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FORESTRY PLANNING AND DEVELOPMENT PROJECT

CONSULTANCY REPORT

WOOD USE IN THE BRICK KILN INDUSTRY
OF PAKISTAN

By

TurkPak International (Pvt) Limited

**Under Contract to:
Winrock International
58 Margalla Road, F 7/2
Islamabad, Pakistan**

**for the
Government of Pakistan
and
United States Agency for International Development**

February 1991

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SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

- i. Brick Kiln Industry in Pakistan is one of the major consumer of coal. However firewood is used as an initial firing fuel in most of the cases. A very negligible segment of industry is exclusively utilising wood for Baking Bricks. Because of the basic and primitive nature of Brick Kiln Industry, the efficiency of firing operations is questionable.
- ii. Industry as a whole in Pakistan is passing through phase of restructuring to improve efficiency of men and machines, Brick Kiln Industry is no exception although the process is bit slow as compared to some other types of industries such as steel re-rolling mills and cement industry which provides essential inputs to construction sector. However there is evidence of few modern brick making plants and introduction of mechanisation in moulding operations at premises of Brick Kilns. Labour reforms to improve the working conditions of "Bonded labour" are underway. Such reforms will certainly force the owners of Brick Kilns to change the nature of their operations from being dependent upon labour and their preference will obviously be to modernize their manufacturing facilities.
- iii. The Brick Kiln Industry as a whole (with the exception of one or two facilities) is primitive in nature, inefficient in operations and is ideal site for forced and bonded labour. Such conditions should not be tolerated in any civilised society. The unorganised nature of industry creates further difficulties of answerability of the owners to any Government Authority.

- iv. Consultants strongly feel that a separate study be commissioned to suggest the technological changes and recommend the modernisation of the "Primitive Industry" to the state of the art and suggest ways and means of financing and technology transfer.
- v. Based upon sample survey we have estimated that there are 3041 brick kilns in Pakistan out of which 2610 are trench type and 431 are clamp type. The clamp type, also known as "avi" or "bathi" use agriculture waste, tootar (rice husk), saw dust, cowdung, coal fine or tree roots as the fuel. In this method the requisite temperature of 900-1000°C cannot be achieved as such the bricks are of low quality. The second type of brick kilns are known as "bathas". It is more popular in brick industry and the fuel in this method consists of coal and firewood, furnace oil or natural gas. Out of 2610 "bathas" 79 kilns are estimated to utilize firewood exclusively as fuel. Remaining 2529 kilns use a combination of coal, firewood and saw dust. It has been estimated that at present 11 billion bricks and 1 billion brick tiles are yearly produced in the country. Growth rate for construction is projected at 2.9 percent per year (7th Plan Period), therefore, in 1995, 12.8 billion bricks and 1.4 billion brick tiles will be produced in Pakistan.
- vi. The brick kilns which use a combination of firewood and coal use 22 m³ stacked firewood per kiln per year. 7 m³ stacked firewood is used for production of 1 million bricks by these kilns. In addition 271 tonnes of coal is utilized for baking 1 million bricks. Brick kilns which are dependent on fuelwood exclusively, use 321 m³ stacked firewood for 1 million bricks. For 12.16 billion bricks and brick tiles 32,370 m³ stacked firewood and 3.12 million tonnes of coal per year is

used at present. Brick kilns which operate only on fuelwood use 57138 m³ wood for 178 million bricks and tiles per year. Thus a total of 139,508 m³ firewood per annum is used at present. If the firewood kilns switch over to coal then they would use 1282 m³ wood only and annual consumption would be 83,652 m³. Babul (Acacia nilotia) shisham (Dalbergia sissoo) and ber (Zizyphus mauritiana) are the preferred species of firewood. The price of firewood varies from Rs.360/= per m³ (stacked) in Sukkur to Rs.1324/= per m³ (stacked) in Lahore. Firewood is a small component (1.5%) of total cost when used in combination with other fuels. When bricks are baked exclusively on firewood, it forms 43% of the total cost.

- vii. Brick industry employs 250,000 workers for earth digging, watering, moulding, setting, firing, extraction, transport and sundry works. Most of the workers constitute bonded labourers who have no rights and facilities of children education, training, work hours, insurance or a genuine wage rate. As a result, relations between the workers and owners are poor and becoming worst day by day. About 4 kiln owners have resorted to machines for moulding bricks. Such machine costs Rs 2.5 million per unit and is capable of moulding 80,000 bricks per shift.
- viii. Permits and licences for felling of trees and transport of wood are required in most of the areas, which are avoidable hurdles in a competitive economy. Permit fees, advance income tax, sales tax, transport tax, district council export tax, union council tax, municipal tax and "jagga" tax increase firewood prices manifold in addition to causing hardship and humiliation to wood producers and traders.

ix. To sum up, brick industry is neglected sector which suffers from labour unrest, taxes, permits, capital, law and order problems. It is recommended that brick industry may be recognized as an important industry deserving all the facilities given to such disciplines as mining, cement and agriculture. It is further recommended that the hurdle of permits and licences be done away with.

1. Background

Under the Forestry Planning & Development Project of the Government of Pakistan and USAID, the study has been designed to collect data on the present wood consumption trends and future demands of woody raw materials in Pakistan. The survey was undertaken specifically to gain an understanding of wood consumption in different consuming sectors. On the basis of this survey future demands by the industry will be ascertained and a private farm forestry action plan to grow the required species will be fully prepared by Government of Pakistan. TURKPAK International (Pvt) Ltd; a professional firm of Consultant was selected to collect nationwide information relating to mining, wood yards and Brick Kiln Industry. The present report is the final version of the Brick Kiln Industry report. Reports relating to other two sectors have been submitted separately.

The present study envisages to ascertain:-

- Total firewood consumption in Brick Kiln Industry.
- Forecast for future demand of firewood.
- Availability of firewood.
- Other fuels used in kilns and their quantity.
- Total production of bricks and tiles.
- Existing market prices of wood.
- Distribution of costs on labour, fuel and others.
- Labour employed
- Taxes imposed, permits and licences required for wood.
- Constraints and problems which obstruct the smooth functioning of the industry.

2. Parameters of the Study

Terms of reference provided by Inspector General of Forests, Islamabad (Project Manager) and Winrock International (Technical Assistance Team) defines the parameters for the assignment as following:

- To collect and review existing documents, reports and statistics and prepare a written summary and evaluation of the use of wood in Mining.
- To conduct sample survey of Brick Kiln Industry by actual visit to premises using the questionnaire specifically designed by Winrock International.
- To present a comprehensive report on the findings. Findings which identify market linkages, bottlenecks and/or market constraints to be highlighted and to present a seminar on the findings of the consultancy to Government of Pakistan and USAID project personnel.
- The assignment to be completed within 12 weeks.

3. Methodology and Approach

The following 30 road segments were selected for survey of brick kilns in Baluchistan, Sind, Punjab and NWFP:

<u>Road Segments</u>	<u>Distance in KM</u>
- Sukkur to Jacobabad	84
- Jacobabad to Dera Murad Jamali	42
- Dera Murad Jamali to Mach	180
- Mach to Quetta	63
- Dera Ghazi Khan to Muzzafar Garh	64
- Muzzafargarh to Multan	35
- Multan to Khanewal	56
- Khanewal to Chichawatni	85
- Chichawatni to Sahiwal	48
- Sahiwal to Okara	36
- Okara to Pattoki	46
- Pattoki to Lanore	80
- Lahore to Wagha	21

- Wagha to Kasur	62
- Lahore to Gujranwala	67
- Gujranwala to Sialkot	60
- Sialkot to Wazirabad	45
- Wazirabad to Gujrat	20
- Gujrat to Jhelum	60
- Jhelum to Gujjar Khan	58
- Gujjar Khan to Islamabad	58
- Gujjar Khan to Rawalpindi	48
- Rawalpindi to Fateh jang	50
- Fateh Jang to Jand	83
- Jand to Attock	88
- Attock to Khairabad	31
- Khairabad to Pesnawar	74
- Peshawar to Mardan	58
- Mardan to Hassan Abdal	89
- Hassan Abdal to haripur	

Subsequently following 2 segments were added to the survey list:-

- Kohat to Bannu
- Bannu to Dera Ismail Khan

These sections are indicated on the map. Two Brick Kilns were surveyed in each segment and answers to the following questions were obtained from total of 64 kilns:

- Location of the kiln and year of establishment.
- Production of bricks and tiles in the last 3 years.
- Wood consumption in the last 3 years.
- Species of wood used.
- Source of wood.
- Price of wood at site.
- Availability of wood
- Fluctuations in prices

- Expected future demand of wood.
- Fuels used other than wood
- Licences permits required for transport of wood.
- Taxes on wood.
- Problems and constraints of Brick Kiln Industry.
- Any other suggestion.

During June-July 1990 survey was undertaken through visit to each kiln and current issues were discussed with the management. In addition to data collection from primary sources, discussions were also held with various authorities in public and private sector. The following institutions extended full cooperation in making the study useful.

- Forestry Departments of Punjab, Sind, Baluchistan and NWFP.
- Pakistan Forest Institute, Peshawar
- Brick Kilns Owner Association, Lahore.
- Building Research Institute, Lahore.
- Chambers of Commerce & Industry
- Local Bodies, Union Councils and District Authorities.

A summary of brick kilns surveyed is given in Table 1.

Table 1
Brick Kilns Surveyed

Province	Brick kilns on coal	B.Kilns on fire-wood only	Avis Bhaties	Total
Punjab	40	1	-	41
Sind	5	-	-	5
N.W.F.P	14	-	-	14
Baluchistan	4	-	-	4
Total:	63	1	-	64

Source: TURKPAK Survey 1990

Review of earlier studies and reports were also undertaken to make the report more comprehensive.

4. Past Studies

The available data on consumption of wood in brick industry is very limited. Sheikh et al (1988) conducted a study entitled, "Fuel consumption for brick industry in NWFP". They estimated that in 1985-86, the total number of brick kilns in NWFP was 458, brick production 149 million, firewood consumption 74,654 m³ and consumption of coal 171,000 tonnes. An average kiln was loaded 5 times a year. Average wholesale price of firewood varied from Rs.17/= to Rs.40/= per 40 kg depending upon the location. Prices of coal varied from Rs.256/= to Rs.1,600/= per tonne depending upon the quality and distance from the mine. The major wood species used in brick industry in NWFP were Pinus roxburgii, Dalbergia sissoo, Acacia nilotica, Zizyphus mauritiana, Tamarix-aphylla and Quercus incana. It is recommended in this study that restrictions be imposed on use of wood in brick kilns in NWFP.

The FAO (1988) study gives estimates of fuels used in brick industry in India, Sri Lanka and Thailand. According to this study, there are 15,000 kilns in India. These kilns use coal but utilize firewood @ 10 tonnes of wood per year for initial firing. In Indonesia oil is a significant source of energy but wood accounts for 59% of the energy for brick and tile industry; its total consumption in Indonesia being 0.6 m tonnes.

5. Brick Kilns in Pakistan

Brick making in Pakistan is as old an industry as Mohinjodero civilization where bricks were used for building construction.

Fuel cost accounts for about half the production cost of bricks. As such a study of wood consumption and other fuels used for baking of bricks and tiles is an important subject. It is estimated that there are 3041 kilns and "Avis" (clamps) which are producing bricks in Pakistan. In Sind and Baluchistan brick kilns are not registered. To ascertain the total number of brick kilns in these two provinces estimates were obtained from the kiln owners interviewed and the representatives of Government Departments who consumed bricks. In the Punjab, the brick kilns are registered with the district councils, however this record is not compiled by one central agency. The total number of brick kilns was therefore obtained from various district councils during field surveys. In N.W.F.P, brick kilns are registered with the industries department. Estimates of total number of brick kilns are based on the above said information. It is possible that about 10 percent of the kilns located in remote areas have escaped notice due to non registration in Punjab, N.W.F.P and ignorance in Sind-Baluchistan. Provincewise distribution of kilns is shown in Table No.2 as under:

TABLE 2

Total Number of Brick Kilns in Pakistan

Province	BHATTAS		BHATTES (Avis)	Total
	Kilns on coal	Kilns on firewood exclusively		
Punjab	1,505	50	166	1,721
Sind	351	29	244	624
NWFP	558	-	-	558
Baluchistan	117	-	21	138
Total:	2,531	79	431	3,041

Source: Turkpak Survey - 1990

5.1 New Kilns

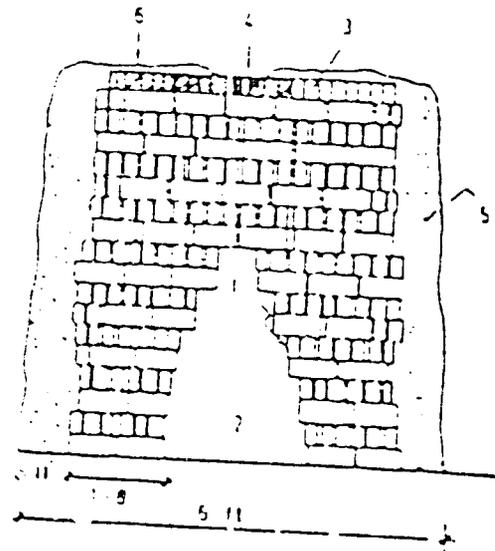
37 new brick kilns started functioning between 1980 to 1990 out of 64 kilns surveyed. Thus new kilns are coming up at the rate of 6 percent per annum or 182 new kilns are established each year. Brick production is increasing @ 2.9 percent per year, and 3.1 percent or 88 kilns are abandoned every year. Thus net annual increase of new kilns comes to 94.

5.2 Types of Kilns

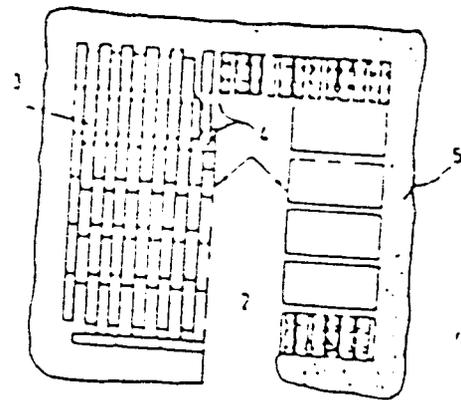
Two types of kilns are used in Pakistan, the intermittent one which is called "Bathi" and the continuous type which is called "Batha". A few of these kilns have a permanent roof. Mostly brick stacks are covered by burnt ash cushion 15 cm to 23 cm thick for insulation. More modern kilns known as tunnel kilns and Hoffmans' kilns, both continuous type, are also in use. These modern kilns have permanent walls and roof made from brick masonry and lined with fire bricks to reduce heat losses. While the setting in Hoffmans' kiln is stationary and fire travels forward to bake bricks just like other continuous kilns bricks are loaded on moveable trolleys in modern kilns and the fire is stationery. Modern kilns are suitable only where furnace oil or gas is used as fuel. Two gas kilns were reported during our study but these were not surveyed because these were not included in the samples.

5.3 Intermittent Kilns (Bathis)

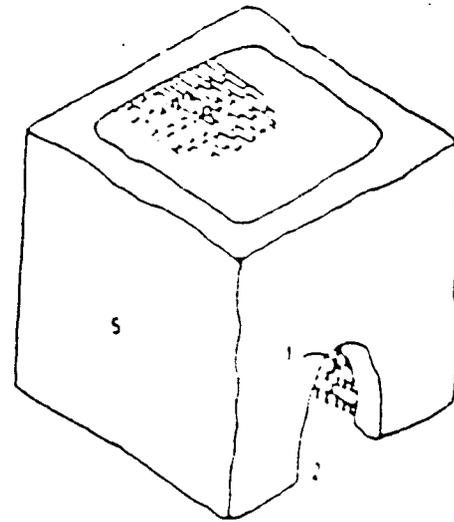
These kilns are used to meet temporary demands of low quality bricks. These are run on agricultural waste "tootar" (rice husk) saw dust, cowdung, charcoal, coal-fines and firewood. The 'bathis' are formed by loose stacking of bricks on edge with an arched opening at the bottom for charging fuel (figure 1). The external sides of stack are plastered with mud, and roof is insulated with earth. Air vent is left in



SECTIONAL ELEVATION



HALF SECTIONAL PLAN



COMPLETE VIEW

- 1 - BRICK STACKS
- 2 - FIRE TUNNEL
- 3 - CLOSELY PACKED BRICKS TO FORM ROOF OF KILN
- 4 - AIR SPACE
- 5 - MUD PLASTER OVER THE WALL OF THE KILN
- 6 - LAYER OF SOIL ON THE ROOF OF THE KILN

Fig. 1 Sketch of intermittent kiln called 'Barthhi'.

the top course for gases to escape. The kiln is charged with fuel at the bottom and fired for 7-10 days. Special types of semi-continuous kilns use rice husk. "Avis" "bhatish" or clamps run on rice husk are very common in rice growing areas such as Shikarpur, Larkana, Jacobabad, Sukkur, Hyderabad, Gujranwala and Sheikhpura. 'Avis' are also very common in remote areas where continuous kilns do not exist and transport expenses on bricks are prohibitive. When farmers colonize lands located in areas like Guddu Barrage, they have to uproot local vegetation. They also need new houses on the colonized area. It is very convenient and inexpensive for them to use the firewood from uprooted trees and burn bricks in small clamps with the help of domestic and hired labour. Such bricks meet the requirements of colonizers in remote rural areas. These are far better than mud walls and "kacha" bricks but are inferior to the bricks from continuous "Bulls" Trench kilns. Rice husk, firewood, cowdung or agricultural wastes used in an "Avi" cannot provide the requisite temperature of 900°C needed for vetrification of bricks. As such most of the government departments, local bodies in Sind have made rules against the use of "avi" bricks for construction of government works.

5.4 Continuous Kilns (Bathas)

Open Bulls' Trench kiln is the popular form of continuous kiln used in Pakistan. A typical sketch of bulls' kiln for an output of about one million bricks per round is shown in figure 2. A system of flue openings or "khudas", lateral flue tunnels, main tunnel and masonry chimney is provided to feed fuel and maintain uniform heat. The openings are fed with coal, or a mixture of coal and saw dust, coal and firewood, charcoal or any other suitable mixture. In order to start fire, 15 cm long pieces of firewood are placed vertically in the empty space through the openings. Fire is

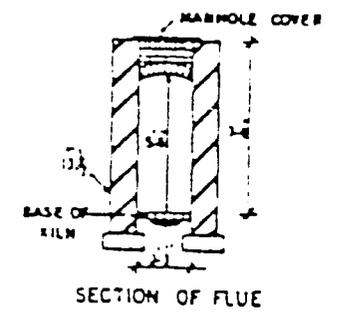
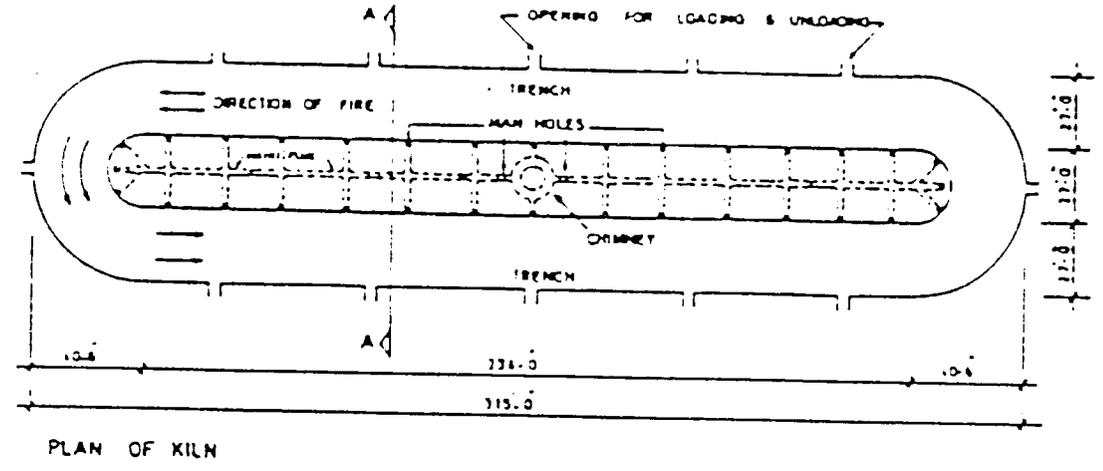
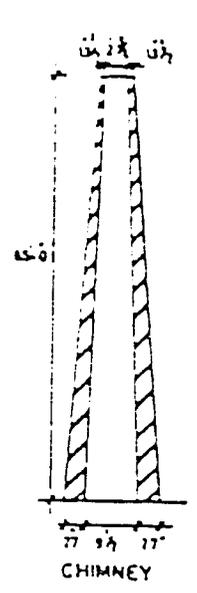
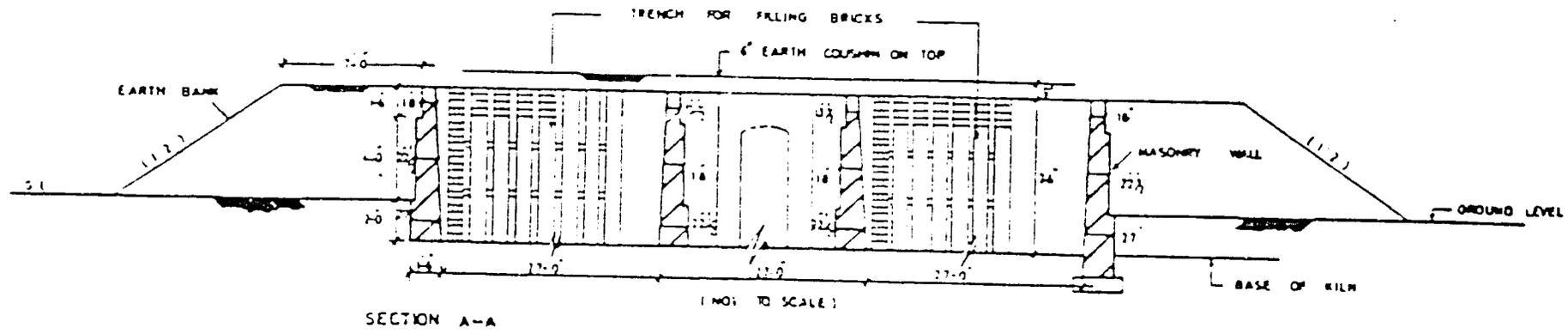


Fig. 2 Typical details of Bull's Trench kiln having capacity of one million bricks.

let through these openings after sprinkling kerosin oil on firewood. When fire starts the feed holes over empty spaces are closed by large pans while firewood is continuously charged from top for about 21 hours. During this period about 8-9 m³ (stacked) firewood is burnt. The first row of feed holes is uncovered and coal feeding started after 15 hours of the initiation of fire and after ensuring that the flame is visible when viewed from the first row of feed hole and that the bricks begin to glow. Coal feeding is started at a slow rate and increased progressively at an interval of every 10 minutes for the first 3 hours. The firewood and coal feeding is continued simultaneously for 6 hours till coal picks up fire. The best results under our conditions are obtained when the bricks begin to glow cherry-red-hot throughout the depth of the fire zone when viewed through a feed hole i.e when kiln attains a temperature of about 900° to 1000°C. The fire is held at a temperature of 900°C-950°C by maintaining the rate of feed of fuel. Bricks are baked in 7 days. "Avis" or "bhaties" are without chimney (funnel): bhattas have a funnel. The number of kilns according to funnel is given in table No.3 as under:

Table 3
Number of Brick Kilns According to Funnel/Chimney

Province	Kilns with Funnel	Kilns without Funnel	Total
Punjab	1555	166	1721
Sind	380	244	624
N.W.F.P.	558	-	558
Baluchistan	117	21	138
Total	2610	431	3041

Source: FURKPAK Survey 1990

Bhatis/Avis are of small size and produce a small quantity of bricks in one round. There are small "Bhattas" which use "Chimney" but cater for a small requirement of bricks for the local population. A distribution of kilns according to size is given in Table 4 as under:

Table 4
Number of Brick Kilns According to Size

Province	<u>SMALL</u> Less than 3 million per year	<u>MEDIUM</u> 3 - 6 million per year	<u>LARGE</u> 6 & above 6 million per year	TOTAL
Punjab	378	923	420	1,721
Sind	374	125	125	624
NWFP	159	120	279	558
Baluchistan	69	34	35	138
Total:	980	1,202	859	3,041

Source: TURKPAK Survey - 1990

5.5 Brick-Tile Production in Pakistan

3041 bricks kilns are estimated to produce 11,118 million bricks and 1227 million tiles per year in Pakistan. The provincewise production of bricks & tiles is shown in Table No.5 and 6 as under:

Table 5
Total Brick Production (1990)

Million				
S.No.	Province	Bricks baked by coal & fire wood	Brick by rice husk agri-waste	Total
1.	Punjab	6,305	149	6,454
2.	Sind	1,415	220	1,635
3.	NWFP	2,597	-	2,597
4.	Baluchistan	413	19	423
Total		10,730	388	11,118

Source: Turkpak Survey - 1990

Table 6
Total Tile Production (1990)

Million				
S.No.	Province	Tiles baked with coal & fire wood	Tiles baked with rice-husk agri-waste	Total
1.	Punjab	700	17	717
2.	Sind	156	24	180
3.	NWFP	280	-	280
4.	Baluchistan	40	2	42
Total		1,184	43	1,227

Source: Turkpak Survey - 1990

Annual production of bricks and tiles baked with coal plus fuel wood and fuelwood alone during 1987, 1988 and 1989 is given in Table No.7 as under. Bricks-tiles produced on rice husk etc are in addition to this.

Table 7

Annual Production of Bricks and Tiles
(Estimated)

Province	Million					
	1987		1988		1989	
	Bricks	Tiles	Bricks	Tiles	Bricks	Tiles
Punjab	5,443	670	5,132	637	6,620	778
Sind	950	106	950	114	1,458	180
NWFP	2,766	340	2,760	313	2,760	299
Baluchistan	380	47	381	50	410	50
	9,539	1,153	9,223	1,119	11,248	1,307

Source: Turkpak Survey - 1990

64 brick kiln were surveyes during the field visits and their total production of bricks and tiles worked out. From this data unit production per kiln was arrived at and projections for the total kilns in Pakistan estimated. Hassan (1937) estimated that 7,200 million bricks are produced in Pakistan every year. This estimate is less than our estimate of 12 billion. Production can be estimated on the basis of coal consumption. Coal has a direct corelation with brick/tile production. According to TURKPAK Survey (1990) total coal production in Pakistan was 3953645 tonnes and 79 percent (3123379 tonnes) of this coal was used in brick kilns. TURKPAK

(1990) further estimated that 271 tonnes of coal is used for production of 1 million bricks. According to these estimates/projections; 11525 million bricks are annually produced in the country.

Apparently this production is inadequate to meet the requirement of construction. At present there is a backlog of 6 million housing units. Every year a demand of 240,000 rural houses and 175,000 urban units is created (Ghazanfar-1990). The demand of industrial construction is in addition to the housing units. Production can be increased in Punjab and NWFP by the existing kilns because they operate on 60% and 49% of installed capacity. Kilns in Sind-Baluchistan operate on full capacity. The growth rate in use of bricks in Pakistan is estimated at 2.9% per year. Therefore forecast for brick and tile production in 1995 is shown in Table No.8 as under:

Table 3

Forecast for Brick & Tile Production Till 1995

(Million)

S.No.	Product	1990	1991	1992	1993	1994	1995
1.	Bricks	11,118	11,440	11,772	12,113	12,464	12,825
2.	Tiles	1,227	1,263	1,299	1,337	1,376	1,416

Source: Punjab Estimates

6. Consumption of Wood, Coal and Other Material for Brick Making

According to the information collected by the survey teams, it is estimated that 7.2 m³ (stacked) firewood and 271 tonnes of coal is consumed to make one million bricks. Provincewise

estimates of consumption of various materials are given as under in Table No.9

Table 9
Fuel Consumption per Million Bricks - 1990

S.No.	Province	Wood M ³	Coal Tonnes	Furnace oil Litre	Saw dust Tonnes
1.	Punjab	9.97	210	13,555	97
2.	Sind	6.72	339	-	-
3.	NWFP	4.30	246	3,947	1
4.	Baluchistan	7.15	287	-	-
Average		7.02	271	875	49

Source: Turkpak Survey - 1990

Comparatively smaller quantity of wood per unit of bricks is used in NWFP because the consumption is generally limited to initial firing. In the Punjab, in addition to initial firing fuel wood supplements coal for better "fire"; hence consumption per unit of brick making is more. In Punjab, Baluchistan and NWFP, efforts are made to keep fire alive, once it is ignited, by continuous working of the kilns. Initial fire in the kilns in Sind may be ignited 3 times a year because fire-wood is cheap.

Out of 3041 brick kilns estimated in the country, 79 are entirely dependent on firewood for baking of bricks. They are estimated to consume 321 m³ (stacked) firewood for 1 million bricks. These kilns are established at locations where the firewood is cheap and is available from the private or government waste lands.

Wood consumption for one million bricks has been indicated in the foregoing paragraphs. It would be interesting to work out the wood consumption per kiln per year in which coal and other fuels are also used. Table 10 gives fuelwood consumption per kiln/per year.

Table 10
Wood Consumption in Kilns Working on Coal & Oil

S.No.	Province	Total No. of kilns	Sample Size	M ³ stacked per kiln			
				1987	1988	1989	1990
1.	Punjab	1,505	41	26.75	24.13	25.9	30.17
2.	Sind	351	5	23.4	23.4	27.0	23.40
3.	N.W.F.P.	556	10	15.5	15.5	15.5	15.00
4.	Baluchistan	117	4	22.5	22.5	22.5	22.50
	Average			22.03	21.38	22.72	22.76

Source: Turkpak Survey - 1990

In addition to 2529 kilns working on coal and firewood there are 79 kilns in the country which use only firewood for brick making.

Average annual consumption of firewood by brick kilns which are dependent on firewood only, works out to be 745 m³ (stacked) in 1990 per brick kiln.

7. Wood Consumption in Brick Kilns

Out of 12345 million bricks and tiles produced in the country 12167 m are produced on coal & firewood: 178 m are made on wood only. It is estimated that 82,376 m³ (stacked) firewood is required for manufacture of 12,167 million bricks and tiles in 1990 and 95,021 m³ (stacked) firewood will be required in 1995. Details of brick and tile production has been given in tables 2 & 3. Forecast for firewood consumption is as under in Table No.11. It is based on a growth rate of 2.9% for construction:

Table 11
Forecast for Firewood Consumption (M³ Stacked)
For Kilns on Coal and Firewood

S.No.	Produce	1990	1991	1992	1993	1994	1995
1.	Firewood for bricks	74183	76332	78547	80823	83164	85573
2.	Firewood for tiles	8187	8427	8667	8921	9181	9448
	Total	82370	84759	87214	89744	92345	95021

SOURCE: Turkpak Survey - 1990

79 brick kilns which operate on firewood only produce 178 million bricks and tiles only. They consume 321 m³ (stacked) firewood for 1 million bricks/tiles. Their future consumption of firewood is not predictable. If they are allowed to continue on firewood then their annual demand is 57138 m³ (stacked) firewood. If they switch over to coal then their annual demand of firewood will be 1282 m³ stacked plus coal.

The gross total consumption of firewood on all types of kilns at present is $82370 \text{ m}^3 + 57138 \text{ m}^3 = 139508 \text{ m}^3$ per annum in 1990. Data regarding wood consumption in last 3 years, wood species consumed and source of wood is given in Table No.12 as under:-

Table 12
Actual Wood Consumed Since 1987

				M ³			
Province	Species	Form of wood	Source	1987	1988	1989	
Punjab	Mixed Shishan Babul & Misc.	Wood cut into pieces	Govt:Nil Private: 100%	60,946	57,516	73,758	
Sind	Mixed Babul Kand Lawa Lai	-do-	Govt:20% Private: 80%	7,096	7,150	11,007	
NWFP	Shishan Babul Puulai Mixed	-do-	Govt:8% Private: 92%	13,356	13,235	13,153	
Baluchistan	Babul Kand Lawa Lai	-do-	Govt:Nil Private: 100%	3,053	3,082	3,289	
(Source: Turkpak Survey - 1990)				Total:	84,451	78,209	89,369

It was noticed at some brick kilns, particularly in Sind, that firewood was not consumed in an economical manner. Initial fire was ignited more than once in a season and adequate insulation was not provided with appropriate measures to conserve heat and avoid wastage. It is possible to reduce firewood consumption for initial firing.

7.1 Choice of Species

The most popular firewood for kilns was babul (Acacia nilotica), followed by shisham (Dalbergia sissoo) and ber (Zizyphus mauritiana). Kiln owners who prepared good quality bricks were willing to pay better prices for babul and shisham firewood if it was cut into small sizes of about 20 cm and it was air dry. Some kiln owners in the Punjab have tried Eucalyptus and found it quite suitable for baking of bricks. Use of saw dust in Multan, Khanewal, Muzzafargarh and Chichawatni in the Punjab is quite common in areas where a large number of saw mills are installed. Sawdust sells @ Rs.20/= per bag of 25 kg. For bulk sale against advance payment sawdust can be purchased @ Rs.15/= per bag.

7.2 Availability of Firewood

97 percent of the kiln owners purchase firewood from the private sector through middlemen or directly from the wood markets. Only 3 percent kiln owners are dependent on government forests for their firewood requirement. Private firewood traders purchase bulk of wood stock from farmers and producers. The wood traders contract the tree growers and strike a lumpsum bargain of standing trees which he wants to sell. Knowledgeable tree growers prefer to sell the trees by weight in which case they may get upto 50 percent of the market price of wood. Standing trees if sold by a government agency may be purchased in open auction. The purchaser, stubs the trees from the roots employing his own labour as well as local labour and converts it into sizes which can be conveniently carried on his transport.

Generally he uses tractors with trollies to carry the wood. For long distances trucks are used. Camels and donkeys are

also popular means of wood transport in Southern Punjab, Sind and N.W.F.P. Animal drawn carts are used for small distances.

The wood trader establishes his depot on the roadside. He prefers to squat on the state land for his wood depot. If no state land is available he may hire a small piece of land from the farmers. For the semi-converted wood, which he brought from the private farmers, he prepares a market plan or "vand". Timber for commercial industrial or mining purposes gets the highest priority. It is sawn on both ends into sizes required by the market and is neatly stocked. Conversion into fuelwood is the next step. Depending upon the demand of the market, wood upto 2 cm diameter may be converted for use as fuel and stacked into marketable sizes. Rest of the wood if any, including root stumps, are fed to the charcoal kilns.

The road side depot owner sells his timber, fuelwood and charcoal to the wholesalers in the wood markets. This is generally done through the commission agents, and almost all wood is carried by trucks. The brick kiln owners purchase fuelwood from 3 main sources. Middlemen purchase firewood from roadside depot owners or wholesalers and supply it to the kilns. Some kiln owners enter into agreement with the roadside wood dealer and become their permanent customers. Kiln owners also purchase fuelwood from the main markets.

7.3 Provincial and Interprovincial Availability

Kiln owners in NWFP, Punjab and Sind meet their entire demand of fuelwood from within the respective provinces. During our surveys no interprovincial transport of firewood for brick kilns in these provinces was observed. Baluchistan province is however entirely dependent on imports to meet its fuelwood

requirement of brick kilns. Brick kilns in Dera Allah Yar and Sibi (Baluchistan) get most of their fuelwood from Jacobabad district (Sind). Rest of brick kilns in Baluchistan import wood mainly from Sukkur civil division of Sind and a small part from Dera Ghazi Khan and Bahawalpur civil divisions of Punjab.

C

8. Prices of Fuel Wood

8.1 Fuelwood prices in Pakistan have risen sharply and are high by world standards. At present they are rising by 11.23% per annum although real increase is 3.09%. One of the reasons for rise in prices is that firewood availability is getting scarce. In 88-89 firewood was more scarce than 1956-57 and this trend is likely to continue. However average retail price of firewood in 1965 was Rs.3.39 per 40 kg in four big cities i.e Karachi, Lahore, Sialkot and Peshawar. In 1972-73 firewood was sold @ Rs.6.19 per 40 kg, in 73-74 @ Rs.10.12, in 83-84 @ Rs.31.06, and in 1988-89 @ Rs.31.06 and in 1988-89 @ Rs.39.31 per 40 kg. This increase in firewood prices is shown in the annexed tables. Seasonal variation in price pattern was reported during the survey. In winter when demand for firewood by brick kilns is high, prices are also very high. Prices are the highest during February, and lowest in summer, (May and June).

A lot of variation in prices was noticed according to locality it was Rs.360/ per m³ (stacked) in Sukkur and Rs.1,324/= per m³ (stacked) in Lahore. Firewood prices in D.I. Khan were found to be one of the lowest but kiln owners demanded dry fuelwood of babul cut into small pieces. Such a quality of firewood fetched high price. The vast difference in prices is due to interaction of supply and demand, and such factors as cost of transport, taxes, overhead charges, species and moisture content. Green firewood of 'lai' (Tamarix spp) carried

from short distances to small towns was least expensive whereas dry firewood of babul or shisham cut into small solid pieces brought from long distances to big cities was most expensive.

8.2 Cost Composition

Table 13 indicates the cost composition of brick making:

Table 13
PRODUCTION COSTS OF BRICKS
(Rupees)

S.No.	Province	Where firewood is used in combination with coal-furnace oil		
		Wood %	Labour %	Others %
1.	Punjab	1.5	40.0	58.5
2.	Sind	1.6	39.0	59.4
3.	N.W.F.P.	1.1	31.7	67.2
4.	Baluchistan	1.8	27.8	70.0
	Average	1.5	34.5	64.0
Where firewood is the only source of energy				
		43	42	15

Source: TURKPAK Survey - 1990

When coal is the main source of energy, wood forms only 1.5 percent of the total cost. If the kiln is run on firewood only, then 43 percent of cost is consumed by wood.

9. Labour in Brick Industry

Brick industry is estimated to employ 250,000 workers, of which a majority is that of moulders. Two labourers working

as a team, can mould 800 bricks a day. To mould 12,345 m bricks-tiles 30.86 million man-days or 0.1 million man-years are required. Labour is also employed on digging of earth, watering, carriage of dried bricks, setting, firing, extraction, transport of bricks and sundry works. Interruption in any one stage of work i.e moulding, setting, firing, removal from the kiln and transportation can disrupt the process of brick making and cause heavy losses. To overcome this problem the owners resort to bonded labour. Against a specified advance, they engage entire families of labourers for work. These workers are paid for the volume of work done every week, generally on Thursdays. The advance is adjusted in small installments. In actual practice the advance is never paid back because the workers obtain more advances on marriage or other family functions. During 1988, the kiln labour "Bhatta Mazdoor Mahaz" challenged the use of advance payments for bonded labour in the High Court through a writ petition. The High Court upheld their right but the kiln owners appealed against this decision in the Supreme Court which is yet pending.

A news item, copy of which is given in the annexure, may throw some light on the nature of disputes between the kilns owners and the labour. Some progressive kiln owners have installed automatic moulding machines to improve productivity. Such a machine imported from China costs Rs.2.5 million and can mould 80,000 bricks in 8 hours.

10. Permits & Licences

Forest Act 1927, makes provisions for regulations of wood in transit. In Sind, and Jhelum-Rawalpindi districts of Punjab, a transit pass is necessary for transport of wood from one place to another. This permit is issued by the district forest officer free of any charge. The Sind DFO issues the

transit pass on the basis of an NOC (No Objection Certificate) issued by Mukhtiarkar and the agreement deed executed by the land owner with the purchaser of firewood. Site is also inspected by the representative of forest department who verifies the bonafides of firewood. For movement of firewood outside the province, conservator of forests issues the transit pass. No fee is charged for this pass to export wood out of the province. In NWFP a fee of Rs.50/= per truck of firewood is charged for transport of wood from one place to another irrespective of the source i.e farm lands, government forests or tribal areas. Felling of trees in Rawalpindi District (Punjab) and all areas within 8 km radius of international border requires the permission of the competent authority. In the former case felling is regulated under the rules of Forest Act 1927 and in the later under Prohibition of Tree-Felling Act (1975).

11. Taxes

Imposition of duties and taxes make direct impact on the pace of development of kilns. High taxes cause slow down of progress.

Advance income tax @ 3% is payable on all purchases of wood made from the government. Small traders of firewood whose annual net income is much below the taxable ceiling, have also to pay this advance tax. In theory advance tax is refundable to those assesseees who do not fall within the income tax bracket. In practice, this is never done. The traders are too poor to pursue the refund case, and the procedure for refund is too difficult to be of any practical use. 12½% sales tax is also payable by purchasers who purchase firewood from the government. It is estimated that the these taxes effect 14 percent of the fuelwood consumed in brick

kilns. In NWFP Rs.50/= per truck is charged by the forest department on all firewood irrespective of the source of origin.

District council export tax is more harsh. According to the schedule of rates fixed by the government, it should be 2% of the value of produce. It is Rs -/50 (fifty paisas) per quintal of firewood. It is however fixed at a higher value. The district councils auction out the export check posts to contractors who charge upto 100% of the value of firewood as export tax. These contractors are influential gangsters and they pay gratification to police, district administration, district council administration and all concerned officers including the ministers of local government departments. As such they are immune from accountability.

Municipal octroi tax is another charge on wood. It was introduced in the sub continent about 200 years ago. Municipal rules 1964 imposed uniform taxes in all the units of then West Pakistan. The average octroi tax schedule at present is as under:-

- Timber	Rs. 4/= for quintal
- Processed Wood	Rs.14/= -do-
- Firewood	Rs. 1/= -do-

Shah (1990) stated that a large number of complaints were received by the government alleging that municipal and district council contractors were charging taxes which were many times higher than the schedule of rates. Government has therefore introduced a system to deal with these complaints. The tax payer can approach the tax inspector, taxation officer, chairman municipal committee/district council or the commissioner for redress of his grievances.

Other taxes include the union council tax. Their extent varies in different areas.

12. Problems in Brick Kiln Industry

12.1 A Neglected Industry

Despite the old tradition of brick making in Pakistan, very little is known about the science of its process in the country. Engineers and scientists have kept them aloof from this dusty industry. Similarly the Government and banks treat brick making as a foreign discipline outside their purview.

Few loans are advanced to kiln owners by the banks. Fewer labour officers visit the kilns to mitigate the problems of labour. At present 12,000 million bricks and tiles are made in the country. At a sale price of Rs.500 per 1000 bricks (which is a conservative estimate), this unorganized industry is contributing Rs.6.0 billion to the national GNP. This is an insignificant contribution of about 1% but compares well with mining and cement. Government must recognize brick making as an important industry, give it a due priority for labour welfare programs, bank loans and research to improve the present stone age technology of brick making. ©

12.2 Bonded Labour

Brick industry has 2 labour problems. First problem is of labour scarcity. Brick making, including moulding, setting and firing is a skilled craft. However no training institutes/schools exist in the country on this subject. The skill of this traditional craft is passed by internship with moulders, kilns setters and firemen over prolonged period. These craftsmen are bonded with kiln owners through advance payments. Thus horizontal mobility of labour is limited, which causes labour scarcity. At present, Afghan refugees provide adequate winter

labour in upper Sind, Southern Punjab and Baluchistan. As soon as Afghans return home, labour problem is likely to become acute because local labour is a poor substitute of Afghan labour.

Second problem is labour relations. The bonded labour is pressing for more freedom and better conditions of work which demands are resisted by kiln owners because they pay substantial advances to labour. As a result, litigation is going on in civil courts for many years which has adversely effected production and prices.

12.3 Law and Order Situation

Construction work is at a stand-still in big cities like Hyderabad, Sukkur, Quetta due to law and order problems and political situation. As such brick production is not growing at the desired rate.

12.4 Overhead Transportation Expenses

It was noticed that a firewood truck in the Punjab has to pay upto Rs.500/= per trip to the police and other functionaries even for short distances. In Sind demand of government agencies is 50% more: Rs.750/= to Rs.800/= per firewood truck is paid by the traders to the officials of revenue, police, forest and local government departments as gratification.

13. Recommendations

13.1 Contribution of Brick Industry to GNP compares well with cement and mining industry. It is recommended that government should give due priority to this industry and provide incentives of soft loans, introduce labour reforms and encourage applied research for improvement of art and science in brick making. Building Research Institute and PCSIR Laboratories can play a very active role in reshaping the industry on modern lines to keep the end product cost

competition and improvement in quality characteristics.

13.2 Brick making should be mechanized for which government may provide loans and access to technology. This will reduce the risks of migration and scarcity of labour. At present 4-5 automatic plants for brick moulding have appeared in the country. The one such plant is located at Km 24 right side of Lahore-Multan road. Its capital cost is Rs.2.5 million and it is capable of moulding 80,000 bricks per shift. This plant was imported from China. The quality of output is as good as, if not better, than hand moulded bricks. Intermediate technology in the form of manual operated presses can also be made use. These presses are manufactured by the Building Research Station Lahore and are more efficient and precise. They consume no electric energy.

13.3 Fuelwood plantations should be increased by implementing agro-forestry programs by the Forest Departments of all the 4 province. Large plantable blanks are lying waste in districts Dera Allah Yar, Dera Murad Jamali in Baluchistan, almost entire Sind and substantial areas in Punjab and NWFP.

13.4 It is recommended that protection from overhead expenses and relief from taxes, may be provided to the fuelwood traders by the government. Almost all the permits and passes are unnecessary and may be done away with. Such a step will not effect the scale of present day theft of firewood from the government areas. In any case there is no justification for illegal gratification in any society.

AVERAGE ANNUAL RETAIL PRICES OF FIREWOOD
(KIKAR) FOR IMPORTANT MARKETS OF PAKISTAN

Year	(Rupees per 40 kg)						
	Karachi	Lahore	Sialkot	Rawalpindi	Peshawar	Quetta	Islamabad
1949-50	1.85	3.15	3.07	2.80	3.27	2.35	-
1950-51	1.99	3.13	3.08	3.04	2.53	2.05	-
1951-52	2.23	3.08	2.83	2.89	2.43	2.05	-
1952-53	2.59	3.24	2.93	2.89	2.32	2.00	-
1953-54	2.89	3.28	3.07	2.89	2.32	2.08	-
1954-55	2.95	3.43	3.10	3.27	2.32	2.00	-
1955-56	3.43	3.69	3.15	3.28	2.39	2.38	-
1956-57	7.57	3.63	3.24	3.33	2.39	2.98	-
1957-58	4.44	3.77	3.40	3.93	3.69	3.22	-
1958-59	3.31	3.48	3.57	3.80	3.64	2.68	-
1959-60	3.69	3.60	3.72	3.93	4.77	2.78	-
1960-61	4.05	3.73	3.75	3.90	4.33	3.23	-
1961-62	3.97	3.82	3.74	3.74	3.79	-	-
1962-63	3.88	3.79	3.67	4.00	3.94	-	-
1963-64	3.94	3.76	3.75	4.18	3.79	-	-
1964-65	4.16	4.04	3.77	4.09	3.47	-	-
1965-66	4.47	4.24	4.05	4.29	-	-	-
1966-67	5.05	4.67	4.41	4.29	4.23	-	-
1967-68	5.36	5.18	4.94	4.67	4.45	-	-
1968-69	5.36	5.15	5.51	5.67	4.48	-	-
1969-70	5.36	5.62	5.40	5.66	4.65	-	-
1970-71	5.28	5.84	5.69	5.66	5.42	0-	-

Note: 17.32 kg = 1 maund.

Contd....

continued from previous page.

Average annual retail prices of
Firewood(Kikar) for important
Markets in Pakistan.

Year	(Rupees per 40 kg)						
	Karachi	Lahore	Sialkot	Rawalpindi	Peshawar	Quetta	Islamabad
1971-72	5.82	6.43	6.02	6.12	5.55	4.93	6.34
1972-73	6.25	7.00	6.70	6.42	6.22	5.44	6.43
1973-74	9.39	12.37	11.70	10.58	10.12	10.00	10.92
1974-75	-	13.56	13.42	13.23	12.86	12.32	13.73
1975-76	13.75	14.53	14.54	12.06	17.80	12.47	14.35
1976-77	16.05	15.72	16.52	15.28	20.37	14.88	16.06
1977-78	15.97	16.68	17.21	17.92	21.69	15.73	17.42
1978-79	16.16	16.82	19.08	18.61	22.46	15.67	18.32
1979-80	19.04	20.92	21.33	20.88	24.19	15.92	21.61
1980-81	25.58	28.25	25.58	24.17	27.10	21.50	26.67
1981-82	28.91	32.67	30.50	32.08	32.50	26.00	30.00
1982-83	29.07	32.59	31.67	32.72	33.98	26.63	30.38
1983-84	30.79	35.67	32.83	36.50	37.28	28.58	34.00
1984-85	33.04	39.09	34.00	40.00	39.64	30.09	40.00
1985-86	33.81	38.75	34.83	41.15	40.00	29.33	40.83
1986-87	35.09	37.85	36.92	43.54	40.17	30.75	43.54
1987-88	39.46	39.96	39.33	44.72	40.20	34.52	45.00

Note: 37.32 kg=1 maund.

Source: 1. 25 Years of Pakistan in Statistics (1947-72).
2. 10 Years of Pakistan in Statistics (1972-82).
3. Pakistan Statistical Yearbook, 1985, 1986, 1987,
1988 and 1989.

Average sale rates of shisham and mulberry
firewood at Changa Munga sale depot

Species Age Year	(Rs. per cubic metre stacked)			(Rs. per cubic metre stacked)		
	Shisham			Mulberry		
	Selected	Thick	Medium	Selected	Thick	Medium
1972-73	69.50	56.57	33.03	72.71	54.19	44.21
1973-74	130.24	88.75	47.79	113.35	82.60	47.13
1974-75	138.12	84.95	53.32	117.59	75.04	53.32
1975-76	154.11	109.11	62.54	128.39	102.24	61.59
1976-77	154.11	107.83	68.91	160.96	124.96	75.41
1977-78	155.18	97.03	58.95	106.78	96.48	52.82
1978-79	158.91	105.94	63.56	141.25	105.91	51.20
1979-80	194.91	129.59	78.03	148.30	121.12	58.26
1980-81	275.42	211.86	123.58	169.49	141.24	98.87
1981-82	285.31	200.56	119.35	189.62	177.97	137.99
1982-83	283.19	203.03	123.58	176.55	158.55	115.11
1983-84	325.20	211.86	143.35	196.32	181.49	125.35
1984-85	362.67	247.20	141.26	217.18	176.57	125.36
1985-86	383.52	232.37	158.92	226.01	176.57	125.37
1986-87	385.64	258.86	143.02	239.08	187.52	134.55
1987-88	500.70	281.77	141.95	212.57	165.95	124.99
1988-89	593.21	445.26	184.67	243.64	195.62	156.42

Source: Data supplied by Divisional Forest Officer, Changa Munga.

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WOOD CONSUMPTION IN BRICK KILNS
SAMPLE SURVEY RESPONSES

Most of the brick kilns are utilizing mineral coal as fuel. Exclusive use of wood is insignificant. However coal based kilns do utilize wood for initial firing only.

A total of 64 brick-kilns were surveyed out of which 63 kiln used coal plus firewood for brick/tile making. One kiln used firewood only and no other fuel

History of Establishment of Brick Kilns

Out of 64 brick kilns surveyed two were started in the year 1930, for the next decade no brick kiln was established. However one brick kiln was established in 1945 and one in 1950. No new brick kilns came into existence in next five years.

One brick kiln was established in 1956 and one in 1958. Five brick kilns started functioning during 1960-64. Sixteen brick kilns were established during 1970-75. 37 brick kilns were established during 1980-89.

Brick-Tiles Production

In Pakistan, the total production in sixty three (coal + firewood) brick-kilns surveyed was 235.86 millions bricks, 29.22 millions tiles in 1987, 228.5 million bricks 27.7 million tiles in 1988 and 263.48 million bricks, 31.57 millions tiles in 1989.

Production in one brick kiln, based on wood was 2 million bricks, 0.25 million tiles in 1987; 2 millions bricks, 0.22 million tiles in 1988 and 2 millions bricks, 0.25 millions tiles in 1989.

In Punjab 41 brick kilns were surveyed. One was based on wood only and its production is given above.

Other 40 brick kilns produced 141 millions bricks, 17.5 millions tiles in 1987; 133.5 millions bricks, 16.5 millions tiles in 1988 and 161 millions bricks, 20 millions tiles in 1989.

In N.W.F.P 14 brick kilns produced 69.4 millions bricks, 8.58 millions tiles in 1987; 69 millions bricks, 8 millions tiles in 1988 and 69 million bricks, 7.5 millions tiles in 1989.

In Sind 5 brick kiln produced 12.46 millions bricks and 1.59 millions tiles in 1987, 12.5 million bricks, 1.5 millions tiles in 1988 and 19.18 millions bricks and 2.37 millions tiles in 1989.

In Baluchistan 4 kilns produced 13 million bricks, 1.6 millions tiles in 1987, 13.5 millions bricks, 1.7 million tiles in 1988 and 14 million bricks, 1.7 million tiles in 1989.

Capacity Utilization in Brick Kilns

40 brick kilns (coal + wood) in Punjab were working at 60% of their capacity and one kiln which used wood only was working 60% of its capacity.

14 brick kilns in N.W.F.P were working at 49% of their capacity.

In Sind, 5 brick kilns were working at 96% of their capacity.

4 brick kilns in Baluchistan were working at 100% capacity.

Wood Consumption

The 6² brick kilns using a combination of wood, coal & furnace oil consumed 1451 m³ wood in 1987; 1886 m³ in 1988 and 1519 m³ in 1989. Wood consumed in one brick kiln was 730 m³ in 1987, 730 m³ in 1988 and 820 m³ in 1989. This kiln was located in the Punjab, and used only firewood as fuel.

40 brick kilns (coal + firewood) in the Punjab consumed 918 m³ in 1987, 1353 m³ in 1988 and 968 m³ in 1989.

In N.W.F.P, the wood consumed in 14 brick kilns was uniform in three years. As 326 m³ in 1987, 1938, 1989.

In Sind 5 brick kilns consumed 117 m³ in 1987, 117 m³ in 1988 and 135 m³ in 1989.

In Baluchistan the wood consumed in 4 brick kilns was 90 m³ in each year 1987, 1988 & 1989.

Species of Wood Used

The most common species used in Punjab were babul, shisham, beri and phulai.

In N.W.F.P. the prevalent types of wood were babul shisham and phulai.

In Sind the prevalent species of wood used were babul, lawa, kandi and lai.

In Baluchistan the most common species of wood used in brick kilns were, babul, kandi, lai and lawa.

Source of Wood

39 brick kilns out of 41 in the Punjab, obtained the wood from middle men and remaining two purchased wood from the tree growers within the province.

In N.W.F.P 10 brick kilns out of 14 obtained wood through middle men. Three kilns purchased wood from the wood market in N.W.F.P and one obtained its firewood from the forest department of N.W.F.P.

Three brick kilns in Sind obtained wood middle men, one from the open market and one kiln obtained 67 percent of wood from the forest department.

In Baluchistan 4 brick kilns were surveyed. All of them obtained the wood from the wood market in Sind.

Mode of Transport of Wood

Wood was carried by trucks from the wood market to the brick kilns by 28 brick kilns out of 64 surveyed.

Ten brick kilns transported a part of wood by animal carts.

Sixteen brick kilns transported their wood by a combination of truck and animal carts. Five brick kilns used trucks and tractor trolley for carriage of wood and another 5 used trucks, animal carts and tractor trolley for the carriage of wood.

Others Materials Used As A Fuel

The material used as a fuel other than wood in 41 surveyed brick kilns were coal 36179 tonnes, sawdust 1902 tonnes and furnace oil 389076 liter in the Punjab.

In N.W.F.P, coal used was 18816 tonnes; saw dust 2 tonnes and furnace oil 30000 liters in 14 brick kilns.

In Sind 7100 tonnes of coal was used in 5 brick kilns.

In Baluchistan 4300 tonnes coal was consumed in 4 brick kilns.

Coal is mixed with furnace oil and sawdust in varying proportions and then the mixture is fed to the brick kilns.

Purchase Price of Wood

The price of wood purchased by 64 brick kilns varied from Rs.500 to Rs.1300 per m³.

In the Punjab the price of wood in 41 brick kilns varied from Rs.500 to Rs.1300 per m³.

In N.W.F.P the price of wood in 14 brick kilns varied from Rs.700 to Rs.1000 per m³.

In Sind the price of wood in 5 brick kilns varied from Rs.630 to Rs.720 per m³.

In Baluchistan the price of wood in 4 brick kilns varied from Rs.720 to Rs.900 per m³.

Fluctuation in Wood Prices

The increase in wood price in 1989 in 41 brick kilns in the Punjab was 13% than the wood purchased in 1988.

In N.W.F.P, the increase in wood price in 1989 in 14 kilns was 16% than the purchase price of 1988.

The increase in wood price in 1989 in 5 kilns in Sind was 3% than the purchase price of 1988.

The increase in wood price in 1989 in 4 kilns in Baluchistan was 4% than the purchase price of 1988.

Distribution of Cost

In Pakistan the cost of wood in brick kilns (coal + wood) was 1.4%; labour 34.6% and others 64% of the total cost.

Distribution of cost in the wood based kiln was 43% on wood, labour 42% and others 15% of the total cost.

In Punjab the cost of wood was 1.5%; labour 40% and others 58.5% of the total cost in (coal + wood) kilns.

One brick kiln in Punjab used only wood. Here the cost of wood was 43%; labour 42% and others 15% of the total cost.

In Sind the cost of wood was 1.5% labour 39% and others 59.5% of the total cost in (coal + wood) kilns.

In Baluchistan the cost of wood was 1%; labour 28% and others 71% of the total cost in (coal + wood) kilns.

Annual Income

In the Punjab, the total gross annual income of 41 brick kilns was Rs.92 millions in 1989.

In N.W.F.P, the total gross annual income of 14 brick kilns was Rs.39 million in 1989.

In Sind, the total gross annual income of 5 brick kilns was Rs.13 millions in 1989.

In Baluchistan, the total gross annual income of 4 brick kilns was Rs.8 millions in 1989.

The gross annual income of all the 64 kilns surveyed was Rs.152 millions in 1989.

Number of Workers Employed

Total number of workers in 64 brick kilns surveyed in Pakistan was 13668.

In the Punjab there were 9028 persons in 41 brick kilns.

In N.W.F.P. 2850 workers were employed in 14 brick kilns.

In Sind 1095 workers were working in 5 brick kilns.

In Baluchistan 695 workers were working in 4 brick kilns.

14. Lahore District

The total number of brick kilns in district Lahore in 1987 was 143; 1988, 150, 1989, 150 and 1990 160.

Six new kilns were started in Lahore District in 1987, 7 in 1988, none in 1989 and 10 in 1990.

No kiln was abandoned in 1987, 1988 or 1989. Only 5 kilns were closed in 1990. District Council Lahore charged Rs.3000/= as registration fee from each kiln registered or renewed.

LIST OF BRICK KILNS SURVEYED

PUNJAB

1. Ch. Muhammad Din & Company (D. G. Khan to Multan Road), D. G. Khan.
2. Muhammad Iqbal and Muhammad Hussain Company (D. G. Khan to Muzaffargarh Road) District Muzaffargarh.
3. Ch. Bukhtiar & Company, Alipur Road, Muzaffargarh.
4. Mr. Nisar Hussain, Al-Rehmanabad, Alipur Chowk, G. T. Road, Multan.
5. Haji Ghulam Muhammad, Rajapur Khanewal Road, Multan.
6. Zahoor Kiln Company, Sham Kot Road, Khanewal.
7. Rana Mumtaz Khan, Pirawala, Sahiwal Road, Khanewal.
8. Ch. Ayoob & Sons Company, 39-Chak G. T. Road, Chichawatni.
10. Imanat Brothers Sahiwal Bhatta Chak, 187/9-2, Takar Shah, G. T. Road Harrappa, Sahiwal.
11. Agha Fiaz Ali & Sons, 90-Arifwala Road, Sahiwal.
12. Muhammad Hussain, Gambar Station, Okara Cantt, G. T. Road, Okara Cantt.
13. Sheikh Muhammad Shaffi Ghosia Bricks, G. T. Road, (Pattoki), Okara.

14. Ch. Muhammad Aslam Bahoo Bricks G. T. Road (Lahore), Pattoki.
15. Javaid Bricks, G. T. Road, Pattoki.
16. Abdul Rehman Pak Bricks, 21-K.M. Multan Road, Lahore.
17. Hamad Bricks Company, Hurbanspura, Lahore.
18. Saeed Brothers, Jalo More, Lahore.
19. Arif Fine Bricks, Jalo More, Lahore.
20. Haji Muhammad Yasin, Fine Bricks, G. T. Road, (Lahore) Kasur.
21. Zulqarnain Bricks Company, Kala Khati, G. T. Road, Lahore.
22. Muhammad Ijaz ghunni Bricks Company, Attawa Gujranwala.
23. Ch. Bricks, Sialkot Road, More Arupe, Gujranwala.
24. Haji Ghulam Ahmed, Haji Bricks Sialkot Road, Bhalomar, Sialkot.
25. Ch. Muhammad Shafi, Ch. Bricks, G. T. Road, Ugoki, Sialkot.
26. Saeed Bricks Company, Head Marala Road, Gujrat.
27. Sana-ul-Allah Bricks Company, Callrawala, G. T. Road, Gujrat.
28. Nasir New Abadi, G. T. road, Jehlum.
29. Ch. Fazal Dad, Newabadi, G. T. Road, Jhelum.

30. Riaz Ahmed, G. T. Road, Dina.
31. Ch. Muhammad Mangti, Guana Road, Gujar Khan.
32. Taj Muhammad Park Road, Chak Shazaz Islamabad.
33. Fazal-ur-Rehman Khanna, Islamabad.
34. Ch. Afzal Gharibabad, Rawalpindi.
35. Talib Hussain, Gharibabad, Rawalpindi.
36. Malik Haji Karam Dad, Taxila, G. T. Road, Taxila.
37. SaIdar Dhok Hameeda Fateh Jang Road, Fateh Jang.
38. Mr. Rahmat, Qaziabad, G. T. Road, Attock.
39. Mr. Abdul Karim, Qaziabad, Attock.
40. Sultan Ali, Dhok Hameeda, Fateh Jang Road, Fateh Jang.
41. Saghir Shah, Taxila.

N.W.F.P.

1. Saleemullah, Kohat Road, Peshawar.
2. Nasir Kohat Road, Peshawar.
3. Dost Muhammad Khan, Kohat Road, Peshawar.
4. Haji Nazir, Kohat Road, Peshawar.
5. Arif Turu, Mayar Road, Mardan.
6. Khalid Khan, Turu Mayar Road, Mardan.

7. Mujahid Khattak, Soiabi Road, Jhangira.
8. Zaigham Khan, Soiabi Road, Jhangira.
9. Aziz Khan Jabibaca (Pannia) Haripur.
10. Nazir Khan, Jabibaca (Pannia) Haripur.
11. Raees Khan, Brick-kiln Company, Lucky Road, Bannu.
12. Pir Sabar Shah Brick Kiln Company, D. I. Khan Road, Bannu.
13. Toor Khan, Brick-kiln Company, Jam Kheel Road, Kohat.
14. Mir Walli Khan Brick Kiln Company, Kohat Road, Bannu.

SIND

1. Abdul Wahab Qureshi, Aror-Sale Hopot Road, Rohri.
2. Gul Muhammad Brohi & Gwanwar Khan Brohi, Semshakh Jacobabad.
3. Zahid Brick Company, Sabzi Mandi Shikarpur Road, Sukkar.
4. Hazoor Bux-Dera Allah Yar (Jhatpat) Highway Right Side Before Entering Town from Jacobabad.
5. Haji Mohammad Siddique, Umrani-Laro District Jacobabad.

BALUCHISTAN.

1. Ghulam Hussain, National Highway Railway Crossing (Road side) Near Wapda Colony, Sibi.

2. Bashir Ahmed, National Highway Rialway Crossing, Road Side Near Wapda Colony Sibi.
3. Khuda Bux Kurd Kiln Sariab Road, Quetta (8 KM from Quetta on Easter Side)
4. Ijaz Siddiqui Brick-kiln Sariab Road, Quetta (7 KM from quetta on Eastern Side)

WOOD USING INDUSTRIES OF PAKISTAN
WOOD CONSUMPTION SURVEY QUESTIONNAIRE
BRICK KILN INDUSTRY

Serial No. _____
Date _____

1. Name and Address of the firm

2. Year the firm was established _____

3. What was the Annual Production of your four primary products:

Product Type	No. Produced per Year		
	1987	1988	1989 (Units?)
#1.			
#2.			
#3.			
#4.			

4. What Per Cent of Capacity are you operating at? _____%

5. Since 1986, what are the actual wood requirement of the four main wood raw materials that you use.

Species	Initial Form of Wood Used*	Source of Raw Material (Private, Govt, Import)	Wood Volume Used				Units
			1987	1988	1989	1990	

- #1.
- #2.
- #3.
- #4.

* (scants, log wood, branch wood, lumber, etc.)

6. How is wood delivered to your factory? (Please Check all that apply)

- | | |
|--|---------------------------------------|
| <input type="checkbox"/> Railway | <input type="checkbox"/> Waterway |
| <input type="checkbox"/> Truck | <input type="checkbox"/> Push cart |
| <input type="checkbox"/> Animal cart | <input type="checkbox"/> Hand carried |
| <input type="checkbox"/> Other (_____) | |

7. How much do you pay for wood raw material per unit delivered at the factory gate for the four primary species and grades used. For up to two other species, if these woods were available, how much could you use and what price would you be willing to pay for it.

<u>Species</u>	<u>Grade</u>	<u>Local Rs/Unit</u>		<u>Imported Rs/Unit</u>
		<small>From lands</small>	<small>State lands</small>	

Current Use:

- #1.
- #2.
- #3.
- #4.

Potential Use:

- #1.
- #2.

8. Are your average per unit wood costs the same as last year?

Choose one:

UP	+	_____ %
THE SAME		00 %
DOWN	-	_____ %

9. From whom is wood purchased? _____

(Tree grower, forest auction, middle man, own lands, etc.)

10. If your primary supplier is an individual please list his name and address here:

11. Please describe any wood availability problems that you now have or expect to have next year:

2. Current and Future Consumption of your four most used woods. (Use actual this year and best estimates thereafter)

Species	Grade	Expected Wood Volume			Units
		1990	1991	1992	
#1.					
#2.					
#3.					
#4.					

3. What significant other materials are used in connection with your wood based product? (e.g. if wood is your fuel are there other fuels used, if it is a part in fabrication what are the other parts?)

Material	Quantity: Tonnes/year
#1.	
#2.	

4. What is the distribution of your costs of production?

Wood raw material	_____ %
Labor costs	_____ %
Other operating costs	_____ %
TOTAL	<u>100</u> %

5. What is your gross annual value of sales in Rs? _____

16. How many man-years of employees does your establishment employ in an average year?
(Include all managers, professionals, staff, and laborers)

_____ man-years

17. Please note any other relevant information from the interview not covered elsewhere in the questionnaire.
(Use reverse side if necessary)

Two brick kiln workers kidnapped

Dawn Lahore Bureau

LAHORE, Aug 1: Two brick kiln workers, Piaro and his son Saleem, were kidnapped from their houses in Yuhannabad adjacent to the kiln in Green Town.

The Bhatta Mazdoor Mahaz has alleged that they were abducted in small hours on Tuesday by the kiln owner, in connivance with the Green Town police. The Mahaz President Hidayat Masih, has sent cables to the President, the Prime Minister, the Punjab Chief Minister, the IG police and the Lahore SSP for the recovery of the abducted.

According to the Mahaz, the workers owed to the kiln proprietor some amount which they had taken as advance. They were earlier abducted by the kiln owner and released on a Lahore High Court order.

The Green Town Police has expressed ignorance about the abduction of the two brick kiln workers.

RAILWAYS & ROADS

Railways

-  Broad gauge railway
-  Other gauge railway

Roads

-  Main metalled road
-  Other metalled/shingled road

-  Capital city
-  Provincial capital
-  Divisional capital
-  District/Tribal area capital
-  Other settlements

SURVEY AREA 

Scale 1:7 500 000
 0 100 200 300 km
 0 50 100 150 miles
 Lambert Conformal Orthomorphic Projection

DOMESTIC AIR ROUTES

Scale 1:15 000 000
 0 100 200 300 km
 0 50 100 150 miles

