The Kingdom of Cambodia occupies 18,153,100 hectares in the southwestern corner of the Indochina peninsula. In 1991, the population was an estimated 9.3 million with an annual growth rate of 3.3 percent. Cambodia has a total forest area of about 13.829 million hectares and it is losing 310,000 hectares per year through deforestation. Cambodia’s *per capita* GDP is between US$ 150 and US$ 200 annually (Dennis & Woodsworth, 1992).

Cambodia has very little industry. It also lacks management and harvesting expertise and adequate statistical data on forest products. These deficiencies limit Cambodia's effective utilization of non-wood forest products (NWFPs).

**Historical development of NWFPs**

NWFPs have been used widely since at least the 11th century during the reign of His Majesty King Suryavarman II, the most powerful King in the country's history. Among the main NWFPs were kingfisher feathers, elephant tusks, rhinoceros horns, beeswax, cardamom, gamboge and lacquer.

People in the remote mountain areas collected elephant tusks from freshly killed or naturally deceased elephants. Beeswax was found in hollow trees or branches, with some honeycombs weighing as much as 50 pounds. Rhinoceros horns that are light coloured and veined were most highly prized. Cardamoms were grown in the mountains by the aborigines. Gamboge, a resin taken from a special tree, was harvested by scoring the bark a year in advance and leaving the sap to ooze slowly until it was harvested the next year. Lacquer gum, which grows on the branches of a special tree, has the form of an epiphytic mulberry and was difficult to harvest. Ladies made from coconuts were used for serving soup and rice. Skins of tigers, panthers and deer, as well as rattan and bamboo mats were used as floor or ground coverings.

**Bamboo**

Bamboos grew wild and were also cultivated. Species such as *Bambusa flexuosa* were used in construction and to produce household handicrafts. *Bambusa burmanica*, a wild bamboo with a diameter of 15-18 centimeters, was used for making rafts, fishnets, storage pots, baskets, etc. Bamboos were also used for manufacturing pulp and paper. In 1961, a pulp and paper factory was established in Chlong Kratie province and it consumed 50,000 cubic metres of bamboo a year. Total production of pulp increased from 1,607 tons in 1961 to 3,695 tons in 1967 and 4,582 tons in 1968. Bamboos were also exported, the largest amount being 36,000 cubic metres in 1944. In 1989, production was estimated to be 173,000 stems.

**Rattan**

There are two mains species of rattan in Cambodia, piidau (*Calamus viminalis* Will) and ropeak (*Calamus salicifolius* Becc). They were used to make chairs, tables and other household items. Rattan exports were estimated to be about 100 tons annually (excluding illegal exports), representing most of the production.

**Lianas**

These climbing vines have always been used by forest dwellers as fasteners for fish traps, fishnets, chairs and
Chor Tuk resin

Chor tuk resin is used to soak wood which is used to make floors, boats and furniture. National production was about 334 tons in 1955, 642 tons in 1960, 6,278 tons in 1967 and 1,317 tons in 1968. It is estimated that about 50 tons of resin was extracted in 1994. The villagers living in or near forests traditionally gather resin by scoring a hole in the trunks of trees, especially those Dipterocarpus species known to produce the best oleo-resin. The hole, which is about 30 cm by 30 cm wide and 5 cm deep, is fired with burning leaves and dry twigs to stimulate the flow of resin. Exudation continues for three or four days, after which the gradually drying resin will stop flowing. At every collection, usually done at the end of the rainy season, fire is applied to melt down the clogging resin. Trees can be tapped from about 20 years of age and they provide at least 30 liters of resin per year for 50 to 60 years.

Hopea resin

This tree resin produces a pale colourless oil which is locally used for caulking boats and baskets. Hopea odorata produces a lower quality oil.

Chor Chong resin

This resin is gathered from the chor chong (Shorea vulgaris) tree and phchek (S. obtusa). The trees exude it where they are damaged by broken branches, insects or other mechanical injuries. The resin is collected from the branches or from the ground beneath the tree. It is sold in pieces or in powdered form. It is used to make torches by combining it with the leaves or bark of rear mangrove trees. It is also used for caulking boats and baskets. Annual production averaged about 125 tons, although there were wide variations from 25 tons to 923 tons (the highest amount in 1968). It is estimated that about 10 tons of resin were extracted in 1994.

Lacquer

Lacquer is extracted from the kroeul tree (Melanorrhoea laccafera). Axes are used to cut the trunk or branches. The gum exuded is mixed with the resin of Dipterocarpus sp. until it becomes hard. Annual production was about 40-50 tons, although in 1989 it went as high as 300 tons.

Laka resin

Laka resin, also known as stick lac or chor leak, is created by the insect Carteria lacca, which masses on young branches of a number of trees common in Cambodia, including sangke (Combretum quadrangularis), pou (Ficus religiosa), pongror (Schleichera oleosa), reang phnom (Pentacme siamensis) and snuol (Dalbergia nigrescens). Most lake resin is extracted at two-year intervals in the southern part of Phnom Penh from insects on sangke trees planted along rice field dikes. Total production was about 27 tons in 1967.

Chor Rung resin

The bark of chor rung trees (Garcinia hamburyi) is cut for gum. Forest dwellers use bamboo pots to store the gum, which later becomes hard and crisp. Up to 10 tons were exported annually.

Bark

The bark of Dipterocarpus and Shorea species can be readily peeled off in large pieces and is sometimes used for the walls and floors of native huts. The chopped bark of Shorea cochinchinaensis is put in sugar palm juice to prevent the growth of microorganisms before it is boiled to make sugar. The bark of Hopea odorata has a high tannin content and is used in tanning.

Sandalwood

Collecting sandalwood resin from the khlem chan krassa tree (Aquilaria crassna) is a traditional activity of the Pore people living in the Kravanh mountains. The resin is used to make incense. Exports of 50 tons a year were made in the latter part of the 1960s.

Medicinal plants
Sleng (*Strychnos nux vomica* L.) is a lowland plant whose seeds contain a toxic strychnine alkaloid. The seeds were exported to Europe and China at an average annual rate of about 425 tons from 1958 to 1967.

Seeds from the krabao tree (*Hydnocarpus anthelmintica*), which grows wild in dense forest and along flowing water in valleys, contain a toxic oil used to treat leprosy. They were sold to (then) South Vietnam and Singapore.

The bark from preah phnov (*Terminalia nigrovelumosa*) was exported as raw material for pharmaceutical products to treat diarrhea. Three thousand tons were exported in 1967.

**Beeswax and honey**

In the forests there are two types of bees, one which rests in tree trunks and the other on branches. Beeswax from those living in tree trunks is preferred. Fifty tons of wax were exported to (then) South Vietnam in 1968. A further 50 tons was used domestically to produce candles and in small-scale manufacturing.

**Turpentine**

Turpentine is tapped from *Pinus merkusii* trees, which are distributed over the 10,000 hectares of the plain of Kirirom at an altitude of 700-800 meters. A refinery operated before the war, although production was variable. A sawmill was also established to produce sawn timber for exports, particularly to Japan and Hong Kong.

**Current status of NWFPS**

After 1979, people returned to homes which had been badly damaged by war. They needed shelter, household facilities, furniture, etc. to start their new lives. The fastest and cheapest way to meet such needs was to encroach on the forest. Simultaneously, there were increased demands from forest product dealers for timber, fuel wood, and NWFPs such as rattan, bamboos, resin, sandalwood, medicinal plants, - wild animal products, honey, wax and lac. These products were used for domestic and export markets. There was considerable illegal export of many products and this makes its difficult to calculate accurate statistics. NWFPs which are smuggled across the border include: python skin, tortoiseshell, sandalwood oil, crocodile, elephant tusk, horn, and rattan.

**Policy**

From 1980 to 1993, the forest policy focused on timber logs being extracted from rainforests. NWFPs were only being exploited by individual families, with activities distributed across most of the provinces with forest resources. From 1980 to 1993, round logs were one of four major national economic targets, and they provided a means for generating hard currency. Exports were to the former socialist countries of Vietnam, USSR, East Germany, Czechoslovakia and to some other countries, such as Thailand, Hong Kong, India, Japan, Taiwan, and Lao PDR. The Department of Forests and Hunting was responsible for meeting production planning targets (averaging about 107,000 cubic metres annually between 1981-89). There was no forest policy concerning the harvesting, utilizing or industrialising minor forest products.

The Royal National Government then decided to support and promote an active conservation policy regarding Cambodia's natural resources. The Royal Decree of 1 November 1993 adopted 23 sites (totaling 3.4 million hectares) for protection, including 7 national parks, 10 wildlife sanctuaries, 3 important landscapes, and 3 multiple-use sites. These 23 sites are under the supervision of the Ministry of Agriculture, Forestry and Fishery, and the Secretariat of Environment.

**Constraints**

One constraint concerns the adequacy of staffing and infrastructure. The Department of Forests and Hunting was reorganised late in 1979, after the period of the Pol Pot regime. During that regime, all kinds of forestry infrastructure were burned down, and about 97 percent of the resource people were killed. In 1980, only three professional forestry staff remained, with seven technical officers and ten vocationally trained workers. Recruitment of new staff began at once and some of them were trained within 45 days.

The capacity for developing NWFPs is very limited due to insecurity caused by the last 30 years of civil war.
This has led to institutional weaknesses, lack of skilled personnel, and unsatisfactory exploitation of forest resources, without technical support and sustainable management practices. There is also an unstable political situation, confusion of roles and responsibilities, and low pay. These factors encourage illegal activities and anarchy.

Conclusion

Cambodia has significant natural resources that could supply its people and foreign investors with many kinds of raw materials for social, cultural and economic development. While Cambodia has the potential to manage its NWFPs wisely, the last 30 years of war have seriously depleted the necessary forest infrastructure. Management is further complicated by illegal activities, corruption and the ignorance of some relevant players. There is an urgent need for the Department of Forests and Hunting to survey the flow of NWFPs from the forests and the social and economic impacts and potentials for NWFPs. Such a survey could produce hard data and form a background for developing solutions to many inter-related economic and environmental issues.

References