FRM 508 LECTURE NOTES

UTILIZATION OF FOREST RESOURCES

BY

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INTRODUCTION

The forests are one of man's very important natural renewable resources. They can be used for recreation, for conservation and for utilization of the products obtained from them. For recreational use, the forests are made into sanctuaries and national parks, where people walk, picnic, and enjoy a change of surroundings from the city. Forests conserve naturally the soil, the water, the flora and fauna. Man does not have to do much to keep this going, other than not to destroy the forest, or not to replace it after use. The purpose of the forests, in which the foresters should be most interested, is its total utilization. This means the various uses to which the forest produce can be put (Fig. 12.1). By far the largest amount of things sold from materials taken from the forest are made of wood in one form or another (Fig. 12.2). Studying the journey from wood in the forest to an article or material which can be sold to the public, is completed in three steps:

- Learning about the properties of wood.
- Learning how to decide that one kind of wood is best for a certain kind of product.
- Learning the various operations and processes that have to take place in order to change the wood from the forest into the article or material that will sell to the public.

This is accomplished with the study of Timber Harvesting, Wood Anatomy, Wood Technology, Forest Industries and marketing; each of which is a specialized subject of Forest Utilization.

Fig. 12.3 explains the holistic approach of the forest resource utilization.

DEFINITION

(i) *Forest Utilization* is a branch of forestry concerned with the harvesting, conversion, disposal and use of forest produce.

(ii) It is that branch of Forestry which deals with the most advantageous and suitable methods of collecting/harvesting, converting, and disposing profitably of forest produce in accordance with the results of experience and study,

consistent with the strictest rules of forest culture, the most complete satisfaction of our wants and the securing of highest possible profit.

Forest Produce: All material yielded by a forest estate. It may include earth, stone, gravel and minerals. It is classified as:

(1) Major Forest Produce – timber, smallwood and firewood, and

(2) Minor Forest Produce – all forest produce, other than major forest produce, including grass, fruit, leaves, animal products, soil and minerals. Also known as Forest Produce other than wood or Non Timber Forest Produce.

Subject Matter: Forest Utilization can be dealt under following heads:

I. Harvesting and Conversion of Wood – Utilization of Major Forest Produce.
II. Utilization of Non Timber Forest Produce.
III. Labour Organization, Modes of Sale and Disposal of Wood and other Forest Produce.

UTILIZATION OF NON TIMBER FOREST PRODUCE

Non timber forest produce also known as Minor Forest Produce, includes all kinds of forest produce other than timber and firewood; it comprises animal, vegetable, and mineral products, and is therefore very varied in kind as well as in value. M.F.P of N.T.F.P. can be dealt under the following heads:

(1) **Grasses, Bamboos and Canes**

Grasses: The main uses consists of:

Grazing: Domestic and nomadic grazings (Cattle, sheep, goats, horse, camel, etc.)

Cut Fodder: Green grass, hay, and ensilage

Fibre-yielding and thatching grasses: Used for cordage, matting, paper and rope making, basket works, aromatic scented mats, roof thatches etc.

Grasses from which oils are distilled: Oils and scents obtained from distillation are used in perfumery and soap making, as tonic and medicines.

Bamboos: The bamboos are an important source of revenue and are used for a wide variety of purposes both locally and on commercial basis, ranging from house posts to fountain pens. Their qualities are – strength, straightness, light weight, hollowness, ability to split and local availability. The common use being roofing rafters, walling, flooring, matting, spear and lance-shafts, sticks, lathis, masts, spars, tent poles, furniture, water pipes, cart shafts, basket and wicker works, musical instruments, paper pulp, fans, umbrella handles, toys, brushes, containers, drinking vessels, fishing rods, fishing traps, paintings, bows and arrows etc. Bamboo leaves are a good fodder, relished by cattle, horses and elephants. Bamboos are also a source of food. Young shoots and rhizomes are pickled and eaten.

Canes: Also known as rattans are the stems of climbing palms belonging to the several genera of the Palmaceae. Of these, Calamus constitutes the important group. The canes are pliable, strong, and of long length. They are used for twining of logs and timber, tying up of rafts, basket, sieves and mats making, walking sticks, polo sticks, umbrella handles, cane furniture, picture frames, chair and table canning, wicker works, ropes and cables in suspension bridges, sports goods. The refuse from split cane is used for stuffing, packing rough cordage, matting and similar articles.

2. Minor Produce from Stems and Roots of Trees and Other Plants

It includes a large number of useful products obtained from the wood, bark, and roots of trees and other plants as user:

Fibres: used in rope making, textile purposes, spinning, paper making, jute making etc.

Tans: found in bark and young wood, certain fruits and leaves, and also in the galls formed on leaves and stems by insects; used as tannin, tannic acid for tanning of raw hides to make leather after colouring/ dyeing, and for manufacture of ink.

Dyes: Obtained from the bark, wood, and in some cases the roots, of many trees and other plants. Tannic acid combined with salts of iron gives a back, grey, purple, or green colour. Brown, blue indigo, violet, black, deep red, mauve, yellow, purple dyes are produced from several plants.

Cutch and Kath: From the heartwood of Acacia catechu three different substances are obtained, namely:

(i) Cutch – a rusty brown or dull orange colour, brittle texture, and with a shining fracture, used as a dying agent.
(ii) Katha – a grey coloured crystalline substance, used in medicine as an astringent and eaten with betel leaf and nut.
(iii) Keersal – a pale crystalline substance occurring as a deposit in the heartwood, and cavities in the wood, valued as a medicine.

Oils And Other Products of Distillation: These include Teak Tar, Rusa-Grass Oil (Cymbopogon martini), Sandalwood-oil (used in perfumery and medicine), Cedar-oil (used for skin diseases and rheumatism), pine-tar and oil (used as insect repellent), eaglewood (used as burning incense), neem-oil (a germicide used for soap making, tooth paste, mosquitoes killers, etc.)

Starchy Products: obtained from the ineer soft issue of the stems of certain palms, cycades, sago palm; tubers or corms of many plants like yams etc.

Drugs And Spices: used as febrifuge and stimulants, astringent, tonic, medicine, aromatic stimulant, quinine, alkaloids, spices for cooking, poisons, perfumes, insect repellent.

Miscellaneous Products: Back, roots and chopped stems of several species are used to poison fish. Milky juice of some plants being poisonous are used on arrow tips to kill game. Grewia barks are used in clarifying sugars; Betula barks are used as writing papers, packing material, umbrellas, roofing houses, and other purposes, Slow-matches, or fuses, are made from the backs of Careya arborea, Bauhinia racemosa, Cordia myxa, Butea frondosa, Ulmus wallichiana, and other species.

3. Leaves

Leaves of trees and other plant are used for various purposes such as fodder, litter and manure, thatching, tanning and dying, and miscellaneous uses (cordage fibres – rope making; leaves and leaf-stalks – mat, fan and basket making; leaves – for umbrella, cups and plates making; Leaves oil-stimulant, medicines, embrocation, soap, disinfectants, etc.; purgatives, insect repellents, etc.).

4. Flowers, Fruits And Seeds

Flowers, fruits, and seeds yield some of the most important minor forest products such as:

Edible Flowers, Fruits, and Seeds.

Flowers, Fruits, and Seeds yielding Oil and other Extracts.

Flowers – extraction of perfumes, scented oil.

Seeds – oil for cooking, lighting, burning, soap making, medicines for skin disease, tonic, lubricating the machines, wax for candle making etc.

Tagua nut – a fruit of a tropical palm tree (Phytelephas aequatorialis) is also known as vegetable ivory. It is an ivory-like seed that is used to

make buttons, jewellery, chess pieces, carvings, and other arts and crafts activities.

Flowers, Fruits, and Seeds yielding Tans and Dyes – Myrabolans (Tanning and dyeing).

Fibre – Yielding Fruits : flosses or silk cottons used for stuffing pillows obtained from Cochlospermum gossypium, Bombax ceiba, Eriodendron anfractuosum, Calotropis gigantean. Coir fibre largely used for ropes, mats, and other purposes – obtained from the thick fibrous rind of the coconut.

Miscellaneous Uses of Flower, Fruits, and Seeds:

Drugs – as verifuge, tonic, febrifuge, purgative, laxative, antidysentery.
Cardamoms – aromatic drugs, spices for flavouring.

Flower heads – acrid-used as stimulant, fish poison: soapnuts used as substitute for soap.

Fruit pulp – viscid pulp used as gum in book binding, for paying the seams of boats.

Marking – nut tree – corrosive juice used as marking ink.

5. Exuded Products

Exudes are usually in a liquid or semi-liquid state, from natural or cut surfaces of stems or other parts of plants; these products, some of which are of great value, may be divided into:

(i) *Gums and resins*: Gum is a more or less viscous substance which exudes from cracks or wounds in the bark of many trees, shrubs, and climbers. It is degradation products of the cell-wall, and occur chiefly in the cortex. Gums are largely used as mucilage, in cloth and calico printing, dyeing, sizing paper, shoe making, confectionery, medicine, water-colour paints, caste-marks, dyeing silk, incense, and for other purposes.

Resins, like gums, are degradation products of the cell-wall, but also occur as derivatives of starch. Resin from pines and dipterocarps is extracted commercially. Resins are insoluble in water, but are soluble in alcohol: they are inflammable, burning usually with a smoky flame, and are divided into three classes:

(a) True Resins, which may be hard or soft.
(b) Gum-Resins, which contain a gum soluble in water.
(c) Oleo-Resin, containing an essential oil.

Pine resin-tapping has gained immense export market potential for Rosin and Turpentine. Rosin is used chiefly in soap-making, for sizing paper, soldering, and in the manufacture of sealing wax, varnishes, cements, and ointments. Oil turpentine is largely used in the preparation of paints and varnishes, as well as in medicines.

Dammar is a trade name given to a certain group of resin. The true dammar is obtained from Agathis loranthifolia. Various types of dammars are:

Black dammar : Obtained from Canarium strictum, used for varnish.
Sal dammar : Obtained from Shorea robusta
Rock dammar : Obtained from Hopea odorata, used for varnish
White dammar : Obtained from Vateria indica, used for varnish
Green dammar : Obtained from Shorea tumbuggaia, used for Varnish
Pwenyet dammar : Collected by bees of the genus Melipona (Trigona from Hopea odorata and various Dipterocarps trees, used for caulking boats.

(ii) Caoutchouc abd gutta-percha: Caoutchouc is a hydro-carbon, milky latex of a large number of plants belonging chiefly to the

families Euphorbiaceae, Urticaceae, Apocynaceae, Asclepiadaceae. It is raw material for rubber production.

Guttapercha is a soft plastic substance obtained from various species of the family Sapotaceae, like Palaquium gutta. It is largely employed in the manufacture of submarine cables.

(iii) Sugary sap: It is yielded by various species of palms, the chief of which are the Coconut palm (Cocos nucifera), the Toddy palm (Borassus flabellifer), the Sago palm (Caryota urens), Arenga ssaccharifera, Nipa fruticans, and the wild Date palm (Phoenix sylvestris). The sap obtained from these palms is used for drinking, either fresh of after being fermented into an intoxicating liquor, vinegar is also made from the fermented sap, while the juice is larly employed for boiling down into raw sugar known as jaggery or gur, which is further refined into sugar.

6. Animal Products, Including Hunting, Fishing, Insect Ranching.

The most important animal products concerning forestry are (1) Lac, (2) Silk, (iii) Honey and wax, (iv) Hides, horns, bones, and ivory, and (5) Certain miscellaneous products. Under the head of animal products may also be included hunting, fishing and elephant-catching.

Lac: It is a resinous incrustation on the twigs of various tees produced by a minute Hemipterous insect called Tachardia lacca of the family Coccidae. Commercially it is known as shellac, being used in the manufacture of varnishes, cements, sealing wax, lacquer work, lithographic ink, gramophone records, etc.

Silk: It is the fibrous substance obtained from the cocoons of various moths, the larvae of which are popularly known as silkworms are divided into two divisions, the domesticated or mulberry-feeding and the wild or non-mulberry-feeding silkworms.

Honey And Wax: Honey and wax, produced by many different species of bees, form an extensive item of minor forest produce. Honey is used as food and medicines, while wax is used for making candles, polishing

wooden floors, in the manufacture of sealing wax, and for many other purposes.

Hides, Horns, Bones, And Ivory: The hides are used as leather and leather products. The trade in horn is principally an export one, the chief uses of horn being for the manufacture of combs, buttons, drinking cups, and other minor articles. The antlers of deer are used for the manufacture of the handles of knives, sticks, and umbrellas, and for various small fancy articles. The trade in ivory, obtained from the tusks of elephants, consists of export quality fancy materials. Bones are used as bone meal for manure, knife handles, buttons, and other small articles.

Miscellaneous Animal Products: These include honey-dew, shells (burned to lime and used in betel-chewing), bat's-guano (used for the manufactire of saltpeter), Edible bird's-nests (composed of gelatinous substance, are much prized by the Chinese as an article of food).

Hunting: Game Animals – Carnivora, Herbivora – Goat Antelope Group, Deer Group, Wild Boar, Hare;
Game Birds – Terrestrial Birds (Pheasants and Fowl Group, Partridge and Quails Group, Doves and Pigeon Group); Acquatic Birds – Ducks, Teals, Goose, and Cranes.

Fishing: Forest streams and rivers provide adequate opportunities for fishing, which is an important source of food and revenue.

Elephant Catching: The capture of wild elephants for the purpose of training them to work in captivity is carried on in many countries of Asia and Africa. They are used as draught animals for various forestry operations.

Insect Ranching: World trade in butterfly and other insects is a very lucrative business. Recent conservative estimates were US $ 20-30 million per annum. In PNG the first example of successful butterfly ranching was the development of the birdwing industry. The Insect Farming and Trading Agency (IFTA) based in Bulolo paid US $ 180,000

to local collectors and farmers between 1978 – 1981. Today this figure is estimated to be US $ 250,000 per annum.

7. Mineral Products

Among mineral products of the forest may be mentioned building-stones, road-metal, gravel, clay, slate, limestone for burning, mica, laterite, sand, and other mineral products. These may be collected by (1) Mining, (2) Quarrying, (3) Collecting off land covered with tree-growth, (4) Collecting from beds of streams; Revenue from mineral products may be obtained either by leasing on fixed payment or leasing and charging royalty on the outturn by weight, volume, or market value.

8. Miscellaneous Minor Produce including Orchids and Mushroom

This includes certain species of edible fungi (Mushrooms), lichens, soda carbonate, pearl-ash etc.

Mushrooms : Large quantities of edible fungus known as morel (Morchell exculenta) is exported to various countries and fetch good price. World trade in mushrooms is a thriving enterprise, especially in Japan, where Shiitake (Lentinus edodes) alone has a production value of US $ 28 million in 1987. Shiitake mushrooms occur naturally in PNG, Australia and SE Asia. In the year 1993 dried Shiitake were sold in Port Moresby for US $ 10 per kilogram.

Lichens : It is used medicinally, and also in the preparation of dyes like litmus and orchid.

Barila : It is a carbonate of soda obtained from the ashes of certain saline plants.

Pearl-ash : It is a form of potassium carbonate obtained from the ashes of a large number of plants.

Orchid : Its flowers are in great demand in western countries and a healthy export market exists. Orchid faming has taken off in many

countries. In Japan, the industry earned more that 4.4 billion Yen in 1987. PNG is a richest country in the world for its varied orchid species. Presently, 2,751 species from 134 genera have been recorded from Papua New Guinea. There are many more species yet to be discovered. Though some genera have been listed as protected species and banned for export, many orchids are taken out of the country by private collectors, who pay the local collectors only one tenth of the market value. It has great potential for artificial propagation and hybridization in near future.

It is a purposeful travel that creates an understanding of cultural and natural history, safeguarding the integrity of the ecosystem and producing economic benefits that encourage conservation. PNG have vast potential for ecotourism.

III LABOUR ORGANIZATION, MODES OF SALE AND DISPOSAL OF WOOD AND OTHER FOREST PRODUCE

The whole subject of Forest Utilization depends on the methods employed in collecting and disposing of the various articles of forest produce in such a way that the forests yield the highest possible income compatible with the maintenance and improvement of the forest. It is therefore necessary to acquire some general knowledge about forest labour and various methods of disposing forest produce. This may be considered conveniently under heads:

1 The Organization of Forest Labour.
2 Methods of sale.
3 System of extraction and disposal of forest produce.

1. THE ORGANIZATION OF FOREST LABOUR

The people of the various jungle tribes make the most satisfactory forest workmen, as they become skilled in woodcraft and in the use of axes or other implements from childhood. While they are move accustomed to the climate and hardships of the jungle than men brought in from outside; the tribal labour is not always to be relied on, owing to the laziness ofter born of a life of freedom in people whose

wants are few. Where local labour is not available, it is imported from outside which increases the cost. For ordinary forest works local unskilled labour can do the job whereas for specialized work, labour may have to be imported.

Classification of Forest Labour: They are of three types.

*Local labour*s are generally unskilled, casual and fluctuation. They may be used to carry out works such as road construction and repairs, departmental burning, nursery works, cultural operations, sawing, planting, trenching, resin tapping etc. Strict supervision is necessary to ensure reasonable output.

Importee labour are acquired when local labour is inadequate or unskilled for specialized jobs and skilled labour with experience of specialized jobs such as saving, floating, roping, felling work, resin tapping, katha extraction, etc. is required. Imported labour means extra transport cost and higher compensatory wages. But they are more efficient workmen. Labour is either imported by the Department through contractor on commission basis or recruited directly by contractors engaged by the department.

Forest Village or Settlement : For large scale, concentrated plantation work employment of permanent labour gangs (settled in forest villages) is justified. In taungya plantations in India and irrigated plantations in Pakistan, there are regular settlements of forest labour, where the department has provided them several amenities, e.g. housing, agricultural land, medical aid, schooling etc.

Wages : Wage level is a result of evolutionary process, and reflects the impact of several economic factors like supply and demand of labour, standard of employment, cost of living and food supplies, proximity to industrial centres, etc. Skilled labor has to be paid more than the unskilled labour as also the imported labour more than the local labour. Work is generally carried out either under the direct supervision of an employee of Government, or of the owner of the forest, or by contract.

System of payment to labour : It is of three types, namely:

(A) Payment by daily labour.
(B) Payment by piece – work (per unit of work done).
(C) Payment under contract.

2. METHODS OF SALE

The chief methods under which sales are conducted, are:

1. *Sale by private bargain* – the price is fixed according to the current market rates, or on the average of past sales.
2. *Sale by public auction* – it is sale by increasing the price; the bidder of the highest price becoming the purchaser.
3. *Sale by tender* – would be purchasers make offers on or before a fixed date, stating the price they are willing to pay. Such tenders are of two kinds, sealed tenders and open tenders.
4. *Sale by royalty or fixed tariff* – the disposal of forest produce is governed by fixed prices, being revised from time to time as conditions change. The tariff prices are fixed as nearly as possible with due regard to current market rates.

3. SYSTEM OF EXTRACTION AND DISPOSAL OF FOREST PRODUCE

To decide a particular system of extraction and disposal of forest produced, the following points need consideration.

1. The maintenance and improvement of the forest.
2. A fair remuneration to the state of forest owner.
3. The prevention of theft or fraud on the part of purchasers or forest employees.
4. The safeguarding of the interests of the local population.
5. The avoidance of unnecessary complication in the system rendering it unworkable, or unintelligible to those who have to carry out the details.
6. The physical conditions of the locality

7. The number and qualifications of the staff responsible for carrying out the work.
8. The capability of financial standing of the contractors or purchasers whose duty it is to extract the produce.
9. The quality and quantity of labour available.
10. The general policy of the Government, particularly as regards the encouragement of private enterprise.

Based on above considerations, the system of exploitation fall into three main groups, as under:

1. Felling and extraction, or collection, by Government Agency.
2. Felling by Government Agency and extraction by purchasers.
3. Felling and extraction, or collection, by purchasers – the methods under which timber and other forest produce may be disposed of to purchasers are grouped into four main heads:

(a) Sale of a whole coupe or area: - Sale by lease.
Sale of standing trees by coupe.

(b) Sale of a few selected trees

(c) Sale by means of licenses or permits

(d) Sale by the commutation system – payment of a fixed sum once in a fixed period, usually a year, in return for the privilege of being allowed to remove certain classes of produce (petty forest produce required for bonafide domestic use, and not for same or barter) at any time and as often as is necessary.

(e) Extraction without previous permit or agreement:

- the forest produce collector pays duty at a revenue station on the line of export, receiving a receipts for the amount paid in the shape of a removal pass.
- An export duty is collected at seaport towns.

In the case of private forests this classification holds good, except that the owner's agency takes the place of Government Agency.

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