WELCOME

Forest Economics

Speaker:

BALAGANESH G.

Scientist-B (Forest Economics),

Resource Survey & Forest Economics Discipline,

Silviculture and Forest Management Division,

Forest Research Institute,

Dehradun- 248006, Uttarakhand.

Contact No. 7860406601, 9095506858.

Email id: gbala@icfre.org

balaganesh.agri@gmail.com

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Topics to be covered…

- Forestry sector and national economy

- Forestry sector contribution to GDP

- Tangible and intangible goods and services from forest

- Investment Analysis (Capital Budgeting)

- NPW, B-C Ratio and IRR

Forestry and National Economy

- Indian forestry revolves around social and environmental elements of Sustainable Forest Management (SFM).

- The demand for wood and wood products will continue to increase in the future. The present need is met mainly from the agro-forestry sector and balance demand through imports

- The forests of the country are catering to 16% of the human and 18% of the cattle population needs

- India is also maintaining around 20% of the forest area under a protected area network for providing ecological security

- The nation has empowered occupation and habitation rights for forest dependent communities along with the responsibility for conservation of forests

- The strengthening in the capacity of the rural poor for improving their income is crucial for checking the degradation of forests

- The forestry sector is impacted by other sectors such as energy, agriculture, education, water resources, industry, infrastructure development, biofuels, change in demographic structure and high economic growth

- All the policies of the Government of India have to move around the prime objective of the National Forest Policy and mandate of achieving 33% forest and tree cover in the country

- Non-wood forest products (NWFPs) are an important source of livelihoods for millions of forest-dependent people and account for 75 percent of total forest export revenue

- Forests provide grazing for over 50 percent of India's 500 million livestock, and 175 to 200 million tonnes of green fodder are collected annually

- About 75 percent of all forest production in India is fuelwood, mostly collected from natural forests

- Forestry is the largest employer in the Indian energy sector, with about 11 million people engaged in fuelwood trade (both formally and informally) worth over US$17 billion

- But in 2006, harvested fuelwood exceeded the amount that could sustainably be removed from forests by 139 million metric tonnes

(National Forest Commission, 2006)

Forest plantations in India

- The area under forest plantations in India is about 32.57 million hectares, which accounts for 17 percent of the global forest plantation area and is the second largest in the world after China

- India has the largest share of teak and rosewood plantations in the world

- Industrial plantations account for 37 percent of total plantations and play a major part in supplying raw material to wood-based industries

(National Forest Commission, 2006)

Forestry imports

- India's forest product imports accounted for US$1.6 billion in 2001, as compared with exports of US$94 million

- India is the third largest importer of tropical logs, mostly from Malaysia and Indonesia but with increasing supplies from Africa

- In 2000–2001, the import value of pulp and paper alone was US$800 million, and it is projected to reach US$3.2 billion by 2011

(National Forest Commission, 2006).

Sector-wise GVA contribution

S. No.	Sector	GVA (Rs. in Crore) at 2011-12 (constant) prices		GVA (Rs. in Crore) at current prices	
		2016-17	% Share	2016-17	% Share
I	**Agriculture Sector**	**1,716,746**	**15.26**	**2,484,005**	**17.95**
1	Crops	1,033,008	9.18	1,530,137	11.05
2	Livestock	448,964	3.99	639,912	4.62
3	Forestry & logging	138,779	1.23	180,465	1.30
4	Fishing and aquaculture	95,996	0.85	133,492	0.96
II	**Industry Sector**	**3,542,821**	**31.50**	**4,054,112**	**29.29**
III	**Services Sector**	**5,988,062**	**53.24**	**7,303,474**	**52.76**
	GVA	**11,247,629**		**13,841,591**	

Source: Ministry of Statistics and Programme Implementation

NATIONAL INDUSTRIAL CLASSIFICATION - 2008

- The National Industrial Classification (NIC) is an essential Statistical Standard for developing and maintaining comparable data base according to economic activities

- Such classifications are frequently used in classifying the economically active population, statistics of industrial production and distribution, the different fields of labour statistics and other economic data such as national income

- Comparability of statistics available from various sources, on different aspects of the economy, and usability of such data for economic analysis, are prerequisite for standardization of a system of classification

NATIONAL INDUSTRIAL CLASSIFICATION - 2008

Section A – Agriculture, forestry and fishing

Division 02 Forestry and logging

  Group 021 Silviculture and other forestry activities

  Group 022 Logging

  Group 023 Gathering of non-wood forest products

  Group 024 Support services to forestry

Benefits from forests

- **Tangible benefits:** Benefits that can be measured in known amount and by known methods.

  E.g. Timber, fodder, fibres, flosses, fuel wood, food, essential oils, resins and drugs.

- **Intangible benefits:** Benefits that are not measurable through accepted methods. These are not traded in the market.

  E.g. Regulation of water cycle, carbon sequestration, ecological stability, soil conservation.

Total Economic Value
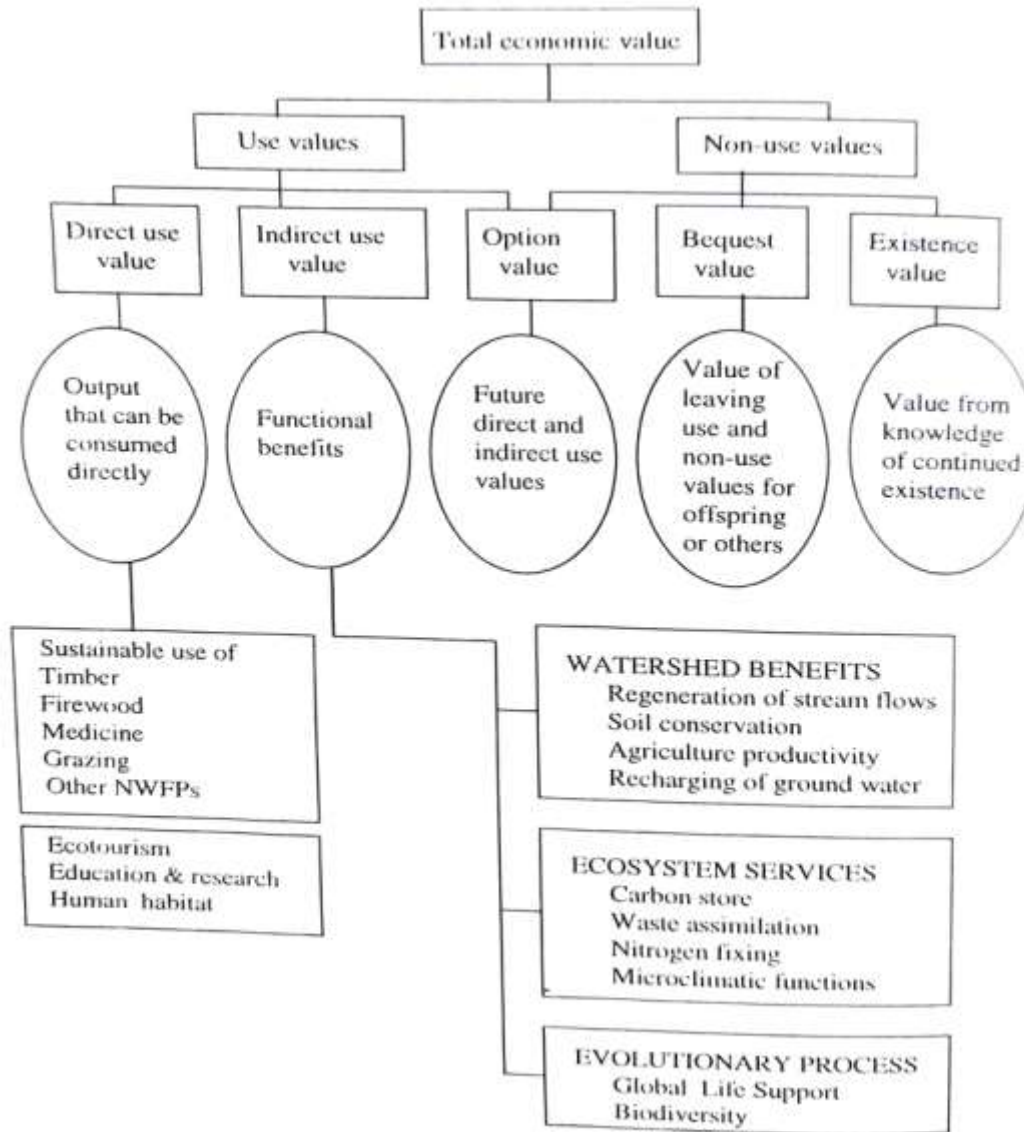
Source: Munasinghe and Lutz, 1993

Investment Analysis (Capital Budgeting)

Time value of money

- **Compounding:** Future value of present money

$$A = P(1 + i)^t$$

where,

A=Future value of the present sum invested

P=Principal amount invested

i=Interest rate in per cent

t=Number of years

Contd..

- **Discounting:** Present value of future money

$$P = \frac{A}{(1 + i)^t}$$

where,

      P=Present value of future money

      A=Money value in future

      i=Interest rate in per cent

      t=Number of years

Two methods of Project Proposal

I.   Undiscounted measures

II.   Discounted measures

I. Undiscounted measures:

- Ranking by inspection

- Payback period: P=I/E

   P=Payback period of the project in years.

   I=Investment of the project in Rs.

   E=Annual net cash revenue in Rs.

- Proceeds per Rupee of Outlay

- Average annual proceeds of Rupee of outlay

II. Discounted measures

- Net present worth (NPW) or Net Present Value (NPV)
- Benefit-Cost Ratio (B-C Ratio)
- Internal Rate of Return (IRR)

a) NPW or NPV:

Difference between the present worth of benefits and present worth of the costs

NPV=Present worth of benefits-Present worth of costs

$$NPV = \sum_{i=1}^{n} \frac{Cash\ Flow_i}{(1+r)^i} - Initial\ Investment$$

Where, r=interest rate; i=time period

If NPV>0, Choose those projects

TABLE 41.2 Estimation of NPW for Two Projects (Hypothetical).

	Sericulture (one ha)						Mango Orchard (one ha)				
Year	Costs (in Rs.)	Returns (in Rs.)	Net income (in Rs.)	Discount factor at 12%	NPW (in Rs.)	Year	Costs (in Rs.)	Returns (in Rs.)	Net income (in Rs.)	Discount factor at 12%	NPW (in Rs.)
1.	38,900	—	-38,900	0.8929	-34,733.81	At the end of 6th year	25,000	—	-25,000	0.507	-12,675
2.	9,239	28,475	19,236	0.7972	15,334.94	" 7th year	4,250	10,260	6,010	0.452	2,716.52
3.	10,575	32,550	21,975	0.7118	15,641.81	" 8th year	4,792	12,550	7,758	0.404	3,134.23
4.	11,952	35,610	23,658	0.6355	15,034.66	" 9th year	5,368	14,530	9,162	0.361	3,307.48
5.	12,858	39,802	26,944	0.5674	15,288.03	" 10th year	5,975	16,275	10,300	0.322	3,316.60
				NPW	26,565.63	" 11th year	6,456	19,396	12,940	0.287	3,713.78
						" 12th year	7,187	21,470	14,283	0.257	3,670.73
										NPW	7,184.34

b) B-C Ratio:

Ratio between present worth of the profits and Present worth of the costs

BCR= Present worth of the profits/ Present worth of the costs

BCR should be more than one

c) **IRR:** Marginal efficiency of the capital or yield on investment.

It is the rate of return at which NPW is equal to zero.

It is the best method in investment analysis.

IRR=[Lowe discount rate]+[Difference between the two discount rates]*{NPW at lower discount rate/Absolute difference between NPW at two discount rates}

TABLE 41.3 Estimation of Benefit-cost Ratio (BCR) for 2 Projects (Hypothetical).

			Sericulture (one ha)					Mango Orchard (one ha)				
Year	Costs (in Rs.)	Gross returns (in Rs.)	Discount factor at 12%	Present worth of costs (in Rs.)	Present worth of gross returns (in Rs.)	Year		Costs (in Rs.)	Returns (in Rs.)	Discount factor at 12%	Present worth of costs (in Rs.)	Present worth of gross returns (in Rs.)
1.	38,900	—	0.8929	34,733.81	—	At the end of 6th year		25,000	—	0.507	12,675.00	–
2.	9,239	28,475	0.7972	7,365.33	22,700.27	„ 7th year		4,250	10,260	0.452	1,921.00	4,637.52
3.	10,575	32,550	0.7118	7,527.29	23,169.09	„ 8th year		4,792	12,550	0.404	1,935.97	5,070.20
4.	11,952	35,610	0.6355	7,595.50	22,630.16	„ 9th year		5,368	14,530	0.361	1,937.85	5,245.33
5.	12,858	39,802	0.5674	7,295.63	22,583.65	„ 10th year		5,975	16,275	0.322	1,923.95	5,240.55
				64,517.56	91,083.17	„ 11th year		6,456	19,396	0.287	1,852.87	5,566.55
						„ 12th year		7,187	21,470	0.257	1,847.06	5,517.79
											24,093.70	31,278.04

$$\text{Benefit-cost-ratio} = \frac{\text{Present worth of gross returns}}{\text{Present worth of costs}} \equiv \frac{91,083.18}{64,517.56} \qquad \text{Benefit-cost-ratio} = \frac{31,278.04}{24.093.70}$$

$$= 1.41 \qquad\qquad\qquad = 1.30$$

TABLE 41.4 Estimation of IRR for Sericulture (One Hectare) (Hypothetical).

Year	Costs (in Rs.)	Gross income (in Rs.)	Net income (in Rs.)	Discount factor (40%)	Net present worth (in Rs.)	Discount factor (43%)	Net present worth (in Rs.)
1	38,900	–	-38,900	0.7143	-27,786.27	0.6993	–27,202.77
2	9,239	28,475	19,236	0.5102	9,814.21	0.48902	9,406.4
3	10,575	32,550	21,975	0.3644	8,007.69	0.3419	7,513.25
4	11,952	35,610	23,658	0.2603	6,158,17	0.2391	5,656.62
5	12,858	39,802	26,944	0.1859	5,008.89	0.1672	4,505.04
			52,913		1,202.69		–121.46

$$IRR = 40 + 3\left[\frac{1202.69}{1,202.69 + 121.46}\right]$$

$$= 40 + 3(0.9083)$$

$$= 40 + 2.7249$$

$$= 42.7249\%$$

$$= 42.7\%$$

Suggested References

FAO. 2014. *Contribution of the forestry sector to national economies, 1990-2011*, by A. Lebedys and Y. Li. Forest Finance Working Paper FSFM/ACC/09. FAO, Rome.

Munasinghe, M. and Lutz, E. 1993. Environmental economics and valuation in development making. *In*: Munasinghe, M. (Ed). Environmental Economics and Natural Resource Management in Developing Countries. Committee of International Development Institution on Environment (CIDIE). The World Bank, Washington D.C.

Important books

- Forest Economics, Valuation & Projects- Dr. S.S. Negi

- Agricultural Economics- S. Subba Reddy, P. Raghu Ram, T.V. Neelakanta Sastry and I. Bhavani Devi

- Forest Economics: Principles and Applications- J.C. Nautiyal

- Forest Economics & Valuation- Madan Mohan Pant

- Basic Readings in Forest Economics- P.K. Muraleedharan, K.K. Subramanian and P.P. Pillai (KFRI Publication)

THANK YOU