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# ECONOMIC VALUATION OF BIODIVERSITY / BIO-RESOURCES

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# Structure of the Presentation

1. **Background (Biodiversity and Bio-resources)**
2. **Economic Significance and Values of Biodiversity**
3. **Market Failure for Biodiversity**
4. **ABS and Valuation Linkage**
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## Background (Biodiversity and Bio-resources)

- Biological diversity (biodiversity) represents the variety of life on earth; which includes **species diversity** (the numbers and kinds of living organism), **genetic diversity** (genetic variations within species) and **ecosystem diversity** (the variety of habitats, biological communities and ecological process).
- Biodiversity is the foundation of life on earth (vital to economic and social development).
- Crucial for the functioning of ecosystems (products and services): Oxygen, fresh water, fertile soil, food, medicines, shelter, protection from storms and floods, stable climate, recreation etc. are sourced from nature or healthy ecosystems.
- Biological diversity is a **global asset with tremendous economic values to present and future generations.**



- Biological resources should be considered as a subset of biodiversity.
- ..... biodiversity is a 'stock' and biological resources are 'flow'.
- Recently the species and ecosystem are under threat than before, (due to human activities)
- "Decline of biodiversity" becoming a major thrust of environmental policy (global to local)
- Under the umbrella of CBD different nations strengthened their biodiversity management policies primarily through **institutional and legal initiatives**.
- However, **through market (economic instruments: incentives and disincentives)** too biodiversity can manage efficiently.



# Economic Significance and Values of Biodiversity

- Biodiversity and its underlying resources are having economic value (base for economic activity).
- All societies depend on biodiversity and biological resources (directly or indirectly)
- It act as commercial products ever since humankind starts trading (Previous and now)
- Unfortunately this link is not well understood
- Most of the biodiversity values are **implicit** rather than explicit (often not captured by markets).
- This is a problem as well as challenge in management



## Total Economic Value (TEV) of Biodiversity / Ecosystem

- The values we place on ecosystem or biodiversity originate due to different uses and services the biodiversity provide to humanity.
- The components of Total Economic Value (TEV) of the biodiversity or bio-resources consists of:  
use and non-use values.



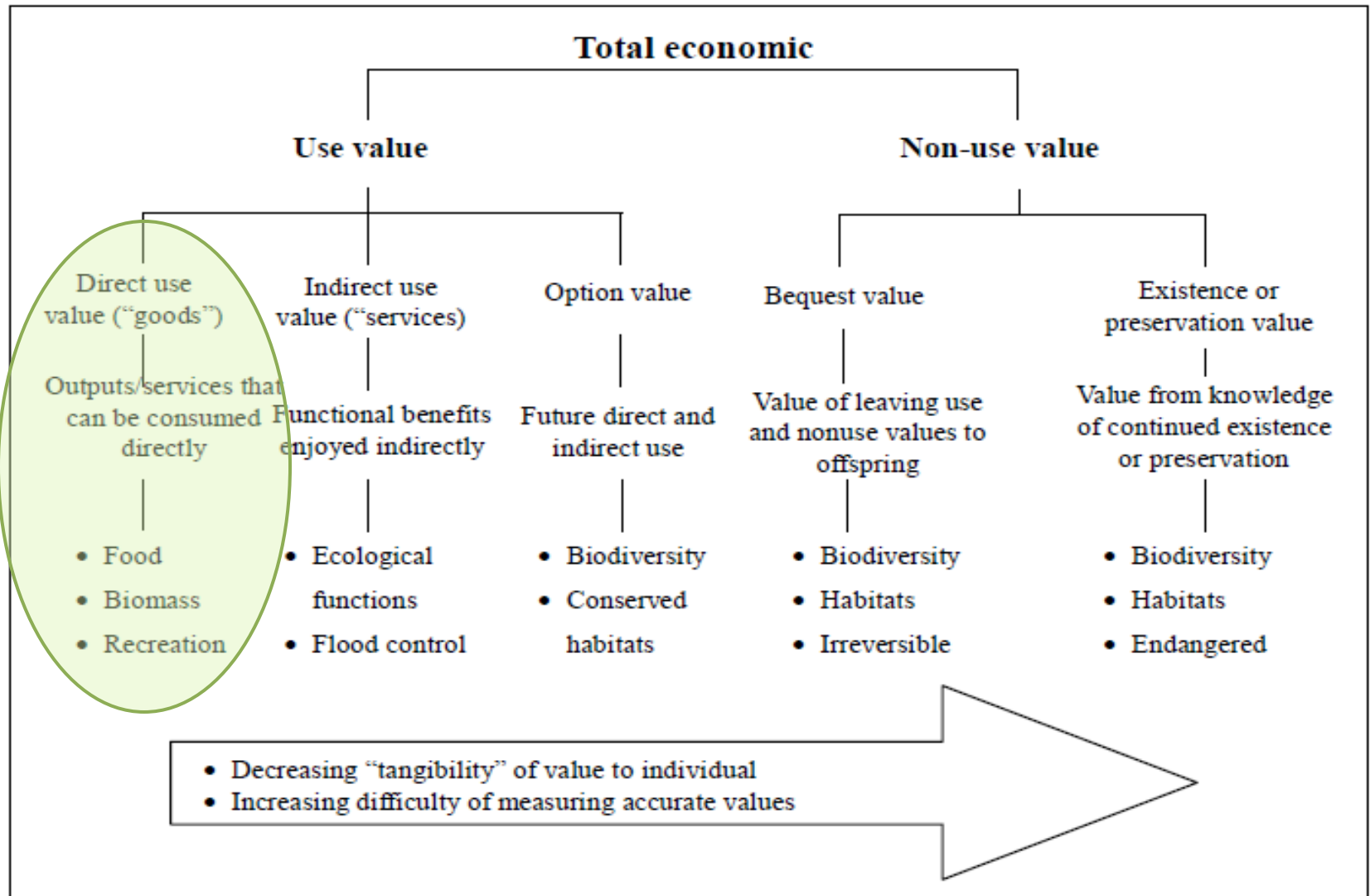
- **Use value** means many goods and services provided by biodiversity / ecosystems, which could be consumed or used directly or indirectly
- Use value consists of:
  - (a) direct use values
  - (b) indirect use values and
  - (c) option values.
- **Direct use value** can be classified as “good”, which measures the consumptive value of tangible and visible bio-resources (genes, fish, medicinal plants and other NTFPs, timber etc.)
- **Indirect use value**, which can be classified as “services”, measures non-consumptive ecological and recreational uses of ecosystems (picnicking, hiking, diving, swimming, boating etc).
- **Option value** (which could be direct or indirect) is the willingness to pay to maintain the biodiversity weighted by the probability that the resource will be used at some future date



- **Non-use values** are those values, which are independent of an individual's present or future direct or indirect use. Traditionally these components have not been quantified in monetary terms.
- The willingness to pay for conservation and preservation of biodiversity, to avoid irreversible changes specifically for the benefit of future generations is known as the **bequest value**. (gift, inheritance value)
- Besides the bequest value, people may gain satisfaction from the knowledge that certain biodiversity exist and therefore may be willing to pay for their continued existence. This is known as the **existence value**.
- Existence value arises from the notion that individuals who make no use of a particular resource may gain utility from the mere existence of the resource, even if there is no intention to use the resource in the future.







**Fig. 1** Total Economic Value of Coastal Resources



# Market Failure for Biodiversity

- When we are dealing with NRs (Biodiversity) → **Market can fail.**  
(Supply, demand, price mechanism etc. not function properly)
- Generally market fails, when **property rights is not clearly defined.**
- If, ones right (in using biodiversity / bio-resources) is not clearly **protected**, **he cannot exclude others from using the good or he cannot protect his right to use the good.**
- In this circumstances the collection and exchange of bio-resources never lead into a **socially desirable outcome (optimism)**



- Everyone “OWNS” the right to **enjoy or receive** biodiversity benefits, but nobody “OWNS” the right to **obtain or possess**.
- Hence it is **impossible** for market to exist in its normal form for bio-resources.
- In brief, the four market failure conditions exists:

Public good

Common property

Externality

Hidden Information



## Public Good

### ○ TOW Conditions for Public Goods are:

<b>Public Good</b>	<i>Private Good</i>
<b>Non Rival</b> <b>Non Excludability</b>	<i>Rival</i> <i>Excludable</i>

### ○ Public goods are two types:

**(a) Pure public good:- Both non-excludable and non-rival.**

Eg. Biodiversity, high seas, Ozone layer, etc (in which benefits accrue to all those around the globe)

**(b) In-pure public good: Either non-excludable or non-rival**

Eg: rivers, lakes, local parks etc. (club goods)



## Common Property Resources

- The commons (Open access) are an **impure public good** (rivalries consumption and non-excludability).  
Eg: rivers, lakes, parks, sea etc.
- 'Tragedy of the Commons' (Garrett Hardin, 1968)
- Open access resources are damaged by overuse (eg: more members collect medicinal plants in a common forests, More fishermen fishing in sea).
- Collective managements of commons (Elinor Ostrom)



## Externality

- Externality exists:
- (a) when a person **does not** bear all the costs of his or her action (a fisherman over fishing in a common lake)
- (b) when a person **does not** receive all benefits of his or her action (a collectors' special efforts in enhancing the harvest of a medicinal plant in a common land).

## Hidden Information

- \* No or lack of Information flows among buyers and sellers
- \* No collusion among buyers and sellers



## What happens in open access commons (like NTFP) ?

Each community member (collector) has an incentive to collect as many forest products before someone else collecting the same product.

He has no incentive to preserve the resources (NTFP) because if he does not collect them someone else will.

His decision to leave the products is not respected by others because they have as much rights on the products as he does.

So he starts expending effort (collection). Initially (in short run) the incremental revenue  $>$  the incremental costs

Gradually incremental revenue may less than or even 0 than the incremental costs

This violates the standard efficiency conditions in natural resources extraction or management.



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***This is exactly happening to our biodiversity or bio-resources***

- Biodiversity (biological resources) are not having a well-defined **property rights**, hence considered as a **Public Good** and experiencing **Free Rider** problems (over-exploitation and unregulated use) which may finally lead to its **Tragedy**.
- Moreover, unprecedented rate of biodiversity loss is occurring due to increasing development pressures induced land use change.





# ABS and Valuation Linkage

- A very large part of the world's biodiversity exist in the poorer countries.
- These countries least able to finance its conservation and least able to resist the land use changes that threaten biodiversity.
- The CBD constitute two compensating mechanisms:
  1. ***The richer world allocating 'new' resources to the financing of conservation in the developing world, in addition to those efforts that they make in their own countries.***
  2. ***Ensuring that developing countries gain a more equitable share in the financial and other benefits that the rich world derives from the biodiversity of the poor world.***



- ABS framework provides guidance for the way in which genetic resources are accessed, and the way benefits are shared between people or countries using the resources (users) and the people or countries that provide them (providers).
- **ABS Philosophy is:** Providers of genetic resources are entitled to receive **fair** benefits from their users.
- Rapid development of modern biotechnology help in using genetic resources in more scientific manner

### **ABS principles** ensure that;

- The physical access to genetic resources is facilitated and the benefits obtained from their use are shared equitably with the providers.
- Need to consider the traditional knowledge associated with GRs



- Prospecting biological / GRs involves number of actors (local C to MCCs).
- There is a need to establish appropriate user-provider chain into ABS
- The negotiation between a provider and a user of resources can never be entirely based on the *nature and quality of resources*.
- Should be in a monetary term: Based on the **true value** of the resources.
- The real economic potential (value) of bio-resources is hardly understood (Becomes a fundamental problem in arriving at suitable ABS agreements).
- Generally, the provider (either the local community and indigenous group or the country) obtain a meagre share of the real resource value.
- Hence CBD acknowledges that "***economic valuation of biodiversity and biological resources is an important tool for well-targeted and calibrated economic incentive measures***".



# Valuation Methods

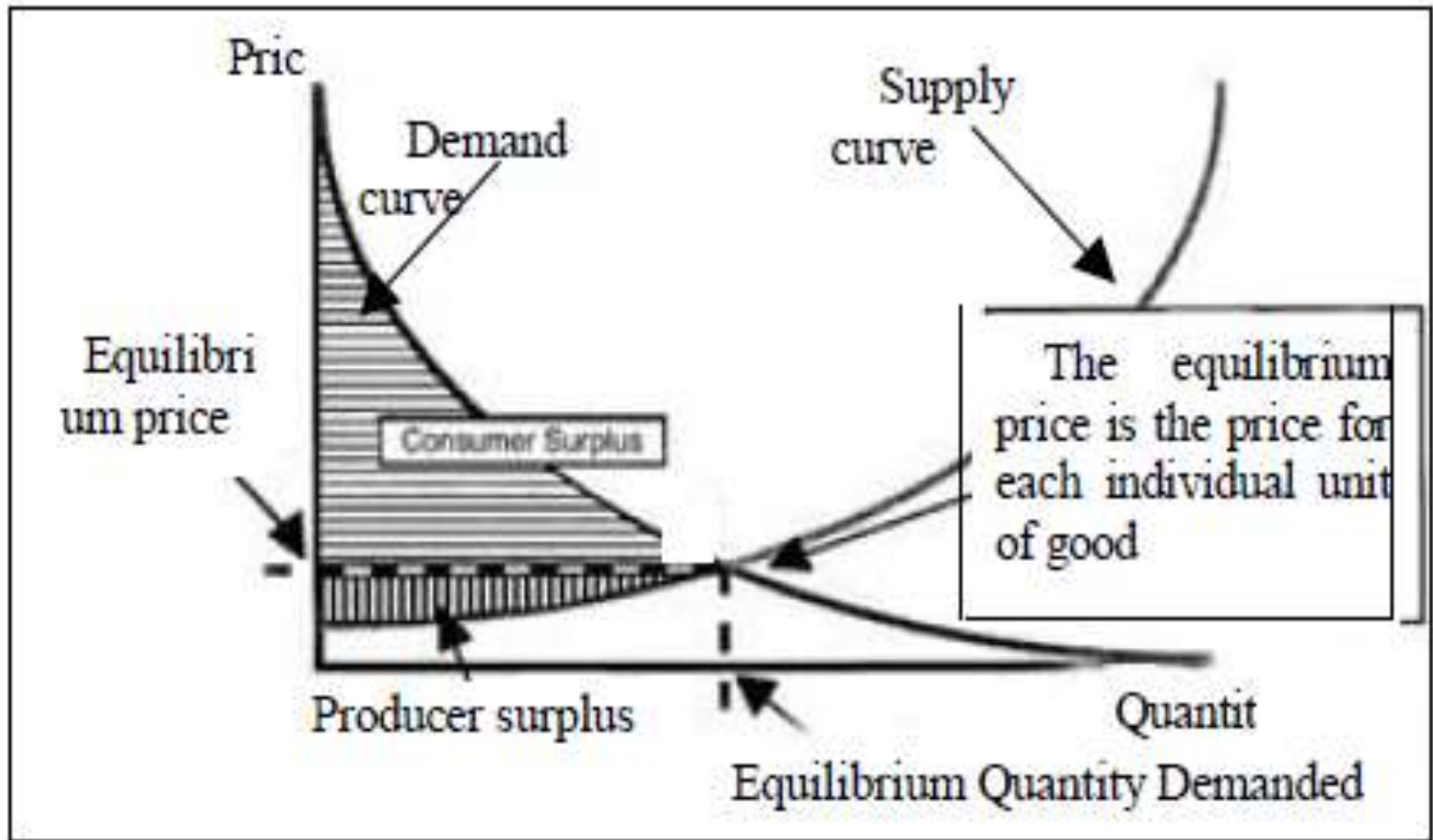
- Biodiversity / Bio-resources valuation is the process of assigning a numeric (monetary) value, to a particular bio-resource.
- Number of valuation methods available to account biodiversity's use and non-use values.
- The valuation of Biodiversity / Ecosystem is not the same as the valuation of ordinary goods and services.
- A forest can be priced based on the market goods (timber and NTFPs) as well as non-marketed services (maintain hydrological cycle, soil erosion, climate control, etc.) they provide.



## Market-based valuation methods

- Market-based valuation methods use actual market prices as a surrogate (substitute) for the value of biodiversity goods and services. These methods have the advantage of easy applicability as well as simplicity in methodology.
- They are used when changes in production or productive capacity of a certain good or service can be measured.
- Here, willingness-to-pay (WTP) is taken to be equal to market price.
- Economists often use the concepts of consumer surplus and producer surplus to approximate the net WTP





**Fig. 2** Consumer and Producer Surplus



- Fig: Conventional supply (marginal cost) and demand (marginal benefit) curves for a typical market good or service
- The value that would show up in gross national product (GNP) is the market price  $p$  times the quantity  $q$ .
- The cost of production is the area under the supply curve.
- The 'producer surplus' or 'net rent' for a resource is the area between the market price and the supply curve.
- The 'consumer surplus' or the amount of welfare the consumer receives over and above the price paid in the market is the area between the demand curve and the market price.
- The total economic value of biodiversity is the sum of the producer and consumer surplus.



## Market Price Approach:

- This methods rely on the availability of market price and quantity information to derive total values.....
- Eg: The existing price of different forest-products multiply with the quantity at the **forest gate**. Here Price not equivalent to value (Unfair, unequal sharing of benefits).

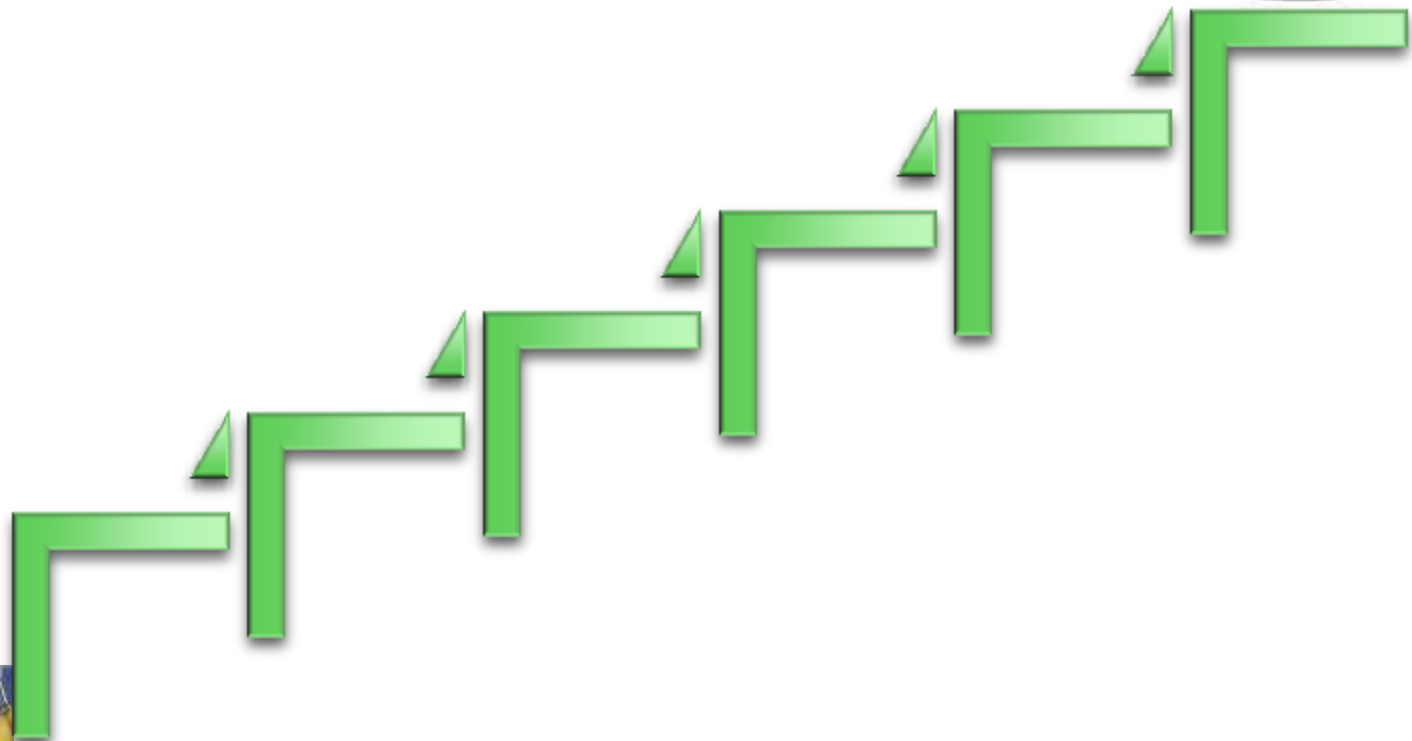
## Value Chain and Production Function Analysis

- Value chain refers to coordinated relationships between actors who are involved directly and indirectly in a **productive activity**, with the aim of taking a product from **supplier** → manufacturer → wholesaler → retailer → consumer
- It establishes market-oriented strategic alliances between producers, processors, distributors, traders, and regulatory and support institutions
- Bio-resources value addition (from input to output)





# Garcinia Cambogia (Input → Output)



# Valuation for non-marketed services

## Travel Cost Method

- Use to determine the recreation value of biodiversity by the willingness-to-pay of visitors. It quantifies the total value of a site by calculating various costs involved.

## Hedonic Methods

- Extra amount paid for higher environmental quality (Housing Market).

## Contingent valuation methods (CVM)

- Construction of hypothetical markets in which biodiversity can be traded to obtain willingness to pay, or willingness to accept bids.



# Conclusion

- Bio-products are generally considered the free gifts of nature (manufactured by nature with its unique and intrinsic ability) and is a public good.
- It is not like any other manufactured commodity, where the cost of factors of production plays a significant role in price fixation.
- The market for bio-resources is highly imperfect or inefficient.
- The non-excludability character of open access resources like biodiversity (bio-products) will often make a market price close to zero, when the actual value is quite large.
- Non-excludable and non-rivalry characters of biodiversity reflects the “off-site effects” and the resources often flow to wider communities to different provinces and countries.



- Majority of bio-resources are currently marketed in traditional manner, where the real value of the product is not reflected in the form of medium of exchange or price.
- Valuation of biodiversity goods and ecosystem services is a fundamental step towards realizing the goal and objectives of ABS framework.
- Once biodiversity and bio-resources were valued, it will become a part of the rational decision process that facilitates its sustainable use and conservation.



