

8. Details of annual output

i t e m	quantity	unit cost (Rs)	s u m (Rs)
air dried lumber	800 m^3	200	160,000
green lumber for kiln drying	2,050 m^3	180	369,000
wood waste and saw dust (for dry kiln)	1,076 m^3	4	4,304
t o t a l			533,304

b) Seasoning factory

1. Outline

(1) Objective

Drying is made at this plant for most of the timber for furniture, fitting and other wood working, and for all of timber for flooring, bottin and shuttle.

(2) Raw material wood

2,050 cubic meters of timber supplied by the sawmill is to be processed here.

(3) Machinery and equipments

Two forced circulation dry kilns of Internal Fan type, each capacity 25 cubic meters.

(4) Products

Kiln dried lumber for wood working such as furniture and fitting, flooring and, bottin and shuttle.

2. Scale of this enterprise

(1)	Annual output	Rs. 574,000
(2)	Annual expenditure	Rs. 537,617
(3)	Area of site	2,550 m^2
(4)	Floor area of buildings	550 m^2
(5)	Construction cost	Rs. 272,550
(6)	Working capital	Rs. 134,404
(7)	Personnel required	16

3. Production plan

(1) Products

Green lumber per year	2,050 m^3
Yield of kiln drying	70 %
Kiln dried lumber	1,435 m^3

(2) Equipments and drying capacity

Two rooms with a capacity of 25 cubic meters are to be constructed each room will be 5 m by 8 m and the ceiling shall be 3 m high from the floor, thus the room will be 50 cubic meters in space with double track. These internal fan type forced air circulation kilns will

operate in 4 rotations per month, the capacity of which will be 2,400 cubic meters of lumber.

4. Details of construction cost

(1) Site

i t e m	quantity (m2)	unit cost (Rs)	s u m (Rs)	remarks
site for buildings	550	1	550	readjustment
yard for air seasoning and the others	2,000	3	6,000	readjustment, partly racks for air seasoning
t o t a l	2,550		6,550	

(2) Buildings

i t e m	a r e a (m2)	unit cost (Rs)	s u m (Rs)	remarks
dry kiln	100	200	110,000	50 m^2 x 2
operating and cooling room	320			
boiler house	90			
warehouse for fuel	40			
t o t a l	550		110,000	

Note: office and warehouse belonged to the sawmill in this complex are used in common for seasoning factory

(3) Machinery and other equipments

i t e m	quantity	unit cost (Rs)	s u m (Rs)	power (kW)
dry kiln equipments	2 sets	30,000	60,000	20
boiler house equipments (including chimney)	1	80,000	80,000	
rail	200 m	10	2,000	
trolley	15	400	6,000	
cost of electric works			3,000	
the others			5,000	
t o t a l			156,000	20

grand total of construction cost Rs. 272,550

5. Depreciation amount

10% of the following total	Rs. 27,000
racks for air seasoning	Rs. 4,000
buildings	Rs. 110,000
machinery and other equipments	Rs. 156,000
t o t a l	Rs. 270,000

6. Personnel expenses

(1) Personnel disposition

i t e m	senior staff and technical employee	junior technical employee	worker	remarks
director, vice-director	2			
engineering works	1	1	4	3-shift
warehouse		1	3	
yard		1	3	
t o t a l	3	3	10	
grand total	16			

(2) Sum

Rs. 270/month for each person (average)

total personnel expenses (annual) 270x12x16 = Rs. 51,840

7. Details of annual expenditure

(1) Unit quantities of fuel, power and water required for 1 m^3 of raw material wood and total quantities of them for one year

i t e m	unit quantity	total quantity required (annual)
fuel	0.42 ton	861 ton = 1,076 m^3 specific gravity 0.8
power	15 kWh	30,750 kWh
water	1.3 ton	2,665 ton

(2) Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)
raw material wood	2,050 m^3	180	369,000
subsidiary materials (10% of sum of raw material wood)			36,900
fuel	1,076 m^3	4	4,304
power	2,665 kWh	0.07	2,153
personnel	16	3,240	51,840
t o t a l			464,197
costs of operation (10% of above total)			46,420
depreciation amount			27,000
grand total			537,617

8. Details of annual output

i t e m	quantity (m3)	unit cost (Rs)	s u m (Rs(
kiln dried lumber	1,435	400	574,000

c) Woodworking factory (furniture, fitting and flooring)

1. Rawmaterial wood

Shisham, babul, mulberry, bakian and poplar from irrigated plantati and riverrain forest.

2. Scale of this enterprise

(1)	Annual output	1,096,100 Rs
(2)	Annual expenditure	1,036,319 Rs
(3)	Area of site	9,000 m^2
(4)	Floor area of buildings	3,550 m^2
(5)	Construction cost	
	i) Site (cost of readjustment)	9,000 Rs
	ii) Buildings	710,000 Rs
	iii) Machinery and other equipments	
	T o t a l	2,014,246 Rs
(6)	Working capital	259,080 Rs
(7)	Personnel required	
	staff 20	worker 72

3. Production plan

(1) Furniture, Fitting

volume of raw material wood (annual)	yield of products (%)	net volume of raw material wood required (annual) (m3)	items of annual production			
			kind of products	quantity (piece)	volume of raw material wood required per unit	total volume of raw material wood required
560 (kiln dried lumber)	65	475	chiffoniers and cabinets	3,000	0.06	180
			desks and tables	3,000	0.06	180
			chairs and stool's	1,500	0.02	30
170 (air dried lumber)			doors	3,000	0.02	60
			window flames	2,500	0.01	25
						475

(2) Flooring board

Volume of raw material wood (annual) 315 m^3 (kiln dried lumber)

Yield of products 70%

Net volume of products (annual) 220.5 m^3 (14,700 m2 by thickness of 1.5cm)

Dimensions of products

Length	50cm - 200cm
Width	6cm - 9cm
Thickness	0.8cm - 2cm

4. Construction cost

(1) Site

i) Area 9,000 m^2 (land)

ii) Unit cost 1 R/m^2 (cost of readjustment)

iii) Sum 9,000 Rs

(2) Buildings

i) Area

i t e m			area (m^2)
o f f i c e			120
manu-factory	furniture and fitting plant	trimming shop	300
		machining mill	300
		gluing, forming and assembling shop	800
		finishing shop	300
		sewing shop	100
		flooring plant	200
		grindery and repair shop	100
	t o t a l		2,100
warehouse		warehouse for dried lumber	150
		warehouse for products	900
		warehouse for sub-sidiary materials	200
		warehouse for paint	80
	t o t a l		1,330
grand total			3,550

ii) Unit cost 200 Rs/m^2

iii) Sum 710,000 Rs

(3) Machinery and other equipments

i) Furniture and fitting plant

The same scale as the furniture and fitting plant (belonging to woodworking factory) in the Khulna wood industry complex plan described in this report.

(a)	Trimming shop	Rs.	239,465
(b)	Machining mill	Rs.	356,975
(c)	Gluing, forming and assembling shop		258,735 shop
(d)	Finishing shop		161,508
(e)	Sewing shop		9,580
	T o t a l		1,026,263 ----- (i)

ii) Flooring plant

i t e m	quantity	power required (kw)		unit cost (Rs)	Sum(Rs)	remarks
		per unit	total			
conveyor	30m		6	100	3,000	
dust collecting system	1		15		4,500	
t o t a l			21		7,500	
cross cut-off saw	1	1.5	1.5	2,000	2,000	
hand planer	1	2.2	2.2	6,500	6,500	600 mm
single surface planer	1	3.7	3.7	10,000	10,000	450 mm
three-side planer and moulder	1	10	10	12,000	12,000	450 mm
end matcher	1	7.5	7.5	10,500	10,500	
t o t a l	5	24.9			41,000	
sum total		45.9			48,500	

i t e m	quan-tity	power required (kw)		unit cost (Rs)	Sum(Rs)	remarks
		per unit	total			
insurance, freight				10%	4,850	
custom duty				7.5%	3,638	
installation cost					1,800	
cost of electric works					4,500	
miscellaneous expenses					2,000	
grand total					65,288	(ii)

iii) Grindery and repair shop

i t e m	quan-tity	Power required (kw)		unit cost (Rs)	Sum(Rs)	remarks
		per unit	total			
automatic knife grinder	5	2.2	11	5,000	25,000	
universal tool grinder	4	1.5	6	2,000	8,000	
automatic band saw sharpener	1	0.75	0.75	2,000	2,000	
automatic circular saw sharpener	2	0.75	1.5	1,300	2,600	
sum total	12		19.25		37,600	
insurance, freight				10%	3,760	
custom duty				7.5%	2,820	
installation cost					1,500	
cost of electric works					6,000	
miscellaneous expenses					4,000	
grand total					55,680	(iii)

iv) Office and warehouse

Item	quantity	Power required (kw) per unit	Power required (kw) total	unit cost (Rs)	Sum(Rs)	Remarks
fork lift	4			16,000	64,000	
push car	3			130	390	*
humidity regulator	1	45			35,000	
sum total	7	45			99,390	
insurance, freight				10%	9,900	exclusive of * marked item
custom duty				7.5%	7,425	"
cost of electric works					1,300	
miscellaneous expenses					30,000	
grand total					148,015	(iv)

Grand total of the cost of machinery and other equipments

(i) + (ii) + (iii) + (iv) = Rs. 1,295,246

Grand total of construction cost

Site	9,000	Rs (readjustment cost)
Buildings	710,000	
Machinery and other equipment	1,295,246	
	2,014,246	

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments

2,005,246 x 0.1 = 200,525 Rs

6. Personnel expenses

(1) Personnel required

staff 20 worker 72

(2) Personnel expenses

number of employees	unit wages (average) (Rs/month)	sum (monthly) (Rs)	sum (annual) (Rs)
92	270	24,840	298,080

(3) Personnel disposition plan

classification	disposition	class of employees			
		senior staff and technical employee	junior staff and technical employee	worker	total
office workers	managing	2			2
	designing	1		1	2
	planning	1	1	1	3
	general affairs	1		1	2
	accounting		1	1	2
	materials supplying	1		2	3
	t o t a l	6	2	6	14
manufacturing workers	trimming	1		10	11
	machining	1	1	12	14
	gluing	1	1	3	5
	assembling		1	15	16
	finishing	1	1	10	12
	sewing		1	3	4
	flooring plant	1	1	5	7
	grinding and repairing		1	3	4
	the others			5	5
	t o t a l	5	7	66	78
Grand total		11	9	72	92

(4) Number of shift 1-shift

7. Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)	r e m a r k s
raw material wood				
air dried lumber	170 m^3	200	34,000	purchased from sawmill of this complex
kiln dried lumber	875 m^3	400	350,000	purchased from seasoning factory of this complex
t o t a l	1,045 m^3		384,000	
plywood, veneer and board				
plywood	60,000 ft^2	0.25	15,000	thickness 4 mm
rotary veneer	12,000 ft^2	0.035	420	thickness 1 mm
sliced veneer	30,000 ft^2	0.07	2,100	thickness 0.8 mm
lumber core plywood	12,000 ft^2	0.7	8,400	thickness 20 mm
particle board	12,000 ft^2	0.6	7,200	thickness 20 mm
t o t a l			33,120	
subsidiary materials		10% of sum of raw material wood	38,400	
personnel	92	270 Rs/ month	298,080	
power				
furniture and fitting plant	73,000 kwh	7 Rs/ month	5,110	power required per unit volume of raw material wood in 100 kwh
flooring plant	15,750 kwh	"	1,103	" is 50 kwh
t o t a l	88,750 kwh		6,213	
sum-total			759,813	
costs of operation		10% of above sum-total	75,981	
depreciation amount			200,525	
grand total			1,036,319	

Working capital ($\frac{1}{4}$ of the annual expenditure) Rs 259,080

Money rates are not included in the above calculation

(It is the same in the following plans).

8. Details of annual output (Estimated earnings)

kind of products	quantity of production	selling (Rs) price per unit	output (Rs)	remarks
chiffoniers and cabinets	piece 3,000	120	360,000	
desks and tables	piece 3,000	120	360,000	
chairs and stools	piece 1,500	35	52,500	
door	3,000 "	35	105,000	
window flame	2,500 "	11	27,500	
flooring board	14,700 m^2	13	191,100	
t o t a l			1,096,100	

annual output	Rs.	1,096,100
annual expenditure	Rs.	1,036,319
estimated earnings (annual)	Rs.	59,781

d) Bobbinfactory

1. Raw material wood

Tamarix articnlata Albzzia lebbck and Poplus euphratica from irrigated plantation and riverain forest.

2. Scale of this enterprise

(1)	Annual output	Rs.	711,588
(2)	Annual expenditure	Rs.	648,094
(3)	Area of site		3,000 m^2
(4)	Floor area of buildings		1,015 m^2
(5)	Construction cost		
	i) Site (Cost of readjustment)	Rs.	3,000
	ii) Buildings	Rs.	203,000
	iii) Machinery and other equipments	Rs.	665,738
	T o t a l	Rs.	871,738

(6) Working capital Rs. 162,024

(7) Personnel required

staff 8 worker 68

3. Production plan

volume of raw material wood (annual)	number of raw material (annual)	yield of products (%)	number of products (annual)	items of annual production	
				kind of products	number of products
280	1,335,000*	85	1,134,750	ring bobbin	734,750
				cop-change weft bobbin	200,000
				shuttle-change weft bobbin	200,000

* Each piece has the volume of about 0.0002 lm3
(3.3 cm x 3.3 cm x 23 cm)

4. Construction cost

(1) Site

i) Area 3,000 m^2

ii) Unit cost 1 R/m^2 (cost of readjustment)

iii) Sum Rs. 3,000

(2) Buildings

i) Area

item		area (m^2)
office		35
manufactory	machining and parts fixing shop	400
	finishing shop	150
	grindery and repair shop	60
	inspecting room	60
total		670

i t e m		area (m2)
warehouse	warehouse for dried lumber	120
	warehouse for products (shipping shop)	80
	warehouse for subsidiary materials	80
	warehouse for paint	30
	t o t a l	310
	grand total	1,015

ii) Unit cost 200 Rs/m^2

iii) Sum Rs. 203,000

(3) Machinery and other equipments

i) Machining and parts fixing shop

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	60 m		8.8	100	6,000	
dust collecting system			26.3		8,000	
t o t a l			35.1		14,000	
circular saw machine	2	2.2	4.4	6,000	12,000	including the cost of accessories
boring machine	2	1.5	3.0	6,000	12,000	
center boring machine	2	0.75	1.5	5,000	10,000	
roughing machine	2	1.5	3.0	7,000	14,000	
cylinder shaper	1	0.75	0.75	7,500	7,500	
shape finishing machine	3	1.5	4.5	10,000	30,000	
re-boring machine	2	0.75	1.5	6,500	13,000	
bottom boring machine	2	0.75	1.5	6,500	13,000	
top boring machine	2	0.75	1.5	6,500	13,000	
boring machine	2	0.75	1.5	6,600	13,200	

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
touching machine	2	0.75	1.5	7,500	15,000	
semi automatic press	2	1.5	3.0	10,500	21,000	
shield fixing machine	3	0.75	2.2	6,500	19,500	
automatic shield fixing machine	1	1.5	1.5	10,500	10,500	
end stock	5			1,200	6,000	
end stock for sand papering machine	2			1,200	2,400	
sand papering machine	2	0.75	1.5	1,400	2,800	
hand press	6			3,400	20,400	*
knock cutting machine	1	0.75	0.75	4,800	4,800	
feeler grooves cutting machine	2	0.75	1.5	7,500	15,000	
cutting machine for driven shield	1	0.75	0.75	6,000	6,000	
serial roughing machine	1	1.5	1.5	6,500	6,500	
automatic roughing machine	1	2.2	2.2	14,000	14,000	
automatic wire ring machine	1	2.2	2.2	14,000	14,000	
automatic shield press machine	1	2.2	2.2	14,000	14,000	
t o t a l	51		43.95		309,600	
sum total			79.05		323,600	
insurance, freight				10%	30,320	exclusive of * marked item
custom duty				7.5%	22,740	
installation cost					8,000	
cost of electric works					25,000	
miscellaneous expenses					15,000	
grand total					424,660	

ii) Finishing shop

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
polishing machine	3	0.75	2.2	1,400	5,200	
end stock for painting	6			1,200	7,200	*
centrifugal pump for painting	1	3.7	3.7	13,500	13,500	
fan	2	1.5	3.0	5,500	11,000	
boiler	1			7,000	7,000	
t o t a l	13	8.9			43,900	
insurance, freight				10%	3,670	exclusive of * marked item
custom duty				7.5%	2,753	"
installation cost					1,000	
cost of electric works					1,800	
miscellaneous expenses					1,500	
grand total					54,623	

iii) Grindery and repair shop

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
universal tool grinder	3	0.75	2.2	2,000	6,000	
repairing machineries	1 set		11	28,000	28,000	
t o t a l			13.2		34,000	

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
insurance, freight				10%	3,400	
custom duty				7.5%	2,550	
installation cost					1,800	
cost of electric works					4,500	
miscellaneous expenses					3,000	
grand total					49,250	(iii)

iv) Inspecting room

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
tester for vibration	2	0.2	0.6	6,500	13,000	
repairing machine	3	0.75	2.2	5,000	15,000	
balancing machine for repair	1	0.75	0.75	6,600	6,600	
t o t a l	6	3.55			34,600	
insurance, freight				10%	3,460	
custom duty				7.5%	2,595	
installation cost					1,500	
cost of electric works					3,500	
miscellaneous expenses					2,500	
grand total					48,155	(iv)

v) Office and warehouse

i t e m	quantity	power required (KW) per unit	power required (KW) total	unit cost (Rs)	s u m (Rs)	remarks
fork lift	2			16,000	32,000	
humidity regulator	1		37.5		30,000	
t o t a l			37.5		62,000	
insurance, freight				10%	6,200	
custom duty				7.5%	4,650	
cost of electric works					1,200	
miscellaneous					15,000	
grand total					89,050	(v)

grand total of the cost of machinery and other equipments

(i) + (ii) + (iii) + (iv) + (v) = Rs. 665,738

grand total of construction cost

site	Rs. 3,000
buildings	Rs. 203,000
machinery and other equipments	Rs. 665,738
	Rs. 871,738

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments

868,738 x 0.1 = Rs. 86,874

6. Personnel expenses

(1) Personnel required

staff 8 worker 68

(2) Personnel expenses

number of employees	unit wages (average) (Rs/month)	s u m (monthly) (Rs)	s u m (annual) (Rs)
76	270	20,520	246,240

(3) Personnel disposition plan

classification	disposition	class of employees			
		senior staff and technical employee	junior staff and technical employee	worker	total
office workers	managing	1			1
	planning		1		1
	general affairs	1		1	2
	accounting		1	1	2
	materials supplying		1	1	2
	t o t a l	2	3	3	8
manufacturing workers	machining and parts fixing	1		35	36
	finishing			10	10
	grinding and repairing		1	8	9
	inspecting	1		6	7
	the others			6	6
	t o t a l	2	1	65	68
	grand total	4	4	68	76

(4) Number of shift 1-shift

7. Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)	r e m a r k s
raw material wood (kiln dried)	280m^3	400	112,000	purchased from seasoning factory of this complex
metal fittings and subsidiary materials			150,000	
personnel expenses	76	270 Rs/month	246,240	
power	KWH 28,000	7 Rs/ 100KWH	1,960	power required per unit volume of raw material wood is 100 KWH
t o t a l			510,200	
costs of operation		10% of above total	51,020	
depreciation amount			86,874	
grand total			648,094	

Working capital (1/4 of the annual expenditure)

Rs. 162,024

8. Details of annual output (Estimated earnings)

kind of products	quantity of production	selling price (Rs) per unit	output (Rs)
ring bobbin	(piece) 734,750	0.65	477,588
cop-change weft bobbin	200,000	0.60	120,000
shuttle-change weft bobbin	200,000	0.57	114,000
t o t a l	1,134,750		711,588

annual output	Rs. 711,588
annual expenditure	648,094
annual estimated earnings	63,494

e) Shuttle factory

1. Raw material wood

Babul, Shisham, mulbery, bakian, kao and parrotia from irrigated plantation and riverrain forest.

2. Scale of this enterprise

(1) Annual output Rs. 1,392,500

(2) Annual expenditure Rs. 1,114,081

(3) Area of site 5,000 m^2

(4) Floor area of buildings 2,020 m^2

(5) Construction cost

(i) Site Rs. 5,000 (cost of readjustment)

(ii) Buildings 404,000

(iii) Machinery and other equipments Rs. 1,243,369

T o t a l Rs. 1,652,369

(6) Working capital Rs. 278,520

(7) Personnel required

staff 17 worker 121

3. Production plan

volume of raw material wood (annual)	number of raw material (annual)	yield of (%) pro-ducts	total number of pro-ducts (annual)	itemts of annual production	
				kind of products	number of products
280	350,000*	85	297,500	shuttles for hand loom and power loom	97,500
				shuttles for shuttle-change automatic loom	100,000
				shuttles for cop-change automatic loom	100,000

* Each piece has the volume of about 0.008 m^3 (5 cm x 4 cm x 40 cm)

4. Construction cost

(1) Site

i) Area 5,000 m^2

ii) Unit cost 1 R/m^2 (cost of readjustment)

iii) Sum Rs. 5,000

(2) Buildings

i) Area

item		area (m^2)
office		80
manu-factory	roughing shop	120
	machining shop	1,000
	finishing shop	40
	oil-treating shop	40
	grindery and repair shop	180
	inspecting and testing room	150
	total	1,530
ware-house	warehouse for dried lumber (warehouse for raw material wood)	120
	warehouse for products (shipping shop)	120
	warehouse for subsidiary materials	120
	warehouse for paint	50
	total	410
	grand total	2,020

ii) Unit cost 200 Rs/m^2

iii) Sum Rs. 404,000

(3) Machinery and other equipments

i) Roughing shop

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	30m		4.4	100	3,000	
dust collecting system	1		13.2		4,800	
t o t a l			17.6		7,800	
automatic leveling planer	1	3	3	10,000	10,000	600mm
single surface planer	1	3.7	3.7	10,000	10,000	450mm
hand planer	2	2.2	4.4	5,000	8,000	300mm
circular-saw machine	1	2.2	2.2	2,800	2,800	
boring machine	2	0.75	1.5	4,000	8,000	
tip fixing machine	1	1.5	1.5	6,500	6,500	
centering machine	2	1.5	3.0	6,000	12,000	
wood milling machine	1	0.75	0.75	5,000	5,000	
t o t a l	11		20.05		62,300	
sum total			37.65		70,100	
insurance, freight				10%	7,010	
custom duty				7.5%	5,258	
installation cost					3,000	
cost of electric works					7,000	
miscellaneous expenses					4,000	
grand total					96,368	(i)

ii) Machining shop

i t e m	quantity	power required (KW) per unit	power required (KW) total	unit cost (Rs)	s u m (Rs)	remarks
conveyor	200m		30	100	20,000	
dust collecting system	1		44		20,000	
t o t a l			74		40,000	
special wood milling machine	50	1.5	75	6,000	300,000	
vertical wood borer	25	0.75	18.75	5,000	125,000	
wood lathe	5	1.5	7.5	6,000	30,000	including the cost of accesories
grinder	5	0.75	3.75	4,000	20,000	
belt sander	8	1.5	12	5,000	40,000	
special planer	7	2.2	15.4	6,000	42,000	
hand press	2			1,300	2,600	*
tapping machine	1	0.75	0.75	5,000	5,000	
t o t a l	103		133.15		564,600	
sum total			207.15		604,600	
insurance, freight				10%	60,200	exclusive of * marked item
custom duty					45,150	
installation cost					18,000	
cost of electric works					45,000	
miscellaneous					30,000	
grand total					802,950	(ii)

iii) Finishing shop

i t e m	quantity	power required (KW) per unit	power required (KW) total	unit cost (Rs)	s u m (Rs)	remarks
floor type spray booth equipped with washing installation	1	4.4	4.4	5,000	5,000	
circulation type paint supplier	1	2.2	2.2	8,000	8,000	
air compressor	1	3.7	3.7	2,000	2,000	
polisher	2	1.5	3	3,000	6,000	
fan	1	1.5	1.5	5,500	5,500	
boiler	1			7,000	7,000	
t o t a l	7		14.8		33,500	
insurance, freight				10%	3,350	
custom duty				7.5%	2,513	
installation cost					1,200	
cost of electric works					2,500	
miscellaneous					3,000	
grand total					46,063	(iii)

iv) Oil-treating shop

i t e m	quantity	power required (KW) per unit	power required (KW) total	unit cost (Rs)	s u m (Rs)	remarks
vacuum type oil impregnating equipment	1-set		3.7		18,000	
fan	1	1.5	1.5		5,500	
t o t a l			5.2		23,500	
insurance, freight				10%	2,350	
custom duty				7.5%	1.763	
installation cost					500	
cost of electric works					500	
miscellaneous					1,200	
grand total					29,813	(iv)

v) Grindery and repair shop

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
automatic knife grinder	4	2.2	8.8	5,000	20,000	
universal tool grinder	10	0.75	7.5	2,000	20,000	
repairing machineries	1-set		26.4		55,000	
t o t a l	14		42.7		95,000	
insurance freight				10%	9,500	
custom duty				7.5%	7,125	
installation cost					5,500	
cost of electric works					10,000	
miscellaneous					7,000	
grand total					134,125	(v)

vi) Inspecting and testing room

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
testing loom	4	2.2	8.8	10,000	40,000	
insurance, freight				10%	4,000	
custom duty				7.5%	3,000	
installation cost					1,500	
cost of electric works					2,500	
miscellaneous					2,000	(vi)
grand total					53,000	

vii) Office and warehouse

i t e m	quan-tity	power required (KW) per unit	power required (KW) total	unit cost (Rs)	s u m (Rs)	remarks
fork lift	1			16,000	16,000	
humidity regulator	1		37.5		30,000	
t o t a l			37.5		46,000	
insurance, freight				10%	4,600	
custom duty				7.5%	3,450	
cost of electric works					2,000	
miscellaneous					25,000	
grand total					81,050	(vii)

grand total of the cost of machinery and other equipments

(i) + (ii) + (iii) + (iv) + (v) + (vi) + (vii) =
Rs. 1,243,369

grand total of construction cost

site	Rs. 5,000
buildings	Rs. 404,000
machinery and other equipments	Rs. 1,243,369
	Rs. 1,652,369

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments

1,647,369 x 0.1 = 164,737 Rs.

6. Personnel expenses

(1) Personnel required

staff 17 worker 121

(2) Personnel expenses

number of employees	unit wages (average) (Rs/month)	s u m (monthly) (Rs)	s u m (annual) (Rs)
138	270	37,260	447,120

(3) Personnel disposition plan

classification	disposition	c l a s s			
		senior staff and technical employee	junior staff and technical employee	worker	total
office workers	managing	2			2
	planning	1		1	2
	general affairs	1		2	3
	accounting	1	1	2	4
	materials supplying		1	1	2
	t o t a l	5	2	6	13
manufacturing workers	roughing	1	1	25	27
	machining	1	1	55	57
	finishing	1	1	4	6
	oil-treating		1	2	3
	grinding and repairing	1	1	12	14
	inspecting and testing	1		5	6
	the others			12	12
	t o t a l	5	5	115	125
	grand total	10	7	121	138

(4) Number of shift 1-shift

7. Annual expenditure

item	quantity	unit cost (Rs)	sum (Rs)	remarks
raw material wood (kiln dried)	280m^3	400	112,000	purchased from seasoning factory of this complex
metal fittings and subsidiary materials			300,000	
personnel expenses	138	270 Rs/month	447,120	
power	56,000KWH	7 Rs/ 100KWH	3,920	power required per unit volume of raw material wood is 200 KWH
total			863,040	
costs of operation		10% of above total	86,304	
depreciation amount			164,737	
grand total			1,114,081	

Working capital (1/4 of the annual expenditure)

Rs. 278,520

8. Details of annual output (Estimated earnings)

kind of products	quantity of production (piece)	selling price (Rs) per unit	output(Rs)
shuttles for hand loom and power loom	97,500	3	292,500
shuttles for shuttle-change automatic loom	100,000	4	400,000
shuttles for cop-change automatic loom	100,000	7	700,000
total	297,500		1,392,500

annual output	1,392,500 Rs.
annual expenditure	1,114,081
estimated earnings (annual)	278,419

B. Dargai Wood Industry Complex Plan

(1) Objective

This paper is for the Third Five Year Plan for the Industrial Development of Pakistan.

(2) Raw materials

Mainly the timber amounting to 28,000 cubic meters per year produced at Swat, Chitral area is to be used.

(3) Organization

a) Saw Mill
b) Wood seasoning factory
c) Furniture and fitting factory

(4) Location

Dargai has been chosen

a) Saw mill

1. Outline

(1) Objective

Production of sawn-lumber and supply of raw materials for furniture and fitting plants.

(2) Raw materials

Mainly the timber amounting to 28,000 cubic meters per year produced at Swat, Chitral area is to be used. Main species are softwood such as deodar, fir, spruce, chir and pail, as well as relatively small volume of hardwood, such as maple, walnut, ash, mulberry, shisham and babul.

(3) Equipments

60" and 80" band saw mill with automatic feed carriage.

(4) Products

Lumber for building, construction and packing material, and sleeper, furniture, fitting and other wood working.

2. Scale of this enterprise

(1)	Annual output	Rs.	2,520,720
(2)	Annual expenditure	Rs.	1,635,788
(3)	Area of site		8,000 m^2
(4)	Floor area of buildings		1,270 m^2
(5)	Construction cost	Rs.	745,000
(6)	Working capital	Rs.	408,947
(7)	Personnel required		52

3. Production plan

(1) Production by use

purpose	volume of raw log (m3/ year)	yield (%)	volume of products (m3/ year)	items of products		yield of kiln drying	volume of kiln dried lumber	supply to
				for air seasoning	for kiln drying			
construction, civil engineering, packing	20,000	65	13,500	13,500				market
furniture, fitting	4,000	60	2,400		2,400	70	1,680	furnit and fi ing factor
sleeper	4,000	60	2,400	2,400				market
t o t a l	28,000		18,300	15,900	2,400		1,680	

4. Details of construction cost

(1) Site

Area	8,000 m^2 (land)
Unit cost	1 R (cost of readjustment)
Sum	Rs. 8,000

(2) Buildings

i t e m	area (m2)	unit cost (Rs)	s u m (Rs)
manufactory	800		
warehouse, adjunct building	400	200	254,000
office	70		
t o t a l	1,270		254,000

(3) Machinery and other equipments

i t e m	quantity	unit cost (Rs)	s u m (Rs)	power (KW)
60 in band saw mill with automatic feed carriage	1	80,000	80,000	55
48 in band saw mill with automatic feed carriage	1	70,000	70,000	40
42 in roller feed band resaw	2	13,000	26,000	30
edger	2	10,000	20,000	10
corss cut saw	2	6,000	12,000	4
sawfiling equipment	1 set	20,000	20,000	10
winch	2 set	6,000	6,000	10
hoist	1 set	10,000	10,000	8
conveyor		40,000	40,000	25
fork lift	2	17,000	34,000	
other machines and equipments			10,000	5
dust collecting system	1	25,000	25,000	20
installation cost	15		60,000	
cost of electric works			60,000	
the others			10,000	
t o t a l			483,000	217

Grand total of construction cost Rs. 745,000

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments Rs. 73,700

6. Personnel expenses

(1) Personnel disposition

i t e m		senior staff and technical employee	junior technical employee	worker
office workers	director, vice-director	2		
	engineering works	1		1
	general affairs	1		1
	accounting	1		1
	materials supplying	1		1
manu-facturing workers	raw log		1	8
	sawing	1	1	15
	sawfiling	1	1	2
	warehouse		1	5
	the others		1	5
	t o t a l	8	5	39
grand total				52

(2) Sum

Rs. 270/month for each person (average)

Total personnel expenses (annual)

Rs. 270 x 12 x 52 = Rs. 168,480

7. Details of annual expenditure

(1) Unit power required for 1 m^3 of raw material wood and total power required for one year

Unit power 10 kWh total power 280,000 kWh

(2) Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)
raw log	28,000	40	1,120,000
subsidiary materials (10% of sum of raw log)			112,000
power	280,000kWh	0.07	19,600
personnel	52	3,240	168,480
t o t a l			1,420,080
costs of operation (10% of above total)			142,008
depreciation amount			73,700
grand total			1,635,788

8. Details of annual output

i t e m	quantity	unit cost (Rs)	s u m (Rs)
air dried lumber	15,900 m^3	140	2,226,000
green lumber for kiln drying	2,400 m^3	120	288,000
wood waste and saw dust (for seasoning factory)	1,680 m^3	4	6,720
t o t a l			2,520,720

b) Seasoning factory

1. Outline

(1) Objective

Most of the lumber for furniture, fitting and other wood working is to be dryed here.

(2) Raw materials

2,400 cubic meters of lumber supplied from the saw mill.

(3) Equipments

Two forced air circulation kilns of internal fan type, each with a capacity of 25 cubic meters of lumber.

(4) Products

Dried lumber for furniture, fitting and other woodworking.

2. Scale of the mill

(1)	Annual sales	Rs. 460,400
(2)	Annual expenditure	Rs. 442,668
(3)	Mill compound	2,550 m^2
(4)	Floor space	550 m^2
(5)	Construction investment	Rs. 272,550
(6)	Working capital	Rs. 110,667
(7)	Number of employees	16

3. Production plan

(1) Products

Lumber dryed per year	2,400 m^3
Yield of artificial drying	70 %
Dried lumber production	1,680 m^3

(2) Equipments and drying capacity

Two rooms, each with a capacity of 25 cubic meters of lumber at a time, are to be constructed, the size of each will be 8 m by 8 m with the ceiling 3 m high from the floor. The room will be 50 cubic meters in space. Internal fan type forced air circulation kiln will operate in 48 rotations per year, the capacity of which will be 2,400 cubic meters of lumber.

4. Details of construction cost

The same scale as the seasoning factory in the Karachi-Hyderabad wood industry complex plan.

Grand total of construction cost Rs. 272,550

5. Depreciation account

Rs. 27,000

6. Personnel expenses

Personnel required	16	Annual personnel expenses Rs. 51,840

7. Details of annual expenditure

(1) Unit quantities of fuel, power and water required for 1 m^3 of raw material wood and total quantities of them for one year

i t e m	unit quantity	total quantity required (annual)
fuel	0.42 ton	1,008 ton = 1,680 m^3 specific gravity
power	15 kWh	36,000 kWh
water	1.3 ton	3,120 ton

(2) Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)
raw material wood	2,400 m^3	120	288,000
subsidiary materials (10% of sum or raw material wood)			28,800
fuel	1,680 m^3	4	6,720
power	36,000 kWh	0.07	2,520
personnel	16	3,240	51,840
t o t a l			377,880
costs of operation (10% of above total)			37,788
depreciation amount			27,000
grand total			442,668

8. Details of annual output

i t e m	quantity (m3)	unit cost (Rs)	s u m (Rs)
kiln dried lumber	1,680	280	460,400

c) Furniture and Fitting Factory

1. Raw material wood

Mainly hardwood (babul, maple, shisham, ash, walnut, mulbery, birdcherry) & partly (20-30%) softwood (deodar, kail, fir, chir) from Swat, Chitral and Dargai districts

2. Scale of this enterprise

(1)	Annual output	Rs. 1,812,000
(2)	Annual expenditure	Rs. 1,416,290
(3)	Area of site	13,000 m^2
(4)	Floor area of buildings	5,480 m^2
(5)	Construction cost	
	(i) Site	Rs. 13,000 (cost of readjustment)
	(ii) Buildings	Rs. 1,096,000
	(iii) Machinery and other equipments	Rs. 1,443,139
		Rs. 2,552,139
(6)	Working capital	Rs. 354,073
(7)	Personnel required	
	staff 23	worker 121

3. Production plan

volume of raw material wood (annual)	yield of products (%)	net volume of raw material wood required (m3)	items of annual products			
			kind of products	quantity (piece)	volume of raw material wood required per unit (m3)	total volume of raw material wood required (m3)
1,300 hardwood kiln dried	65	1,092	chiffoniers and cabinets	6,000	0.06	360
			desks and tables	6,000	0.06	360
			chairs and stools	6,000	0.02	120
380 softwood kiln dried			door	6,000	0.02	120
			window flames	13,200	0.01	132

4. Construction cost

(1) Site

(i) Area 13,000 m^2

(ii) Unit cost 1 R/m^2 (cost of readjustment)

(iii) Sum Rs. 13,000

(2) Buildings

(i) Area

item		area (m^2)
office		100
manufactory	trimming shop	600
	machining mill	700
	gluing and forming shop	200
	assembling shop	1,200
	finishing shop	600
	sewing shop	150
	grindery and repair shop	80
	total	3,530

i t e m		area (m^2)
warehouse	warehouse for dried lumber	150
	warehouse for products	1,200
	warehouse for subsidiary materials	400
	warehouse for paint	100
	t o t a l	1,850
	grand total	5,480

(ii) Unit cost 200 Rs/m^2

(iii) Sum 1,096,000 Rs

(3) Machinery and other equipments

(i) Trimming shop

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	80m		11	100	8,000	
dust collecting system	1		22		13,000	
t o t a l			33		21,000	
cross cut-off saw	4	2.2	8.8	2,400	9,600	
rip saw	3	10	30	13,000	39,000	
double saw	2	7.5	15	10,000	20,000	
automatic leveling planer	2	3	6	10,000	20,000	600 mm
hand planer	5	2.2	11	4,000	20,000	300 mm
three-side planer and moulder	1	10	10	12,000	12,000	450 mm
four-side planer and moulder	1	15	15	24,000	24,000	150 mm
single surface planer	3	3.7	11.1	10,000	30,000	450 mm
"	1	3.7	3.7	10,500	10,500	600 mm
"	1	7.5	7.5	13,000	13,000	1,100mm
band scroll saw	2	3.7	7.5	5,000	10,000	800 mm
t o t a l	25		125.6		208,100	
sum total			158.6		229,100	

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
insurance, freight				10%	22,910	
custom duty				7.5%	17,183	
installation cost					6,000	
cost of electric works					15,000	
miscellaneous expenses					6,500	
grand total					296,693	(i)

(ii) Machining mill

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	100m		15	100	10,000	
dust collecting system	1		33		20,000	
fork lift	2			16,000	32,000	
t o t a l			48		62,000	
cross cut-off saw	3	2.2	6.6	2,400	7,200	
tenover	2	3.7	7.5	8,000	16,000	
double end tenover	2	7.5	15.0	13,000	26,000	
circular-saw machine	4	3.7	14.8	3,300	13,200	
single spindle shaper	3	3.7	11.1	8,000	24,000	
dovetail jointer	1	3.7	3.7	8,000	8,000	
dovetail machine	2	3.7	7.5	6,500	13,000	
corner locking machine	2	3.7	7.5	6,000	12,000	
hollow chisel mortiser	5	1.5	7.5	2,400	12,000	
router	3	2.2	6.6	6,500	19,500	
single wood borer	4	0.75	3.0	900	3,600	

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
two spindle wood borer	1	1.5	1.5	2,600	2,600	
multi-spindle wood borer	1	3.7	3.7	13,000	13,000	
super surfacer	2	3.7	7.5	12,000	24,000	
glue jointer	2	4.5	9.0	9,000	18,000	
copying machine	1	5.3	5.3	32,500	32,500	
drum sander	2	7.3	14.6	26,000	52,000	3 drum
belt sander	2	7.4	14.6	6,500	13,000	
disk sander	1	2.2	2.2	2,000	2,000	
spindle sander	1	1.5	1.5	1,300	1,300	
t o t a l	44		150.7		312,900	
sum total			198.7		374,900	
insurance, freight				10%	37,490	
custom duty				7.5%	28,118	
installation cost					10,000	
cost of electric works					25,000	
miscellaneous expenses					6,500	
grand total					482,008	(ii)

(iii) Gluing and forming shop

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	70m		13.5	100	7,000	
fork lift	1			16,000	16,000	
t o t a l			13.5		23,000	

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
lumber edge gluer	1	3.7	3.7	16,000	16,000	
veneer jointer	1	3.7	3.7	20,000	20,000	
veneer clipper	1	2.2	2.2	13,000	13,000	
veneer splicer	1	2.2	2.2	13,000	13,000	
glue mixer	1	1.5	1.5	4,000	4,000	
glue spreader	1	2.2	2.2	2,600	2,600	
hot press (oil pressure)	1	3.7	3.7	26,000	26,000	
"	1	2.2	2.2	20,000	20,000	
cold press (oil pressure)	1	3.7	3.7	13,000	13,000	
radio-heater	1	10	10	20,000	20,000	
turn buckle	1				4,000	*
t o t a l	10		35.1		151,600	
sum total			48.6		174,600	
insurance, freight				10%	17,060	exclusive of * marked item
custom duty				7.5%	12,795	
installation cost					3,000	
cost of electric works					10,000	
shielding of radio heater					2,500	
miscellaneous expenses					10,000	
grand total					229,955	

(iv) Assembling shop

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	150m		22.0	100	15,000	
flame assembling press	2	2.2	4.4	10,000	20,000	
assembling jig (plane)	2	1.5	3.0	400	800	*
assembling jig (three dimensional)	2	2.2	4.4	5,000	10,000	
assembling jig (for drawer)	2	0.75	1.5	200	400	*
circular-saw machine	1	2.2	2.2	3,000	3,000	
wood borer	2	0.75	1.5	800	1,600	
t o t a l	11		39		50,800	
insurance, freight				10%	4,960	exclusive of * marked items
custom duty				7.5%	3,720	
installation cost					3,000	
cost of electric works					8,000	
miscellaneous expenses					10,000	
grand total					80,480	(iv)

(v) Finishing shop

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	150m		22.0	100	15,000	
filler mixer	1	1.5	1.5	2,000	2,000	
ultra-red dryer	1	20	20	60,000	60,000	

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
floor type spray booth equipped with washing installation	2	4.4	8.8	5,000	10,000	
circulation type paint supplier	1	2.2	2.2	6,000	6,000	
air compressor	2	3.7	7.5	2,000	4,000	
belt sander	2	2.2	4.4	5,000	10,000	
compound polisher	2	2.2	4.4	5,000	10,000	
t o t a l	11	52.8			117,000	
insurance, freight				10%	11,700	
custom duty				7.5%	8,775	
installation cost					3,500	
cost of electric works					8,000	
miscellaneous					10,000	
grand total					158,975	(v)

(vi) Sewing shop

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	40m		7.3	100	4,000	
automatic cutting machine	2	0.75	1.5	500	800	
sewing machine	2	0.1	0.2	400	800	
t o t a l	4		9.0		5,600	

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
insurance, freight				10%	560	
custom duty				7.5%	420	
installation cost					400	
cost of electric works					1,500	
miscellaneous expenses					1,500	
grand total					9,980	(vi)

(vii) Grindery and repair shop

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
automatic knife grinder	4	2.2	8.8	5,000	20,000	
universal tool grinder	4	1.5	6.0	2,000	8,000	
automatic band saw sharpener	1	0.75	0.75	2,000	2,000	
automatic circular saw sharpener	3	0.75	2.25	1,300	3,900	
t o t a l	12		17.8		33,900	
insurance, freight				10%	3,390	
custom duty				7.5%	2,543	
installation cost					2,000	
cost of electric works					8,000	
miscellaneous expenses					6,000	
grand total					55,833	(vii)

(viii) Office and warehouse

i t e m	quantity	power required (KW) per unit	power required (KW) total	unit cost (Rs)	s u m (Rs)	remarks
fork lift	3			16,000	48,000	
push car	3			130	390	*
humidity regulator	1		45		35,000	
t o t a l	6		45		83,390	
insurance, freight				10%	8,300	exclusive of * marked item
custom duty				7.5%	6,225	
cost of electric works					1,300	
miscellaneous					30,000	
grand total					129,215	(viii)

Grand total of the cost of machinery and other equipments

(i) + (ii) + (iii) + (iv) + (v) + (vi) + (vii) + (viii)

= Rs. 1,443,139

Grand total of construction cost

Site	Rs. 13,000
Buildings	Rs. 1,096,000
Machinery and other equipment	Rs. 1,443,139
	Rs. 2,552,139

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments

2,539,139 x 0.1 = Rs. 253,914

6. Personnel expenses

(1) Personnel required

staff 23 worker 121

(2) Personnel expenses

number of employees	unit wages (average) (Rs/month)	s u m (monthly)	s u m (annual) (Rs)
144	270	38,880	466,560

(3) Personnel disposition plan

classification	disposition	class of employees			
		senior staff and technical employee	junior staff and technical employee	worker	total
office workers	managing	2			2
	designing	1	1	2	4
	planning		1	1	2
	general affairs	1		2	3
	accounting			2	2
	materials supplying	1	1	2	4
	t o t a l	5	3	9	17
manufacturing workers	trimming	1	1	20	22
	machining	1	2	20	23
	gluing	1	1	6	8
	assembling	1	2	25	28
	finishing		2	20	22
	sewing		1	6	7
	grinding and repairing	1	1	5	7
	the others			10	10
	t o t a l	5	10	112	127
	grand total	10	13	121	144

(4) Number of shift · 1-shift

7. Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)	r e m a r k s
raw material wood (kiln dried)	1,680m^3	280	470,400	1. all round price of hard wood and soft-wood 2. purchased from seasoning factory of this complex
plywood, veneer and board				
ply wood	70,000ft^2	0.25	17,500	thickness 4 mm
rotary veneer	27,000ft^2	0.035	945	thickness 1 mm
sliced veneer	50,000ft^2	0.07	3,500	thickness 0.8 mm
lumber core plywood	30,000ft^2	0.7	21,000	thickness 20 mm
particle board	30,000ft^2	0.6	18,000	thickness 20 mm
t o t a l			60,945	
subsidiary materials		10% of the sum of raw material wood	47,040	
personnel expenses	144	270Rs/month	466,560	
power	168,000	7 Rs/100kwh	11,760	power required per unit volume of raw material wood is 100 kwh
t o t a l			1,056,705	
costs of operation			105,671	
depreciation amount			253,914	
grand total			1,416,290	

Working capital (1/4 of the annual expenditure)

Rs. 354,073

8. Details of annual output (Estimated earnings)

kind of products	quantity of production	selling price per unit (Rs)	output (Rs)
	(piece)		
chiffoniers and cabinets	6,000	110	660,000
desks and tables	6,000	110	660,000
chairs and stools	6,000	30	180,000
door	6,000	30	180,000
window flames	13,200	10	132,000
t o t a l			1,812,000

Annual output	Rs. 1,812,000
Annual expenditure	Rs. 1,416,290
Annual estimated earnings	Rs. 395,710

C. Bagasse Pulp and Paper Mill Plan in West Pakistan

The most promising raw material for pulping in West Pakistan is baggasse. Since it is an important fuel of Sugar mills, pulping of baggasse shall be considered in the following two directions:

(A) To use surplus bagasse at sugar mills, in which case it is necessary to obrain bagasse from several sugar mills in order to have ample supply of it. The price of bagasse may be cheap, but the costs of transportation and packaging will be considerably high. It will be convenient when there are many sugar mills around the proposed pulp mill site.

(B) To collect all bagasse produced at sugar mills, the fuel of which being entirely switched over to other substitute materials. The pulp mill is to be located close to the sugar mill, to make handling of bagasse easy and to save transportation and packaging costs. It will be further convenienced if Sui gas of West Pakistan can be utilized.
Mardan area, where substitute fuel is relatively dear and where there are large mills like Premier Sugar Mill, is considered to

come under (A) above. If one fifth to one forth of released bagasse of this area could be made available, a paper mill to produce 15,000 tons can be established there.

This report shall deal with a case at Fouji Sugar Mill, which come under (B), where substitute fuel is supposed to be obtained at relatively low prices. Crude oil, which is dear, is taken as substitute fuel, but if Sui gas can be used, fuel price should be replaced to it.

In the neighborhood of Karachi, mangrove may be utilized in addition to bagasse, and the case is similar to that of Khulna area.

1. Outline

(1) Objective ..... Utilization of released bagasse of Fouji Sugar Mill for the establishment of a bagasse pulp and paper mill.

(2) Raw materials ..... Bagasse and imported pulps.

(3) Equipments ..... Bleached Kraft Pulp Plant, Paper Machine and Auxiliary equipments.

(4) Products ..... Bleached Bagasse Pulp, and subsequent writing and printing paper.

2. Scale of the Mill

(1)	Sales	Pulp 10,200 t/year
		Paper 12,000 t/year
(2)	Expenditure per year	17.99 Million Rupee
(3)	Mill compound	50,000 m^2
(4)	Floor space	10,000 m^2
(5)	Construction investment .	45.00 Million Rupee
(6)	Working capital	4.50 Million Rupee
(7)	Number of employees	330

3. Break down of construction expenses

(1) Machinery

(Rupee in Million)

Boiler conpersion at Sugar mill	1.00
Bagasse Handling machine	0.50
Bagasse Depithing machine	1.00
Cooking Dept	1.20

Washing and Screening	1.00
Bleaching Dept.	1.50
Stack preparation	1.80
Paper making Dept.	9.00
Finishing Dept.	1.20
Chemical preparation	0.20
Fraporator	0.70
Recovery Boiler	1.80
Recauticizing plant	1.20
Electrolyses plant	2.20
Bleaching agent making	0.20
Water supply	1.50
Steam Boiler	1.50
Power generator	2.00
Power distributor	0.50
Repan Shop	0.80
Laboratory	0.20
Spare parts	2.00
Pipeline and Wiring material	2.00
Transportation equip.	1.00
Machine for unloading and transportation	1.50
Machine and equip for erection work	1.50
T o t a l	39.00

(2) Buildings

Floor space 10,000 m x 300 Rs	3.00

(3) Ground preparation

50,000 m x 20 Rs	1.00
(4) Other reserve expenses	2.00
T o t a l	45.00

4. Number of employees

Cooking Dept	14 x 3 =	42
Bleaching Dept	9 x 3 =	27
Recovery Dept	12 x 3 =	36
Boiler & generator	10 x 3 =	30
Stock preparation	6 x 3 =	18
Paper making Dept	8 x 3 =	24
Finishing Dept	16 x 2 =	32
Chemical preparation	5 x 3 =	15
Maintenance	6 x 3 =	18
Electrolysis Plant	8 x 3 =	24
Repair Shop	12 x 1 =	12
Laboratory	7 x 1 =	1
Indirect workers	15 x 1 =	15
Clerical workers	30 x 1 =	30
T o t a l		330

5. Estimates of Bagasse cost

Sugar mill crusing		
Capacity (Fouji sugar mill) (1)	1,500	t/D
Crushing season (2)	150	D/year
Crushing capacity (3)	225,000	t/year
Fresh Bagasse released (4)	340	t/D
	51,000	t/year
	(3)/(2) x 0.12 x 100/(100 - 48)	
Fresh Bagasse Consumed by paper mill (5)	170	t/D
Air dry Bagasse consumed by paper mill (6)	105	t/D
Pulp production	35	t/D (6)/0.3
Fuel Substitution Cost		
Per ton Fresh Bagasse		
Fuel replacement		
Value Rs/t (7)	22.1	Rs/t
Baling, Piling, Unpiling cost Rs/t (8)	3.7	Rs/t
Baled Bagasse cost (9)	25.8	Rs/t (7) + (8)

Fresh Bagasse cost Baled and stored (10)	29.3 Rs/t (9) + yield + overhead
Air Dry Baled Bagasse total cost at Sugar Mill (11)	47.8 Rs/t (10) x 1.63 1.63=(1.00-0.15/1.00-0.45
Unbaled, unpiled air dry bagasse total cost (12)	36.0 Rs/t (6) x 1.63
Bagasse Handling Cost (13)	2 Rs/t
Delivered cost, annual average	43.9 Rs/t {(11)-(12)}/2+(13)

6. Production cost

(1) Direct expenses of pulping

Raw material	Unit per ton	Unit price	Rs/pulpt	Consumption per year
Bagasse	3 t/t	43.9 Rs/t	131.7	30,000 t
Salt	120 kg/t	180 Rs/t	21.6	1,200 t
Sulfur	18 kg/t	300 Rs/t	5.4	180 t
Lime stone	100 kg/t	30 Rs/t	3.0	1,000 t
Fuel oil	200 l/t	130 Rs/kl	26.0	2,000 kl
Power for electrolysis	350 KWH/t	7 Rs/100 KWH	24.5	Million KWH 3.50
Power for pulping	600 KWH/t	"	42.0	Million KHW 6.00
Water	500 m^3/t	0.07 Rs/m^3	35.0	Million 5.00 m^3
Maintenance			20.0	
Auxiliary materials			10.8	
T o t a l			320.0	

(2) Costs of paper making (all inclusive)

Raw material	Unit per ton	Unit price	Rs/papert	Consumption per year	Expenditure per year
					(Rupee in Million)
Bagasse Pulp	850 kg/t	320 Rs/t	272.0	10,200 t	3.26
Imported Pulp	200 kg/t	1050 Rs/t	210.0	2,400 t	2.52
Clay	100 kg/t	0.3 Rs/kg	30.0	1,200 t	0.36
Alum	30 kg/t	0.35 Rs/kg	10.5	360 t	0.13
Size	15 kg/t	1 Rs/kg	15.0	180 t	0.18
Fuel oil	400 l/t	130 Rs/kl	52.0	4,800 t	0.63
Power	600 KWH/t	7 Rs/KWH	42.0	7.2 Million KWH	0.51
Water	200 m^3/t	0.07 Rs/m^3	14.0	2.4 Million m^3	0.17
Tools			30.0		0.36
Auxiliary materials			30.0		0.36
Packaging materials			15.0		0.18
Maintenance			20.0		0.24
Labor 330 x 25 Rs/man-month			82.5		0.99
Overhead for sale			300.0		3.60
Depreciation 45 Million x 1/10x1/12,000			375.0		4.50
T o t a l			1,498.0		17.99

* Production of cotton linter pulp may be considered instead of importing pulp.

6. Production per year

2,000 Rs/t x 12,000 t = 24.00 Million Rupee

Profit per year

24.00 Million Rupee - 17.99 Million Rupee = 6.01 Million Rupee

D. Kaptai Wood Industry Complex Plan

(1) Objective

This paper is for the Third Five Year Plan for the Industrial Development of Pakistan.

(2) Raw materials

Timber amounting to 200,000 cubic meters, per year produced at Kassalong and Rangkheong Reserved Forests is to be used.

(3) Organization

a) Saw mill
b) Wood seasoning factory
c) Furniture and fitting factory
d) Flooring factory
e) Wood working factory
f) Plywood factory
g) Particle board factory
h) Briquette factory
i) Wood treating factory
j) Urea resin factory

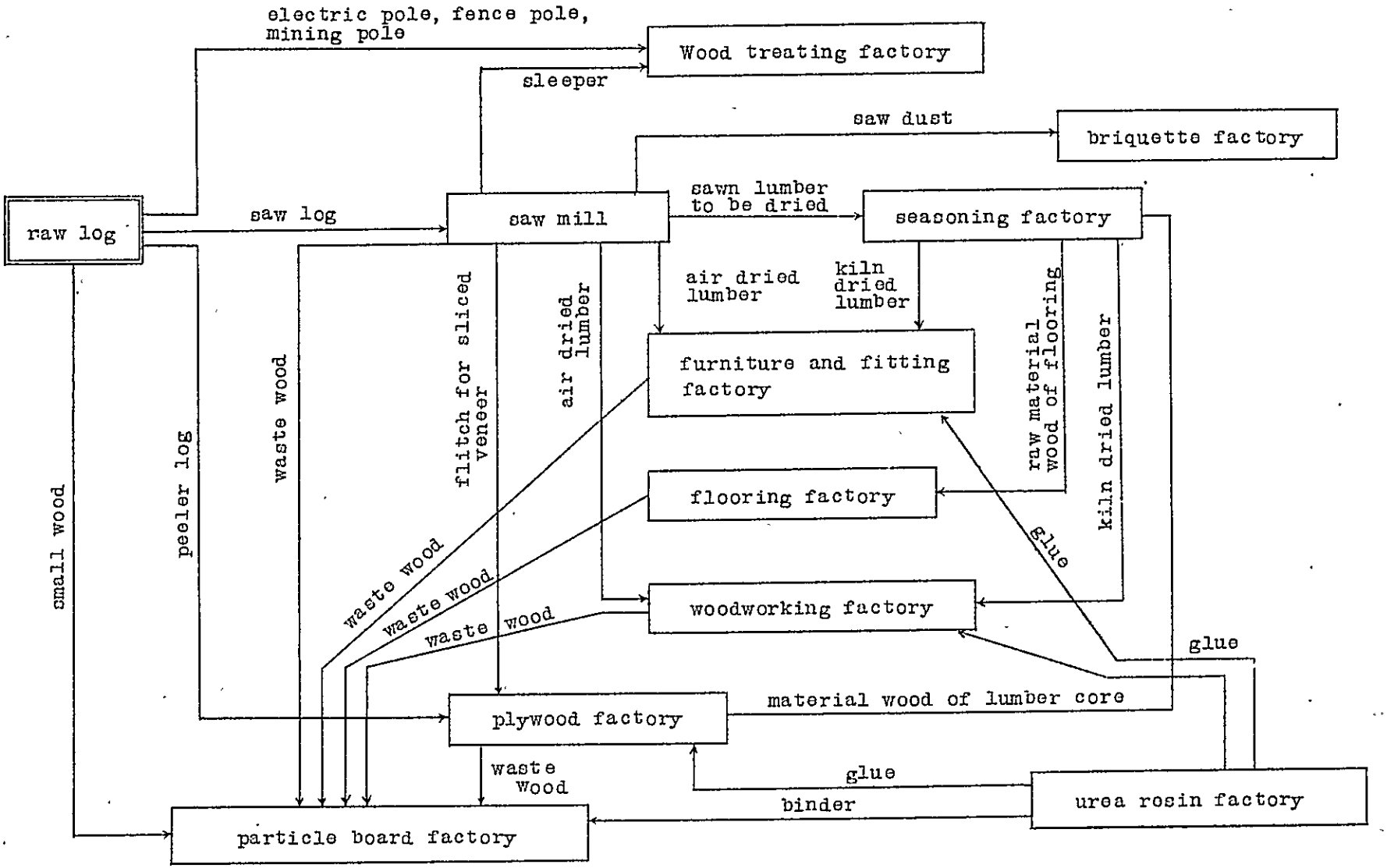
(4) Location

It is considered best to assemble all plants at Kaptai (above the Dam), but some plants, such as furniture, fitting flooring, general wood working, wood treatment and urea resin, may be examined to be located at other places.
Development of Samgoo-Matamuri Reserved Forests may be considered in the same way as the above plan at such places as cox's Bazar area.

(5) Distribution of raw materials

Raw log for saw-lumber	99,000 m^3
Peeler log	72,500 "
Raw log for treating	5,000 "
Raw log for particle board (small log)	5,000 "
T o t a l	181,500 "

(6) Flow sheet of raw materials



a) Saw mill

1. Outline

(1) Objective

A mill at Kaptai with two lines of sawing equipments, each with a capacity of processing 50,000 cubic meters of logs is to be established, for the purpose of producing market lumber and of supplying lumber for wood working plant.

(2) Raw materials

Timber amounting 100,000 cubic meters per year produced at Kassalong and Rangkheong Reserved Forests is to be used main species are garjan, civit, champa and gamar.

(3) Equipments

Main equipment shall be 72" and 60" band saw with automatic feed carriage.

(4) Products

Main products shall be lumber for building, construction, wheeles, vessels, furniture, fitting, packaging, treated sleeper flooring board materials for lumber core and flitch for sliced veneer.

2. Scale of this enterprise

(1)	Annual output	Rs. 10,568,800
(2)	Annual expenditure	Rs. 6,668,530
(3)	Area of site	15,000 m^2
(4)	Floor area of buildings	3,200 m^2
(5)	Construction cost	Rs. 2,045,000
(6)	Working capital	Rs. 1,667,133
(7)	Personnel required	121

3. Production plan

(1) Products by uses

Uses	Raw material wood (m3/year)	Yield (%)	Production (m3/year)	Analized production(m3/year)		Yield of kiln drying (%)	Kiln-dried lumber production (m3/year)	Destination
				Air-dried	kiln-dried lumber			
Building and construction	50,000	60	30,000	30,000				Market
Vehecles and vessels	5,000	60	3,000	2,500	500	75	375	Market
Furniture and fitting	10,000	60	6,000	3,000*	3,000	75	2,250	Furniture and fitting plant
Flooring board	8,000	50	4,000		4,000	75	3,000	Flooring plant
Packing material	5,000	60	3,000	3,000*				General wood working plants
General wood working	5,000	60	3,000	2,500*	500	75	375	
Lumber core	8,000	70	5,600		5,600	75	4,200	veneer plant
Flitch for sliced venner	3,000	50	1,500					
Sleeper	5,000	60	3,000	3,000				Wood treatment plants
T o t a l	99,000		59,100	44,000	13,600		10,200	

* Actually drying yield is set at 85% (95% for sleeper), which is sent to defined destinations, and the remaing 1,425 m3 is sold in the market for building and construction.
In this factory, raw log for furniture, fitting, packing materials and other common wooden ware will be sawn to rough lumber, for flooring, veneer flitch and sleeper to the dimensions of itself and for lumber core strips to the dimensions of raw lumber.

(2) Sawing capacity

The capacity will be 2 lines, each sawing about 50,000 m^3 of wood per year.

4. Details of construction cost

(1) Site

item	quantity (m2)	unti cost (Rs)	s u m (Rs)	remarks
water	5,000	0.1	500	readjustment
land	10,000	1	10,000	"
total	15,000		10,500	

(2) Buildings

i t e m	quantity (m2)	unit cost (Rs)	s u m (Rs)	remarks
manufactory	2,000	200	640,000	1,000m2 x 2
warehouse, adjunct buildings	1,000			
office	200			
t o t a l	3,200		640,000	

(3) Machinery and other equipments

i t e m	quantity	unit cost (Rs)	s u m (Rs)	power (kW)
72 in band saw mill with automatic feed carriage	2	95,000	190,000	150
60 in band saw mill with automatic feed carriage	2	80,000	160,000	110
44 in band saw mill with light duty automatic feed carriage	2	60,000	120,000	70
42 in roller feed band resaw	6	13,000	78,000	80
edger	4	10,000	40,000	20
cross cut saw	6	6,000	36,000	12
sawfiling equipments	2 set	25,000	50,000	30
winch	2 set	12,000	24,000	30
hoist	2 set	20,000	40,000	20
conveyor	2 set	60,000	120,000	70
fork lift	4	17,000	68,000	
other machines and equipments	2 set	12,000	24,000	14
dust collecting system	2 set	30,000	60,000	60

installation cost			200,000	
cost of electric works			160,000	
the others			25,000	60
t o t a l			1,395,000	726

grand total of construction cost Rs. 2,045,500

5. Depreciation amount

10% of the following total = Rs. 203,500

Buildings	Rs. 640,000
Machinery and other equipments	Rs. 1,395,000
T o t a l	Rs. 2,035,000

6. Personnel expenses

(1) Personnel disposition

i t e m		senior staff and technical employee	junior staff and technical employee	worker
office workers	director, vice-director	2		
	engineering works	2	1	3
	general affairs	1	1	3
	accounting	1	1	3
	materials supplying	1		3
manufacturing workers	raw log	1	2	16
	sawing	2	4	40
	sawfiling	2	2	8
	warehouse	1	1	10
	the others		2	8
	t o t a l	13	14	94
grand total		121		

(2) Sum 250 Rs/month for each person (average)

Total personnel expenses (annual) Rs. 250x12x121 = Rs. 363,000

7. Details of annual expenditure

(1) Unit power required for 1 m^3 of raw material wood and total power required for one year

unit power --- 10 kWh total power --- 990,000 kWh

(2) Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)
row log	99,000 m^3	50	4,950,000
subsidiary materials (10% of sum of raw log)			495,000
power	990,000 kWh	0.07	69,300
personnel	121	3,000	363,000
t o t a l			5,877,300
costs of operation (10% of above total)			587,730
depreciation amount			203,500
grand total			6,668,530

8. Details of annual output

i t e m	quantity	unit price (Rs)	s u m (Rs)	remarks
air dried lumber	44,000m^3	140	6,160,000	
green lumber for kiln drying	13,600m^3	120	3,902,000	
flitch for sliced veneer	1,500m^3	240	360,000	
raw materials for particle board	9,900m^3	12	118,800	99,000m^3 x 0.1
waste wood, saw dust (raw materials for briquette)	7,000m^3 (=7,000ton)	4	28,000	99,000m^3x 0.07≒7,000m^3
t o t a l			10,568,800	

b) Seasoning factory

1. Outline

(1) Objective

Drying part of lumber for vehicle, vessel, furniture fitting and general wood working and all of the lumber for flooring and lumber core.

(2) Raw materials

13,600 m^3 of lumber supplied by the saw mill.

(3) Equipments

12 forced air circulation kilns of internal fan type with a capacity of 25 m^3.

(4) Products

Dried lumber for vehicle, vessel, furniture, fitting, general wood working, flooring board and lumber core.

2. Scale of this enterprise

(1)	Annual output	Rs. 2,346,000
(2)	Annual expenditure	Rs. 2,265,344
(3)	Area of site	8,190 m^2
(4)	Floor area of building	2,190 m^2
(5)	Construction cost	Rs. 1,288,190
(6)	Working capital	Rs. 566,336
(7)	Personnel required	35

3. Production plan

(1) Itemized products

U s e	wood (m3/year)	Yield of drying %	Production (m3/year)	Destination
Vehicle and Vessel	500	75	375	Market
Furniture and Fitting	3,000	75	2,250	Furniture and fitting plant
Flooring board	4,000	75	3,000	Flooring plant
General wood working	500	75	375	General wood working plant
Lumber core	5,600	75	4,200	Plywood plant
T o t a l	13,600		10,200	

(2) Equipments and drying capacity

12 rooms with a capacity of 25 m3 of wood each.
Each room shall be 5 m by 8 m and 3 m high from the floor, with a space of 50 m3 and double tracks.
Internal fan type forced air circulation, 4 rotations per month.
Capacity: 14,400 m3 of wood per year.

4. Details of construction cost

(1) Site

i t e m	area (m2)	unit cost (Rs)	s u m (Rs)	remarks
site for buildings	2,190	1	2,190	readjustment
yard for air seasoning and the others	6,000	3	18,000	readjustment, partly racks for air seasoning
t o t a l	8,190		20,190	

(2) Buildings

i t e m	area (m2)	unit cost (Rs)	s u m (Rs)	remarks
dry kiln	600	200	438,000	50 m2 x 12
operating and cooling room	1,440			
boiler house	100			
warehouse for fuel	50			
t o t a l	2,190		438,000	

remarks: Office and warehouse belonged to the sawmill in this complex are used in common for this factory

(3) Machinery and other equipments

i t e m	quantity	unit cost (Rs)	s u m (Rs)	p o w e r
dry kiln equipments	12 set	30,000	360,000	120
boiler house equipments (including chimney)	1 set	400,000	400,000	
rail	800 m	10	8,000	
trolley	80	400	32,000	
costs of electric works			15,000	
the others			15,000	20
t o t a l			830,000	140

Grand total of construction cost --- Rs. 1,288,190

5. Depreciation amount

10% of the following total =	Rs. 128,000
racks for air seasoning	Rs. 12,000
buildings	Rs. 438,000
machinery and other equipments	Rs. 830,000
t o t a l	Rs. 1,280,000

6. Personnel expenses

(1) *Personnel disposition*

i t e m	senior staff and technical employee	junior technical employee	worker	remarks
director, vice-director	2			
engineering works	1	4	12	3-shift
warehouse		2	6	
yard		2	6	
t o t a l	3	8	24	
grand total		35		

(2) Sum

Rs. 250/month for each person (average)

Total personnel expenses (annual)

Rs. 250 x 12 x 35 = Rs. 105,000

7. Details of annual expenditure

(1) Unit quantities of fuel, power and water required for/m3 of raw material wood and total quantities of them for one year

i t e m	unit quantity	total quantity required (annual)
fuel (waste wood)	420 kg	5712 ton = 7,140m3 (specific gravity 0.8)
power	15 kWh	204,000 kWh
water	1.3 ton	17,680 ton

(2) Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)
raw material wood	13,600 m3	120	1,632,000
subsidiary materials (10% of sum of raw material wood)			163,200
fuel	7,140 m3	4	28,560
power	204,000 kWh	0.07	14,280
personnel	35	3,000	105,000
t o t a l			1,943,040
costs of operation (10% of above total)			194,304
depreciation amount			128,000
grand total			2,265,344

8. Details of annual output

i t e m	quantity	unit cost (Rs)	s u m (Rs)
kiln dried lumber	10,200 m3	230	2,346,000

c) Furniture and fitting factory

1. Raw material wood

Mainly civit and champa from Kassalong and Rankheong districts

2. Scale of this enterprise

(1) Annual output Rs. 4,118,400

(2) Annual expenditure Rs. 2,987,314

(3) Area of site 33,000 m2

(4) Floor area of buildings 13,500 m2

(5) Construction cost

(i) Site Rs. 33,000 (cost of readjustment)

(ii) Buildings Rs. 2,700,000

(iii) Machinery and other equipments Rs. 3,094,693

T o t a l Rs. 5,872,693

(6) Working capital Rs. 746,829

(7) Personnel required

staff 44 worker 300

3. Production plan

volume of raw material wood (annual)	yield of products (%)	net volume of raw material wood required (m3)	items of annual products			
			kind of products	quantity (piece)	volume of raw material wood required per unit	total volume of raw material wood required
2,250 kiln dried lumber 2,550 air dried lumber	65	3,120	chiffoniers and cabinets	10,000	0.06	600
			desks and tables	20,000	0.06	1,200
			chairs and stools	20,000	0.02	400
			doors	20,000	0.02	400
			window flames	52,000	0.01	520

4. Construction cost

(1) Site

(i) Area 33,000 m2 (land)

(ii) Unit cost 1 R/m2 (cost of readjustment)

(iii) Sum Rs. 33,000

(2) Buildings

(i) Area

item		area (m2)
office		200
manufactory	trimming shop	1,500
	machining mill	1,500
	gluing and forming shop	500
	assembling shop	3,000
	finishing shop	1,500
	sewing shop	450
	grindery and repair shop	150
	total	8,600

warehouse	warehouse for dried lumber	400
	warehouse for products	3,000
	warehouse for subsidiary materials	1,000
	warehouse for paint	300
	t o t a l	4,700
	grand total	13,500

(ii) Unit Cost 200 Rs/m2

(iii) Sum Rs. 2,700,000

(3) Machinery and other equipments

(i) Trimming shop

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	200m		30	100	20,000	
dust collecting system	1		40		26,000	
t o t a l			70		46,000	
cross cut-of saw	10	2.2	22	2,400	24,000	
rip saw	8	10	80	13,000	104,000	
gang rip saw	1	24.2	24.2	20,000	20,000	
double saw	4	7.5	30	10,000	40,000	
automatic leveling planer	4	3	12	10,000	40,000	600 mm
hand planer	15	2.2	33	4,000	60,000	300 mm
three-side planer and moulder	2	10	20	12,000	24,000	450 mm
four-side planer and moulder	2	15	30	24,000	48,000	150 mm
single surface planer	8	3.7	29.6	10,000	80,000	450 mm
"	2	3.7	7.5	10,500	21,000	600 mm
"	2	7.5	15.0	13,000	26,000	1,100mm
band scroll saw	6	3.7	22.2	5,000	30,000	800 mm
t o t a l	64		325.5		517,000	
sum total			395.5		563,000	

insurance, freight				10%	56,300	
custom duty				7.5%	42,225	
installation cost					12,000	
cost of electric works					30,000	
miscellaneous expenses					13,000	
grand total					716,525	(i)

(ii) Machining mill

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	200m		30	100	20,000	
dust collecting system	1		52		30,000	
fork lift	3			16,000	48,000	
t o t a l			82		98,000	
cross cut-off saw	8	2.2	17.6	2,400	19,200	
tenoner	6	3.7	22.2	8,000	48,000	
double end tenoner	2	7.5	15.0	13,000	26,000	
circular-saw machine	12	3.7	44.4	3,300	39,600	
single spindle shaper	8	3.7	29.6	8,000	64,000	
dovetail jointer	2	3.7	7.5	8,000	16,000	
dovetail machine	5	3.7	18.5	6,500	32,500	
corner locking machine	4	3.7	14.8	6,000	24,000	
hollow chisel mortiser	16	1.5	24.0	2,400	38,400	
router	12	2.2	26.4	6,500	78,000	
single wood borer	12	0.75	9.0	900	10,800	
two spindle "	2	1.5	3.0	2,600	5,200	
multi-spindle "	2	3.7	7.5	13,000	26,000	
super surfacer	6	3.7	22.2	12,000	72,000	
glue jointer	3	4.5	13.5	9,000	27,000	
copying machine	2	5.3	10.6	32,500	65,000	
drum sander	4	7.3	29.2	26,000	104,000	3 drum

disk sander	2	2.2	4.4	2,000	4,000	
belt sander	4	7.3	29.2	6,500	26,000	
spindle sander	2	1.5	3.0	1,300	2,600	
t o t a l	114		351.6		728,300	
sum total			433.6		826,300	
insurance, freight				10%	82,630	
custom duty				7.5%	61,973	
installation cost					20,000	
cost of electric works					50,000	
miscellaneous expenses					13,000	
grand total					1,053,903	(ii)

(iii) Gluing and forming shop

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	150m		22.0	100	15,000	
fork lift	1			16,000	16,000	
t o t a l			22.0		31,000	
lumber edge gluer	1	3.7	3.7	16,000	16,000	
veneer clipper	1	2.2	2.2	13,000	13,000	
veneer jointer	1	3.7	3.7	20,000	20,000	
veneer splicer	1	2.2	2.2	13,000	13,000	
glue mixer	1	1.5	1.5	4,000	4,000	
glue spreader	2	2.2	4.4	2,600	5,200	
hot press (oil pressure)	3	7.5	22.5	26,000	78,000	
cold press (oil pressure)	2	3.7	7.5	13,000	26,000	
radio heater	2	10	20	20,000	40,000	
turn buckle	1 set				8,000	*
t o t a l	14		67.7		223,200	
sum total			89.7		254,200	

insurance freight				10%	24,620	exclusive of * marked item
custom duty				7.5%	18,465	"
installation cost					4,000	
cost of electric works					13,000	
shielding of radio heater					4,000	
miscellaneous expenses					13,000	
grand total					331,285	(iii)

(iv) Assembling shop

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	400m		44	100	40,000	
flame assembling press	6	2.2	13.2	10,000	60,000	
assembling jig (plane)	5	1.5	7.5	400	2,000	*
assembling jig (three dimensional)	4	2.2	8.8	5,000	20,000	
assembling jig (for drawer)	5	0.75	3.8	200	1,000	*
circular-saw machine	2	2.2	4.4	3,000	6,000	
wood borer	5	0.75	3.8	800	4,000	
t o t a l	27		85.5		133,000	
insurance, freight				10%	13,000	exclusive of * marked item
custom duty				7.5%	9,750	"
installation cost					7,000	
cost of electric works					18,000	
miscellaneous expenses					15,000	
grand total					195,750	(iv)

(v) Finishing shop

i t e m	quantity	power required (KW) per unit	power required (KW) total	unit cost (Rs)	s u m (Rs)	remarks
conveyor	400m		44	100	40,000	
fork lift	1			16,000	16,000	
t o t a l			44		56,000	
filler mixer	1	1.5	1.5	2,000	2,000	
ultra-red dryer	2	20	40	60,000	120,000	
floor type spray booth equipped with washing installation	5	4.4	22	5,000	25,000	
circulation, type paint supplier	1	2.2	2.2	8,000	8,000	
air compressor	5	3.7	18.5	2,000	10,000	
belt sander	5	2.2	11	5,000	25,000	
compound polisher	5	2.2	11	5,000	25,000	
t o t a l	24		106.2		215,000	
sum total			150.2		271,000	
insurance freight				10%	27,100	
custom duty				7.5%	20,325	
installation cost					7,000	
cost of electric works					18,000	
miscellaneous expenses					18,000	
grand total					361,425	(v)

(vi) Sewing shop

i t e m	quantity	power required (KW) per unit	power required (KW) total	unit cost (Rs)	s u m (Rs)	remarks
conveyor	100m		15	100	10,000	
automatic cutting machine	3	0.75	2.2	400	1,200	
sewing machine	5	0.1	0.5	400	2,000	
t o t a l	8		17.7		13,200	

insurance, freight				10%	1,320	
custom duty				7.5%	990	
installation cost					600	
cost of electric works					2,000	
miscellaneous expenses					2,000	
grand total					20,110	(vi)

(vii) Grindery and repair shop

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
automatic knife grinder	10	2.2	2.2	5,000	50,000	
universal tool grinder	10	1.5	1.5	2,000	20,000	
automatic band saw sharpener	3	0.75	2.2	2,000	6,000	
automatic circular saw sharpener	8	0.75	6	1,300	10,400	
t o t a l	31		45.2		86,400	
insurance, freight				10%	8,640	
custom duty				7.5%	6,480	
installation cost					3,500	
cost of electric works					15,000	
miscellaneous expenses					10,000	
grand total					130,020	(vii)

(viii) Office and warehouse

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
fork lift	8			16,000	128,000	
push car	10			130	1,300	*
humidity regulator	1		90		65,000	
t o t a l	18		90		194,300	

insurance, freight				10%	19,300	exclusive * marked i
custom duty				7.5%	14,475	"
cost of electric works					2,600	
miscellaneous expenses					55,000	
grand total					285,675	(viii)

grand total of the cost of machinery and other equipments
(i) + (ii) + (iii) + (iv) + (v) + (vi) + (vii) + (viii)
= Rs. 3,094,693

grand total of construction cost

Site	Rs. 33,000
Building	Rs. 2,700,000
Machinery and other equipment	Rs. 3,094,693
	Rs. 5,827,693

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments

5,794,693 x 0.1 = Rs. 579,469

6. Personnel expenses

(1) Personnel required

staff 44 worker 300

(2) Personnel expenses

number of employees	unit wages (average) (Rs/month)	s u m (monthly) (Rs)	s u m (annual) (Rs)
344	250	86,000	1,032,000

(3) Personnel disposition plan

classi-fication	disposition	class of employees			
		senior staff and technical employee	junior staff and technical employee	worker	total
office workers	managing	2			2
	designing	1	2	5	8
	planning	1	1	2	4
	general affairs	1		5	6

	accounting	1		5	6
	materials supplying	1	1	6	8
	t o t a l	7	4	23	34
manu-factur-ing workers	trimming	1	4	50	55
	machining	1	4	50	55
	gluing	1	4	15	20
	assembling	1	4	60	65
	finishing	1	4	50	55
	sewing	1	2	15	18
	grinding and repairing	1	3	12	16
	the others		1	25	26
	t o t a l	7	26	277	310
grand total		14	30	300	344

(4) Number of shift 1-shift

7. Annual expenditure

i t e m	quantity	unit cost (Rs)	sum (Rs)	remarks
raw material wood				purchased
air dried lumber	2,550	140	357,000	from sawmill of this complex
kiln dried lumber	2,250m3	230	517,500	purchased from seasoning factory of this complex
t o t a l	4,800m3		874,500	
plywood, veneer and board				
ply wood	200,000ft2	0.2	40,000	4mm thickness
rotary veneer	80,000 "	0.03	2,400	1mm thickness
sliced veneer	150,000 "	0.06	9,000	0.8mm "
lumber core plywood	100,000 "	0.6	60,000	20mm "
particle board	100,000 "	0.5	50,000	20mm "
t o t a l			161,400	
subsidiary materials	10% of sum of raw material wood		87,450	

personnel	344	250Rs/month	1,032,000	
power	480,000 KWH	7Rs/100KWH	33,600	power requir per unit vol of raw mater wood is 100K
sum total			2,188,950	
costs of operation		10% of above total	218,895	
depreciation amount			579,469	
grand total			2,987,314	

Working capital (1/4 of the annual expenditure)

Rs. 746,829

8. Details of annual output (Estimated earnings)

i t e m	quantity of production (piece)	selling price per unit (Rs)	output (Rs)	remarks
chiffoniers and cabinets	10,000	90	900,000	
desks and tables	20,000	90	1,800,000	
chairs and stools	20,000	25	500,000	
doors	20,000	25	500,000	
window flames	52,000	8	416,000	
waste wood	200m3	12	2,400	to the partic board factor in this compl
t o t a l			4,118,400	

Annual output	Rs. 4,118,400
Annual expenditure	Rs. 2,987,314
Annual estimated earnings	Rs. 1,131,086

d) Flooring factory

1. Raw material wood

Mainly civit and partly garjan, chapalish and toon from Kassalong and Raukheong districts

2. Scale of this enterprise

(1)	Annual output	Rs. 1,402,400	
(2)	Annual expenditure	Rs. 1,157,461	
(3)	Area of site	7,200 m2	
(4)	Floor area of buildings	3,000 m2	
(5)	Construction cost		
	(i) Site	7,200	(cost of readjustment)
	(ii) Buildings	Rs. 600,000	
	(iii) Machinery and other equipment	Rs. 728,110	
	t o t a l	Rs. 1,335,310	
(6)	Working capital	Rs. 289,365	
(7)	Personnel required		
	staff 12	worker 42	

3. Production plan

Volume of raw material wood (annual)	3,000 m3 (kiln dried lumber)
Yield of products	70%
Net volume of products (annual)	2,100m3 (140,000m2 by thickness of 1.5cm)

Dimensions of products (flooring board)

Length	50 cm - 200 cm
Width	6 cm - 9 cm
Thickness	0.8 cm - 2 cm

4. Construction cost

(1) Site

(i)	Area	7,200 m2
(ii)	Unit cost	1 R/m2 (cost of readjustment)
(iii)	Sum	7,200 Rs

(2) Buildings

(i) Area

i t e m		area (m2)
o f f i c e		100
manu-factory	machining mill	1,000
	grindery and repair shop	100
	t o t a l	1,100
warehouse	warehouse for dried lumber	300
	warehouse for products	1,500
	t o t a l	1,800
grand total		3,000

(ii) Unit cost 200 Rs/m2

(iii) Sum 600,000 Rs

(3) Machinery and other equipments

(i) Machining mill

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	150m		22.0	100	15,000	
dust collecting	1 system		22.0		15,000	
t o t a l			44.0		30,000	
cross cut-off saw	4	2.2	8.8	2,400	9,600	
hand planer	6	3	18	9,500	57,000	equipped wi automatic f ing attachm 600mm
single surface planer	6	3.7	22.2	10,500	63,000	"
three-side planer and moulder	6	10	60.0	12,000	72,000	450 "
end matcher	6	7.5	45.0	10,500	63,000	
band saw mill	1	7.5	7.5	8,000	8,000	equipped wi table 1,100
automatic lumber sorter	2	22	44	40,000	80,000	
t o t a l	31		205.5		352,600	
sum total			249.5		382,600	

insurance, freight				10%	38,260	
custom duty				7.5%	28,695	
installation cost					10,000	
cost of electric works					18,000	
miscellaneous expenses					6,500	
grand total					484,055	(i)

(ii) Grindery and repair shop

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
automatic knife grinder	2	2.2	4.4	5,000	10,000	
universal tool grinder	3	1.5	4.5	2,000	6,000	
automatic band saw sharpener	1	0.75	0.75	2,000	2,000	
automatic circular saw sharpener	2	0.75	1.5	1,300	2,600	
t o t a l	8		11.15		20,600	
insurance, freight				10%	2,060	
custom duty				7.5%	1,545	
installation cost					1,000	
cost of electric works					6,000	
miscellaneous expenses					4,000	
grand total					35,205	(ii)

(iii) Office and warehouse

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
fork lift	5			16,000	80,000	
automatic stapling machine	3	2.2	6.6	4,000	12,000	
humidity regulator	1		75		50,000	
t o t a l	8		81.6		142,000	

insurance, freight				10%	14,200	
custom duty				7.5%	10,650	
cost of electric works					2,000	
miscellaneous expenses					40,000	
grand total					208,850	(iii)

Grand total of the cost of machinery and other equipments

(i) + (ii) + (iii) = Rs. 728,110

Grand total of construction cost

Site	Rs.	7,200
Buildings	Rs.	600,000
Machinery and other equipments	Rs.	728,110
	Rs.	1,335,310

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments

1,328,110 x 0.1 = Rs. 132,811

6. Personnel expenses

(1) Personnel required

staff 12 worker 42

(2) Personnel expenses

number of employees	unit wages (average) Rs/month	s u m (monthly) Rs	s u m (annual) Rs
54	250	13,500	162,000

(3) Personnel disposition plan

classification	disposition	class of employees			
		senior staff and technical employee	junior staff and technical employee	worker	total
office workers	managing	2			2
	planning		1	1	2
	general affairs	1		4	5
	accounting	1		4	5

	materials supplying	1	1	4	6
	t o t a l	5	2	13	20
manufacturing workers	machining	1	2	20	23
	grinding and repairing		1	4	5
	the others		1	5	6
	t o t a l	1	4	29	34
	grand total	6	6	42	54

(4) Number of shift 1-shift

7. Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)	r e m a r k s
raw material wood (kiln dried lumber)	3,000m3	230	690,000	purchased from seasoning factory of this complex
subsidiary materials		10% of sum of raw material wood	69,000	
personnel	54	250Rs/month	162,000	
power	150,000KWH	7Rs/100KWH	10,500	power required per unit volume of raw material wood is 50 KWH
t o t a l			931,500	
costs of operation		10% of above total		
depreciation amount			132,811	
grand total			1,157,461	

Working capital (1/4 of the annual expenditure)
Rs. 289,365

8. Details of annual output (Estimated earnings)

i t e m	quantity of production	selling price per unit (Rs)	output (Rs)	remarks
flooring board	140,000m2	10	1,400,000	
waste wood	200m3	12	2,400	to the particle board factory in this complex
t o t a l			1,402,400	

Annual output	Rs. 1,402,400
Annual expenditure	Rs. 1,157,461
Annual estimated earnings	Rs. 244,939

e) Woodworking factory (wooden packing materials and common wooden ware)

1. Raw material wood

Civit and garjan from Kassalong and Rankheong districts

2. Scale of this enterprise

(1)	Annual output	Rs. 1,845,500
(2)	Annual expenditure	Rs. 1,301,361
(3)	Area of site	7,500 m2
(4)	Floor area of buildings	3,150 m2
(5)	Construction cost	
	(i) Site	Rs. 7,500 (cost of readjustment)
	(ii) Buildings	Rs. 630,000
	(iii) Machinery and other equipments	Rs. 960,880
	T o t a l	Rs. 1,598,380
(6)	Working capital	Rs. 325,340
(7)	Personnel required	
	staff 18	worker 53

3. Production plan

(1) Wooden packing materials

Volume of raw material wood (annual)	2,550 m3 (kiln dried lumber)
Yield of products	90 %
Volume of products (annual)	2,295 m3

(2) Common wooden ware

volume of raw material wood (annaul) (m3)	yield of products (%)	net volume of raw material wood required (m3)	items of annual production			
			kind of products	quantity of production (piece)	volume of raw material wood required per unit (m3)	total volume of raw material wood required (m3)
2,125 air dried lumber	70	1.750	wooden parts of machine	60,000	0.005	300
			wooden accessories of instrument	60,000	0.005	300
375 kiln dried lumber			wooden accessories of agricultural instrument	100,000	0.005	500
2,500			wooden sporting goods	40,000	0.005	200
			the others	90,000	0.005	450
			t o t a l			1.750

4. Construction cost

(1) Site

(i) Area 7,500 m2

(ii) Unit cost 1 R/m2 (cost of readjustment)

(iii) Sum Rs. 7,500

(2) Buildings

(i) Area

i t e m		area (m2)
o f f i c e		150
manu-factory	machining mill	1,000
	grindery and repair shop	500
	t o t a l	1,500
warehouse	warehouse for dried lumber	300
	warehouse for products	1,200
	t o t a l	1,500
grand total		3,150

(ii) Unit cost 200 Rs/m2

(iii) Sum Rs. 630,000

(3) Machinery and other equipments

(i) Machining mill (including gluing and forming process)

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	150		22.0	100	15,000	
dust collecting system	1		30.0		15,000	
fork lift	2			16,000	32,000	
t o t a l			52.0		62,000	
cross cut-off saw	4	2.2	8.8	2,400	9,600	
rip saw	4	10	40	13,000	52,000	
automatic leveling planer	6	3	18	10,000	60,000	600 mm
hand planer	4	1.5	6	4,000	16,000	300 mm
single surface planer	4	3.7	14.8	10,500	42,000	600 mm
three-side planer and moulder	2	10	20	12,000	24,000	450 mm
four-side planer and moulder	1	15	15	24,000	24,000	150 mm
double saw	2	7.5	15	10,000	20,000	
double end tenoner	1	7.5	7.5	13,000	13,000	
lumber edge gluer	2	3.7	7.5	16,000	32,000	
wood lathe	8	2.2	17.6	2,500	20,000	
copying lathe	2	5.3	10.6	32,500	65,000	
single wood borer	4	0.75	3	900	3,600	
multi-spindle wood borer	2	3.7	7.5	13,000	26,000	
hollow chisel mortiser	2	1.5	3	2,400	4,800	
drum sander	1	7.3	7.3	26,000	26,000	3 drum
glue mixer	1	1.5	1.5	4,000	4,000	
glue spreader	1	2.2	2.2	2,600	2,600	
hot press (oil pressure)	1	7.5	7.5	26,000	26,000	
radio-heater	1	10	10	20,000	20,000	
turn buckle	1 set				2,600	*
t o t a l	53		222.8		493,200	
sum total			274.8		555,200	

insurance, freight				10%	55,260	exclusive of * marked item
custom duty				7.5%	41,445	"
installation cost					12,000	
cost of electric works					20,000	
miscellaneous expenses					13,000	
grand total					696,905	(i)

(ii) Grindery and repair shop

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
automatic knife grinder	5	2.2	11	5,000	25,000	
universal tool grinder	3	1.5	4.5	2,000	6,000	
automatic circular saw sharpener	4	0.75	3.0	1,300	5,200	
t o t a l	12		18.5		36,200	
insurance, freight				10%	3,620	
custom duty				7.5%	2,715	
installation cost					1,200	
cost of electric works					6,500	
miscellaneous expenses					5,000	
grand total					55,235	(ii)

(iii) Office and warehouse

i t e m	quantity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
fork lift	5			16,000	80,000	
automatic stopling machine	3	2.2	6.6	4,000	12,000	
humidity regulator	1		75		50,000	
t o t a l	8		81.6		142,000	

insurance, freight				10%	14,200	
custom duty				7.5%	10,650	
cost of electric works					2,000	
miscellaneous					40,000	
grand total					208,850	(iii)

Grand total of the cost of machinery and other equipments
(i) + (ii) + (iii) = Rs. 960,880

Grand total of construction cost

Site	Rs.	7,500
Buildings	Rs.	630,000
Machinery and other equipments	Rs.	960,880
	Rs.	1,598,380

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments

1,590,880 x 0.1 = 159,088 Rs.

6. Personnel expenses

(1) Personnel required

staff 18 worker 53

(2) Personnel expenses

number of employees	unit wages (average) Rs/month	s u m (monthly) Rs	s u m (annual) Rs
71	250	17,750	213,000

(3) Personnel disposition plan

classification	disposition	class of employees			
		senior staff and technical employee	junior staff and technical employee	worker	total
office workers	managing	2			2
	designing	1	1	3	5
	planning	1	1	1	3
	general affairs	1		4	5

	accounting	1		4	5
	materials supplying	1	1	4	6
	t o t a l	7	3	16	26
manu-facturing workers	machining	1	4	25	30
	grinding and repairing	1	1	4	6
	the others		1	8	9
	t o t a l	2	6	37	45
grand total		9	9	53	71

(4) Number of shift 1-shift

7. Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)	r e m a r k s
raw material wood				
air dried lumber	4,675m3	140	654,500	purchased from sawmill of this complex
kiln dried lumber	375m3	230	86,250	purchased from seasoning factory of this complex
t o t a l	5,050m3		740,750	
subsidiary materials		10% of sum of raw material wood	74,075	
personnel	71	250Rs/month	213,000	
power	151,500KHW	7 Rs/100KWH	10,605	power required per unit volume of raw material wood is 30 KWH
sum-total			1,038,430	
costs of operation		10% of above total	103,843	
depreciation amount			159,088	
grand total			1,301,361	

Working capital (1/4 of the annual expenditure)

Rs. 325,340

8. Details of annual output (Estimated earnings)

i t e m	quantity of production	selling price per unit(Rs)	output	remarks
wooden packing materials	2,295m3	180	413,100	
wooden parts of machine	piece 60,000	5	300,000	
wooden accessories of instrument	piece 60,000	4	240,000	
wooden accessories of agricultural instrument	piece 100,000	3	300,000	
wooden sporting goods	piece 40,000	8	320,000	
the others	piece 90,000	3	270,000	
waste wood	200m3	12	2,400	to the partic board factory this complex
t o t a l			1,845,500	

Annual output	Rs. 1,845,500
Annual expenditure	Rs. 1,301,361
Annual estimated earnings	Rs. 544,139

f) Plywood factory

1. Outline

(1) Objective

Plywood is to be produced from the suitable wood cut and collec from Chittagong Hill Tracks.

(2) Raw Materials

75,000 cubic meters of timber produced annually at Kassalong an Rankheong Researved Forests. The most important specie for making veneer is civit, and such species as garjan, uliam (wild mango), and champa can also be used. Sliced veneer may be mada from teak and mahogany grown in plantations.

(3) Equipments

Main equipments include normal plywood producing machines such as rotary veneer lathe, veneer slicer, dryer and hot press, and lumber core plywood producing machine such as composer.

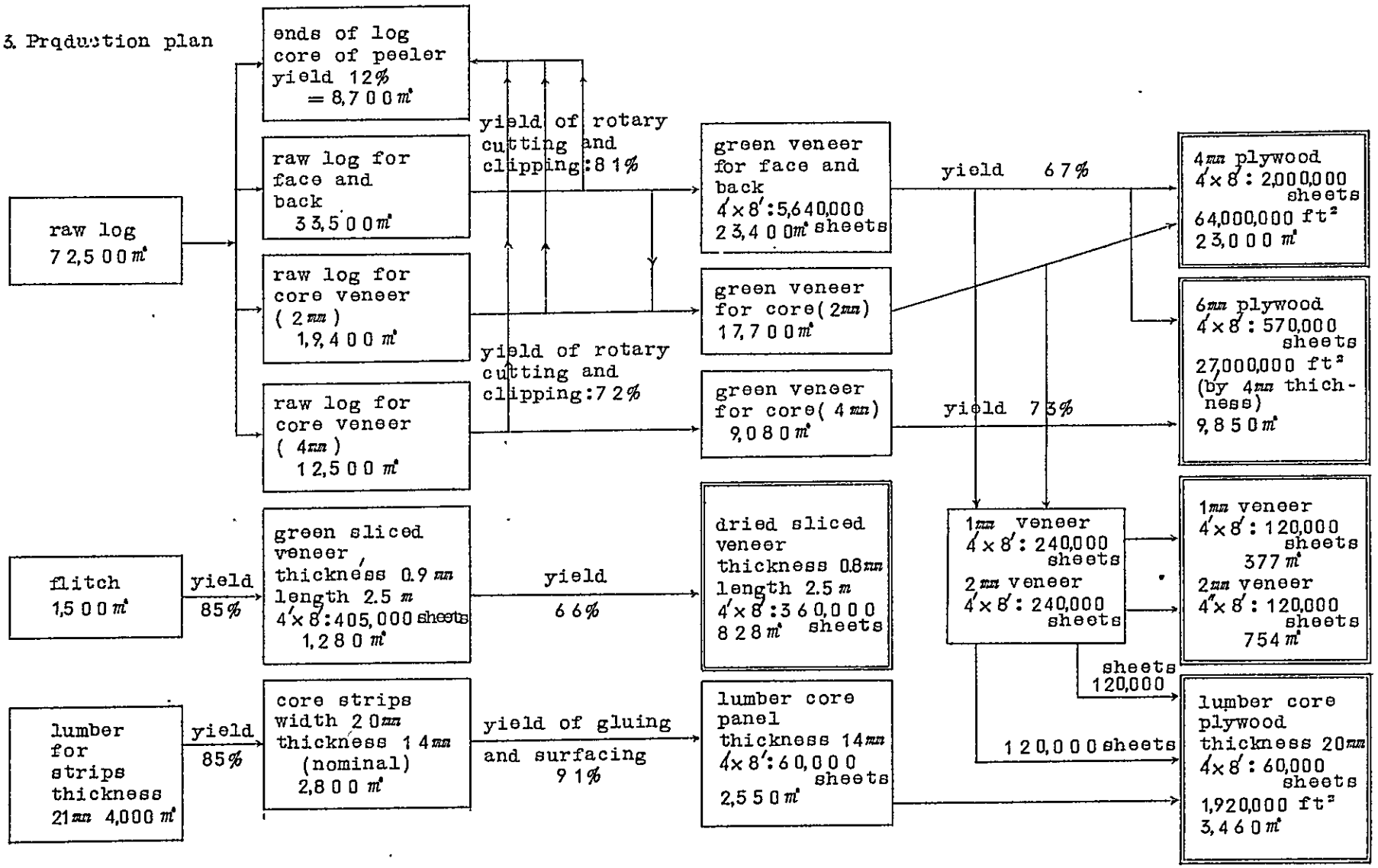
(4) Products

Common plywood, lumber core plywood and small quantity of rotary veneer and sliced veneer.

2. Scale of this enterprise

(1)	Annual output	Rs. 20,535,760
(2)	Annual expenditure	Rs. 16,058,341
(3)	Area of site	25,000 m2
(4)	Floor area of buildings	9,300 m2
(5)	Construction cost	Rs. 7,178,500
(6)	Working capital	4,014,585
(7)	Personnel required	218

3. Prqduction plan



remarks : raw log → plywood : yield 48.5% (exclusive of end of log and core of peeler)

4. Details of construction cost

(1) Site

item	area (m2)	unit cost (Rs)	s u m (Rs)	remarks
water	5,000	0.1	500	readjustment
land	20,000	3	60,000	
total	25,000		60,500	

(2) Buildings

i t e m	area (m2)	unit cost (Rs)	s u m (Rs)
manufactory	8,000	200	1,860,000
boiler house, transformer room	300		
warehouse, adjunct buildings	800		
office	200		
t o t a l	9,300		1,860,000

(3) Machinery and other equipments

i t e m	quantity	unit cost (Rs)	s u m (Rs)	power (kW)
(A) preparing of raw log				
crane for raw log	1 set	45,000	45,000	22
vat (4m x 10m)	4	4,000	16,000	
chain saw	2	4,500	9,000	2
the other	1 set	7,000	7,000	
(B) rotary cutting				
8ft rotary veneer lathe	2	350,000	700,000	60
4ft " " "	2	180,000	360,000	40
8ft clipper	2	40,000	80,000	5
4ft "	2	12,000	24,000	3
knife grinder	1	25,000	25,000	3
5 ton hoist	2 set	10,000	20,000	3
3 ton "	2 "	6,000	12,000	2

	conveyor for waste veneer	1 set	15,000	15,000	2
	the other	1 "	10,000	10,000	
(C)	dryer	3	250,000	750,000	60
(D)	preparing of veneers				
	8ft jointer	2	40,000	80,000	20
	circular saw machine	4	4,000	16,000	8
	splicer	2	25,000	50,000	10
	edge gluer	1	40,000	40,000	5
	taping machine	2	8,000	16,000	2
	patching machine	2	4,000	8,000	3
	the others	1 set	10,000	10,000	
(E)	slicing				
	10ft slicer	1	400,000	400,000	30
	3 ton hoist	1 set	6,000	6,000	1
	the others	1 "	5,000	5,000	
(F)	gluing				
	2 ton tank for glue	2	6,000	12,000	
	300 ℓ glue mixer	2	4,000	8,000	4
	8ft glue spreader	2	25,000	50,000	10
	elevator	2 set	7,000	14,000	6
	4ft x 8ft cold press	2	40,000	80,000	20
	I-beam, turn buckle	30 set	1,000	30,000	
	4ft x 8ft hot press	2	300,000	600,000	80
	the others	1 set	10,000	10,000	
(G)	finishing				
	double size	2	50,000	100,000	40
	drum sander	2	60,000	120,000	60
	wide belt sander	1	65,000	65,000	80
	automatic belt	1	30,000	30,000	10
	the others	1 set	10,000	10,000	
(H)	fork lift	3	17,000	51,000	
(I)	dust collecting system	2 set	30,000	60,000	60
(J)	gauges for control, testing machine	1 set	30,000	30,000	5
(K)	lumber core				
	cross cut-off saw	2	6,000	12,000	6
	rip saw	1	7,000	7,000	10

	leveling planer	1		25,000	25,000	5
	single surface planer	2		25,000	50,000	10
	gang rip saw	2		35,000	70,000	50
	composer	1		120,000	120,000	2
	double surface planer	1		40,000	40,000	6
	the others	1	set	10,000	10,000	
(L)	boiler, piping, chimney	1	set	400,000	400,000	
(M)	installation cost	80			300,000	
(N)	cost of electric works				200,000	
(O)	the others				50,000	
	t o t a l				5,258,000	745

Grand total of construction cost Rs. 7,178,500

5. Depreciation amount

10% of the following total =	Rs. 903,850
Buildings	Rs. 1,860,000
Machinery and other equipments	Rs. 7,178,000
	Rs. 9,038,500

6. Personnel expenses

(1) Personnel disposition

i t e m		senior staff and technical employee	junior staff and technical employee	worker
office worker	director, vice-director	2		
	engineering works	2	1	3
	general affairs	1	1	3
	accounting	1	1	3
	material supplying	1	1	3
manu-facturing worker	raw log preparing	1	1	10
	rotary cutting	1	2	30
	slicing	1	1	8
	dryer	1	1	15
	veneer preparing	1	1	20
	gluing	1	2	20
	finishing	1	1	15
	lumber core	1	1	15
	inspecting, warehouse	1	2	25
	boiler and the others		4	12
	t o t a l	16	20	282
grand total 218				

(2) Sum

Rs. 250/month for each person (average)

Total personnel expenses (annual)

Rs. 250 x 12 x 218 = Rs. 654,000

7. Details of annual expenditure

(1) Unit quantities of raw low, glue, fuel and power required for 1 ton of products and total quantities of them required for one year.

i t e m		unit quantity	total quantity required(annual)
common plywood 32,800 m3 = 16,400 ton	raw log	4.4 m3	72,500 m3
	urea resin adhesive (solid content 40%)	70 kg	1,148 ton
	heavy oil	200 ℓ	3,280 kl
	power	150kWh	2,460,000 kWh
lumber plywood 3,460 m3 = 1,730 ton	lumber for core	2.4 m3	4,200 m3
	urea resin adhesives (solid content 40%)	70 kg	121 ton
	heavy oil	200 ℓ	346 kl
	power	150 kWh	259,000 kWh

(2) Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)
peeler log	72,500 m3	130	9,425,000
flitch for sliced veneer	1,500 m3	240	360,000
lumber for lumber core (kiln dried)	4,200 m3	230	966,000
t o t a l			10,751,000
subsidiary materials (10% of above total)			1,075,100
urea resin adhesives (solid content 40%)	1,270 ton	500	635,000
fuel (heavy oil)	3,626 kl	130	471,380
power	2,719,000 kWh	0.07	190,330
personnel	218	3,000	654,000
sum total			13,776,810

costs of operation (10% of above sum total)			1,377,681
depreciation amount			903,850
grand total			16,058,341

8. Details of annual output

i t e m	q u a n t i t y	unit price (Rs)	s u m (Rs)
common plywood	by 4mm thickness 91,000,000 ft2 4mmx4ftx8ft: 2,000,000 sheets = 64,000,000 ft2 6mmx4ftx8ft (by 4mm thickness) : 570,000 sheets = 27,000,000 ft2	0.2	18,200,000
lumber core plywood	20mmx4ftx8ft: 60,000 sheets = 1,920,000 ft2	0.6	1,152,000
rotary veneer	by 1mm thickness 11,520,000 ft2 1mmx4ftx8ft: 120,000 sheets 2mmx4ftx8ft: 120,000 sheets	0.03	345,600
sliced veneer	0.8mmx4ftx8ft: 360,000 sheets = 11,520,000 ft2	0.06	691,200
waste wood (raw materials of particle board)	8,700 m3 (72,500m3x0.02)	12	104,400
waste wood (fuel of seasoning factory and briquette factory in this complex)	10,640 m3 15% of the volume of raw log	4	42,560
t o t a l			20,535,760

g) Particle Board factory

1. Outline

(1) Objective

Production of particle board utilizing residue obrained from saw mill, furniture and fitting, veneer and other plants and small loge.

(2) Raw materials

This plant shall use 19,200 cubic meters of residue supplied from various plants and 5,800 cubic meters of small logs produced at Kassalong and Rangkheong Reserved Forests, Urea resin is to be used as binding agent.

(3) Equipments

Main equipments are Bezner and Pallmam type shaving machines jet dryer and hot press.

(4) Products

Main products are 3 layer particle board, 20 mm in thickness and 4' by 8' in size, to be used mainly for making fittings and also for cabinets and buildings.

2. Scale of this enterprise

(1)	Annual output	Rs. 3,571,500
(2)	Annual expenditure	Rs. 2,796,700
(3)	Area of site	10,000 m2
(4)	Floor area of buildings	4,950 m2
(5)	Construction cost	Rs. 3,940,000
(6)	Working capital	Rs. 699,175
(7)	Personnel required	118

3. Production plan (omitted)

4. Details of construction cost

item	area (m2)	unit cost (Rs)	s u m (Rs)	remarks
land	10,000	3	30,000	readjustment

(2) Buildings

i t e m	area(m2)	unit cost (Rs)	s u m (Rs)
manufactory	4,000	200	990,000
boiler house, transformer room	300		
warehouse, adjunct buildings	500		
office	150		
t o t a l	4,950		990,000

(3) Machinery and other equipments

i t e m	quantity	unit cost (Rs)	s u m (Rs)	power (kW)
(A) preparing of material wood, preparing of particle				
facilities for raw material carring	1 set	40,000	40,000	60
cross cut-off saw	4	6,000	24,000	12
splitter	1	12,000	12,000	40
drum barker	1	40,000	40,000	50
shaving machine for particles of outer layer	3	80,000	240,000	150
hammer mill for particles of outer layer	2	7,000	14,000	40
pallmann type hammer mill for core	1	120,000	120,000	120
vat (4m x 6m)	1	6,000	6,000	
silo	2	30,000	60,000	
screen	2	15,000	30,000	16
knife grinder	1	15,000	15,000	10
equipments for taking out particle, conveyor	2 set	15,000	30,000	16
the others	1 set	30,000	30,000	20
(B) drying, forming and pressing				
jet dryer	2	100,000	200,000	20
silo	2	30,000	60,000	
equipments for taking out particle, conveyor	2 set	15,000	30,000	16
glue coating machine	2	40,000	80,000	16
forming machine	1	100,000	100,000	20
attached equipments to forming machine	1 set	50,000	50,000	30
weighing equipments	1 "	80,000	80,000	
prepress (4ft x 8ft)	1	50,000	50,000	10
hot press equipped with loader (4ftx8ft, 10 openings)	1	500,000	500,000	40
equipments of caul circulation	1 set	100,000	100,000	30
the others	1 "	30,000	30,000	20

(C) finishing				
double sizer	1	80,000	80,000	20
drum sander	2	60,000	120,000	60
conveying equipments	1 set	20,000	20,000	30
the others	1 "	15,000	15,000	10
(D) fork lift	2	17,000	34,000	
(E) dust collecting system	1 set	30,000	30,000	30
(F) gauges for control, testing machine	1 set	30,000	30,000	10
(G) boiler, piping, chimney	1 "	300,000	300,000	
(H) installation cost	50		200,000	
(I) cost of electric works			100,000	
(J) the others			50,000	
t o t a l			2,920,000	896

Grand total of construction cost --- Rs. 3,940,000

5. Depreciation amount

10% of the following total = Rs. 391,000

Buildings	Rs. 990,000
Machinery and other equipments	Rs. 2,920,000
	Rs. 3,910,000

6. Personnel expenses

(1) Personnel disposition

i t e m		senior staff and technical employee	junior staff and technical employee	worker
office worker	director, vice-director	2		
	engineering works	2	1	2
	general affairs	1	1	2
	accounting	1	1	2
	material supplying	1	1	2
	raw material		1	10
	shaving	1	1	20
	dryer	1	1	7
	glue coating, forming	1	1	10

manu-facturing worker	press	1	1	10
	finishing	1	1	10
	inspecting, warehouse	1	2	10
	boiler and the others		3	5
	t o t a l	13	15	90
grand total		118		

(2) Sum

Rs. 250/month for each person (average)

Total personnel expenses (annual)

Rs. 250 x 12 x 118 = Rs. 354,000

7. Details of annual expenditure

(1) Unit quantities of raw material wood, glue, fuel and power required for 1 ton of products and total quantities of them required for one year

i t e m	unit quantity	total quantity required (annual)
raw material wood	2.5 m3	25,000 m3
urea resin adhesives (solid content 70%)	0.07 ton	700 ton
heavy oil	0.4 kl	4,000 kl
power	150 kWh	1,500,000 kWh

(2) Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)
wood waste from saw mill	9,900 m3	12	118,800
wood waste from plywood factory	8,700 m3	12	104,400
wood waste from woodworking factory	600 m3	12	7,200
raw log (small wood)	5,800 m3	40	232,000
t o t a l			462,400
subsidiary materials (10% of above total)			115,600
urea resin adhesives (solid content 70%)	700 ton	900	630,000
fuel (heavy oil)	4,000 kl	130	520,000

power	1,500,000kWh	0.07	105,000
personnel	118	3,000	354,000
sum total			2,187,000
costs of operation (10% of above sum total)			218,700
depreciation amount			391,000
grand total			2,796,700

8. Details of annual output

item	quantity	unit cost (Rs)	sum (Rs)
products	20mm x 4ft x 8ft 7,143,000 ft2 { 10,000 ton = 14,286m3 (specific gravity) = 714,300 m2 }	0.5	3,571,500

h) Briquette factory

1. Raw material

Saw dust from the saw mill of this complex.

2. Scale of this enterprise

(1) Annual output Rs. 288,000
(2) Annual expenditure Rs. 229,380
(3) Area of site 3,500 m2
(4) Floor area of buildings 850 m2
(5) Construction cost
  (i) Site Rs. 3,500 (cost of readjustment)
  (ii) Buildings Rs. 170,000
  (iii) Machinery and other equipments Rs. 305,800
  Total Rs. 479,300
(6) Working capital Rs. 57,345
(7) Personnel required
  staff 5 worker 15

3. Production plan

Quantity of raw material	saw dust (annual) 7,000 ton (moisture content 90%)
Yield of products	90%
Quantity of products (annual)	3,600 ton ($\doteq \frac{7,000 \times 0.9}{1.9}$) (12 ton/day in absolutely dired condition)
Dimensions of products	
Diameter 5cm x length 40cm	(having a hole along the central axis)
Weight ca 1 kg/piece	
Annual production	3,600,000 pieces

4. Construction cost

(1) Site

(i) Area 3,500 m2

(ii) Unit cost 1 R/m2 (cost of readjustment)

(iii) Sum Rs. 3,500

(2) Buildings

(i) Area

item		area (m2)
office		150
warehouse	briqueting shop	300
	warehouse for saw dust	300
	warehouse forproducts	100
	total	400
grand total		850

(ii) Unit cost 200 Rs/m2

(iii) Sum Rs. 170,000

(3) Machinery and other equipments

(i) Briquetting shop

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	100m		15	100	10,000	
dust collecting system	1		11		10,000	
t o t a l			26		20,000	
briquettor	6	22	132	13,000	78,000	300 kg/hr.
chest for dried saw dust	6			650	3,900	* 10m3
chest for green saw dust	6			900	5,400	* 15m3
cyclon	3	1.5	4.5	10,000	30,000	10m3
rotary dryer (including combustion furnace and reduction gear)	3	1.5	4.5	13,000	39,000	1 ton/hr
screen	3	0.75	2.2	3,500	10,500	
screw conveyor	12	0.75	9	2,500	22,500	
t o t a l	39		152.2		189,300	
sum total			178.2		209,300	
insurance, freight				10%	20,000	exclusive of * marked item
custom duty				7.5%	15,000	"
installation cost					10,000	
cost of electric works					15,000	
miscellaneous expenses					10,000	
grand total					279,300	(i)

(ii) Office and warehouse

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
push car	10			250	2,500	
rail for push car	100m			40	4,000	
miscellaneous					20,000	
t o t a l					26,500	(ii)

Grand total of the cost of machinery and other equipments
(i) + (ii) = Rs. 305,800

Grand total of construction cost

Site	Rs. 3,500
Building	Rs. 170,000
Machinery and other equipments	Rs. 305,800
	Rs. 479,300

5. Depreciation amount

10% of the total cost for buildings, machiner and other equipments
475,800 x 0.1 = Rs. 47,580

6. Personnel expenses

(1) Personnel required

staff 5 worker 15

(2) Personnel expenses

number of employees	unit wages (average) (Rs/month)	s u m (monthly) (Rs)	s u m (annual) (Rs)
20	250	5,000	60,000

(3) Personnel disposition plan

disposition	class of employees			
	senior staff and technical employee	junior staff and technical employee	worker	total
managing	1			1
raw material	1		3	4
manufacturing	1	1	6	8
products			4	4
general affairs, accounting		1	1	2
the others			1	1
t o t a l	3	2	15	20

(4) Number of shift 1-shift

7. Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)	r e m a r k s
green saw dust	7,000ton	4	28,000	
personnel	20	250Rs/month	60,000	
power	140,000KWH	7Rs/100KWH	9,800	power required per 1 ton of raw material is 20KWH
fuel (waste wood)	3,500m3	4	14,000	fuel required per 1 ton of raw material is 400kg (specific gravity 0.8)
costs of operation			70,000	
depreciation amount			47,580	
t o t a l			229,380	

Working capital (1/4 of the annual expenditure)
Rs. 57,345

8. Details of annual output (Estimated earnings)

Annual production quantity 3,600 ton
Selling price per unit 80 Rs/ton
Annual output Rs. 288,000
Estimated earnings (annual) = Rs. 288,000 - Rs. 229,380
= Rs. 58,620

i) Wood treating factory (electric pole, mining pole, fence pole and sleeper)

1. Raw material wood

Garjan civit and the others from Kassalong and Rankheong districts

Electric pole ..... Garjan and the others (small wood)

Mining pole, fence pole .... Civit and the others (small wood)

Sleeper ..... Garjan and the others (sawn and air dried in the saw mill of this complex)

2. Scale of this enterprise

(1) Annual output Rs. 1,565,625
(2) Annual expenditure Rs. 1,196,844

(3) Area of site 30,000 m2

(4) Floor area of buildings 1,110 m2

(5) Construction cost

(i)	Site	Rs. 30,000 (cost of readjustment)
(ii)	Buildings	Rs. 222,000
(iii)	Machinery and other equipments	Rs. 698,133
	T o t a l	Rs. 950,133

(6) Working capital 299,211

(7) Personnel required

staff 9 worker 29

3. Production plan

volume of raw log (annual) (m3)	yield of log-making and air seasoning	net volume of raw material wood required (annual)	items of annual production			
			kind of products	quantity (piece)	average volume of log per piece	total volume of each product
5,000	85	4,250	electric pole	6,875	0.4	2,750
			fence pole mining pole	100,000	0.015	1,500

(2) Sleeper

Total volume of treated sleepers (annaul) 2,850 m3

Volume of one sleeper (for broad-gauge railway) ... 0.095 m3

Total number of treated sleepers (annual) ..... 30,000 pieces

4. Construction cost

(1) Site

(i)	Area	30,000 m2
(ii)	Unit cost	1 R/m2 (cost of readjustment)
(iii)	Sum	Rs. 30,000

(2) Buildings

(i) Area

i t e m		area (m2)
o f f i c e		100
manu-factory	treating shop	750
	winch room	25
	boiler house	60
	repair shop	60
	balancing room	15
	worker's room	100
	t o t a l	1,010
grand total		1,110

(ii) Unit cost 200 Rs/m2

(iii) Sum Rs. 222,000

(3) Machinery and other equipments

i t e m	quan-tity	power required (KW)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
treating cylinder L20m x D2m	1			53,000	53,000	
treating cylinder L14m x D2m	1			40,000	40,000	
measuring tank L4m x D1.5m	2			3,300	6,600	
overhead cylinder (Rueping tank) L15m x D2m	1			40,000	40,000	including rad
" L10m x D2m	1			26,000	26,000	
water-cooled multi-tubular condensor	2			6,000	12,000	
tank of preservatives (200 ton)	1			37,300	37,300	*
tank of preservatives (100 ton)	2			22,600	45,200	*
washington pump	4			2,000	8,000	

air compressor	2			12,000	24,000	horizontal type 50HP
recorders	6			460	2,760	
meters	6			200	1,200	
balance	4			4,600	18,400	5 ton
motor (50 HP)	1	37	37	5,300	5,300	
motor (30 HP)	1	22	22	4,000	4,000	
motor (10 HP)	3	7.5	22	1,300	3,900	
boiler L4.5mxD1.5m evaporative surface	1			53,000	53,000	
winch	3	7.5	22	2,000	6,000	
chain saw	2	1.5	3	1,700	3,400	
fork lift	2			20,000	40,000	
trolley	50			930	46,500	*
machine repairing equipment	1 set			10,000	10,000	
t o t a l			106		486,560	
insurance, freight				10%	35,756	exclusive of * marked item
custom duty				7.5%	26,817	"
installation cost					53,000	
laying cost of trolley track					30,000	15 kg/m 1,200 m
piping cost					33,000	
cost of electric works					20,000	
miscellaneous expenses					13,000	
grand total					698,133	

Grand total of construction cost

Site	Rs. 30,000 (readjustment cost)
Buildings	Rs. 222,000
Machinery and other equipments	Rs. 698,133
	Rs. 950,133

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments

920,133 x 0.1 = 92,013 Rs.

6. Personnel expenses

(1) Personnel required

staff 9 worker 29

(2) Personnen expenses

number of employees	unit wages (average) (Rs/month)	s u m (monthly) (Rs)	s u m (annual) (Rs)
38	250	9,500	114,000

(3) Personnel disposition plan

disposition	class of employees			
	senior staff and technical employee	junior staff and technical employee	worker	total
managing	1			1
treating	1	1	3	5
raw log	1	1	14	16
products		1	8	9
general affairs, accounting	1	1		2
marketing		1		1
the others			4	4
t o t a l	4	5	29	38

(4) Number of shift 1-shift

7. Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)	r e m a r k s
raw material wood				
raw log	5,000m3	40	200,000	electric pole, fence pole, mining pole
air dried lumber	2,850	140	399,000	sleeper(sawn lumber), purchased from the saw mill of this complex
t o t a l	7,850		599,000	

creosote oil	1,177,500kg	0.24	282,600	quantity required for 1 m3 of raw material wood is 150 kg
personnel	38	250Rs/month	114,000	
power	125,600 KWH	7Rs/100KWH	8,792	power required per 1 m3 of raw material wood is 16 KWH
sum-total			1,004,392	
costs of operation		10% of above total	100,439	
depreciation amount			92,013	
grand total			1,196,844	

Working capital (1/4 of the annual expenditure)
Rs. 299,211

8. Details of annual output (Estimated earnings)

kind of products	quantity of treatment (piece)	selling price(Rs) per piece	output(Rs)
electric pole	6,875	75	515,625
fence pole, mining pole	100,000	4.5	450,000
sleeper	30,000	20	600,000
t o t a l			1,565,625

Annual output	Rs. 1,565,625
Annual expenditure	Rs. 1,196,844
Estimated earnings (annual)	Rs. 368,781

j) Urea resin factory

1. Outline

(1) Objective

This plant is to make urea resin used as binding agent at veneer, particle board, furniture and fitting and other wood working plants.

(2) Raw material

Main raw materials are formalin and urea resin.

(3) Equipments

Main equipments are 2 condensation vessels.

(4) Products

Urea resin binder, the yields of solid contents being solid content. 70% for particle board and wood working, and 40% unconcentrated for veneers.

2. Scale of this enterprise

(1)	Annual output	Rs. 1,928,700	
(2)	Annual expenditure	Rs. 1,800,050	
(3)	Area of site	1,000	m2
(4)	Floor area of buildings	400	m2
(5)	Construction cost	Rs. 236,000	
(6)	Working capital	Rs. 450,013	
(7)	Personnel required	16	

4. Details of construction cost

(1) Site

item	area (m2)	unit cost (Rs)	sum (Rs)	remarks
site	1,000	3	3,000	readjustment

(2) Buildings

item	area (m2)	unit cost (Rs)	sum (Rs)
manufactory	300	200	80,000
warehouse, adjunct buildings	100		
total	400		80,000

remarks: Office belonged to the particle board factory in this complex is used in common for this factory.

(3) Equipments

item	quantity	unit cost (Rs)	sum (Rs)	power (kW)
(capacity 2 ton 1-cycle 3 hrs) condensation vessel	2	25,000	50,000	
storetank of formaldehyde	2	7,000	14,000	

storetank of products	2	7,000	14,000	
piping for steam			15,000	
cost of electric works			20,000	
installation cost			25,000	
the others			15,000	
t o t a l			153,000	
grand total of construction cost			Rs. 236,000	

remarks: Boiler belonged to the particle board factory in this complex is used in common for this factory.

5. Depreciation amount

10% of the following total ...	Rs. 23,300
Buildings	Rs. 80,000
Equipments	Rs. 153,000
t o t a l	Rs. 233,000

6. Personnel expenses

(1) Personnel disposition

i t e m	senior staff and technical employee	junior staff and technical employee	worker
director, vice-director	2		
engineering works	1	1	8
general affairs, accounting	1	1	2
t o t a l	4	2	10
grand total	16		

(2) Sum

Rs. 250/month for each person (average)

Total personnel expenses (annual)

Rs. 250 x 12 x 16 = Rs. 48,000

7. Details of annual expenditure

(1) Unit quantities of raw materials required per 1 ton of products and total quantities for one year

i t e m	unit quantity	total quantity required(annual)	r e m a r k s
urea	0.6 ton	900 ton	quantity of production: solid resin --- 1,500 ton liquid resin -- 2,143 ton (60% concentration solid content 70%)
formaldehyde (37%)	1.8 ton	2,700 ton	
caustic soda	0.5 kg	750 kg	

(2) Annual expenditure

i t e m	quantity	unit cost (Rs)	sum (Rs)
urea	900 ton	600	540,000
formaldehyde (37%)	2,700 ton	300	810,000
caustic soda	760 kg	100	75,000
t o t a l			1,425,000
subsidiary materials (10% of above total)			142,500
personnel	16	3,000	48,000
sum total			1,615,500
costs of operation (10% of above sum total)			161,550
depreciation amount			23,000
grand total			1,800,050

8. Details of annual output

i t e m	quantity	unit cost (Rs)	sum (Rs)
urea resin adhesives	2,143 ton (solid resin 1,500 ton = 70%)	900	1,928,700

E. Khulna Wood Industry Complex Plan

(1) Objective

This paper is for the Third Five Year Plan for the Industrial Development of Pakistan.

(2) Raw materials

This complex is to use 130,000 cubic meters of timber produced at Sundarbans Forest.

(3) Organization

a) Saw mill

b) Seasoning factory

c) Woodworking factory

d) Bobbin factory

e) Shuttle factory

f) Briquet factory

g) Electric pole treating factory

h) Pulp and paper mills

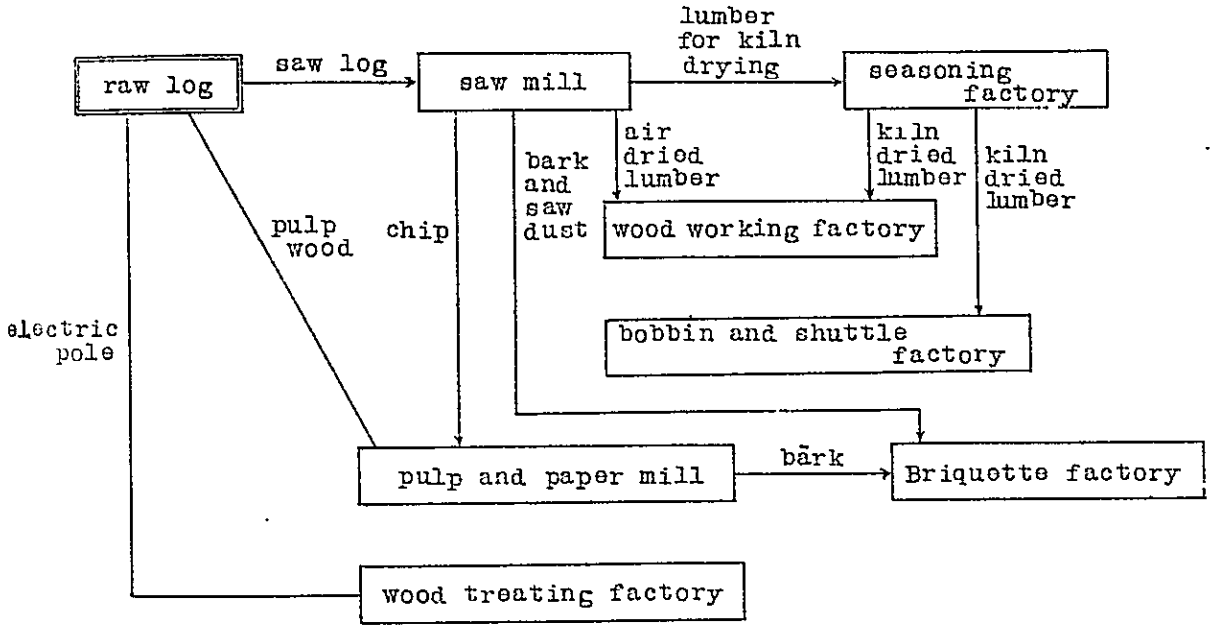
(4) Location

It is considered that Khulna is best suited in view of timber collection from Sundarbaus Forest, labor supply and marketing of products.

(5) Division of raw materials

Raw log	10,000 m3
Log for treatment (electric poler)	5,000 "
Pulpwood	112,500 "
T o t a l	127,500 m3

(6) Flow sheet of material wood



(a) Saw mill

1. Outline

(1) Objective

Production of market lumber and supply of lumber to woodworking and bobbin plants.

(2) Raw materials

This plant is to use 10,000 cubic meters of timber produced at Sundarbaus Forest. Main species are sundri, baea, keora, and passur, of which bigger logs are to be picked out.

(3) Equipments

Sawing equipments including 48" band saw with automatic feed carriage and chipping machine to process residues.

(4) Products

Lumber for building construction, furniture, fitting, packaging, bobbin, shittle and flooring, as well as small quantity of chips for pulping.

2. Scale of this enterprise

(1)	Annual output	Rs. 722,720
(2)	Annual expenditure	Rs. 688,000
(3)	Area of site	3,200 m2
(4)	Floor area of buildings	870 m2
(5)	Construction cost	Rs. 580,200
(6)	Working capital	Rs. 145,050
(7)	Personnel required	42

3. Production plan

(1) Production by use

purpose	volume of raw log (m3/year)	yield (%)	volume of products (m3/year)	items of products (m3/year)		yield of kiln drying	volume of kiln dried lumber	supply to
				for air seasoning	for kiln drying			
construction, civil engineering	1,000	50	500	400	100	70	70	market
furniture, fitting	2,000	50	1,000	200*	800	75	600	woodworking factory
flooring	2,000	45	900		900	75	675	
packing material	1,000	55	550	550*				
agricultural instrument and the others	1,000	50	500	300*	200	75	150	
bobbin, shuttle	3,000	40	1,200		1,200	70	840	bobbin, shuttle factory
t o t a l	10,000		4,650	1,450	3,200		2,335	

* Actually, yield of air seasoning (yield of lumber suitable for each purpose of * marked items) will be 85%, which will be sent to woodworking factory, remaining 15% (157 cubic meters) will be sold in the market for building and construction.

4. Details of construction cost

(1) Site

i t e m	area (m2)	unit cost (Rs)	sum (Rs)	remarks
water	2,000	0.1	200	readjustment
land	3,000	1	3,000	"
t o t a l	5,000		3,200	

(2) Buildings

i t e m	area (m2)	unit cost (Rs)	sum (Rs)
manufactory	500	200	174,000
warehouse, adjunct buildings	300		
office	70		
t o t a l	870		174,000

(3) Machinery and other equipments

i t e m	quantity	unit cost (Rs)	sum (Rs)	power (kW)
48 in band saw mill with automatic feed carriage	1	70,000	70,000	40
42 in roller feed band resaw	2	13,000	26,000	30
edger	1	10,000	10,000	5
cross cut saw	2	6,000	12,000	4
sawfiling equipments	1 set	20,000	20,000	10
winch	1 set	6,000	6,000	10
hoist	1	10,000	10,000	8
conveyor	1	30,000	30,000	20
fork lift	2	17,000	34,000	
other machines and equipments			10,000	5
chip manufacturing equipments	1 set	40,000	40,000	40
dust collecting system	1 set	25,000	25,000	20
installation cost	15		50,000	
cost of electric works			50,000	
the others			10,000	
t o t a l			403,000	192

Grand total of construction cost Rs. 580,200

5. Depreciation amount

10% of the following total = Rs. 57,700

Buildings	Rs. 174,000
Machinery and other equipments	Rs. 403,000
t o t a l	Rs. 577,000

6. Personnel expenses

(1) Personnel disposition

i t e m		senior staff and technical employee	junior technical employee	worker
office worker	director, vice-director	2		
	engineering works	1		1
	general affairs	1		1
	accounting	1		1
	material supplying		1	1
manu-facturing worker	raw log		1	5
	sawing	1	1	10
	sawfilling	1	1	2
	warehouse		1	5
	the others		1	3
	t o t a l	7	6	29
grand total		42		

(2) Sum

Rs. 250/month for each person (average)

Total personnel expenses (annual)
Rs. 250 x 12 x 42 = Rs. 126,000

7. Details of annual expenditure

(1) Unit power required for 1 m3 of raw material wood and total power required for one year

Unit power 10 kWh Total power 100,000 kWh

(2) Annual expenditure

i t e m	quantity	unit cost (Rs)	sum (Rs)
raw log	10,000m3	40	400,000
subsidiary materials (10% of sum of raw log)			40,000
power	100,000kWh	0.07	7,000
personnel	42	3,000	126,000
t o t a l			573,000
costs of operation (10% of above total)			57,300
depreciation amount			57,700
grand total			688,000

8. Details of annual output

i t e m	quantity	unit cost (Rs)	sum (Rs)	r e m a r k s
air dried lumber	1,450m3	160	232,000	
green lumber for kiln drying	3,200m3	140	448,000	
chip (for pulp making)	2,000m3	20	40,000	10,000m3x0.2
saw dust (for briquette)	630ton	4	2,520	10,000m3=9,000ton 9,000x0.1x0.7
bark (for briquette)	100ton	2	200	10,000m3x0.05=500m3 specific gravity 0.25x500=125t 125x0.8
t o t a l			722,720	

b) Seasoning factory

1. Outline

(1) Drying of lumber for furniture, fitting, flooring, bobbin and shittle.

(2) Raw materials

3,200 cubic meters of lumber supplied from the saw mill.

(3) Equipments

Three internal fan type kilns, each the capacity of 25 cubic meters, equipped with forced air circulation.

(4) Products

Dried lumber for furniture, fitting, woodworking, flooring, bobbin and shittle.

2. Scale of this enterprise

(1)	Annual output	Rs. 700,500
(2)	Annual expenditure	Rs. 2,306
(3)	Area of site	2,760 m2
(4)	Floor area of buildings	760 m2
(5)	Construction cost	388,260
(6)	Working capital	Rs. 163,077
(7)	Personnel required	19

3. Production plan

(1) Products

Raw lumber per year	3,200 m3
Yield of dried lumber	70 %
Dried lumber per year	2,240 m3

(2) Equipments and capacity

This plant is to have 3 rooms, each accomodating 25 cubic meters of lumber. 5m by 8m and 3m high from floor. The size of each room will be 50 cubic meters with double track, with as internal fan type forced air circulation kiln, operating at 4 rotations per month. The drying capacity per year will be 3,600 cubic meters of raw lumber.

4. Details of construction cost

(1) Site

i t e m	area(m2)	unit cost (Rs)	sum(Rs)	remarks
site for buildings	760	1	760	readjustment
yard for air seasoning and the others	2,000	3	6,000	readjustment, partly racks for air seasoning
t o t a l	2,760		6,760	

(2) Buildings

i t e m	area (m2)	unit cost (Rs)	sum (Rs)	remarks
dry kiln	150			50m2x3
operating and cooling room	480	200	152,000	
boiler house	90			
warehouse for fuel	40			
t o t a l	760		152,000	

remarks: Office and warehouse belonged to the saw mill in this complex are used in common for this factory.

(3) Machinery and other equipments

i t e m	quantity	unit cost (Rs)	sum (Rs)	power (kW)
dry kiln equipments	3 set	30,000	90,000	30
boiler house equipments	1 set	120,000	120,000	
rail	250 m	10	2,500	
trolley	20	400	8,000	
cost of electric works			4,000	
the others			5,000	
t o t a l			229,500	30

Grand total of construction sost Rs. 388,260

5. Depreciation amount

10% of the following total =	Rs. 38,550
racks for air seasoning	Rs. 4,000
buildings	Rs. 152,000
machinery and other equipments	Rs. 229,500
t o t a l	Rs. 385,500

6. Personnel expenses

(1) Personnel disposition

i t e m	senior staff and technical employee	junior technical employee	worker	remarks
director, vice-director	2			
engineering works	1	1	5	3-shift
warehouse		1	4	
yard		1	4	
t o t a l	3	3	13	
grand total	19			

(2) Sum

Rs. 250/month for each person (average)

Total personnel expenses (annual) ---
Rs. 250 x 12 x 19 = Rs. 57,000

7. Details of annual expenditure

(1) Unit quantities of fuel, power and water required for 1 m3 of raw material wood and total quantities of them for one year

i t e m	unit quantity	total quantity required (annual)
fuel (bark from pulp mill)	0.42 ton	1,344 ton ≒ 2,400 ton of green bark (moisture content 80%)
power	15 kWh	48,000 kWh
water	1.3 ton	4,160 ton

(2) Annual expenditure

i t e m	quantities	unit cost (Rs)	sum (Rs)
raw material wood	3,200 m3	140	448,000
subsidiary materials (10% of sum of raw material wood)			44,800
fuel	2,400 ton	2	4,800
power	48,000 kWh	0.07	3,360
personnel	19	3,000	57,000
t o t a l			557,960
costs of operation (10% of above total)			55,796
depreciation amount			38,550
grand total			652,306

8. Details of annual output

i t e m	quantity (m3)	unit cost (Rs)	sum (Rs)
kiln dried lumber	2,335	300	700,500

c) Woodworking factory
(ferniture, fitting, wooden packing materials and other common wooden ware)

1. Raw material wood

Mainly keora and baen and partly sundri from Sundarbaus mangrove forest.

2. Scale of this enterprise

(1)	Annual output	Rs. 1,612,820	
(2)	Annual expenditure	Rs. 1,533,272	
(3)	Area of site	13,000 m2	
(4)	Floor area of buildings	5,550 m2	
(5)	Construction cost		
	(i) Site	Rs. 1,300	(cost of readjustment)
	(ii) Buildings	Rs. 1,110,000	
	(iii) Machinery and other equipments	Rs. 1,701,967	
	T o t a l	Rs. 2,824,967	
(6)	Working capital	Rs. 383,318	
(7)	Personnel required		
	staff 30	worker 127	

3. Production plan

(1) Furniture

volume of raw material wood (annual)	yield of products (%)	net volume or raw material wood required (annual)	items of annual production			
			kind of products	quantity (piece)	volume of raw material wood required per unit	total volume of raw material wood required
600 (kiln dried lumber)	65	390	chiffoniers and cabinets	3,000	0.06	180
			desks and tables	3,000	0.06	180
			chairs and stools	1,500	0.02	30

(2) Fitting

volume of raw material wood (annual)	yield of products (%)	net volume or raw material wood required (annual)	items of annual production			
			kind of products	quantity (piece)	volume of raw material wood required per unit (m3)	total volume of raw material wood required (m3)
170 (air dried lumber)	65	110	doors	3,000	0.02	60
			window flames	5,000	0.01	50

(3) Flooring board

Volume of raw material wood (annual) 675 m3 (kiln dried lumber)

Yield of products 70 %

Net volume of products 473 m3

(31,500 m2 by thickness of 1.5 cm)

Dimensions of products

Length	50cm - 200cm
Width	6cm - 9cm
Thickness	0.8cm - 2cm

(4) Wooden packing materials

Volume of raw material wood (annual) 468 m3 (air dried lumber)

Yield of products 90 %

Volume of products 421 m3

(5) Common wooden ware

volume of raw material wood (annual) (m3)	yield of products (%)	net volume of raw material wood required (annual) (m3)	items of annual production			
			kind of products	quantity of production (piece)	volume of raw material wood required per unit (m3)	total volume of raw material wood required (m3)
255 (air dried lumber)	70	284	wooden accessories of instrument	10,000	0.005	50
			wooden accessories of agricultural instrument	20,000	0.005	100

150 (kiln dried lumber 405			wooden sporting goods	10,000	0.005	50
			the others	16,800	0.005	84
					total	284

4. Construction cost

(1) Site

(i) Area 13,000 m2 (land)

(ii) Unit cost 1 R/m2 (cost of readjustment)

(iii) Sum Rs. 13,000

(2) Buildings

(i) Area

item			area (m2)
office			150
manufactory	furniture and fitting plant	trimming shop	300
		machining mill	300
		gluing, forming and assembling shop	800
		finishing shop	300
		sewing shop	100
		flooring plant	250
		wooden packing materials and common wooden ware plant	300
		grindery and repair shop	100
	total		2,450
warehouse		warehouse for dried lumber	250
		warehouse for products	2,000
		warehouse for subsidiary materials	600
		warehouse for paint	100
		total	2,950
grand total			5,550

(ii) Unit cost 200 Rs/m2

(iii) Sum Rs. 1,110,000

(3) Machinery and other equipments

(i) Furniture and fitting plant

(a) Trimming shop

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	50m		7.3	100	5,000	
dust collecting system	1		22		6,500	
t o t a l			29.3		11,500	
cross cut-off saw	2	2.2	4.4	2,400	4,800	
rip saw	2	10	20	13,000	26,000	
double saw	2	7.5	15	10,000	20,000	
automatic leveling planer	2	3	6	10,000	20,000	600mm
hand planer	3	2.2	6.6	4,000	12,000	300mm
three-side planer and moulder	1	10	10	12,000	12,000	450mm
four-side planer and moulder	1	15	15	24,000	24,000	150mm
single surface planer	2	3.7	7.5	10,000	20,000	450mm
"	1	3.7	3.7	10,500	10,500	600mm
"	1	7.5	7.5	13,000	13,000	1,100mm
band scroll saw	2	3.7	7.5	5,000	10,000	800mm
t o t a l	19		103.2		172,300	
sum total			132.5		183,800	
insurance, freight				10%	18,380	
custom duty				7.5%	13,785	
installation cost					4,000	
cost of electric works					13,000	
miscellaneous expenses					6,500	
grand total					239,465	(a)

(b) Machining mill

i t e m	quan-tity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	50m		7.3	100	5,000	
dust collecting system	1		30.0		10,000	
fork lift	1			16,000	16,000	
t o t a l			37.3		31,000	
cross cut-off saw	2	2.2	4.4	2,400	4,800	
tenoner	2	3.7	7.5	8,000	16,000	
double end tenoner	2	7.5	15.0	13,000	26,000	
circular-saw machine	2	3.7	7.5	3,300	6,600	
single spindle shaper	2	3.7	7.5	8,000	16,000	
dovetail jointer	1	3.7	3.7	8,000	8,000	
dovetail machine	2	3.7	7.5	6,500	13,000	
corner locking machine	1	3.7	3.7	6,000	6,000	
hollow chisel mortiser	4	1.5	6.0	2,400	9,600	
router	3	2.2	6.6	6,500	19,500	
single wood borer	4	0.75	3.0	900	3,600	
two spindle wood borer	1	1.5	1.5	2,600	2,600	
multi-spindle wood borer	1	3.7	3.7	13,000	13,000	
super surfacer	2	3.7	7.5	12,000	24,000	
glue jointer	1	4.5	4.5	9,000	9,000	
copying lathe	1	5.3	5.3	32,500	32,500	
drum sander	1	7.3	7.3	26,000	26,000	3 drum
belt sander	2	7.3	14.6	6,500	6,500	
disk sander	1	2.2	2.2	2,000	2,000	
spindle sander	1	1.5	1.5	1,300	1,300	
t o t a l	36		120.5		246,000	
sum total			157.8		277,000	

insurance, freight				10%	27,700	
custom duty				7.5%	20,775	
installation cost					7,000	
cost of electric works					18,000	
miscellaneous expenses					6,500	
grand total					356,975	(b)

(c) Gluing and forming shop

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	150m		22	100	15,000	
fork lift	1			16,000	16,000	
t o t a l			22		31,000	
lumber edge gluer	1	3.7	3.7	16,000	16,000	
veneer clipper	1	2.2	2.2	13,000	13,000	
veneer jointer	1	3.7	3.7	20,000	20,000	
veneer splicer	1	2.2	2.2	13,000	13,000	
glue mixer	1	1.5	1.5	4,000	4,000	
glue spreader	1	2.2	2.2	2,600	2,600	
hot press (oil pressure)	1	7.5	7.5	26,000	26,000	
cold press (oil pressure)	1	3.7	3.7	13,000	13,000	
radio-heater	1	10	10	20,000	20,000	
turn buckle	1				4,000	*
flame assembling press	2	2.2	4.4	10,000	20,000	
assembling jig (plane)	2	1.5	3.0	400	800	*
assembling jig (three dimensional)	1	2.2	2.2	5,000	5,000	
assembling jig (for drawer)	1	0.75	0.75	200	200	*
circular-saw machine	1	2.2	2.2	3,000	3,000	
wood borer	2	0.75	1.5	800	1,600	
t o t a l	18		50.75		162,000	
sum total			72.75		193,200	

insurance, freight				10%	18,820	exclusive of * marked item
custom duty				7.5%	14,115	"
installation cost					4,000	
cost of electric works					13,000	
shielding of radio-heater)					2,600	
miscellaneous					13,000	
grand total					258,735	(c)

(d) Finishing shop

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	100m		15	100	10,000	
filler mixer	1	1.5	1.5	1,300	1,300	
ultra-red dryer	1	20	20	60,000	60,000	
floor type spray booth equipped with washing installation	1	4.4	4.4	5,000	5,000	
"	2	2.2	4.4	3,000	6,000	
circulation type paint supplier	1	2.2	2.2	8,000	8,000	
air compressor	1	3.7	3.7	2,000	2,000	
"	2	2.2	4.4	1,300	2,600	
belt sander	2	2.2	4.4	5,000	10,000	
compound polisher	2	2.2	4.4	5,000	10,000	
t o t a l	13	64.4			114,900	
insurance, freight				10%	11,490	
custom duty				7.5%	8,618	
installation cost					3,500	
cost of electric works					10,000	
miscellaneous expenses					13,000	
grand total					161,508	(d)

(e) Sewing shop

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	40m		7.3	100	4,000	
automatic cutting machine	2	0.75	1.5	400	800	
sewing machine	2	0.1	0.2	400	800	
t o t a l	4		9.0		5,600	
insurance, freight				10%	560	
custom duty				7.5%	420	
installation cost					400	
cost of electric works					1,300	
miscellaneous					1,300	
grand total					9,580	(e)

Grand total for furniture and fitting plant =
(a) + (b) + (c) + (d) + (e) = Rs. 1,026,263

(ii) Flooring plant

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	40m		7.3	100	4,000	
dust collecting system	1		17.6		5,500	
t o t a l			24.9		9,500	
cross cut-off saw	1	2.2	2.2	2,400	2,400	
hand planer	1	3	3	9,500	9,500	600mm (equipped with automatic feeding attachment
single surface planer	1	3.7	3.7	10,000	10,000	450mm
three-side planer and moulder	1	10	10	12,000	12,000	450mm

end matcher	1	7.5	7.5	10,500	10,500	
t o t a l	5		26.4		44,400	
sum total			51.3		53,900	
insurance, freight				10%	5,390	
custom duty				7.5%	4,043	
installation cost					2,000	
cost of electric works					5,000	
miscellaneous expenses					2,500	
grand total					72,833	(ii)

(iii) Wooden packing materials and common wooden ware plant

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	50m		7.3	100	5,000	
dust collecting system	1		15		5,000	
t o t a l			22.3		10,000	
cross cut-off saw	2	2.2	4.4	2,400	4,800	
rip saw	2	10	20	13,000	26,000	
automatic leveling planer	1	3	3	10,000	10,000	600mm
hand planer	2	1.5	3	4,000	8,000	300mm
single surface planer	2	3.7	7.5	10,500	21,000	600mm
three-side planer and moulder	1	10	10	12,000	12,000	450mm
four-side planer and moulder	1	15	15	24,000	24,000	150mm
double saw	1	7.5	7.5	10,000	10,000	
double end tenoner	1	7.5	7.5	13,000	13,000	
lumber edge gluer	1	3.7	3.7	16,000	16,000	
wood lathe	2	2.2	4.4	2,500	5,000	
copying lathe	1	5.3	5.3	32,500	32,500	
single wood borer	2	0.75	1.5	900	1,800	
multi-spindle wood borer	1	3.7	3.7	13,000	13,000	

hollow chisel mortiser	1	1.5	1.5	2,400	2,400	
drum sander	1	7.3	7.3	26,000	26,000	3 drum
glue mixer	1	1.5	1.5	4,000	4,000	
glue spreader	1	2.2	2.2	2,600	2,600	
radio-heater	1	10	10	20,000	20,000	
turn buckle	1 set				1,300	*
t o t a l	25		119		253,400	
sum total			141.3		263,400	
insurance, freight				10%	26,210	exclusive of * marked item
custom duty				7.5%	19,658	"
installation cost					5,000	
cost of electric works					15,000	
miscellaneous expenses					6,500	
grand total					335,768	(iii)

(iv) Grindery and repair shop

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
automatic knife grinder	6	2.2	13.2	5,000	30,000	
universal tool grinder	6	1.5	9.0	2,000	12,000	
automatic band saw sharpener	1	0.75	0.75	2,000	2,000	
automatic circular saw sharpener	5	0.75	3.75	1,300	6,500	
t o t a l	18		26.7		50,500	
insurance, freight				10%	5,050	
custom duty				7.5%	3,788	
installation cost					2,000	
cost of electric works					10,000	
miscellaneous expenses					6,500	
grand total					77,838	(iv)

(v) Office and warehouse

i t e m	quan-tity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
fork lift	5			16,000	80,000	
push car	3			130	390	*
humidity regulator	1		70		45,000	
t o t a l	8		70		125,390	
insurance, freight				10%	12,500	exclusive of * marked item
custom duty				7.5%	9,375	"
cost of electric works					2,000	
miscellaneous expenses					40,000	
grand total					189,265	(v)

Grand total of the cost of machinery and other equipment
(i) + (ii) + (iii) + (iv) + (v) = Rs. 1,701,967

Grand total of construction cost

Site	Rs. 13,000 (readjustment cost)
Buildings	Rs. 1,110,000
Machinery and other equipments	Rs. 1,701,967
	Rs. 2,824,967

5. Depreciation amount

10% of the total cost for buildings, machiner and other equipments

2,811,967 x 0.1 = Rs. 281,197

6. Personnel expenses

(1) Personnel required

staff 30 worker 127

(2) Personnel expenses

number of employees	unit wages (average) (Rs/month)	s u m (monthly) (Rs)	s u m (annual) (Rs)
157	250	39,250	471,000

(3) Personnel disposition

classification	disposition	class of employees			
		senior staff and technical employee	junior staff and technical employee	worker	total
office workers	managing	2			2
	furniture and fitting	1	1	2	4
	flooring		1	1	2
	wooden packing materials and common wooden ware	1	1	1	3
	general affairs	1		2	3
	accounting		1	3	4
	materials supplying	1	1	3	5
	t o t a l	6	5	12	23
manufacturing workers	furniture and fitting	5	8	75	88
	flooring	1	1	9	11
	wooden packing materials and common wooden ware	1	1	8	10
	grinding and repairing		2	8	10
	the others			15	15
	t o t a l	7	12	115	134
grand total		13	17	127	157

(4) Number of shift 1-shift

7. Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)	r e m a r k s
raw material wood				
air dried lumber	893m3	160	142,880	purchased from sawmill of this complex
kiln dried lumber	1,425m3	300	427,500	purchased from seasoning factory of this complex
t o t a l	2,318m3		570,380	

plywood, veneer and board				
plywood	60,000ft^2	0.22	13,200	4mm thickness
rotary veneer	12,000 "	0.033	396	1mm thickness
sliced veneer	30,000 "	0.066	1,980	0.8mm thickness
lumber core plywood	12,000 "	0.66	7,920	20mm thickness
particle board	12,000 "	0.55	6,600	20mm thickness
t o t a l			30,096	
subsidiary materials		10% of sum of raw material wood	57,038	
personnel	157	250Rs/month	471,000	
power	139,080KWH	7 Rs/100KWH	9,736	power required per unit volume of raw material wood is 60 KWH
sum total			1,138,250	
costs of operation		10% of above sum-total amount	113,825	
depreciation			281,197	
grand total			1,533,272	

Working capital (1/4 of the annual expenditure) Rs. 383,318

8. Details of annual output (Estimated earnings)

kind of products	quantity of production	selling (Rs) price per unit	output(Rs)
chiffoniers and cabinets	3,000 piece	110	330,000
desks and tables	3,000 "	110	330,000
chairs and stools	1,500 "	30	45,000
doors	3,000 "	30	90,000
window flames	5,000 "	10	50,000
flooring board	31,500 m^2	12	378,000
wooden packing materials	421 m^3	220	92,620
wooden accessories of instrument	10,000 piece	5	50,000

wooden accessories of agricultural instrument	20,000 piece	4	80,000
wooden sporting goods	10,000 "	10	100,000
the others	16,800 "	4	67,200
t o t a l			1,612,820

Annual output	Rs. 1,612,820
Annual expenditure	Rs. 1,533,272
Estimated earnings (annual)	Rs. 79,548

d) Bobbin factory

1. Raw material wood

Gorjon, keora, baen and the others from Sundarbaus mangrove forest.

2. Scale of this enterprise

(1) Annual output Rs. 981,000

(2) Annual expenditure Rs. 817,490

(3) Area of site 3,500 m^2

(4) Floor area of buildings 1,270 m^2

(5) Construction cost

(i)	Site	Rs. 3,500 (cost of readjustment)
(ii)	Buildings	Rs. 254,000
(iii)	Machinery and other equipments	Rs. 870,556
	T o t a l	Rs. 1,128,056

(6) Working capital Rs. 204,373

(7) Personnel required

staff 10 worker 94

3. Production plan

volume of raw material wood (annaul) (m3)	number of raw material (annual) (piece)	yield of products (%)	total number of products (annual)	items of annual production	
				kind of products	number of products
420	2,000,000 *	85	1,700,000	ring bobbin	1,100,000
				cop-change weft bobbin	300,000
				shuttle-change weft bobbin	300,000

* Each piece has the volume of about $0.0002 m^3$ (3.3cm x 3.3cm x 23cm)

4. Construction cost

(1) Site

(i) Area 3,500 m^2

(ii) Unit Cost 1 R/m^2 (cost of readjustment)

(iii) Sum Rs. 3,500

(2) Buildings

(i) Area

item		area (m2)
office		40
manufactory	machining and parts fixing shop	500
	finishing shop	180
	grindery and repair shop	80
	inspecting shop	80
	total	840
warehouse	warehouse for dried lumber	150
	warehouse for products	100
	warehouse for subsidiary materials	100
	warehouse for paint	40
	total	390
grand total		1,270

(ii) Unit cost 200 Rs/m2

(iii) Sum Rs. 254,000

(3) Machinery and other equipments

(i) Machining and parts fixing shop

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	80m		11	100	8,000	
dust collecting system	1		30		10,000	
t o t a l			41		18,000	
circular saw machine	2	2.2	4.4	6,000	12,000	including the cost of accessories
boring machine	3		4.5	6,000	18,000	
center boring machine	2	0.75	1.5	5,000	10,000	
roughing machine	3	1.5	4.5	7,000	21,000	
cylinder shaper	1	0.75	0.75	7,500	7,500	
shape finishing machine	5	1.5	7.5	10,000	50,000	
re-boring machine	3	0.75	2.2	6,500	19,500	
bottom boring machine	3	0.75	2.2	6,500	19,500	
top boring machine	3	0.75	2.2	6,500	19,500	
boring machine	3	0.75	2.2	6,600	19,800	
touching machine	2	0.75	1.5	7,500	15,000	
semi automatic press	2	1.5	3.0	10,500	21,000	
shield fixing machine	4	0.75	3.0	6,500	26,000	
automatic shield fixing machine	2	1.5	3.0	10,500	21,000	
end stock	8			1,200	9,600	
end stock for sand papering machine	3			1,200	3,600	
sand papering machine	3	0.75	2.2	1,400	4,200	
hand press	10			3,400	34,000	*
knock cutting machine	1	0.75	0.75	4,800	4,800	
feeler grooves cutting machine	3	0.75	2.2	7,500	22,500	
cutting machine for driven shield	1	0.75	0.75	6,000	6,000	

serial roughint machine	1	1.5	1.5	6,500	6,500	
automatic roughing machine	1	2.2	2.2	14,000	14,000	
automatic wire ring machine	1	2.2	2.2	14,000	14,000	
automatic shield press machine	2	2.2	4.4	14,000	28,000	
t o t a l	72		58.65		427,000	
sum total			99.65		445,000	
insurance, freight				10%	41,100	exclusive of * marked item
custom duty				7.5%	30,825	"
installation cost					10,000	
cost of electric works					30,000	
miscellaneous expenses					20,000	
grand total					576,925	

(ii) Finishing shop

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
polishing machine	5	0.75	0.75	1,400	7,000	
end stock for painting	8			1,200	9,600	*
centrifugal pump for painting	1	3.7	3.7	13,500	13,500	
fan	2	1.5	3.0	5,500	11,000	
boiler	1			7,000	7,000	
t o t a l	17		10.45		48,100	
insurance, freight				10%	3,850	exclusive of * marked item
custom duty				7.5%	2,888	"
installation cost					1,000	
cost of electric works					2,000	
miscellaneous expenses					2,000	
grand total					59,838	(ii)

(iii) Grindery and repair shop

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
universal tool grinder	4	0.75	3.0	2,000	8,000	
repairing machineries	1		15		35,000	
t o t a l			18		43,000	
insurance, freight				10%	4,300	
custom duty				7.5%	3,225	
installation cost					2,500	
cost of electric works					6,000	
miscellaneous expenses					4,000	
grand total					63,025	(iii)

(iv) Inspecting room

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
tester for vibration	3	0.2	0.6	6,500	19,500	
repairing machine	5	0.75	3.75	5,000	25,000	
balancing machine for repair	1	0.75	0.76	6,600	6,600	
t o t a l	9		5.1		51,100	
insurance, freight				10%	5,110	
custom duty				7.5%	3,833	
installation cost					2,000	
cost of electric works					5,000	
miscellaneous expenses					3,500	
grand total					70,543	(iv)

(v) Office and warehouse

i t e m	quantity	power required (kw) per unit	power required (kw) total	unit cost (Rs)	s u m (Rs)	remarks
fork lift	2			16,000	32,000	
humidity regulator	1		45		35,000	
t o t a l			45		67,000	
insurance, freight				10%	6,700	
custom duty				7.5%	5,025	
cost of electric works					1,500	
miscellaneous expenses					20,000	
grand total					100,225	(v)

Grand total of the cost of machinery and the other equipments
(i) + (ii) + (iii) + (iv) + (v) = Rs. 870,556

Grand total of construction cost

Site	Rs.	3,500
Buildings	Rs.	254,000
Machinery and other equipments	Rs.	870,556
	Rs.	1,128,056

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments

1,124,556 x 0.1 = Rs. 112,456

6. Personnel expenses

(1) Personnel required

staff 10 worker 94

(2) Personnel expenses

number of employees	unit wages (average) (Rs/month)	s u m (monthly) (Rs)	s u m (annual) (Rs)
104	250	26,000	312,000

(3) Personnel disposition plan

classification	disposition	class of employees			
		senior staff and technical employee	junior staff and technical employee	worker	total
office workers	managing	2			2
	planning		1	1	2
	general affairs	1		1	2
	accounting		1	1	2
	materials supplying		1	1	2
	t o t a l	3	3	4	10
manufacturing workers	machining and parts fixing	1		50	51
	finishing		1	12	13
	grinding and repairing		1	12	13
	inspecting	1		8	9
	the others			8	8
	t o t a l	2	2	90	94
grand total		5	5	94	104

(4) Number of shift 1-shift

7. Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)	r e m a r k s
raw material wood (kiln dried)	420m3	300	126,000	purchased from seasoning factory of this complex
metal fittings and subsidiary materials			200,000	
personnel	104	250Rs/month	312,000	
power	42,000KWH	7Rs/100KWH	2,940	power required per unit volume of raw material wood is 100 KWH
t o t a l			640,940	
costs of operation		10% of above total	64,094	
depreciation amount			112,456	
grand total			817,490	

Working capital (1/4 of the annual expenditure)
Rs. 204,373

8. Details of annual output (Estimated earnings)

kind of products	quantity of production (piece)	selling price per unit (Rs)	output(Rs)
ring bobbin	1,100,000	0.60	660,000
cop-change weft bobbin	300,000	0.55	165,000
shuttle-change weft bobbin	300,000	0.52	156,000
t o t a l	1,700,000		981,000

Annual output	Rs. 981,000
Annual expenditure	Rs. 817,490
estimated earnings (annual)	Rs. 163,510

e) Shuttle factory

1. Raw material wood

Sundri from sundarbaus mangrove forest.

2. Scale of this enterprise

(1) Annual output Rs. 1,339,000
(2) Annual expenditure Rs. 936,420
(3) Area of site 4,000 m2
(4) Floor area of buildings 1,730 m2
(5) Construction cost

(i)	Site	Rs. 4,000	(cost of readjustment)
(ii)	Buildings	Rs. 346,000	
(iii)	Machinery and other equipments	Rs. 1,050,856	
	T o t a l	Rs. 1,400,856	

(6) Working capital Rs. 234,105
(7) Personnel required

staff 15 worker 100

3. Production plan

classification	volume of raw material wood (annual) (m3)	number of raw material (annual) (piece)	yield of products (%)	total number of products (annual)	items of annual production	
					kind of products	number of products
for cotton	120	*1 150,000	85	127,500	shuttles for hand loom and power loom	27,500
					shuttles for shuttle-change automatic loom	50,000
					shuttles for cop-change automatic loom	50,000
for jute	300	*2 130,000	85	110,500	shuttles for jute loom	110,500

*1 Each piece has the volume of about 0.0008 m3 (5cm x 4cm x 40cm)

*2 Each piece has the volume of about 0.0023 m3 (7cm x 6cm x 55cm)

4. Construction cost

(1) Site

(i) Area 4,000 m2

(ii) Unit cost 1 R/m2 (cost of readjustment)

(iii) Sum Rs. 4,000 .

(2) Buildings

(i) Area

item		area (m2)
office		80
manufactory	roughing shop	100
	machining shop	800
	finishing shop	30
	oil-treating shop	30
	grindery and repair shop	150
	inspecting and testing room	150
	total	1,260

warehouse	warehouse for dried lumber (warehouse for raw material wood)	150
	warehouse for products (shipping shops)	100
	warehouse for subsidiary materials	100
	warehouse for paint	40
	t o t a l	390
grand total		1,730

(ii) Unit cost 200 Rs/m2

(iii) Sum Rs. 346,000

(3) Machinery and other equipments

(i) Roughing shop

i t e m	quantity	power required (kw) per unit	power required (kw) total	unit cost (Rs)	s u m (Rs)	remarks
conveyor	20m		3.7	100	2,000	
dust collecting system	1		11		4,000	
t o t a l			14.7		6,000	
automatic leveling planer	1	3	3	10,000	10,000	600mm
single surface planer	1	3.7	3.7	10,000	10,000	450mm
hand planer	1	2.2	2.2	4,000	4,000	300mm
circular-saw machine	1	2.2	2.2	2,800	2,800	
boring machine	1	0.75	0.75	4,000	4,000	
tip fixing machine	1	1.5	1.5	6,500	6,500	
centering machine	2	1.5	3.0	6,000	12,000	
wood milling machine	1	0.75	0.75	5,000	5,000	
t o t a l	9		17.1		54,300	
sum total			31.8		60,300	
insurance, freight				10%	6,030	
custom duty				7.5%	4,523	
installation cost					2,500	

cost of electric works					6,000	
miscellaneous expenses					3,500	
grand total					82,853	(i)

(ii) Machining shop

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	160m		22	100	16,000	
dust collecting system	1		37		15,000	
t o t a l			59		31,000	
special wood milling machine	40	1.5	60	6,000	240,000	including the cost of accessories
vertical wood borer	20	0.75	15	5,000	100,000	
wood lathe	4	1.5	6	6,000	24,000	
grinder	4	0.75	3	4,000	16,000	
belt sander	6	1.5	9	5,000	30,000	
special planer	6	2.2	13.2	6,000	36,000	
hand press	1			1,300	1,300	*
tapping machine	1	0.75	0.75	5,000	5,000	
t o t a l	82		106.95		452,300	
sum total			165.95		483,300	
insurance, freight				10%	48,200	exclusive of * marked item
custom duty				7.5%	36,150	"
installation cost					13,000	
cost of electric works					35,000	
miscellaneous expenses					25,000	
grand total					640,650	(ii)

(iii) Finishing shop

item	quantity	power required (kw) per unit	power required (kw) total	unit cost (Rs)	sum (Rs)	remarks
floor type spray booth equipped with washing installation	1	3.7	3.7	4,000	4,000	
circulation type paint supplier	1	2.2	2.2	8,000	8,000	
air compressor	1	2.2	2.2	1,300	1,300	
polisher	1	1.5	1.5	3,000	3,000	
fan	1	1.5	1.5	5,500	5,500	
boiler	1			7,000	7,000	
total	6	11.1			28,800	
insurance, freight				10%	2,880	
custom duty				7.5%	2,160	
installation cost					1,000	
cost of electric works					2,000	
miscellaneous expenses					3,000	
grand total					39,840	(iii)

(iv) Oil-treating shop

item	quantity	power required (kw) per unit	power required (kw) total	unit cost (Rs)	sum (Rs)	remarks
vacuum type oil impregnating equipment	1 set	2.2			15,000	
fan	1	1.5	1.5	5,500	5,500	
total			3.7		20,500	
insurance, freight				10%	2,050	
custom duty				7.5%	1,538	
installation cost					400	
cost of electric works					500	
miscellaneous expenses					1,000	
grand total					25,988	(iv)

(v) Grindery and repair shop

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
automatic knife grinder	3	2.2	6.6	5,000	15,000	
universal tool grinder	8	0.75	6.0	2,000	16,000	
repairing machineries	1		22		45,000	
t o t a l	11		34.6		76,000	
insurance, freight				10%	7,600	
custom duty				7.5%	5,700	
installation cost					4,500	
cost of electric works					8,000	
miscellaneous expenses					6,000	
grand total					107,800	(v)

(vi) Inspecting and testing room

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
testing loom	4	2.2	8.8	10,000	40,000	
insurance, freight				10%	4,000	
custom duty				7.5%	3,000	
installation cost					1,500	
cost of electric works					2,500	
miscellaneous expenses					2,000	
grand total					53,000	(vi)

(vii) Office and warehouse

item	quantity	power required (kw) per unit	power required (kw) total	unit cost (Rs)	sum (Rs)	remarks
fork lift	2			16,000	32,000	
humidity regulator	1		45		35,000	
total			45		67,000	
insurance, freight				10%	6,700	
custom duty				7.5%	5,025	
cost of electric works					2,000	
miscellaneous expenses					20,000	
grand total					100,725	(vii)

Grand total of the cost of machinery and other equipments

(i) + (ii) + (iii) + (iv) + (v) + (vi) + (vii) = Rs. 1,050,856

Grand total of construction cost

Site	Rs. 4,000
Buildings	Rs. 346,000
Machinery and other equipments	Rs. 1,050,856
	Rs. 1,400,856

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments

1,400,856 x 0.1 = 140,086 Rs

6. Personnel expenses

(1) Personnel required

staff 15 worker 100

(2) Personnel expenses

number of employees	unit wages (average) (Rs/month)	sum (monthly) (Rs)	sum (annual) (Rs)
115	250	28,750	345,000

(3) Personnel disposition plan

classification	disposition	class			
		senior staff and technical employee	junior staff and technical employee	worker	total
office workers	managing	2			2
	planning	1		1	2
	general affairs	1		1	2
	accounting		1	2	3
	material supplying	1	1	1	3
	total	5	2	5	12
manufacturing workers	roughing	1	1	20	22
	machining	1	1	45	47
	finishing	1		3	4
	oil-treating		1	2	3
	grinding and repairing		1	10	11
	inspecting and testing	1		5	6
	the others			10	10
	total	4	4	95	103
grand total		9	6	100	115

(4) Number of shift 1-shift

7. Annual expenditure

item	quantity	unit cost (Rs)	sum (Rs)	remarks
raw material wood (kiln dried)	420m3	300	126,000	purchased from seasoning factory of this complex
metal fittings and subsidiary materials			250,000	
personnel	115	250Rs/month	345,000	
power	42,000KWH	7Rs/100KWH	2,940	power required per unit volume of raw material wood is 100 KWH
total			723,940	
costs of operation		10% of above total	72,394	
depreciation amount			140,086	
grand total			936,420	

Working capital (1/4 of the annual expenditure)
Rs. 234,105

8. Details of annual output (Estimated earnings)

kind of products	quantity of production (piece)	selling price per unit (Rs)	output(Rs)
shuttles for hand loom and power loom	27,500	2	55,000
shuttles for shuttle-change automatic loom	50,000	3	150,000
shuttles for cop-change automatic loom	50,000	5	250,000
shuttles for jute loom	110,500	8	884,000
t o t a l	238,000		1,339,000

Annual output	Rs. 1,339,000
Annual expenditure	Rs. 936,420
Estimated earnings (annual)	Rs. 402,580

f) Briquette factory

1. Raw material

Saw dust and bark from the saw mill of this complex and bark from the paper mill.

2. Scale of this enterprise

(1)	Annual output	Rs. 64,400
(2)	Annual expenditure	Rs. 57,818
(3)	Site	(Belonged to the saw mill)
(4)	Floor area of buildings	270 m2
(5)	Construction cost	
	(i) Site	Rs. 0
	(ii) Buildings	Rs. 54,000
	(iii) Machinery and other equipments	Rs.116,363
	T o t a l	Rs.170,363

(6) Working capital Rs. 14,455

(7) Personnel required

staff 2 worker 4

4. Production plan

Quantity of raw material saw dust (annual) 630 ton (moisture content 100%)

Quantity of raw material saw dust (annual, from paper mill) 600 ton (moisture content 80%)

Quantity of raw material saw dust (annual, from saw mill) 100 ton (moisture content 50%)

Yield of products 90%

Quantity of products (annual, in absolutely dried condition)

from saw dust ----- 284 ton ($\div \frac{630 \times 0.9}{2}$)

from bark of paper mill ----- 300 ton ($\div \frac{600 \times 0.9}{1.8}$)

from bark of saw mill ----- 60 ton ($\div \frac{100 \times 0.9}{1.5}$)

T o t a l ----- 644 ton (2.1 ton/day)

In practice these materials are mixed together dimensions of products

diameter 5cm x length 40cm (having a hole along the center axis)

weight Ca. 1kg/piece

annual production ----- 644,000 pieces

4. Construction cost

(1) Site

Belonged to the saw mill

(2) Buildings

(i) Area

i t e m	a r e a (m2)
o f f i c e	belonged to the office of saw mill
briquetting shop (including a room for products)	120
warehouse for saw dust	150
t o t a l	270

(ii) Unit cost 200 Rs/m2

(iii) Sum Rs. 54,000

(3) Machinery and other equipments

(i) Briquetting shop

i t e m	quantity	power required (kw)		unit cost (Rs)	s u m (Rs)	remarks
		per unit	total			
conveyor	20m		3.7	100	2,000	
dust collecting system	1		3.7		2,000	
t o t a l			7.5		4,000	
briquettor	1	37	37	16,000	16,000	400kg/hr.
chest for dried raw materials	1			650	650	* 10m3
chest for undried raw materials	2			650	1,300	* 10m3
mixing machine for raw materials	1	3.7	3.7	3,500	3,500	for mixing of saw dust and bark
cyclon	2	0.75	1.5	6,500	13,000	5m3
rotary dryer including combustion furnace and reduction gear	1	1.5	1.5	9,000	9,000	0.5 ton/hr.
screen	2	0.75	1.5	3,000	6,000	
screw conveyor	2	0.75	1.5	2,500	5,000	
bark crusher	2	1.5	3.0	6,500	13,000	
t o t a l	14		49.7		67,450	
sum total			57.2		71,450	
insurance, freight				10%	6,950	exclusive of * marked item
custom duty				7.5%	5,213	"
installation cost					4,500	
cost of electric works					6,500	
miscellaneous expenses					3,000	
grand total					97,613	(i)

(ii) Office and warehouse

item	quantity	power required (kw) per unit	power required (kw) total	unit cost (Rs)	sum (Rs)	remarks
push car	3			250	750	
rail for push car	50m			40	2,000	
miscellaneous expenses					16,000	
total					18,750	(ii)

Grand total of the cost of machinery and other equipments

(i) + (ii) = Rs. 116,363

Grand total of construction cost

Site	Rs. 0
Buildings	Rs. 54,000
Machinery and other equipments	Rs. 116,363
	Rs. 170,363

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments

170,363 x 0.1 = 17,036 Rs

6. Personnel expenses

(1) Personnel required

staff 2 worker 4

(2) Personnel expenses

number of employees	unit wages (average) (Rs/month)	sum (monthly) (Rs)	sum (annual) (Rs)
6	250	1,500	18,000

(3) Personnel disposition plan

disposition	class of employees			
	senior staff and technical employee	junior staff and technical employee	worker	total
raw material			1	1
manufacturing	1		2	3
products		1	1	2
t o t a l	1	1	4	6

(4) Number of shift 1-shift

7. Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)	r e m a r k s
green saw dust	630 ton	4	2,520	
green bark	700 ton	2	1,400	
personnel	6	250Rs/month	18,000	
power	26,600 KWH	7Rs/100KWH	1,862	power required per 1 ton of raw material is 20KWH
fuel (bark from paper mill)	1,000 ton	2	2,000	fuel required per 1 ton of raw material is 400kg (moisture content 80%)
costs of operation			15,000	
depreciation amount			17,036	
t o t a l			57,818	

Working capital (1/4 of the annual expenditure)
Rs . 14,455

8. Details of annual output (Estimated earnings)

Annual production quantity 644 ton
Selling price per unit 100 Rs/ton
Annual output Rs. 64,400
Estimated earnings (annual) = Rs. 64,400 - Rs. 57,818
= Rs. 6,582

g) Electric pole treating factory

1. Raw material wood

Mainly sundri (small wood) from Sundarbaus mangrove forest.

2. Scale of this enterprise

(1)	Annual output	Rs. 796,875	
(2)	Annual expenditure	Rs. 574,600	
(3)	Area of site	25,000 m2	
(4)	Floor area of buildings	705 m2	
(5)	Construction cost		
	(i) Site	Rs. 25,000	(cost of readjustment)
	(ii) Buildings	Rs. 141,000	
	(iii) Machinery and other equipments	Rs. 450,404	
	t o t a l	Rs. 616,404	
(6)	Working capital	Rs. 143,650	
(7)	Personnel required		
	staff 8	worker 19	

3. Production plan

Volume of raw log (annual)	5,000 m3
Yield of log-making and air seasoning	85%
Net volume of raw log required (annual)	4,250 m3
Number of electric pole treated (annnal)	10,625 (0.4 m3/one pole, average)

4. Construction cost

(1) Site

(i)	Area	25,000 m2
(ii)	Unit cost	1 R/m2 (cost of readjustment)
(iii)	Sum	Rs. 25,000

(2) Buildings

(i) Area

item		area (m2)
office		80
manufactory	treating shop	400
	winch room	25
	boiler house	60
	repair shop	50
	balancing room	10
	worker's room	80
	total	625
grand total		705

(ii) Unit cost 200 Rs/m2

(iii) Sum Rs. 141,000

(3) Machinery and other equipments

item	quantity	power required (kw)		unit cost (Rs)	sum (Rs)	remarks
		per unit	total			
treating cylinder L20m x D2m	1			53,000	53,000	
measuring tank L4m x D1.5m	1			3,300	3,300	
overhead cylinder (Rueping tank) L15m x D2m	1			40,000	40,000	including rack
water-cooled multi-tubular condensor	1			6,000	6,000	
tank of preservatives (200 ton)	1			37,300	37,300	*
tank of preservatives (100 ton)	1			22,600	22,600	*
washington pump	2			2,000	4,000	
air compressor	1			12,000	12,000	horizontal type
recorders	3			460	1,380	

meters	3			200	600	
balance	2			4,600	9,200	5t
motor (50 HP)	1	37	37	5,300	5,300	
motor (10 HP)	2	7.5	15	1,300	2,600	
boiler L3.5m x D1.5m evaporative surface	1			40,000	40,000	
winch	3	7.5	22	2,000	6,000	
chain saw	2	1.5	3	1,700	3,400	
fork lift	1			20,000	20,000	
trolley	30			930	27,900	*
machine repairing equipment	1			6,500	6,500	
t o t a l			77		301,080	
insurance, freight				10%	21,328	exclusive of * marked item
custom duty				7.5%	15,996	"
installation cost					40,000	
laying cost of trolley track					26,000	15kg/m, 1,000m
piping cost					20,000	
cost of electric works					16,000	
miscellaneous expenses					10,000	
grand total					450,404	

Grand total of construction cost

Site	Rs. 25,000 (readjustment cost)
Buildings	Rs. 141,000
Machinery and other equipments	Rs. 450,404
	Rs. 616,404

5. Depreciation amount

10% of the total cost for buildings, machinery and other equipments

591,404 x 0.1 = Rs. 59,140

6. Personnel expenses

(1) Personnel required

staff 8 worker 19

(2) Personnel expenses

number of employees	unit wages (average) (Rs/month)	s u m (monthly) (Rs)	s u m (annual) (Rs)
27	250	6,750	83,000

(3) Personnel disposition plan

disposition	class of employees			
	senior staff and technical employee	junior staff and technical employee	worker	total
managing	1			1
treating	1	1	2	4
raw log	1	1	10	12
products		1	5	6
general affairs, counting	1	1		2
the others			2	2
t o t a l	4	4	19	27

(4) Number of shift 1-shift

7. Annual expenditure

i t e m	quantity	unit cost (Rs)	s u m (Rs)	r e m a r k s
raw log	5,000m3	40	200,000	
creosote oil	750,000kg	0.24	180,000	quantity required for 1 m3 of raw material wood is 150 kg
personnels	27R	250Rs/month	83,000	
power	80,000KWH	7Rs/100KWH	5,600	power required per 1m3 of raw material wood is 16 KWH
t o t a l			468,600	
costs of operation		10% of above total	46,860	
depreciation amount			59,140	
grand total			574,600	

Working capital (1/4 of the annual expenditure) Rs. 143,650

8. Details of annual output (Estimated earnings)

Number of electric pole treated (annual)		10,625
Selling price per unit	Rs.	75
Annual output	Rs.	796,875
Annual expenditure	Rs.	574,600
Estimated earnings (annual)	Rs.	222,275

h) Pulp and Paper Mill Project at Khulna Area

In planning a pulp and paper mill in East Pakistan for the purpose of utilizing forest resources, the most promising specie is Sundri produced from Sundarban Forests.

Sundri can be collected most easily and is suited as pulpwood which is consumed constantly in big quantities. As Sundri is heavy, it is better suited to be used by chemical treatment.

As for pulping process, the first choice should be sulphate process which is technically the easiest in chemical recovery and in the local supply of fuel and power, since those items are dear in East Pakistan. However, the initial capital investment for sulphate process with recovery equipment is big, the mill has to be relatively big in scale.

Our plan places the size at 150 tons per day, taking into consideration both wood supply and paper requirements.

The possibility of establishing a pulp mill utilizing miscellaneous small trees at Chittagong Hill tracts is small at present.

However, if it becomes economical to collect big quantities of wood in future, they may be utilized as raw material for making corrugated board.

1. Outline

(1) Objective

The purpose of this paper is to draw up a model plan of establishing a pulp and paper mill at Khulna area utilizing Sundarban Forests wood.

(2) Raw material ..... Sundri

(3) Mechanical equipments

A bleached pulp plant and paper machine with auxiliary equipments.

(4) Products

Bleached Sulphate Pulp. Writing & Printing Paper.

2. Size of the mill

(1)	Paper production	45,000 t/year
(2)	Annual expenditure	49.06 million Rupees
(3)	Mill site	100,000 m2
(4)	Floor space	25,000 m2
(5)	Construction investment	95.00 million Rupees
(6)	Working capital	13.00 million Rupees
(7)	Number of employees	540

3. Itemized expenditure for construction

(1) Machines

	(Rupee in Million)
Logging equipment	6.20
Chiping storage	1.50
Cooking dept.	3.00
Washing & Screening	2.50
Bleaching dept.	3.00
Pulp machine	1.20
Stock preparation	2.50
Paper making dept.	20.00
Finishing dept.	2.00
Chemical preparation	0.20
Evaporator	1.80
Recovery Boiler	4.00
Recausticizing plant	3.20
Electrolysis plant	5.50
Bleaching agent making	0.20
Water supply	2.00
Steam Boiler	2.00
Power generator	5.00
Power distributor	0.80
Repair shop	1.50
Laboratory	0.20
Spare parts	4.00

Pipe line & Wiring material	3.50
Transportation equip.	1.00
Machine for unloading and transportation	2.00
Machine and equip for erection work	3.00
T o t a l	81.80

(2) Buildings

Floor space 25,000 m2 x 300 Rs.	7.50

(3) Ground preparation

100,000 m3 x 20 Rs.	2.00
(4) Reserves for other expenditures	3.70
T o t a l	95.00

4. Number of employees

Log yard	20 x 2 shift =	40
Wood preparation	20 x 2 " =	40
Pulping Dept.	14 x 3 " =	42
Bleaching Dept.	9 x 3 " =	27
Recovery Dept.	12 x 3 " =	36
Boiler & Generator	10 x 3 " =	30
Stock preparation	10 x 3 " =	30
Paper making dept.	16 x 3 " =	48
Finishing Dept.	32 x 2 " =	64
Electrolysis plant	12 x 3 " =	36
Chemical Preparation	5 x 3 " =	15
Maintenance	9 x 3 " =	27
Repair Shop	20 x 1 " =	20
Laboratory	10 x 1 " =	10
Indirect workers	25 x 1 " =	25
Clerical workers	50 x 1 " =	50
T o t a l		540

5. Production costs

(1) Direct costs at pulp mill

Raw material	Per ton	Unit price	Rs/pulp	Annual consumption
Wood	2.5 m3/t	36 Rs/m3	90.0	112,500m3
Salt	135 kg/t	180 Rs/t	24.3	6,175 t
Sulfur	20 kg/t	300 Rs/t	6.0	900 t
Lime stone	120 kg/t	30 Rs/t	3.6	5,400 t
Fuel oil	100 l/t	130 R/kl	13.0	4,500 kl
Power for electrical dissolving	350 KWH/t	7 Rs/100KWH	24.5	Million KWH 15.75
Power for pulping	600 KWH/t	7 Rs/100KWH	42.0	Million KWH 27.00
Water	500 m3/t	0.07 Rs/m3	35.0	Million m3 22.5
Maintenance			20.0	
Auxiliary materials			11.6	
T o t a l			270.0	

(2) All costs for paper making

Raw material	Per ton	Unit price	RS/ paper t	Annual consumption	Annual expenditure (Rupee in Million)
Pulp	t/t	270.0 Rs/t	270.0	45,000 t	12.15
Clay	150 kg/t	0.3 Rs/kg	45.0	6,750 t	2.02
Alum	30 kg/t	0.35 Rs/kg	10.5	1,350 t	0.47
Size	15 kg/t	1 Rs/kg	15.0	675 t	0.67
Fuel oil	400 l/t	130 Rs/kl	52.0	18,000 kl	2.34
Power	600 KWH/t	7 Rs/100KWH	42.0	27.0 Million KWH	1.89
Water	200 m3/t	0.07 Rs/t	14.0	9.0 Million KWH	0.63
Tools			30.0		1.35
Auxiliary materials			30.0		1.35
Packaging materials			15.0		0.67
Maintenance			20.0		0.90
Labor	540x250Rs/		36.0		1.62
Sales expenditure			300.0		13.50
Depreciation 95 Million x 1/10 x 1/45,000			211.1		9.50
T o t a l			1,090.5		49.06

6. Annual Sales

2,000 Rs/t x 45,000 t = 90.00 Million Rs

Annual Profit

90.00 Million Rs - 49.06 Million Rs = 40.94 Million Rs

F. Logging Plan at Chittagong Hill Tracts Area

Resume of Logging and Transportation Plan

1. Location of operation

One block 5 kilometers inside from depot around lake or river side at Chittagong Hill Tracts.

2. Operating area

2,000 acres (See 1)

3. Production per year

3,000,000 cu.ft. (See 2)

4. Scope of operation

Felling and transportation to river side depot (See 3)

5. Method of operation and tools

Clear cutting all sound timber of all species larger than 1 foot d.b.h. are to be carried out.

T o o l s

Type of operation	Tools and machines	R e m a r k s
Felling	Hatchet & hand saw	
Bucking	Hand saw	
Proyarding	Yarder (100 HP)	High lead system
Yarding	Tractor (10 ton)	
Loading	Truck crane (10 ton)	
Transportation	Truck (7 ton)	
Operations at timber yard	Wheel crane (10 ton)	
Construction of Forest-road	Angle dozer (15 ton)	
	Rake dozer (15 ton)	
Yard preparation	Angle dozer	

6. Operating days

Considering rainy days and disability of machines, operating days of workers are supposed to be 200 days per year. However, all field workers are supposed to be hired the year round, they are to be attending to machine maintenance on unoperating days.

7. Expenses not included in felling costs.

Following items are not included in felling costs.

(a) Overhead expenses
(b) Forest survey expenses
(c) Reserve parts of machines and repair (Part of repair expenses is included in the form of year round hire of drivers and their assistants.)

8. Machines, depreciation and fuel costs

(a) Big size machines are supposed to be used, in spite of the fact that in many cases smaller machines may fit better, because wood is heavy and to insure ample depreciation.
(b) Depreciation period is taken as 5 years for all machines.
(c) Fuel costs are calculated on the basis of experiences of Japanese National Forest Service and Japanese companies. The price is set at 80 to 100 paisa per litter of light oil.
(d) Prices of machinery include transportation, insurance, import tax. etc.

9. Small timber for making charcoal and particle board

It is considered that log smaller than 1 foot are unsuitable for other purposes due to not and other defects should better be made into particle board and charcoal.

This kind of timber should also be collected by high lead wires and be piled up after cutting in lengths suitable for making charcoal.

(1) Operating area

At Bagaihat, the area is divided into blocks of 500 acres each and 2 chain green belts are left out.

In view of augmenting production per block and of the labor situation, one operating area is set in this report at 2,000 acres.

(2) Volume of production

Production at the said area was told to come to 350 cubic feet. However, at present only big trees of certain spacies are produced. If all trees over 1 foot in diameter are carried out, more than 4 times as much as that could be produced. So, production per acre is set at 1,500 cubic feet. (In my personal view, more than 2,000 cubic feet)

Some deductions are necessary to be made, because green belts have to be left out, and because some parts can not be worked due to geographical conditions, and to no tree growth. On the other hand, some parts may produce more wood. So average production has been calculated as above.

(3) Scope of operation

Truck transportation is most rationable as a basis forestry operation policy. However, due to following consideration, rafting to depot, as is practice now has been made the basis of calculation.

(a) Trees are heavy and less cargo can be carried.
(b) Bamboo is abundant, and there is demand for bamboo.
(c) Geographical conditions for making forest roads are not clear. Moreover, gravel necessary for building roads is unavailable. Further examination is necessary for the constant supply of wood, since rafting is impossible during dry season.

(4) Operating method

(a) Bucking

At present, hatchet is used for bucking, but it is very inefficient and unproductive method. Efficiency could be increased by using chain saw, but it might be difficult to take up chain saw all at once. So for the time being, it may be advisable to use hatchet. So the calculation is made on that basis.

(b) Yarding

Yarding is supposed to take two stage system, high lead wire yarding as the first stage and tractor yarding in the second. High lead method is taken as suitable, as roads should be built on.

In high lead system, intensive selective cutting or clear cutting is indispensable. Since artificial planting is made after cutting, it is considered there are us problems for this. In the second stage, trees collected by high lead wire are transported by tractor by use of arch, sulky or trailer up to the point where they are loaded to trucks. Some of the trees may be loaded on trucks at this stage. Also, considerable volumes may not require yarders, but to insure sound calculation, these volumes are not taken into consideration.

(c) Loading

Truck crane is to be used for loading to truck.

(d) Transportation

Transportation by cable is one method. However, it is costly-road construction is considered better in order to facilitate regeneration works and the use of tractor in the forests.

(e) Yard operation

Size of one yard is supposed to be 5 acres at most in view of the geographical conditions. Unloading and stacking at the yard is to be made by wheel crane, because of its mobility and efficiency.

(f) Road building

In the construction of forest roads, this machine is used as rake dozer for the removal of stumps and as angle dozer for ground preparation. Some explosives are supposed to be used for the removal of stumps.

(For reference)

Bricks for road construction

The biggest problem for road construction is the lack of gravel in this area. Bricks in complete shape are not necessary for constructing roads, and if clay for making bricks is available in this area, it may be advisable to burn bricks using waste wood left out in the forests.

Estimates of logging and transportation

1. Felling and Bucking

Work done: Felling, Removal of branches, Bucking } 250 cu.ft./day

Number of employees

Cutter ..... 3,000,000 cft. ÷ 250 cft. = 12,000 working days 200 days/year

Laborer ..... 2 laborers per one cutter (Miscellaneous works)

Cost

Logger's wage ..... 4 Rs/day

4 Rs ÷ 250 cft. = $1\frac{6}{}$ paisa/cft.

Laborer's wage ..... 3 Rs/day

3 Rs x 2 ÷ 250 cft = $2\frac{4}{}$ paisa/cft.

T o t a l ..... $4\frac{0}{}$ paisa/cft.

2. Preyarding and Yarding

2-1 Preyarding

Yarding range

Distance max ..... 1,500 ft ave. ..... 600 ft

Area ave. ..... 50 acre

Work done

1 time average ..... 80 cft.

25 times per day, ave. ... 2,000 cft/day

Number of machines needed

Ave. yarding volume at one place: 1,500 cft/acre x 50 acre = 75,000 cft.

Working days at one place: 75,000 ÷ 2,000 = 38 days

No. of days needed for moving: 5 days

Working days in a year: 150 days

No. of moving per machine: 150 ÷ (38+5) = 3.5 times

No. of working places: 2,000 acre ÷ 50 acre = 40 places

40 places ÷ 3.5 times = 12 machines

(2 reserve places)

No. of employees (per machine)

Driver	1
Assistant	1
Laborer for loading and unloading	3
Other laborers	3
T o t a l	8

Cost

Labor	Driver	150 Rs/day x 12 months = 1,800 Rs
	Assistant	120 Rs/day x 12 months = 1,440 Rs
	Laborer	3 Rs/day x 6 x 150 days = 2,700 Rs
	T o t a l	= 5,940 Rs
	5,940 Rs x 12 machines = 71,280 Rs	
Fuel	70 Rs/days x 150 days x 12 machines = 126,000 Rs	
Installing	Per moving 20 persons @ 3 Rs/day	
	60 Rs x 40 places = 2,400 Rs	
Depreciation		
Yarder	120,000 Rs x 12 = 1,440,000 Rs	
Wire and accessories		
	20,000 Rs x 12 = 240,000 Rs	
T o t a l	140,000 Rs 1,680,000 Rs	
	1,680,000 Rs ÷ 5 years = 336,000 Rs	
T o t a l	535,680 Rs.	

2-2 Yarding by Tractors

Yarding range

Distance	200 - 1,000	ave. 400 m
Slope	5 - 15°	ave. 10°

Volume

One third of timber is supposed not to need tractor

3,000,000 cft. x 2/3 ÷ 2,000,000 cft.

Machines required

2,000,000 cft ÷ 1,000 cft/day = 2,000 machines

Working days 150 days

2,000 machines ÷ 150 days = 14 machines

Arch	5
Sulky	5
Trailer	4

No. of employees per machine

Driver	1
Assistant	1
T o t a l	2

Cost

Labor	Driver	150 Rs/month x 12 month =	1,800 Rs
	Assistant	120 Rs/month x 12 month =	1,440 Rs
	T o t a l		3,240 Rs
	3,240 Rs x 14 machines =		46,360 Rs
Fuel	110 Rs/day x 150 days x 14 machines =		231,000 Rs

Depreciation

Tractor	100,000 Rs x 14	1,400,000 Rs
Sulky	20,000 Rs x 5	100,000 Rs
Arch	25,000 Rs x 5	125,000 Rs
Trailer	23,000 Rs x 4	92,000 Rs
T o t a l		1,717,000 Rs

5 years depreciation

1,717,000 Rs ÷ 5 = 343,400 Rs

T o t a l 619,760 Rs

Total yarding costs

per 1 cu.ft. 1,155,440 Rs. 38.5 paisa

3. Transportation

3-1 Loading

Work done ..... Ave. per time 40 cft.

50 times per day. 2,000 cft/day

Cranes required

3,000,000 cft ÷ 2,000 cft ÷ 150 days = 10 machine

No. of workers required (per one crane)

Driver	1
Assistant	1
Laborer for loading and unloading	3
Other laborer	2
T o t a l	7

Cost

Labor	Driver	150 Rs/day x 12 month =	1,800 Rs
	Assistant	120 Rs/day x 12 month =	1,440 Rs

Laborers	3 Rs/day x 5 x 150 days =	2,250 Rs
T o t a l		5,490 Rs

5,490 Rs x 10 machines = 105,000 Rs

Fuel 70 Rs x 150 day x 10 machines = 105,000 Rs

Depreciation

Crane 100,000 Rs x 10 machines = 1,000,000 Rs

1,000,000 Rs ÷ 5 years = 200,000 Rs

Total 359,900 Rs

3-2 Trucking

Distance 7 - 15 km Ave. 10 km

Work done 150 cft/times. times/day 600 cft/day.

No. of trucks required

3,000,000 cft ÷ 600 cft = 5,000 machines

5,000 machines ÷ 150 days = 34 machines

(100 machines reserved)

No. of employees

Driver	1
Assistant	1
T o t a l	2

Cost

Labor Driver 150 Rs/day x 12 months = 1,800 Rs

Assistant 120 Rs/day x 12 months = 1,440 Rs

T o t a l 3,240 Rs

3,240 Rs x 34 machines = 110,160 Rs

Fuel 20 paisa per 1 km.

per day 10 km x 2 x 4 times x 20 paisa = 16 Rs

16 Rs x 150 days x 20 machines = 48,000 Rs

Depreciation

Truck 50,000 Rs x 34 machines = 1,700,000 Rs

1,700,000 Rs ÷ 5 years = 340,000 Rs

T o t a l 498,160 Ts

Total transportation cost - 858,060 Rs

Per 1 cu. ft. 28$\frac{0}{-}$ paisa.

4. Timber yard operation

Supposed logs ..... Big logs 50 %

Medium logs (stackable) 50 %

Log accumulation per unit space

Big logs 40 cft/Yd2

Medium logs 60 cft/Yd2

Ave. 50 cft/Yd2

Space required .... 3,000,000 cft ÷ 50 cft = 60,000 Yd2

Supposing one yard is 4 to 5 acre big, 3 yards are required, the average space being 20,000 Yd2

Volume handled

Average volume per year 3,000,000 cft ÷ 2 = 1,500,000 cft.

Average volume per day 1,500,000 cft ÷ 150 days = 10,000 cft.

Machines required.. 1 wheel crane per 1 yard.

No. of employees

Driver	1
Assistant	1
Laborers	5
T o t a l	7

Cost Labor

Driver	150 Rs/month x 12 months	= 1,800 Rs
Assistant	120 Rs/month x 12 months	= 1,440 Rs
Laborers	3 Rs/day x 5 x 150 days	= 2,250 Rs
T o t a l		5,490 Rs

5,490 Rs x 3 = 16,470 Rs

Fuel - 70 Rs/day x 150 days x 3 machines = 31,500 Rs.

Depreciation

Wheel crane 120,000 Rs x 3 = 360,000 Rs.

360,000 Rs ÷ 5 = 72,000 Rs

Total ..... 119,970 Rs.

Per 1 cu.ft. 4.$\frac{0}{}$ paisa

5. Forest-road

5-1 Construction of forest-road

Road for log transportation

Aggregate distance ..... 10 m per acre

10 m x 2,000 acre = 20,000 m

Width ..... 4 m

Stump removal ..... 1 per 20 m

Work done by rake dozer 10 stumps/day

200 m/day 5 laborers per dozer

Ground preparation ... Work done by rake dozer 500 m/day

2 laborers per dozer

Road for yarding by tractor

Aggregate distance ... 15 m per acre

15 m x 2,000 acre = 30,000 m

Width ..... 3 m

Stump removal ..... 1 stump per 30 m.

Work done by rake dozer 10 stump/day

300 m/day 5 laborers per dozer

Ground preparation ... Work done by rake dozer 1,000 m/day

2 laborers per dozer

Machines required

Rake dozer for stump removal

Road for log transportation	- 20,000 m ÷ 200 m =	100 days
Road for yarding	- 30,000 m ÷ 300 m =	100 days
T o t a l		225 days

200 days ÷ 150 days = 2 machine (100 days reserved)

Angle dozer for ground preparation

Road for log transportation	- 20,000 m ÷ 500 m =	40 days
Road for yarding	- 30,000 m ÷1000 m =	30 days
T o t a l		70 days

70 days ÷ 150 days = 0.5 machines (Used for ground preparation, too)

No. of employees

Stump removal (Transportation road) ..	5 x 100 days =	500
(Yarding road)	5 x 100 days =	500
Ground preparation		
(Transportation road) ..	2 x 40 days =	80
(Yarding road)	2 x 30 days =	60
T o t a l		1,400

Per dozer Driver	1
Assistant	1

Cost

Labor	Driver	150 Rs/day x 12 months =	1,800 Rs
	Assistant	120 Rs/day x 12 months =	1,440 Rs
	T o t a l		3,240 Rs
3,240 Rs x 2.5 =			8,100 Rs
Laborers		3 Rs x 1,400 =	4,200 Rs
T o t a l			12,300 Rs

Fuel ..... 110 Rs/day

110 Rs x (200 + 70 days) = 29,700 Rs

Depreciation .....

110,000 Rs x 2.5 machines = 275,000 Rs

275,000 Rs ÷ 5 years = 55,000 Rs

T o t a l ..... 97,000 Rs

5-2 Maintenance of forest-road

Trucking road ..... 2,000 m per person/day

Aggregate distance normally used

(20 km ÷ 2) + 5 km = 15 km

No. of workers - 15 km - 2 km = 8

3 Rs x 8 persons x 150 days = 3,600 Rs

Road for tractor ... 5,000 m per person/day

Aggregate distance normally used - 15,000 m

No. of workers - 15,000 m ÷ 5,000 m = 4

3 Rs x 3 persons x 150 days = 1,350 Rs

T o t a l 4,950

Total road cost ..... 101,950 Rs

Per cu.ft. 3.4 paisa.

6. Yard construction

* Machinery ... Angle dozer for road around preparation is used for this purpose, too.

No. of days required ... 1,000 Yd2/day

60,000 Yd2 ÷ 1,000 Yd2 = 60 days (37 days reserved)

* No. of workers ..... 10 persons/day

* Cost ... Labor

	Driver	150 Rs/day x 12 months =	1,800 Rs
	Assistant	120 Rs/day x 12 months =	1,440 Rs
	T o t a l		3,240 Rs

	3,240 Rs x 0.5 =	1,620 Rs
	Laborers ... 3 Rs x 10 x 60 =	1,800 Rs
	T o t a l	3,420 Rs
Fuel	110 Rs/day x 60 days =	6,600 Rs
Depreciation	110,000 Rs x 0.5 =	22,000 Rs
	22,000 Rs ÷ 5 years =	4,400 Rs
T o t a l	14,420 Rs	
	Per 1 cu.ft. 0.5 paisa	

7. Total costs

	Price per cu.ft.	Value
Logging	4.0 Paisa	120,000 Rs
Yarding	38.5 Paisa	1,155,440 Rs
Transportation	28.6 Paisa	858,060 Rs
Yard operation	4.0 Paisa	119,970 Rs
Forest road	3.4 Paisa	101,950 Rs
Yard construction	0.5 Paisa	14,420 Rs
T o t a l	79.0 Paisa	2,369,840 Rs

8. Price of finished log

8-1 Average finished log price

Royality	25 Paisa/cft.
Cost of logging operation	79
Floating cost	104
Derafting cost	10
T o t a l	218

(Note) Floating cost is the average of 7.5 paisa/cu.ft. from Rangapehar to Kaptai and 128 paisa/cu.ft. from Bagainet to Kaptai.

8-2 Estimated profit

Suppose logs for making veneer and regular sawing are 130 Rs/M3 (368 Paisa/cft), and 50 Rs/M3 (142 paisa/cft) respectively:

Log for veneer	1,200,000 cft	368 Paisa/cft	4,416,000 Rs
Log for saw mill	1,800,000	142	2,556,000
T o t a l	3,000,000	255	6,972,000

On the basis of two fifth suitable for veneer are obtained, profit per cu.ft. becomes 2 paisa, making the total gain of 432,000 Rs.

9. Timber of making charcoal and particle board

a. Felling and logging

Work done 200 cft/day 4 Rs - 200 cft 2 Paisa/cft

Miscellaneous works - same with regular timber
3.0 Paisa/cft

T o t a l ..... 5.0 Paisa/cft.

b. Yarding cost

Same with regular timber 17.9 Paisa/cft

c. Cost of cutting and stacking

Work done per day ..... 300 cft.

300 Paisa ÷ 300 cft = 1.0 Paisa/cft.

d. Total cost of production = 23.9 Paisa/cft.

G. The method of charcoal making in Kassalong forest

1. Outline

The method of cutting and yarding of woods in Kassalong area have been redeveloped. Even though justifiable usage of the unused woods are made for the beging, there would be much amount (Presumption seems to be difficult but ray about 20,000 m) of wood waste in forest (smallwood, branchwood) presumed to be left over and these are carbonized and sent to Chittagong and Dacca.

2. The Method of Charcoal making.

1) When comparatively smallwood are used as raw material (Dia. 10 - 15 cm, length 1.50 - 2.00 m)

(A) Charcoal Kiln

Proper size and type is shown in Fig. 1.
This can be assembled above the ground, dugged under ground or dugged into the hills, but finally it is required to build a wall to prevent water from coming in as shown in Fig. 2.

Fig 1. Charcoal Kiln

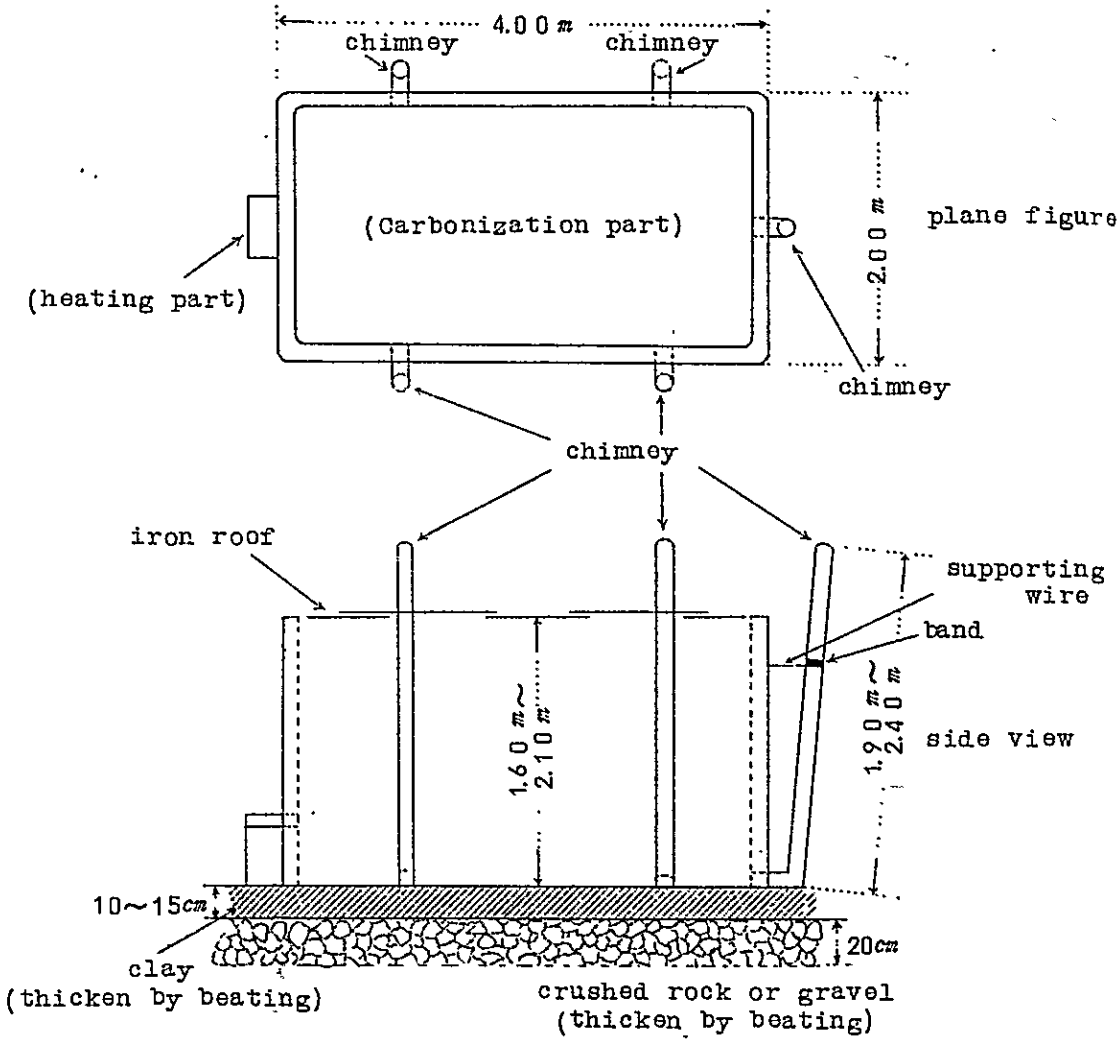


Fig 2. Constrnctin of water proof wall in the hills

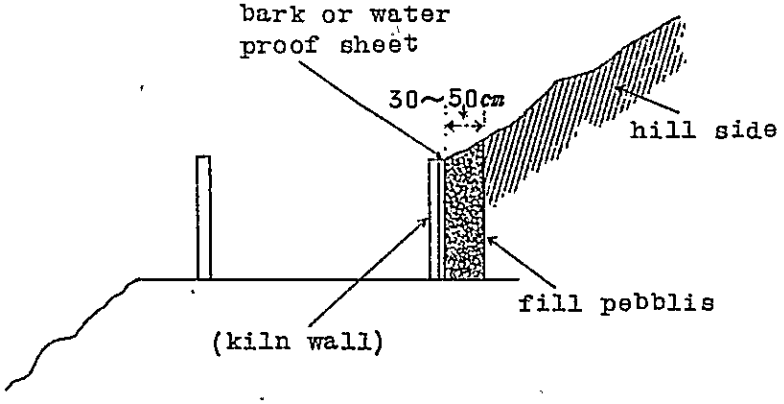
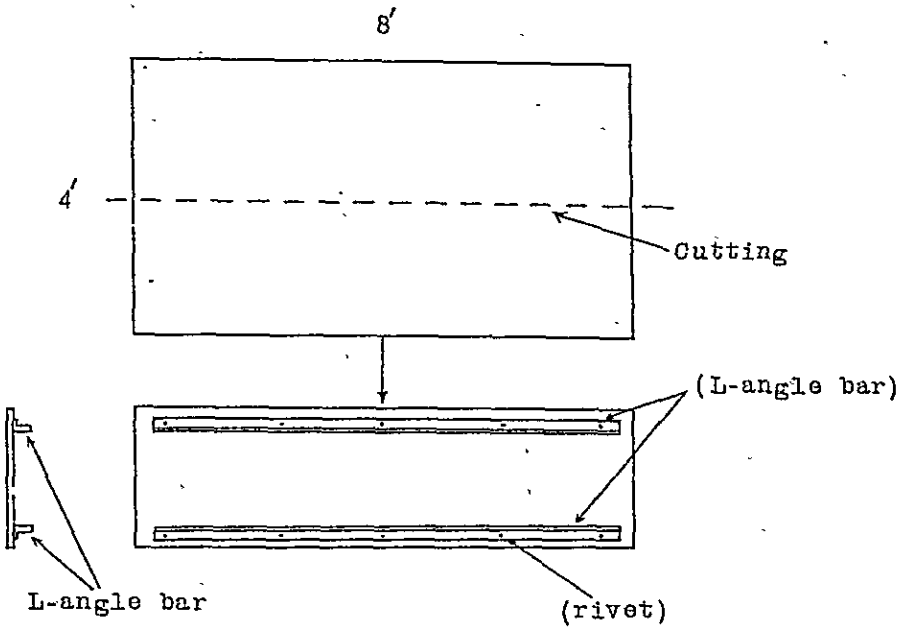


Fig 3. Iron plate for roof



a) Size of carbonizing furnace

Width ..... 2.00 m

Length ..... 4.00 m

Height ..... 1.60 - 2.10 m

b) Material of Kiln wall

Brick blocks or stone construction with mud plastering etc.

c) Chimney

Dia. 4-6" pipes, earthen pipe, ethanit pipe, or bricks to be used and should be made about 30 cm higher than the furnace length, for instance the length should be 1.90-2.40m and should also must be removable.

d) Roofing

Iron sheet 4' x 8' cut into two pieces and rivet it on the L shape angle bar. Thickness should be about 2 mm. (See Fig. 3).

Roof assembling must be done as shown in Fig. 4 put on by using L shape angle bar and the spaces must be filled with sands, further also the opening of the contact of roof and wall must be closed with mud.

(B) Material wood for carbonization

a) Filling of material wood for carbonization.

Material wood must be placed in upright position.

Faggot must be placed at the bottom of the furnace.

(See Fig. 5)

b) Assembling iron sheet roof

A part of iron sheet roof should be removed when operation "a" and according to the operation the whole roof should be removed.

c) Carbonization

i) Heating ... At the end of filling after material wood for carbonization roof must be fixed on and fire should be enlighted in the heating room. Fuel wood required about 1/10-2/10 of the material wood for carbonization. Chimney should be placed one at the end from the side of heating room and two at the both end making it a total of 3 chimneys front chimney removed. In this way the temperature at the back of the roof should be at 350°C and the temperature of the outlet of chimney about 80°C and when the smoke come out fill the heating room with fuel wood and close the opening with bricks, leaving a small hole (length 20cm x height 10cm) as air passage at the bottom as shown in Fig 6. The total precissing time required would be 20-30 hrs.

ii) Carbonization ... Naturaly the carbonization occurs, but the two chimney in front must be placed making the total chimney to be 5. Carbonization time 7-10 hrs. During this time it is well to put sand on top of the roofing so as to keep the heat from escaping and in this case L shape angle bar must not be buried with sand, because it may become deformed.

iii) Extinguishing ... When carbonization begins to end the smoke from the chimney seems to dowindle. If in case when carbonization does not take place uniformly for instance, when one chimney only stops smoking and the other keeps on smoking, remove this chimney and close it up with mud, and

Fig 4. Method of assembling roof

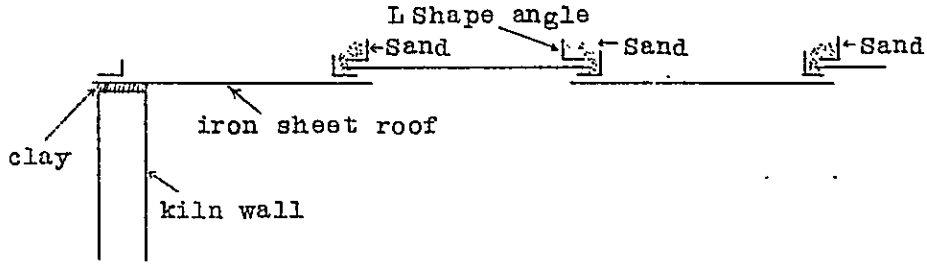


Fig 5. Method of filling material wood

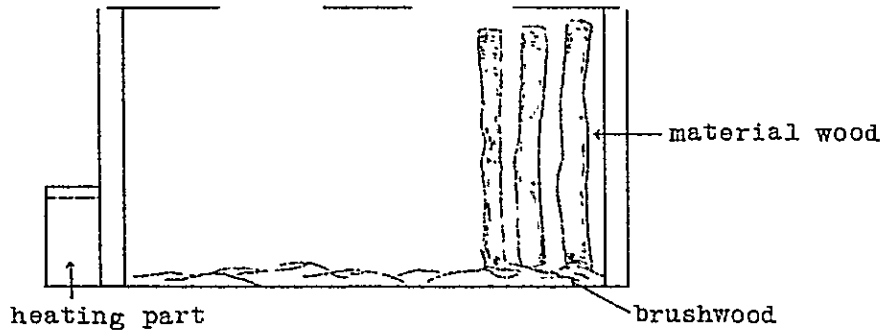
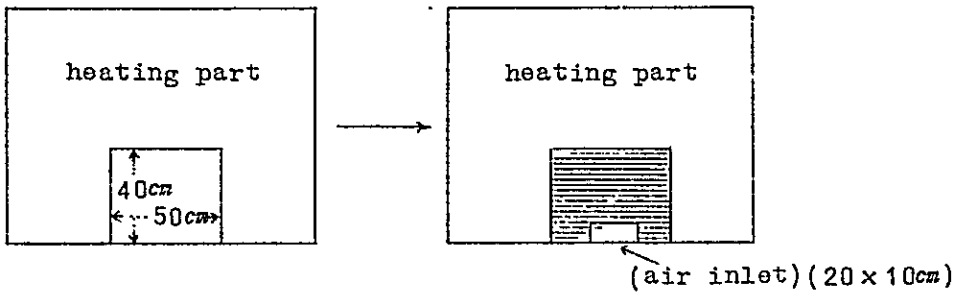


Fig 6. Method of closing kiln inlet



continue the operation until the carbonization is throughly done. At first white smoke can be seen and grathcally it will turn into greyish colour, and when this smoke ends the chimney must be removed because the carbonization have been completed. Close the place with mud, remove the sand from the roof and leave it alone for 2-3 days for fire to extinguishes and than the charcoal can be removed.

(C) Yield of charcoal

The yield of one cook would be 800-1,000 kgs. and the material woods required would be 3-4 tons.

2) When using comparatively large wood (Dia. above 20 cm)

In case of wood dia. above 40 cm it can be used by splitting into 1/2 or 1/4. In splitting methods there are ways by making a hole in the center of the wood and filling it with carlite (explosive), and exploding, or by using saw.

Rigards to the furnace para 1) (Fig. 1) should be made with width 3.00 m length 5.00 m and the height the same, and the carbonization method should be done as same as para 1).

This furnace fields about 2 tons per cook and the time of carbonization is 7-10 hrs.

3) Others

1) As regards to the furnace there are many other types, the than the above mentioned but, the given furnace seems to give less trouble than others therefore, it seems quite suitable in this case.

2) With the above furnace with fixed roof a separate inlet for filling in material wood for carbonizing should be made. For this inlet about 60 cm length hole must be made in the wall and after filling with material wood it must be again closed by utilizing iron sheet or bricks. And when doing this in connection with heating room, see Fig. 7.

3) Material cost of furnace

The construction cost of one furnace of Fig. 1, size would be as follows:

Material cost (including work cost) ..... Rs. 200

Labour cost (includes land reforming, and furnace bed maintenance) ..... 60 men/day, @Rs 4 per unit
(according to local inhabitant)

Total ..... Rs. 240

Grand Total ..... Rs. 440

The kiln can be used for about 5 years.

Fig 7. Material inlet and heating part