

## VALUATION OF SELECTED BIODIVERSITY / ECOSYSTEMS

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# **Forest Ecosystem**

## Significance

- Ecosystem is renewable
- Significant benefits to the society:
  - $\rightarrow$  environmental
  - $\rightarrow$  economic
  - $\rightarrow$  social
  - $\rightarrow$  cultural



- Provides raw-materials for food, medicines, fuel and shelter
- Forest ecosystems contribute to purification of air & water, regulate climate and recycle nutrients & wastes









#### **Economic Value of Forest Ecosystem**

- Price for forest products/goods (timber and non-timber) are fixed through markets
- However, forest services (regulating weather patterns, recreational services, controlling soil erosion and hydrological cycle etc.) are not marketed

• Valuation of non-market benefits of forest is possible through the application of appropriate methodologies









### Goods provided by forest ecosystem

Goods
Timber
Fuel wood
Drinking and irrigation water
Fodder
Non timber forest products
Food (honey, mushrooms, fruit, and other edible plants)
Genetic resources
Cultural resources
Source : OECD,2003



जहां हे हरियाली । वहां हे खुराहाली ।।





#### Services provided by forest ecosystem

#### **Services**

Remove air pollutants, emit oxygen

**Cycle nutrients** 

Maintain array of watershed functions (infiltration, purification, flow control, soil stabilization)

Maintain biodiversity

Sequester atmospheric carbon

Moderate weather extremes and impacts

**Generate soil** 

**Provide employment** 

Provide human, wildlife, and beneficial insect habitat

Contribute to aesthetic beauty and provide recreation

Source : OECD,2003

#### Annual Economic Value of Forests of Himachal Pradesh (as per 2000 prices)

Category	Goods and Services	Physical Value	Monetary value (Rs. Crore)
Direct Consumptive benefits (A)	1.Salvage	3.50 lakhs m3	32.00
	2. Timber for right holders	1.06 lakhs m3	60.00
	3. Fuel-wood	27.60 lakh tons	276.00
	4.Fodder	92.0 lakh tons	690.00
	5.Minor forest produce	1161.56 tons	25.00
			1083.00
Direct Non-consumptive benefits (B)	6.Eco-tourism	66.56 lakh - Tourists	6657.00
Total Direct Benefits (A+B)			7740.00
Indirect Benefits (C)	7.Watershed	6.77crore m3 - Growing stock in river Basin Forest Circle and 36986 km2 - entire forest area	73972.00
	8.Microclimatic Factors	969018 Households	145.00
	9.Carbon Sink	14346 km2 - Area under tree cover and scrub forest	17645.00
	10.Biodiversity / Endangered Species	8966- Total no. of species found in Himanchal Pradesh & 125 – Endangered species	7137.00
	11.Employment Generation	48.40 Man days	25.00
Total Indirect Benefits (C)		2	98924.00
Total Economic Value (A+B+C)			106664.00

Source: Madhu Verma (2000)

## Forest Resources/goods Valuation for ABS

- Forest resources are used for manufacturing different consumer products
- Resources are having markets
- But at forest gate market is weak (imperfect or inefficient), Price is low
- However many value added products are derived from forest resources
- Value addition: through transaction costs or and processing / manufacturing costs

#### → Transaction costs













#### Price of Certain NTFP (Rs/Kg.) from a Protected Area: Kerala

NTFP items	Collection price at forest gate	Sales price of the Federation	Final consumer price	Price spread	Collection price as % of final consumer price
Honey	119	133	200	81	59.5
Honeywax	80	135	203	123	39.4
Kalpasam	51	85	128	77	39.8
Cheevakkai	9	11	16	7	56.3
gooseberry	5	5	8	3	62.5
Kakkumkai	5	7	10	5	50.0
Atthithippali	10	16	24	14	41.7
Kunthirikkam	30	39	58	28	51.7
Kudampuli	74	110	165	91	44.8
Pachottitholi	11	13	19	8	57.9

Source : Shylajan and Mythili (2007)









#### → Processing / Manufacturing Costs

- Certain forest resources may act as basic raw-material for manufacturing final products
- Eg: *Jeevani* an immuno-modulatory product (ayurvedic medicine) is manufactured from the plant known as *Arogyapacha*





- Arogyapacha is an unavoidable input, but not an exclusive one
- Many other products and knowledge/skill (research and development) also attribute to such development
- Amortised (Remunerated) pricing technique is relevant to estimate the real price of bio-resources.









#### **Bio-resources real price estimation: basic/general steps**

Steps	Tasks	Sources of Information
First	Identification of the key forest products (having economic and ABS potential) extracted from a geographical area	BMC, PBR, local community, indigenous group, forest department
Second	Understand its potential / purpose / usage	BMC, traders, research organizations, government departments, industries
Third	Identify its leverage / movements: local → regional → state → national → international	BMC, traders, industrial association, companies, exporters, customs department
Fourth	Prioritize the promising uses based on value addition (ranking)	Industries, traders, research organizations.









#### **Bio-resources real price estimation: specific steps**

Steps	Tasks	Sources of Information
First	Select any manufacturing or bio-resources processing company	Appropriate industry
Second	Estimate the transaction cost of bio-resources: from forest gate to company gate. (Price at company gate – price at forest gate)	Forest dwellers traders, industries
Third	Identify the major production steps	Company management and production manager
Fourth	Identify the different factors of production involved in each stage and its cost / remuneration (Factor cost method)	Company management, production manager and labourers
Fifth	Identify the abnormal benefit claimers and rates (differences between company rate with general market rate)	Company management, production manager, labourers, industrial/govt. departments.
Sixth	Fix the optimum benefit and share the surplus to local communities who preserve the bio-resources <b>(Royalty</b> ; institutional mechanism for distribution)	Company management, production manager, labourers, industrial/govt. departments and BMC









# Wetland Ecosystem

One of the most productive ecosystems





## Types:

• Wetland includes:





- $\rightarrow$  Estuaries deltas, mudflats, salt marshes
- → Marine shorelines
- $\rightarrow$  Riverine land periodically inundated by river overtopping
- $\rightarrow$  Palustrine permanent water storage: swamp, marshes, fen
- $\rightarrow$  Lacustrine permanent water with little flow: ponds, lakes









- components of a wetlands:
  - \* Biotic (plants and animals)



\* Abiotic (soil and water).

 Interactions between the components → wetland functioning (nutrient cycling, hydrological cycle, diversity of species .....)



• Wetland functions are has internal and external values











Figure 51. Wetland functions and internal and external values.

Source : http://water.usgs.gov/nwsum/WSP2425/functions.html









• Wetland ecosystem provides direct as well as indirect services to humanity



• <u>Direct Use</u>: fertile soils, fish, timber, fuel-wood, medicinal plants, recreation (bird watching or sailing) and research

• <u>Indirect Use:</u> flood control, regulating the atmospheric conditions and climate, protection from natural calamities.









#### Goods provided by wetlands ecosystems

Ecosystems	Goods
Coastal ecosystems	Fish and shellfish Fish meal (animal feed) Seaweeds (food & industrial use) Salt Genetic resources Cultural resources
Freshwater ecosystems	Drinking and irrigation water Fish Hydroelectricity Genetic Resources Cultural Resources

#### Source : OECD,2003









#### Services provided by wetlands ecosystems

Ecosystems	Services
Coastal ecosystems	Moderate Storm Impacts (mangroves) Provide wildlife (marine and terrestrial habitat) Maintain biodiversity Dilute and treat wastes Provide harbour and transportation roots Provide human and wildlife habitat Provide employment Contribute to aesthetic beauty and recreation
Freshwater ecosystems	Buffer Water flow (control of timing and volume) Dilute and carry away wastes Cycle nutrients Maintain biodiversity Provide aquatic habitat Provide Transportation corridor Provide employment Contribute to aesthetic beauty and recreation

#### Source : OECD,2003









#### Economic Value of Bhoj Wetland (Bhopal) in Selected Use

Use	Stakeholder	Valuation Technique	Annual Value (Rs)
Drinking Water	Water supplying agencies	Supply Cost	9,54,13,962
Fish Production	Fishermen	Market Price of Existing Production	80,00,000
Boating	Boatmen	Income Estimation	24,37,880
Trapa cultivation	Trapa (water chest nut) Cultivators	Market Price of Existing Production	50,00,000
Washing of clothes	Washer men	Income Estimation	36,00,000
Boating	MP Tourism Dev. Corporation	Revenue Generation	6,74,635
Recreation	Entire population of the city	Contingent Valuation	4,84,68,956
Increase in property prices	Lake front property owners	Hedonic pricing	50% difference in property prices

#### Source : Madhu Verma et al. (2001)









#### Wetland Resources and Value Added Products

• Wetland resources have significant market potential

• Their use is not known widely

• Wetland resources have markets at collection point (imperfect or inefficient)











## Fish

















## Seaweeds













## Valuation approach:

- Wetland resources have similar characteristics with forest resources
- Hence valuation methods identified for forest resources are suitable.









# Agriculture Ecosystem

- Agricultural biodiversity contributes:
  - $\rightarrow$  Food production
  - → Livelihood security
  - → Agricultural development
- Agriculture biodiversity consists of the variety and variability of animals, plants and micro-organisms contributes to food and nutritional security
- These are necessary to sustain/function of the ecosystem.













Agricultural biodiversity includes:

- Harvested crop varieties, livestock breeds, fish species, nondomesticated (wild) resources within field, forest, rangeland and in aquatic ecosystems
- Non-harvested species within production ecosystems that support food provision, including soil micro-biota, pollinators
- Non-harvested species in the wider environment that support food production ecosystems (agricultural, pastoral, forest and aquatic ecosystems).









#### Goods provided by agro-ecosystems



Source : OECD, 2003









#### Goods and services provided by agro-ecosystems

#### **Services**

- Maintain limited watershed functions
- Provide habitat for humans, birds, pollinators, soil organisms important to agriculture, maintain biodiversity and cycle nutrients.
- Sequester atmospheric carbon
- Provide employment
- Contribute to aesthetic beauty and provide recreation

Source : OECD, 2003



















## Valuation: Concerns

• Since agro-resources are cultivated / cultured, its price determination is much more reliable than forest or wetland resources





- In preserving the genetic resources of traditional variety of crops and animals, local and indigenous communities role is significant
- Application of bio-technology and scientific farming have intensified agricultural development









- Farm products are basic raw-materials for many agro-processing industries
- Benefits derived from agri-business should be distributed to farmers and indigenous communities, who preserve the seeds
- For estimating the real price of agriculture products the assigned methods for forest and wetland resources will be appropriate.















# In Brief:

- Value addition or amortised pricing technique may apply with required modifications based on the characteristics of bio-resources and the nature of products which are derived from it.
- Value chain analysis is complex: Apart from tangible goods many services including skill, knowledge and research are significantly attributes in production.
- NBA is currently working with relevant experts to come up with suitable methodologies and models.











# Thank You







