PRACTICAL MANUAL

Non Timber Forest Products

FPU 329 3(2+1)

B.Sc. (Hons.) Forestry VI Semester

Dr. Amey S Kale
Dr. V.David Chella Baskar
Dr. Jahangeer A. BHAT

2021

College of Horticulture & Forestry
Rani Lakshmi Bai Central Agricultural University
Jhansi – 284003

Syllabus: FPU 329 Credit Hrs.3(2+1):

Visit to nearby forests to study important NTFP yielding plants. Study of fodder: grasses and leaves. Study of canes and bamboos and their sources. Study of essential oils and their uses. Study of gums and resins and their collection. Study of plant yielding drugs, spices, wild fruits, poisons and bio-pesticides and their collection from nearby forests. Visit to nearby extraction units. Visits to timber produce and NTFP markets to collect price data and quantity sold and to observe auctions and competitions. Library review of studies on marketing and trade of timber forest produce (teak, rosewood, *Terminalia spp. Pterocarpus* and other important timber of national importance etc.). Analysis of price and quantitative data of timber forest produce, NTFP for examining trend; seasonal, cyclical variations. Development of hypotheses to study the marketing of forest produce. Presentation of results on analysis of price and quantity.

Name of Student .....

Roll No. .....

Batch .....

Session .....

Semester .....

Course Name: .....

Course No. : .....

Credit .....

Published: 2021

No. of copies: ……..

Price: Rs.

CERTIFICATE

This is to certify that Shri./Km. .....ID No..... has completed the practical of course.....course No. ..... as per the syllabus of B.Sc. (Hons.) Agriculture/ Horticulture/ Forestry ..... semester in the year.....in the respective lab/field of College.

Date: Signature of Instructor

INDEX

Exercise no.	Title of the Exercise	Remarks	Sign.
1.	To study about gum and resin yielding trees		
2.	To study about methods of resin tapping and collection		
3.	To study about fodder trees and grasses		
4.	To study about Dyes and Tannins yielding plant species		
5.	To study about canes and bamboos and their sources		
6.	To study about drug yielding plants		
7.	To study about methods of essential oil extractions		
8.	Visits to local NTFP market		
9.	Visit to timber market		
10.	Field visit to identify important NTFP yielding plants		
11.	To study about analysis of price and quantitative data of timber forest produce		
12.	To study about valuation of timber and NTFP (existence value, use and option values, intrinsic value etc).		
13.	To develop hypotheses to study the marketing of forest produce		
14.	Presentation of results on analysis of price and quantity		
15.	To study economics of processing pulp to paper/poly fiber; wood to plywood/veneers		
16.	Presentation of Marketing channels for NTFP		
	Appendices		

Practical No. 1

Objective: To study about gum and resin yielding trees

Introduction: ……

……

……...

……...

……...

……...

……...

……...

Gums & Resins: ……

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

Uses of Gums and resins:……

……...

……...

……...

……...

……...

……...

Sr. No.	Trade Name	Botanical Name	Family
Gum and Resin Yielding trees in India			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.			
26.			
27.			
28.			
29.			
30.			

Practical No. 2

Objective: To study about methods of resin tapping and collection

Practical No. 3

Objective: To study about fodder trees and grasses

Sr. No.	Common name	Botanical Name	Family
Fodder Trees			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
Fodder Grasses			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.			

Practical No. 4

Objective: To study about Dyes and Tannins yielding plant species

Sr. No.	Common name	Botanical Name	Family	Plant part from dye/ tannin obtained
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				

Practical No. 5

Objective: To study about canes and bamboos and their sources

Practical No. 6

Objective: To study about drug yielding plants

Sr. No.	Common name	Botanical Name	Family	Use
ROOT DRUGS				
1.				
2.				
3.				
4.				
5.				
Bark Drugs				
1.				
2.				
3.				
4.				
5.				
6.				
7.				
Flower, Fruit & Seed Drug				
1.				
2.				
3.				
4.				
5.				
6.				
7.				
Leaf Drugs				
1.				
2.				
3.				
4.				
5.				
6.				
7.				

Practical No. 8

Objective: To study about methods of essential oil extractions

Practical No. 8

Objective: To visit local NTFP market

Practical No. 9

Objective: To visit timber market

Practical No. 10

Objective: Field visit to identify important NTFP yielding plants

Practical No. 11

Objective: To study analysis of price and quantitative data of timber forest produce

To quantify the NTFPs which was calculated in terms of mean annual values

am=$Qm*Vu$,is mean annual value

$Qm$is mean annual quantity of NTFPs collected per household (Kg)

$Vu$is unit value in

The following discounting formula was used to estimate the economic value of NTFPs that was expressed in terms of annual present value (PV):

$$\mathrm{PV} = \frac{[(1+r)]n^{-1}}{[(1+r)]}$$

PV is present value of NTFPs

a is the estimated annual actual value of NTFPs

Products	Units	Mean annual quantity	Value
Firewood	Head load		
Medicinal plants	Kgs		
Honey	Litres		
Mahua flowers	kgs		
Gum	Kgs		
Shatavar roots	kgs		

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

Practical No. 12

Objective: To study about valuation of timber and NTFP (existence value, use and option values, intrinsic value etc).

Practical No. 13

Objective: To develop hypotheses to study the marketing of forest produce

- To expose the students on the concepts of Marketable and Marketedsurplus
- To introduce the students on the methods of estimating the marketable and marketedsurplus
- To highlight the significance and the relationship between the marketable and marketed surplus.

The information on area under crops cultivated, quantity requirements for different purpose and quantity sold by the farmer Mr.Y is given below.

Tree crop	Area (ac)	Total Production (Q)	Seed requirement (Q)	Consumption requirements (Q)	Requirement for livestock (Q)	Requirement for artisans (Q)	Quantity Sold (Q)

Given this information, estimate the marketable and marketed surplus of the different tree species and give inference.

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

……...

Practical No. 14

Objective: Presentation of results on analysis of price and quantity

To analysis the price and quantity of forest products and to know about the Price discovery

1. Collect data on Arrivals and prices for various agricultural commodities and analyse the relationship and behaviour of arrivals and prices using above method ofanalysis.

1. Name of Commodity……..

2. Name of market…….

3. Selling quantity of commodity……..

4. Time of arrival commodity……

5. Time of selling…….

6. Price of commodity at arrival time ……

7. Price of commodity at selling time……

8. Price of commodity at occasion time……..

9. Other Information …….

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

Practical No. 15

Objective: To study economics of processing pulp to paper/poly fiber; wood to plywood/ veneers

To know the production cost and to know the cost involved in processing pulp to paper

S. No.	Particulars	Unit	Qty.	Unit Rate (Rs.)	1st Year	2nd Year	3rd Year	4th Year	Total
A.	**Cost of Planting**								
1	Cost of initial ploughing	Hrs							
2	Alignment and Digging of pits	MD							
3	Application of manure (Incl. cost	L S							
4	Cost of Clones	Nos							
5	Refilling of pits, planting and Channelformation	MD							
6	Causality replacement	MD							
7	Seedling cost	Nos							
B.	**Cost of Maintenance**								
1	Irrigation and Protection expenses	Months							
2	Soil working and weeding	MD							
C.	**Fixed Expenses**								
	Depreciation of farm implements andbuildings								
	Rental Value of owned Land								
	Imputed value of family labour								
	Interest on Fixed Capital other than Land								
D.	**Yield**	**Ton**							
	Price (Rs./ton)	**Ton**							

Practical No. 16

Objective: Presentation of Marketing channels for NTFP

GUMS AND RESINS

Natural Resins: Resin secretion occurs in special cavities or in many plant species. They are formed in the specialized structures called passages ducts. Resins exude or ooze out from the bark of the trees and tend to harden on exposure to air. With the exception of lac, which is produced by the lac insect (*Kerria lacca*), all other natural resins are of plant origin. Natural resins of particular importance to the furniture coatings are rosin, damar, copal, sandarac, amber and manila. The principal characteristics of resins are:

- They are insoluble in water.
- They are soluble in ordinary solvents like alcohol, ether and turpentine.
- They are brittle, amorphous and are transparent or semi-transparent.
- They have a characteristics luster, are ordinarily fusible and when ignited, resins burn with a smoky flame.

Natural Gums: Gums are a group of plant products, formed primarily due to the disintegration of plant cellulose. This process is known as gummosis. Gums is produced by members of a large number of families but exploitation is restricted to of commercial a few tree species Leguminosae, Sterculiaceae and Combretaceae families. The important gum yielding trees are *Acacia nilotica* (babul), *A. catechu* (khair), *Steruculiaurens* (kullu), *Anogeissus latifolia* (dhawra), *Butea monosperma* (palas), *Bauhinia retusa* (semal), *Lannea coromandelica* (lendia) and *Azadirachta indica* (neem). Gums are also extracted from seeds of certain plants like guar, tamarind, Cassia tora etc. Guar gum is the prominent seed based natural gum.
The principal characteristics of gums are:

- They consist of polysaccharides or their derivatives.
- They are soluble in water or at least become soft and swollen when mixed with water. However they are insoluble in alcohol and other organic solvents.
- They decompose completely on heating without melting and tend to become charred
- Most gums emanate from plants in a liquid form. They dry up into translucent, amorphous, tear-shaped bodies or flakes on contact with air.

Gum-resins: Gum-resins are a mixture of both gums and resins and possess the properties of both the groups. They contain traces of essential oils.These are usually derived from the plant growing in dry and arid regions. Some of the commonly used gum-resins are Asafoetida, myrrh, salai, guggul etc.

METHODS OF RESIN TAPPING

In India two kinds of tapping are in vogue, viz. Light continuous tapping and Heavy tapping

Light continuous tapping: Light continuous tapping is done in trees above 0.9m in girth. Trees between 0.9 and 1.8 m in girth are tapped in one channel, and those above 1.8 m in girth in two channels each at a time. The first channel or each set of two channels is tapped for five years. At the end of five years, a new channel or a new set of two channels as the case maybe, is started leaving an inter space of 10 cm between the old and new channels. At the end of second five year period, another channel or set of two channels is again made leaving another inter space and so on till tapping has progressed channels,right round the tree. This is the common mode of tapping that is being practiced in India and the trees are regularly tapped without any rest.

Heavy tapping: In heavy tapping (also known as tapping to death), maximum possible out turn of the resin is derived before the trees are due for felling and it is achieved by cutting on the tree as many channels as it can bear, with a minimum inter space of 10 cm between the successive channels. It is generally started five year in advance of main felling in prospective regeneration areas and two years in advance of thinning in areas marked for thinning. The lowest girth prescribed for heavy tapping is 60 cm. There are four methods of tapping pine trees i.e.

- Box method
- Cup and lip method
- Rill method and
- Bore hole method

At present, three methods are commonly employed for tapping pine trees in India. These are Box method, Cup and lip method and Rill method

Box method: This is the oldest method of resin tapping. A cavity or box of 10cm x 10 cm and upto 12 cm deep is chopped at the base of the trees. It is meant to collect the resin as it exudes from the blaze or incision that is made just below the box, by chipping bark and outer layer of the sapwood. The resin oozes out of the blaze and is collected in the box.However, this method is very damaging and the trees tend to die within few years after resin tapping is started.

Cup and lip method: In this method, the outer bark of the tree is scraped off with the edge to a reasonably smooth surface of 60 cm long, 15 cm wide and 25 cm above the point where the lip is fixed. In light tapping.Channels are initially located on south or south-west face of the tree as better yields are obtained from the warmer aspects.Subsequent channels are made in an anti-clockwise direction. A cut of about 15 cm broad and slightly slanting outwards is made with a curved chisel and mallet about 25 cm below the lower edge of the blaze. The lip, a rectangular piece of galvanized iron (15 cm X 5 cm), is driven into the cut to collect resin into a pot kept below. The pot is partially covered to prevent pieces of bark, dirt etc.from falling into the cone, and also to minimize the evaporation of resins that accumulate into it. In order to open up the clogged resin ducts and aid in the smooth and continuous flow of resin, the channels are freshened at definite intervals.
The cup and lip method of tapping has number of disadvantages. Even though a channel depth of 2.5 cm has been prescribed for the blazes, very often the depth exceeds the prescribed limit. The inherent hacking action involved in case of adze, makes it very difficult to control the depth of the blazes.Also the tapper makes much deeper blazes in the hope of getting more resin. Deep cuts around the hole results in loss of timber and make the trees less resistant to wind storms. Moreover, after covering the circumference of the tree, a second cycle of tapping is not possible because of the slow healing of deeper blazes. This generally results in abrupt fall in resin production.

Rill method: This is an improved method, standardized at Forest Research Institute, Dehradun to overcome the disadvantages of the cup and lip method. In rill method, the bark of the tree over a surface area of about 45 cm in height and 30 cm in width is removed with the help of a bark shaver. The surface is made very smooth and the thickness of the bark left should not be more than 2 mm to facilitate freshening of the blaze. The blaze frame is kept on the stem in the vertical portion, 15 cm above the ground level and the position of the blaze is marked with a marking gauge. The control groove is cut with a grove cutter by drawing it from top to bottom. The lip is then fixed in the tree with nails.

For freshening of the blaze, the tapper stands near the tree on one side of the blaze and holds the freshening knife at the lowest point of the control groove. The knife is then pulled up by the tapper along with blaze line marked on the tree. The depth of the rill is about 2mm into the wood. After making a freshening on both arms of the blaze a 1:1 mixture of dilute sulphuric acid (20%) and dilute nitric acid (20%) is sprayed on the freshly cut rill with the help of spray bottle. Exudation of oleoresin starts soon after the rills are made.The pot containing the oleoresin is emptied into a collection can. The resin adhering to the pot is removed with the help of a scraper.The control groove is also increased to avoid accumulation of resin in it.

Bore hole method: Forest Research Institute, Dehradun has developed a new tapping technique known as bore hole technique of resin extraction from *Pinusroxburghii*. In this method holes are made near the ground level with the help of a machine into tree's sapwood to open the resin ducts and exudating resin is collected in a closed container. The hole in each tree is done approximately 10 cm above the ground. It has been found from the studies that holes of 15cm depth and 2.5 cm diameter are suitable for obtaining maximum resin yield. The holes are drilled straight into the tree stem with a slight slope towards the opening so that resin drains freely.

Immediately after making the hole the stimulants/ chemicals (mixture of sulphuric acid and ethephon i.e., 2-chloro-ethyl phosphonic acid) are sprayed inside each freshly made hole. Spray volume of 1 to 2 ml are applied to each hole. Chemical treatment is done once only, immediately after boring holes. After treatment a spout is installed inside the hole by gently hammering with a small mallet or pushing with palm of the hand to achieve compression fitting in the hole. The spout is meant for joining the collection container (polybag made up of high density poly ethylene, HDPE, 35.3 x l2 cm) tightened to each spout.

DYES AND TANNIN YIEDLING PLANTS

Tannins and dyes are products of secretion found in plant tissues. Tannins make the animal hides and skins resistant to decomposition, make them flexible and strong, and improve their quality. Dyes are the substances used for imparting colour and staining purposes. There is currently very little commercial use of natural dyes - used mostly as food dyes and histological stains.

Bark tans: Some of the important species whose bark yields tannin are described below.

- ***Acacia nilotica* (Babul)** – tannin content is about 18%, and widely used.
- ***Cassia fistula* (Amaltas, Bandorlathi)** – tannin content is about 10-12%.
- ***Shorea robusta* (Sal)** – bark contains about 3-9% tannin
- ***Acacia mollisima* (Wattle)** – Cultivated in south India, the most important among vegetable tan stuff.
- ***Terminalia arjuna* (Arjun)** – tannin content is 20-24%.
- ***Ceriopsrox burghiana*** – A small evergreen mangrove tree; tannin content in bark is 20-37%.
- ***Rhizophora mucronata*** – A mangrove tree; bark is rich in tannin but contains excessive colouring matter.

Fruit tans: Some examples of fruit tans of forest origin are given below.

- ***Terminalia chebula* (Haritaki)** – The tannin content is about 32% and is of high quality.
- ***Acacia nilotica* (Babul)** – pods contain about 12-19% tannin.
- ***Emblica officinalis* (Amlaki)** – Immature fruits are used in combination with other tan stuff.

Leaf tans Leaves are not much used for tanning purpose, but used by local tanners as colouringagents. Some examples are

- ***Anogeissus latifolia* (Dhaw)** – A mixture of green leaves, red leaves and petioles, when dried and ground, yields a product containing about 30% tannin.
- ***Carissa spinarum* (Karaunda, Karamcha)** – A thorny shrub; leaves have 9-11% tannin.

Wood dyes

- **Santaline** – Santaline dye is probably the best known of wood dyes. The wood of ***Pterocarpus santalinus* (Red sanders)** yields a bright red dye. When dissolved in alcohol, it dyes cloth a beautiful salmon pink colour.
- ***Artocarpus* spp**. – The wood of the jack tree, *Artocarpus integrifolia*, as also that of A. *lakoocha*, if ground to powder and boiled in water, yields a bright yellow dye.
- **Cutch dye** – The cutch extract from *Acacia catechu* is an important dyeing agent.

Bark dyes: Many barks yield brown and black dyes. However, as these barks are often used for tanning purpose, the dye contained in them is considered a defect. Following are of local interest *Terminalia tomentosa, Acacia* spp, *Alnus*spp etc.

Flower and Fruit Dyes: The dyes obtained from flowers and fruits are, generally speaking, more important than the wood and bark dyes. A few important dyes under this category are described below.

- **Kamela**– One of the best known fruit dyes is that obtained from the red fruit glands of ***Mallotus philippinensis***, and commercially known as "kamela powder". The ripe fruits are placed in a cloth or sack which is then beaten and shaken until the red powder is all removed from the glands. The powder is then sifted free from the broken refuse and is ready for market. The dye is extensively used for dyeing silk a bright orange or flame colour.
- **Arnotto**– Well known as "arnotto dye" of commerce, it is obtained from the pulp surrounding the seeds of *Bixaorellana.* The dye is obtained by boiling the fruit pulp and pressing the residue into cakes.
- **Dhak**– A popular flower dye which is obtained from *Butea monosperma* (Dhak, Palash). The dried flowers yield a bright yellow dye. It was extensively used in colouring saris, but has been largely replaced by more permanent aniline dyes.

BAMBOOS AND CANES

Bamboos: Bamboos are tall arborescent (tree like) woody grasses; belong to the family Gramineae. Most of the bamboos are hollow, often gregarious in habit. Growth of bamboos is very fast. Some common characteristics of bamboos – straightness, being light though hard, easy to split, availability in various sizes, easy propagation – have added to their utility. Common uses are in house construction, masts, cart shafts, basket making, furniture etc.

Arundinari aspathiflora- A small bamboo found growingin western Himalayas at 2,000-2,700m in elevation as an under growth of fur, spruce and deodar trees

Bambusa arundinacea - A thorny bamboo, culms 24-30 m in height 15-18 cm in diameter. It occurs in wild, especially in the hill forests of western and southern India, ascending upto 900m. The bamboo is used in paper manufacture

Dendrocalamus giganteus-This is the biggest of the Indian bamboo cultivated in parts of West Bengal, Assam and Malabar. It is 24-30 m high and 20-25 cm in diameter.

Dendrocalamus strictus-This occurs throughout India, deciduous forests often of a dry in elevation. The culms type, on hill-slopes upto 1,000 m are usually quite solid, 6-15 m high and 2.5-7.5 cm in diameter. It is most universally used of all the bamboos. It is put to a great variety of uses.

Dendrocalamus hamiltonii-This occurs in the sub-Himalayan tract upto 900 m. The culms are upto 25 m long, 10-18 cm in diameter, and thin-walled.

Dendrocalamus longispathus-This occurs in parts of West Bengal and Assam, usually along streams upto 1,200 m. The culms are from 12-18 m in height and 7.5-10 cm in diameter.

Melocanna bambusoides-This bamboo is found in Garo, Khasi and Lushai Hills in Assam. The culms are upto 2 m in length and 9.5 cm in diameter. It is typically gregarious.

Ochlandraira vancorica-This is found in the mountains of Kerala, Karnataka and Tamil Nadu. It is an erect reed-like, gregarious bamboo, which covers large areas.

Oxytenanther anigrociliata -This is a tufted bamboo with culms 9-15 m high and 1.3-10 cm in diameter, found in Assam, Orissa and Andaman Islands.

Canes: Canes ("rattans" of commerce) are the stems of climbing palms of the genus Calamus principally and of a few other related genera. The genus Calamus has about 30 species occurring in India and chiefly distributed in Himalayas, Assam, West Bengal, Kerala, Karnataka, Tamilnadu and Andaman. The stems of canes are long, usually cylindrical, solid, straw-yellow in colour. They are strong, tough and elastic. The canes reach maturity in about 5 years. Mature canes after harvest are dried in sun. The silica layer is removed by rubbing the canes over a knife or a sharp piece of bamboo, and then the

canes are bleached by fumigation with burning sulphur. In order to restore the natural lustre, they are polished with woolen rag or soap-stone. Canes are used as furniture frames, walking sticks, umbrella handles, baskets, etc.

Calamus erectus (FEKRE BET) **HABIT:** erect, non deciduous, perennial, maximum 3m in height, leaflet wide. **FLOWERING:** October to November **OCCURRENCE:** 100-1000m altitude, foothill to lower middle hill area, slopes, river banks, swampy, shady area **REGENERATION STATUS:** Scattered **USES:** Garden fencing, basket making, furniture	*Calamusguruba* (MURGI BET) **HABIT:** erect, non deciduous, perennial, maximum 17m in height. **FLOWERING:** December to March **OCCURRENCE:** 33-500m altitude, plain to foothill area, near river banks, ditch-pond area, shady area. **REGENERATION STATUS:** Abundant, common **USES:** Basket- furniture making; Rava, Mech, Garo, tribes use the flagellum for capturing cricket insect for food.
Calamus latifolius (PUTULI BET) **HABIT:** At a glance resembling like Palm sp, erect, only sub – deciduous species, perennial, 40 m in height, spine falls on maturity. **FLOWERING:** December to February **OCCURRENCE**: 33-850m altitude, plain to foothill area, slopes, river banks, swampy, shady area **REGENERATION STATUS:** Scattered **USES:** Making furniture, walking stick	*Calamus tenuis* (PANI BET) **HABIT**: erect, non deciduous, perennial, Stem at base not clavate or arise singly. **FLOWERING:** January to March **OCCURRENCE:** 33-500m altitude, plain to foothill slopes, river banks, wet, damp, shady area **REGENERATION STATUS:** Uncommon. One of the threatened species. **USES:** basket, furniture making; Forest villagers use tender top of stem as vegetables, Medicine

VALUATION OF TIMBER AND NTFP

To know the values are specific to a given context and situation.

(i) Direct-use values (including consumptive & non consumptive values).
(ii) Indirect-use values
(iii) Option values
(iv) Existence and bequest values

Classification of forest values

1. **Direct use value are associated with Consumptive uses:**
   (a) Commercial & industrial market goods, Fuel wood, timber, pulpwood poles, fruits, animals, medicines etc.
   (b) Domestic non-market goods and services (fuel wood, non-commercial non-wood products, animals, fruits etc).
   Non consumption uses:
   (a) Recreation (jungle, cruises wildlife, photography, trekking)
   (b) Science and Education (forest studies)
2. **List out the face value of each commodity with their units**
   Indirect use values are associated with-
   Environmental protection
   Waster shed protection, nutrient recycling, soil fertility agricultural productivity -
   Gas exchange, contribution to climate stabilization.-
   Habitat and protection of biodiversity.
   Aesthetic, cultural and spiritual values.
3. **Option value:** People may value the option to use a forest in the future. Although such values are difficult to measure in economic term, they should be recognized in valuing the contribution of forest to human welfare.
4. **Existence & Bequest values:** People may value forests purely for its existence without the intension of using it directly in the future. People may value forest as a bequest to their children.