

Pakistan

Mohammad Iqbal Sial
Deputy Conservator of Forests
North West Frontier Province, Pakistan

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Introduction

Pakistan has limited, but diverse, forest resources spread over an area of 4.37 million hectares, or about 5 percent of the country's total area. Areas under different forest types in the country are shown in Table 1.

Table 1. Distribution of forest types in Pakistan

Forest type	Area (1,000 ha)	Percent of total
Coniferous forests	1,870	43
Scrub forests (dry subtropical broad leaved and tropical thorn forests)	1,683	39
Irrigated plantations	200	4
Riverine forests	290	7
Coastal mangroves	283	6
Others (linear plantations mazri, etc.)	40	1
Total	4,366	100

Source: FAO/RAPA, 19117

In addition to the natural and man-made forests mentioned above, considerable tree growth exists on farmlands. According to a recent survey, the farmlands in the North West Frontier Province (NWFP) alone carry a total growing stock of 80 million trees (14 million cubic meters), i.e., 46 trees or 8 cubic meters per hectare (Amjad, 1990). Results of the survey in other provinces have not yet been compiled.

The forests in Pakistan, besides providing timber, firewood, water, wildlife and recreation, also supply products known as "minor forest produce" in the official terminology of the Forest Department. These include the following:

Definition of NWFP

Non-wood forest products (NWFPs) are goods of biological origin other than wood, derived from forests, other wooded land and trees outside forests. NWFPs and similar terms such as "minor", "secondary" and "non-timber" forest products (NTFPs) have emerged as umbrella expressions for the vast array of both animal and plant products other than wood derived from forests or forest tree species

Non-wood forest products can be defined as all goods for commercial, industrial or subsistence use derived from forests and their biomass, which can be sustainably extracted from a forest ecosystem in quantities and ways that do

not downgrade the plant community's basic reproductive functions. 'Forests' embraces the global range of vegetation types where woody plants normally predominate.

A. Food products

Morels
Honey
Wild fruits and nuts
Vegetables
Condiments

B. Medicinal plants

C. Industrial products

Resin

(**resin** is a solid or highly viscous substance of plant or synthetic origin that is typically convertible into polymers. **Resins** are usually mixtures of organic compounds).

Babul bark
Bhabar grass

D. Fibers (e.g. mazri leaves)

E. Silk cocoons

F. Miscellaneous products

Soap-nut
Walnut bark
Palosa gum
Neem leaves

The importance of these products cannot be over-emphasized as they provide job opportunities to a large number of rural people (Iqbal, 1991). They also augment the meager income of rural poor (Sheikh and Hafeez, 1977). Some of them, such as morels, are an important source of valuable foreign exchange. The term "minor forest produce" is therefore misleading because the products are not minor at all in their economic significance.

The initials of the term "non-wood forest products" are the same as those of the, North West Frontier Province. Therefore, the term non-timber forest produce (NTFP) has been adopted for this paper. It implies all the tangible products produced by forests, other than timber and firewood, which are used by people. In the stricter sense, the term should include wildlife and bush meat, but these have not been covered in this paper.

Food products

Morels

A variety of black mushrooms or morels (*Morchella esculenta*, *M. conica*, *M. anquistipect*, etc.), grow naturally in the temperate forests of Pakistan between 1,800 and 3,000 meters above sea level. About 50 tons of dried morels are collected each year by about 150,000 forest dwellers, mainly children and women.

The morels are purchased by local grocers or roving purchasers who sell them to dealers in nearby towns. The dealers sell the morels to wholesalers in Mingora, Rawalpindi and Peshawar. From the wholesalers the mushrooms go to big cities such as Karachi, Lahore and Islamabad. Some of the wholesalers in Mingora are exporters as well.

The entire quantity of morels is exported, generating Rs130 to 150 million (1US\$ = Rs.25) in foreign exchange (Shah, 1991). Except for drying, de-stalking, grading and fumigating, no further processing is involved. To increase the supply base, technology for their cultivation needs to be developed and standardized for the benefit of the forest dwellers (Iqbal, 1991).

Honey

Honey collected from wild beehives is an important source of nutrition, as well as income for forest dwellers in the country. Between 55 to 65 tons of honey are collected each year in the country from wild beehives by about 15,000 persons (Ahmad and Muzaffar, 1987; Iqbal, 1991).

Traditional beekeeping by rearing colonies of Oriental bees (*Apis cerana*) in earthen pots and log hollows fixed in the walls of the houses is popular among women living in remote forest areas in the north and northwest parts of the country. The number of these beehives is 35,000 to 40,000, producing about 50 tons of honey. The honey is sold to local grocers at Rs60 to 80 per kilogram. An average colony yields 4 to 5 kilograms of honey, but 35 to 45 percent of the colonies are sub-standard and produce little or no honey (Ahmad and Muzaffar, 1987).

A recent survey (Iqbal, 1991), observed that Oriental bees do not colonize the hives as frequently as they did 10 to 12 years ago, possibly because the local bees are unable to compete with the 20,000 colonies of European bees (*A. mellifera*) brought by the Afghan refugees into the tracts. Consequently, natural populations of the local bees have dwindled. To overcome the problem and to augment income of the rural women, it is recommended that modern beekeeping with European bees should be introduced among the traditional beekeepers (Iqbal, 1991).

The entire production of honey is used within the country as food and in a number of medicinal formulations. Although modern beekeeping is gaining popularity in the country, the demand for honey cannot be met and honey worth Rs3 to 4 million is imported each year.

Wild fruits and nuts

A variety of wild fruits and nuts is collected by forest dwellers, both for domestic consumption and for sale. Some of the important ones are discussed below:

Pine nut: Roasted seeds of *Pinus gerardiana*, locally known as chalgoza pine, are a popular dried fruit. Natural forests of pine occur in the dry temperate zone in Waziristan, near the Pakistan-Afghanistan border and in some parts of Baluchistan and the NWFP. A tree yields 20 to 40 kilograms of nuts. Total production in the country is estimated 21,000 tons of which 95 percent comes from Baluchistan.

Seeds are collected from the still-green cones by climbing the trees and wrenching off the cones with hooks attached to long poles. The cones are then buried for about a fortnight until they open. The seeds are then extracted by striking the cones against a hard surface.

The pine nuts are roasted by mixing them in a special kind of soil in iron containers placed over fire. The roasted nuts are sold at Rs1,500 per 40 kilograms. Total value of produce is about Rs37.5 million per year.

In addition to domestic consumption, the pine nuts are exported to the Middle East. Information on the export of pine nuts during the last five years is given in Table 2, which indicates that about 271 tons of pine nuts are exported each year, fetching Rs6.3 million.

Table 2. Export of roasted pine nuts from Pakistan

Year	Quantity (tons)	Value (1.000 Rs)	Unit value (Rs/kg)
1986	768	11,131	14.49
1987	234	6,996	29.78
1988	105	2,800	26.59
1989	122	4,063	33.28

1990	125	6,719	53.72
Average	271	6,342	31.57

Source: Monthly statistical bulletin, Federal Bureau of Statistics, Statistics Division, Govt. of Pakistan

Walnuts: Walnut (*Juglans regia*) kernels are a favourite dry fruit in the country. Walnut trees grow naturally between 1,500 and 3,000 meters in the northern and northwestern mountains. In cultivated form, they grow at about 1,000 meters. Production is about 20,000 tons per year. The bulk is produced in NWFP and Azad Kashmir. The average wholesale price is Rs 10 per kilogram. The total annual value of the produce is about Rs200 million. The average number of walnut trees per household is 5 and average production per tree is 115 kilograms (Iqbal, 1991). About 35,000 families are involved in walnut production. The entire production is consumed within the country.

Wild persimmon: The wild persimmon tree (*Diospyros lotus*) grows naturally between 600 and 1,800 meters in the north and northwestern mountains. The fruit is purple, globose or ovoid, and 12 to 20 millimeters in diameter, is sweet, and can be eaten fresh or dried. Semi-dried fruits are collected from the trees in November and December. An average tree yields 120 kilograms of dry fruit. Total production is estimated at about 800 tons (Iqbal, 1991), most of which comes from NWFP. Actual production is more, but not all of it is collected. Most of the fruit goes to waste. The number of households involved in collecting persimmon is about 2,000 (Iqbal, 1991).

The current wholesale price is Rs3.50 to 3.75 per kilogram and the total value of the produce has been estimated to be Rs2.8 to 3.0 million.

Wild persimmon is considered an inferior fruit. It is perishable and deteriorates in storage. All of it is consumed domestically.

Other wild fruit: Small quantities of wild fruit such as gurgura (*Reptonia buxifolia*); deela (*Capparis aphila*), pelu (*Salvadora oleoides*), jujube (*Zizyphus spp.*), sumal (*Berberis lycium*), guch (*Viburnum nervosum*), wild fig (*Ficus glometra*) and mulberry (*Morus alba*) are collected by men, women and children for domestic use, often eaten on the spot. The wild fruit is collected by graziers in the forests. Occasionally small quantities appear in local towns for sale (RAPA, 1987).

Vegetables

Kachnal: Unopened flower buds of the tree, *Bauhinia variegata*, are collected as a favorite vegetable. The tree is cultivated in plains and sub-mountainous tracts. Flower buds which appear from March to April are collected by climbing the trees 2 to 3 times a season. Collection of individual buds from a tree is a tedious process.

An average tree yields 20 to 25 kilograms. Total production in Pakistan is estimated to be 30 tons, of which 20 tons are produced in NWFP. Wholesale price is Rs5 to 10 per kilogram. The vegetable is cooked fresh as well as in dried form. All of it is consumed within the country.

Suhanjna: The drumstick, or horseradish, tree (*Moringa oleifera*), locally known as "suhanjna," is cultivated on a limited scale in irrigated plains of the country primarily for its partially opened inflorescences. These are eaten as a vegetable. There is a small supply of about 10 tons, which is used domestically. Prices average Rs7 to 8 per kilogram.

Kunjai: (*Dryopteris felix-mas*) is a male fern which grows in moist temperate forests in the country at 1,500 to 3,000 meters. Women, while going to forests for grazing livestock or collecting firewood, collect the fern. It is available from mid-April to mid-May. Total production is 15 to 20 tons (Iqbal, 1991), all of which is used locally. Average retail price is Rs7 to 8 per kilogram.

Condiments

Wild pomegranate seeds: Dried seeds of wild pomegranate (*Punica granatum*), locally known as "anar dana," are widely used in cooking to develop a sour taste in dishes. They also have medicinal properties. The tree grows naturally in sub-mountainous tracts of the country from 900 to 1,800 meters. Flowers appear in April and May and the fruit is ready for harvesting in September and October. An average tree yields 15 to 25 kilograms of fresh fruit.

Total production of the fruit is about 250 tons, of which two-thirds comes from NWFP and one-third from the Punjab. The fruit yields 90 to 95 tons of dried seed and about 100 tons of skin. The skin is used by tanneries in Punjab.

Production of fresh pomegranate fruit is estimated at 35 kilograms per household (Iqbal, 1991). About 6,000 to 7,000 families collect wild pomegranate fruits. The seeds are extracted by about 150 to 200 old women who work in the warehouses of dealers. The women generally do not like the work because it stains their hands.

The entire production of Pakistan is consumed within the country. It is not enough to meet local demand and some quantities are imported from Iran. The Iranian anar dana is, however, of inferior quality because of its sweetish taste and is mostly used in pharmaceutical preparations by local Greco-Arab pharmacies.

Caraway: (*Carum carvi*), known locally as "zeera siah," is widely used to flavor bread, biscuits, cakes and cheese. It is also an ingredient of pickling spice. It is a mild stomachic and carminative, occasionally used for flatulent colic and as an adjuvant or corrective for medicines (CSIR, 1950).

The plant is a perennial herb with thick tuberous roots. It grows wild in dry temperate regions of the country. The fruit is collected before ripening. The plants are dried and fruits are thrashed out, cleaned, and stored in bags.

Total production is about 300 tons (Khan, 1985), all which is consumed locally. Wholesale prices range from Rs160 to 180 per kilogram.

Medicinal plants

Because of its varied environment, Pakistan is rich in medicinal herbs. The country's list of plants is quite long (Zaman and Khan, 1970), but all of the plants are not exploited commercially. A survey conducted by the Pakistan Forest Institute records 320 medicinal plants, growing in different ecological zones (RAPA, 1987). A list of commercially important medicinal plants is provided in Table 3.

All these plants grow wild and no effort has been made to cultivate them. Pakistan Forest Institute has standardized the methodology of cultivation of a number of important medicinal herbs (Khan and Zaidi, 1989)

Methods of collection

The collection of medicinal plants is controlled by the Forest Department. Three methods of collection are practiced (Iqbal, 1991; RAPA, 1987; and Khan, 1985):

- Leasing the area for collection of medicinal herbs. This method is used in the Hazara forests in NWFP.
- Collection by the traders from local people who pay nominal royalties to the Forest Department. This method is common in the Malakand forests in NWFP.
- In Azad Kashmir, the Forest Department auctions off fixed quantities.

Table 3. Commercially important medicinal plants collected from forests in Pakistan

Name	Botanical name	Part used	Estimated quantities extracted annually (tons)	Price (Rs/kg)	Export potential; comments
Mushk-e-Bala	<i>Valeriana wallichii</i>	Roots	300-400	40-50	About 150 tons exported to Hong Kong and Germany @Rs. 40-50 per kg.
Persoshan (maiden hair)	<i>Adiantum capillus</i>	Whole plant	100-125	6-8	About 15-20 tons exported to Germany each year.

fern)						Extraction can be increased up to 1,000 tons per year.
Anjabar	<i>Polygonum amplexicule</i>	Roots	40	10		-
Unab	<i>Zizyphus vulgaris</i>	Fruits	30-40	10-12		-
Hub-al-as (Munru)	<i>Myrtus communis</i>	Fruits and leaves	40-45	40		-
Banafsha	<i>Viola serpens</i>	Flowers	30	100-240		Up to 200 tons can be collected easily
		Leaves	40	15		
		Corms	12	60		Entire quantity is exported to Germany, South Africa, France and Bulgaria
Suranjan-e-Telkh	<i>Colchicum luteum</i>	Seeds	2	125-150		
Ban Kakri	<i>Podophyllum emodi</i>	Rhizomes and roots	30-60	40-45		Exported to Belgium
Kamila	<i>Mallotus philippensis</i>	Fruits	4-5	40-50		-
Mamekh	<i>Paeonia emodi</i>	Rhizomes	18	22		-
Afsantine	<i>Artemisia maritima</i>	Leaves/ shoots	100-150	15		-
Ajwain	<i>Carum copticum</i>	Seeds	200	15		-
Chiraita	<i>Swertia chirata</i>	Twigs	30	28		-
Wirch	<i>Acorus calamus</i>	Roots	10	24		-
Darhald or Meda Chob	<i>Berberis lycium</i>	Wood	600	10		-
		Roots	120	14		-
Khurasani	<i>Hyocyamus niger</i>	Seeds	2	20		-
Ajwain Khaksir	<i>Sisymbrium irio</i>	Seeds	50	10		-
Ajwain	<i>Carum copticum</i>	Seeds	200	15		-
Zeera Siah	<i>Carum carvi</i>	Seeds	10	160-180		-
Bermi Booti	<i>Centella asiatica</i>	Whole plant	12	32		-
Meetha Teela or sufaid Mori	<i>Aconitum chasmanthum</i>	Roots	4	25		-
Atis	<i>Aconitum hetero phyllum</i>	Roots	2	250		-
Kaniz (Yam)	<i>Dioscorea deltodea</i>	Rhizome	230	16		Kurram Chemical purchases it @Rs 4-5 per kg. Also reported to be exported to Japan
Angoor shefa (Belladonna)	<i>Atropa acuminata</i>	Whole plant	10	12		-
Barg-u; Azra (Foxglove)	<i>Digitalis purpurea</i>	Whole plant	10	10		-
Bhaikar	<i>Adhatoda vasica</i>	Leaves	20	5		-
Bhang	<i>Cannabis sativa</i>	Whole plant	20	10		-

Panir Dodi	<i>Withania coagulans</i>	Fruit	125	5	Khyber Agency, Waziristan
Asgand	<i>Withania sominifera</i>	Roots	32	35	Naziampur, Peshawar Exported to India
Amaltas	<i>Cassia fistula</i>	Pods	150	15	Haripur and Gadoon
Baid Mushk	<i>Salix alba</i>	Bark	10	18	Mardan, Peshaw Swabi, Rustam
Jangli piaz Scilla	<i>Urginea indica</i>	Bulbs	6	30	Rustam. Kot, Buner
Indrayan (Colocynth)	<i>Citrulus colocynthus</i>	Fruits	12	9	Risalpur, Nizampur, Peshawar
Asmania	<i>Ephedra nebrodensis</i>	Twigs	780	43	Baluchistan

Source: Iqbal, 1991 and Khan, 1985

The method adopted in Malakand forests has given encouraging results. It is flexible and competitive because of the absence of unnecessary controls of the Forest Department. As a result, Mingora has emerged as one of the biggest trading centres of medicinal herbs in the country. Some of the traders in Mingora also export medicinal herbs.

Role of forest dwellers

Collection is done by the forest dwellers living in remote valleys, people who go to forests to graze their livestock, cut grass, collect firewood and mushrooms. Akram and Sabir (1990) describe the process of collecting:

"It is an unusual observation, while having tea in a way-side hotel in the mountain range of Himalaya in Pakistan that workmen descending from a hill top with a load of firewood, hand over a small collection of mushrooms or a bundle of Swertia herb to the shopkeeper. The tea shopowner, when asked about the fate of the herb, took us inside a spacious mud room, used as a store, where jute bags full of dried Swertia were kept for an expected buyer."

A survey by Iqbal (1991) in NWFP, found 21,000 men, women and children involved in collection of medicinal herbs. No such information is available for other parts of the country.

Marketing

The herbs are sold either dried or fresh to the local grocers who sell them to wholesalers. The wholesalers sell them to the pharmaceutical concerns or to exporters.

Processing plants

There is only one state-owned processing plant, Kurram Chemicals Ltd., in Rawalpindi. It uses *Artemisia maritima*, yam roots (*Dioscorea deltoidea*) and *Ephedra nebrodensis* as raw materials to extract alkaloids. The factory, which used to process 100 tons a year, stopped using *Artemisia maritima* two years ago because of the availability of synthetic substitutes. The factory has capacity to process 560 tons of yam root to extract diosgenin, but it was only able to procure 240 tons last year. The yam roots are purchased at the factory gate for Rs5 per kilogram.

The factory is also capable of processing 1200 tons of *Ephedra nebrodensis* into ephedrin each year. All of its supplies come from Baluchistan, where the plant contains 0.7 to 1 per cent ephedrin. Extraction is done between September and October each year, when the Forest Department gives out contracts. Contractors supply the material to the factory at Rawalpindi. The extraction charges established by the contractor and the department are paid by the factory management to the contractors. Moreover, an amount of Rs5 per kilogram is also paid by the factory management to the forestry department in royalties. During 1990, the factory paid Rs0.95 per kilogram to the contractors in addition to paying Rs5 to the department as royalty. Thus, total cost of raw material was Rs1.08 per kilogram. During 1990, total supply of the plant to the factory was 780 tons, 65 percent of its installed capacity.

Recommendations

All medicinal herbs in the country are obtained from the wild. There is no cultivation and no efforts are made to replenish sources. As a result, production of plants such as *Valerina wallichii* and *Dioscores deltoidea* has declined. To ensure a sustainable supply of medicinal herbs, cultivation of important medicinal herbs in forest areas should be encouraged, particularly those with export potential. For this purpose, long-term leases should be given to interested parties.

The Pakistan Forest Institute has developed technology to cultivate some of the commercially important medicinal herbs (Khan and Zaidi, 1989). These results need to be disseminated among the forest dwellers along with other extension services. The supply base needs to be widened to increase job and income opportunities for forest dwellers. This can be achieved by including cultivation of medicinal herbs in social forestry programs.

In light of the success of the experience in the Malakand Forest, that model should be replicated in other places in the country to encourage collection and to develop the trade to the advantage of forest dwellers.

Industrial products

Resin

Resin is obtained by tapping the chir pine (*Pinus roxburghii*) trees. Chir pine forests occur primarily in the Punjab (60,000 hectares), Azad Kashmir (60,000 hectares), and the NWFP (80,000 hectares).

Method of extraction: The French method of resin tapping, introduced in 1888, is still in use. Trees under 30 centimeters in diameter are not tapped. Trees between 30 and 57 centimeters are given 1 blaze and those above 57 centimeters are given 2 blazes.

When a tree is tapped for the first time, a 20-centimeter broad cut is made about 15 centimeters above ground level. A thin sheet of iron, 15 centimeters long and 5 centimeters wide, is hammered into this cut to form a lip. Above the lip a 15 x 12 centimeter gash is made in the wood. This is called a "channel," or "blaze." An earthen pot is hung below the lip to collect the resin. The blaze is freshened every week. At each freshening, the length of blaze is increased by about 0.8 centimeters. The process continues for about 5 years, after which a new blaze is started about 15 centimeters to the left of the old one. At each freshening of the blaze, the resin from the clay pot goes into an empty kerosene tin. The tins are transported to roadside depots and from there to the resin processing factories. This method yields 1.5 to 2 kilograms of resin per tree each season (Sheikh and Hafeez, 1977).

The operation of resin tapping is carried out manually with small hand tools. It is seasonal and lasts for 7 to 8 months from March/April to October/November. The work is labor intensive and affords job opportunities to some 2,000 workers (Khattak and Amjad, 1981.)

One problem is that extraction contractors are not careful in making blazes and as a result many trees are damaged. The situation is exacerbated when the resin blazes catch fire and valuable butt logs are scarred and damaged (Iqbal, 1980). For these reasons, the Forestry Department in Punjab has stopped resin extraction and its rosin factory at Jallo has been closed.

Resin extraction and processing are controlled by the Government through its Forestry Departments.

The average production of crude resin during the last 10 years is 4,132 tons (Table 4).

Table 4. Production of crude resin in Pakistan (tons)

Year	Azad Kashmir	NWFP	Punjab	Total
1981	2,697	1,350	1,200	5,247
1982	2,369	1,163	1,105	4,637
1983	2,371	1,714	937	4,022
1984	1,870	1,021	991	3,882

1985	1,448	780	1,320	3,548
1986	2,151	1,091	1,318	4,562
1987	2,098	887	1,659	4,644
1988	2,180	653	604	3,437
1989	2,318	887	-	3,205
Average	2,167	950	1,142	4,132

Source: Amjad and Khan ,1990: Records of Rosin and Turpentine Factory, Haripur (NWFP)

Processing facilities: Crude resin is processed to produce rosin and turpentine. The yield of rosin from crude resin is about 65 to 75 percent and of turpentine 15 to 20 percent. At present, only one state-owned factory, at Haripur in NWFP is producing rosin and turpentine. The capacity of the factory at Haripur is 3,600 tons, but it is running at one-third capacity because of a shortage of resin.

The importation of synthetic rosin, which is cheaper than domestic rosin, has further set back the processing plants and the closure of the Haripur factory is being considered.

Extraction costs Rs3 to 4 per kilogram and for Rs6.70 per kilogram in NWFP and Rs11.55 per kilogram in Azad Kashmir. The wholesale price of rosin and turpentine is Rs28.82 per kilogram and Rs27.08 per liter, respectively, at the factory gate.

Vegetable tanning

Bark or "babul" (*Acacia nilotica*) is the principal agent used in vegetable tanning of hides in Pakistan. The bark is obtained as a byproduct when the trees are felled. It is separated from logs by beating them with wooden mallets and the strips are dried in the open and sent to tanneries. The proportion of bark to wood is 1:5 by weight and a plantation of 25 trees per acre, when 15 years old, may yield about 5 tons of bark (CSIR 1950).

Tannin content of bark varies from 7 to 20 percent. The bark from old trees and main stems, though richer in tannin, is inferior to the bark from branches and young trees because the latter has a low proportion of non-tanning coloring substances.

The leather produced by babul bark possesses firmness and durability, but it exhibits harshness and is dark colored. Babul bark is bulky and its tanin content is comparatively low (Trotter, 1940).

Recently, farmers in some parts of Punjab (Sargodha, Jhang and Faisalabad) have started raising babul plantations around their crops. They harvest the plants after 2 years and extract the bark. The bark is sold to the crushing plants at Rs1.00 to 1.25 per kilogram. The crushing plants sell the crushed bark to the tanneries at Rs1.75 per kilogram. Thus the status of bark has shifted from being a by-product to being a main product.

About 210 kilograms of crushed bark are needed to produce 100 kilograms of leather (5 hides). Total annual production of vegetable-tanned leather in the country is estimated at 40,000 tons. The tanneries are concentrated in Punjab (Wazirabad, Qusur, Gujranwala, Sialkot, Daska and Pasrur). Annual consumption of babul bark is estimated at 84,000 tons. Potential production of the bark is more than that, but not all of it is currently extracted.

The vegetable tanning process has also been set back because of availability of the synthetic tannin. A number of tanneries have been closed or have shifted to synthetic tanin. There is, therefore, not much hope for expansion of this cottage industry. Furthermore, the bark is not exported because of its bulk and the availability of synthetic tanin. Nearly all leather produced by vegetable tanning is used domestically.

Bhabar grass

Bhabar or Sabai (*Eulioopsis binata*) is a tufted perennial grass. It grows on dry and bare sub-mountainous tracts in Torai Shinai (Kohat), Nizampur and Parang Ghar (Mohamand Agency) in NWFP. The grass is hardy, surviving both frost and drought and is light demanding. Sabai grass is harvested annually in November and December. Yields vary

from 20 to 75 maunds (1 maund = 82.3 pounds) per acre, depending upon locality, rainfall and intensity of management (CSIR, 1950).

Sabai grass, when carefully collected and free from weeds and foreign material, yields medium-quality writing paper. It is singularly homogenous in quality throughout the whole plant. Even the nodes are digestible and consequently it is reduced to a clean and regular pulp by simple digestion. The yield of good quality bleached pulp ranges from 33 to 35 percent (of the weight of raw material). The fibre length is about 2 millimeters (CSIR, 1950).

There is only one paper mill in the country, at Nowshera (NWFP), which uses Sabai grass in addition to **Saccharum** grass. The mill purchases 1,000 to 1,500 tons of the grass annually at Rs750 per ton. The supplies come exclusively from the Parang Ghar area.

Harvesting the grass is tedious, low-paying work. Poor people with no alternatives resort to this work. A person can earn Rs25 to 30 per day from this work. After harvesting, the grass is bundled and despatched to the mill in trucks. About 250 to 300 people are involved in supplying the grass to the mill.

Another 500 to 600 tons of grass are sold each year in local markets at Rs1.00 per kilogram, for use as carpeting in mosques.

Fibers

Mazri leaves

Mazri is the local name for dwarf palm (*Nonnorrhops ritchieana*). It is a gregarious, tufted, low-growing and shrubby palm, growing naturally in NWFP, Baluchistan and the adjacent tribal belt along both sides of the Suleiman Range, from 600 to 1100 meters in elevation. Farmers in some parts of NWFP (Paniala, D.I. Khan) have also started cultivating it in their agricultural fields between other crops.

Mazri leaves are used in a variety of everyday products, including mats, baskets, brooms, trays, hand fans, grain bins and cordage. Average annual production of raw mazri leaves in the country is 37,315 tons (Table 5).

Table 5. Mazri production in Pakistan

Province	Estimated average annual production (tons)
Baluchistan	27,265
NWFP	2,851
Federally Administered Tribal Areas (FATA)	7,199
Total	37,315

Source: Amjad and Khan, 1990; Iqbal, 1991

It has been estimated that an average worker can process more than 0.5 tons of raw mazri leaves per year (Iqbal, 1991). About 65,000 people are involved in processing mazri leaves, 78 percent of them women.

The retail price of raw mazri leaves is about Rs3.40 per kilogram with a total value of collected leaves reaching Rs126 million annually. Although prices of the finished mazri products vary considerably, the estimated value of mazri leaves almost doubles after processing. Thus processing nets about Rs126 million to the manufacturers each year (Iqbal, 1991).

Because of indiscriminate damage, mazri forests are disappearing in many places. The supply base is gradually shrinking and the incomes of families are threatened. Rehabilitation of mazri forests is, therefore, essential in order to maintain the supply base. Also, the farmers who have taken up mazri cultivation need extension support to obtain the maximum possible returns.

In some areas, such as Hangu (Kohat), unnecessary legal restrictions on harvesting, transportation and marketing of mazri leaves and its products have put the manufacturers of mazri products at a disadvantage. The law requires that raw mazri leaves and products should be marketed in places designated by the Government. In the mazri producing areas, the products are to be sold only to the purchasers of the mazri leaves. This restriction seriously weakens the bargaining position of the manufacturers of mazri products and consequently they do not get adequate return for their products. The relaxation of legal restrictions may encourage a free market and improve the situation for the manufacturers (Iqbal, 1991).

Silk cocoons

Silkworm rearing on mulberry leaves obtained from high-trunk trees grown in government plantations and farmlands is an old cottage industry in many rural areas. Only one crop of silkworms is reared during the spring season. About 40,000 packets (one packet contains 20,000 eggs) of silkseed imported from Korea and Japan are distributed each year among silkworm rearers, by both public and private agencies. About 13,000 families are involved in silkworm rearing. Total production of dry cocoons in the country is about 245 tons (RAPA, 1987).

Up to 600 kilograms of mulberry leaves are required to rear silkworms obtained from one packet of silkseed. Thus, 22,000 to 24,000 tons of mulberry leaves are consumed each year. Iqbal (1991) has reported that the value of the leaves required to rear one packet of silk seed is Rs200 to 300. The total value, therefore, is about Rs10 million, based on an average price of Rs250. Net return to the rearers is estimated at Rs1,140 per packet (Iqbal, 1991), generating a total net income of Rs45.6 million to the silkworm rearers in the country.

Silkworm rearing techniques are generally primitive. Consequently the yield is low. Moreover, a recent survey by Iqbal (1991) observed that silkworm rearing is mainly done by women but the extension staff of the sericulture sections of the Forest Departments are all men, who are unable to communicate directly with the women silkworm rearers. Therefore, there is an obvious opportunity to improve extension services by employing women extension workers.

The entire production of cocoons is processed locally on primitive hand-reeling machines. The raw silk is used as weft in the local weaving industry. The warp is imported.

Miscellaneous products

Soap-nut

Soap-nut, known as "retina," is a fruit of a tree (*Sapindus mukrossi*). Its pericarp contains saponin, which makes lather with water and is used as a substitute for soap. It is preferable to regular soap for certain articles such as flannel and silk clothes. Women use it as shampoo.

The soap-nut tree is cultivated in sub-Himalayan tracts up to 1,200 meters. People in Haripur (Hazara) grow the tree in their court yards and agricultural fields.

The tree starts bearing when 6 to 8 years old. It flowers between May and June and all the fruit ripens at once in November and December. The fruit is picked from the tree and dropped to the ground where it is gathered by other workers. Two people can collect the fruit of one tree in a single day. The wholesale price has risen from Rs5 per kilogram in 1988 to Rs10 per kilogram in 1990. The produce is often sold while still on the tree at Rs400 to 500 per tree. The purchaser is then responsible for collecting the fruits.

A recent survey in the village of Najafpur (Haripur) indicated that yields per tree are 50 to 100 kilogram (average 60.8 kilograms) and the number of bearing trees is between one and three per family (Iqbal, 1991). Total production in the country is estimated to be 250 tons. The number of families involved in collection is about 4,100 with a total value estimated to be Rs2.5 million, based on an average wholesale price of Rs10 per kilogram.

To expand opportunities in soap-nut production, the Forest Department should encourage cultivation through its watershed and social forestry programmes.

Walnut bark

Root bark of walnut (*Juglans regia*,) and sometimes even the stem bark is frequently used in the country as a tooth cleanser, particularly by women, as it imparts a pinkish colour to the lips. Removal of the bark, however, injures the trees. In extreme cases, it even kills them. Moreover, it is suspected that the bark is used in preparing fake tea, which is harmful to the health. For this reason, extraction of walnut bark has been banned by the government. It is still extracted by forest dwellers, however, for domestic use and for sale to visitors. Prior to the ban, the bark was exported to the Middle East.

The quantity of bark extracted each year is difficult to estimate due to the ban on its extraction and marketing.

Palosa gum

Gum collected from trees of *Acacia modesta* is locally known as "palosa." Palosa gum is eaten by women as a sweet. It is believed to restore vitality, particularly after child birth.

The tree grows in sub-mountainous tracts up to 1,200 meters. It starts producing gum after 4 or 5 years, when it yields about 0.06 kilograms of gum. Production increases with age until about 20 years, when it stabilizes at about 0.25 kilograms per tree per year. The gum oozes spontaneously from the stems and main branches in October and November and is then collected by hand.

A recent survey in the village of Sherawala (Haripur) found the number of *Acacia modesta* trees ranged between 2 and 200 per family (average 69). The quantity of gum obtained from these trees ranged from 1 to 20 kilograms per household (average 11.2 kilograms), of which 15 percent is estimated to be consumed within the household (Iqbal, 1991). The rest is sold for about Rs60 per kilogram, generating an average revenue of Rs571 per family. Production figures for the entire country are not available.

Basketry

Branches of *Tamarix dioica*, locally known as "lei" by the nomads living along the banks of river Indus are used for making baskets. The branches are cut during July and August and stored for the rest of the year. An average household, consisting of 5 working members makes 2,000 baskets each year. An average worker makes two baskets in a day. The baskets are made without tools. The number of households involved has been estimated to be 300. Therefore about 1,500 persons are involved in the process. Total annual production is estimated to be 600,000 baskets, consuming 2,000 to 2,500 tons of raw material each year.

The baskets are transported to the nearby towns where they are sold to the shopkeepers at an average price of Rs5 each. This produces a revenue of Rs3 million each year.

Neem leaves and seeds

Leaves of the neem tree (*Azadirachta indica*) are used by rural women as insect repellent. Layers of leaves are placed between woolen clothes to keep the moths away while storing them. The leaves also protect grain from grain pests during storage. At present there is no market for the product.

Neem seeds contain 40 percent of deep yellow fatty oil known as "margosa oil." It is effective in the treatment of leprosy and skin diseases and is used in pharmaceutical preparations, face cream, hair lotion, medicated soap, tooth paste, disinfectant and as an emulsifying agent in insecticides. The unrefined margosa oil is used as lamp oil. The seed cake is a good fertilizer and is said to keep white ants away from plants. All parts of the neem tree, including "neem toddy," the juice that exudes from the trunk spontaneously or through wounds, have numerous therapeutic uses in traditional medicine.

Unfortunately, the potential of this wonderful multi-purpose tree has only begun to be exploited, although it grows abundantly in the plains of Punjab, Sind, and the southern parts of NWFP. There is a need to re-introduce neem as a multipurpose tree through social forestry programs of the Forest Department and to harness its potential for supplying raw material for industry.

Conclusions and future directions

Use of the term "minor forest produce" has relegated NTFPs to an insignificant position among the priorities of the Forest Departments. Many products are not even included in the official statistics, with the result that little information is available regarding their production, uses, prices, and markets. Products which are not extracted by the Forest Departments, or on which no taxes are levied, have particularly been ignored. For example, official statistics say nothing about morels, despite the fact that the livelihood of millions of forest dwellers depend on them, and valuable foreign exchange (Rs130 to 150 million), is earned each year.

Consequently, the potential of NTFPs has never been fully exploited, either for the development of the forests or for the betterment of the people. Hardly any efforts have been made to develop these products and very little research support is available.

The positive side of NTFPs is that the products are a key component of the social fabric of forest dwellers and a significant source of revenue for poor people. Iqbal (1991) estimated that NTFPs contribute about 34 percent to the income of those involved in collecting and processing them.

NTFPs have real potential in watershed and social forestry programs in the Forest Departments of the country. The departments should be reorientated to include NTFPs as an alternative source of income for forest dwellers to wean them away from the destructive habit of using trees as a primary source of income.

This can be achieved only by adequate research leading to a better understanding of NTFPs. Extensive surveys of existing levels of NTFP production, marketing chains and end-uses are a good starting point.

[Neem \(*Azadirachta indica*\) provides a multitude of useful wood and non-wood products.](#)

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