VALUATION OF BIODIVERSITY

Dissemination Paper - 1

Biodiversity Economics from Access and Benefit Sharing Perspective

Biodiversity Economics from Access and Benefit Sharing Perspective

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Acknowledgements

The authors wish to thank the members of the expert committee on 'Economic Valuation for ABS' who helped and guided us in preparation of the three reports. Thanks are also due to participants at the Group Convergence Method workshop on "Recalculation of Net Present Value (NPV) rates for forest diversion in India" in Bhopal who provided insightful comments on the points elaborated in this report.

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Design & Layout
D. Muthukumaran, NBA

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FOREWORD

The report of The Economics of Ecosystems and Biodiversity (TEEB) that was launched during the tenth Conference of Parties to the Convention on Biological Diversity (CBD-COP 10) in 2010 raised a lot of awareness among policy makers on the need to look at economic valuation.

At the National Biodiversity Authority (NBA), we have been focusing on designing an appropriate benefit sharing mechanism related to implementation of the Biological Diversity Act for the past two years where the intention was to understand the economic potential of biodiversity goods for determining suitable benefit sharing plans. We realized, in pursuit of the above, that there are no standard methods to do the same nor there is appropriate understanding of economic valuation for ABS purposes.

The set of three reports compiled through the UNEP-GEF ABS Project is an attempt by NBA to raise the understanding on issues above for suitable determination of benefit sharing under the access and benefit sharing regime.

We are aware that some of the ideas and approaches presented here are not particularly mainstream thinking of environmental economics or economists but we are placing before the readers a perspective that needs attention now. Your comments, if any, are welcomed by the authors.

Happy reading!

Balakrishna Pisupati
Chairman,
National Biodiversity Authority

Chennai
September, 2013

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1. Introduction

Biological diversity (biodiversity) represents the variety of life on earth, which include 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. It is crucial for the functioning of ecosystems, which provide us 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. The earth's biological resources are vital to economic and social development. In brief, biological diversity is a global asset with tremendous value to the present and future generations.

However, the species and ecosystem are under threat in recent years than ever before and their losses (some estimates indicate loss of 45-250 species per day) have become a global concern. Population growth, unplanned economic development, unscientific land use changes, and consumerism are the major challenges that increase the pressure on biodiversity. But biodiversity once lost is lost for ever and likely to cause serious consequences to the ecosystem and human life. Considering this fact, arresting the decline of biodiversity (species and ecosystems) is a major objective of environmental policy at global, national and local levels. In this context, the Convention

of Biological Diversity (CBD) was adopted at the global level and 193 countries, including India, are parties to the convention. The CBD objectives includes: (a) conservation of biological diversity, (b) sustainable use of its components, and (c) fair and equitable sharing of the benefits arising from the use of biological resources and the associated knowledge.

According to OECD (2003), under the umbrella of CBD, different nations strengthened their biodiversity management policies primarily through institutional and legal initiatives. However, through market (economic instruments such as economic incentives and disincentives) too biodiversity can be manage efficiently. Recognising this fact, the OECD Environment Ministers meeting (dated 19-21 April 2004) stressed the need for incentive measures to protect biodiversity and identified that creation and use of markets for biodiversity products and services, as an option.

The driving force behind the CBD, however, is the fact that a very large part of the world's biodiversity resides in the poorer countries of the world, i.e. in those countries least able to finance its conservation and least able to resist the land use changes that threaten biodiversity. The CBD thus contains 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.

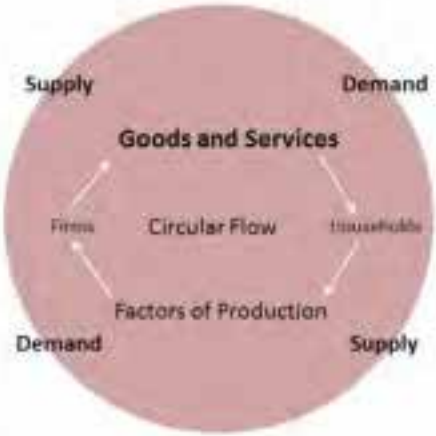
2. Ensuring that developing countries gain a more equitable share in the financial and other benefits that the rich world derives from the biodiversity of the poor world.

These factors point to the need to focus attention on biodiversity economics, particularly the valuation of biodiversity and the bio-resources. Further the debate may also emerge on at what flows of resources from rich to poor countries would be justified in the interests of helping developing countries conserve their biodiversity? Unless there is some idea of the value that the world as a whole gets back, and, indeed, what the donor countries get back, from such investments, the question of what resources to transfer is likely to be settled on an *ad hoc* and probably unsatisfactory basis (OECD, 2002).

2. Linkages Between Ecosystem / Biodiversity and Economy in a Changing World

In the initial stages of human development, economic process treats the economy as an independent, self-regulating and self-sustaining system. That is whose productivity and growth are not seriously constrained by the ecosystem/biodiversity. Ecosystem/biodiversity was primarily viewed as "infinite" resources. Besides economists believed that ecosystem also have the infinite capacity as sinks to absorb waste. This philosophy might be true in an era when population growth was insignificant and economic activities were in a subsistence level (See fig 1).

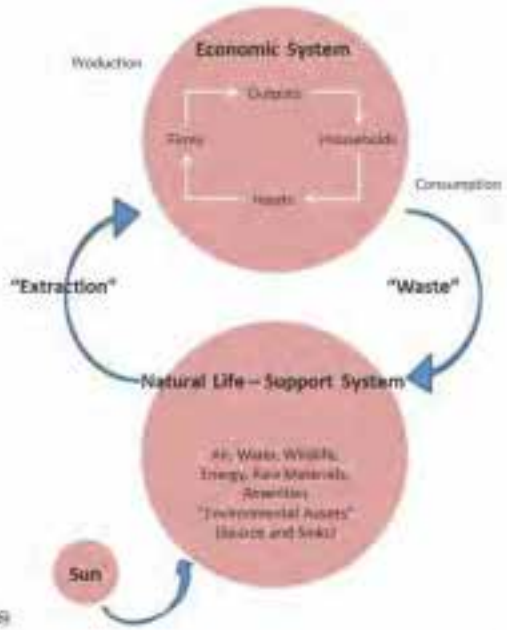
Figure 1 - The Economy as an Isolated System



Source : Goodland (1996)

However, over a period, when the population and the economic activities start to increase, the dependencies on ecosystem for its provisional and waste sink services multiplies. These changes on the per capita consumption of natural capital disordered the relationship between economic activity and ecosystem/ biodiversity sustainability. The global ecosystem/biodiversity is the source of all material inputs feeding the economic system, and is the sink for all its wastes. Population times per capita consumption of natural capital is the total flow (through-put) of resources from the global ecosystem to the economic subsystem, then back to the global ecosystem as waste - Fig. 2 – (Goodland, 1996). However there is a limit for natural system to provide the resources and other materials to the economic system. Similarly ecosystem cannot absorb infinite volume of wastes discharged by the economic system.

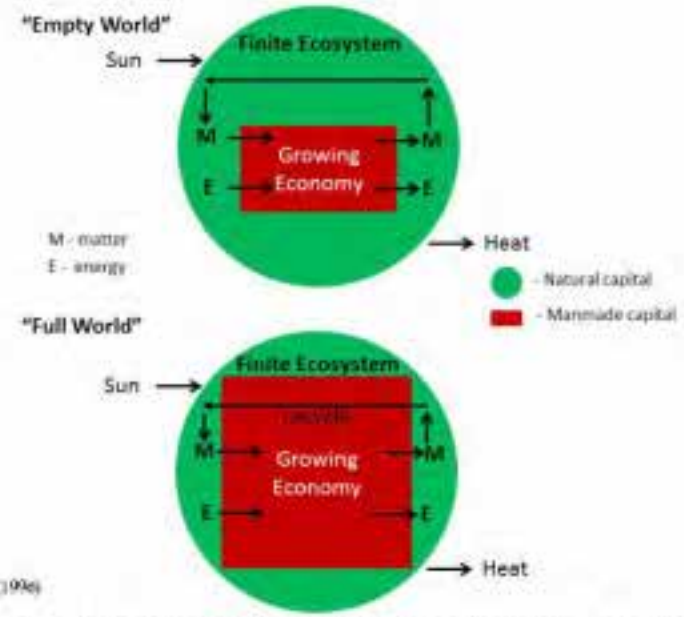
Figure 2 - Linking Economic and Ecological System



Source : Goodland (1998)

In the long-gone "empty-world" (Fig.3, top), the scale of the human economic subsystem is small relative to the large, but non-growing, global ecosystem. But in the "full-world" (Fig.3, bottom), the scale of the human economic system is large and still growing, relative to the finite global ecosystem. In the full-world case, the economic subsystem has already started to interfere with global ecosystem processes, such as altering the composition of the atmosphere (greenhouse warming), or the now nearly global damage to the ozone shield.

Figure 3 - The Economy as Depended on Ecosystem



Source : Goodland (1996)

In brief, during the past era the economic subsystem was small relative to the size of the global ecosystem. But recently the situation has changed drastically and today the economic subsystem is very large relative to the global ecosystem. The global ecosystem's source and sink functions have large but limited capacity to support the economic subsystem. The imperative, therefore, is to maintain the size of the global economy to within the capacity of the ecosystem to sustain it.

3. Biodiversity Economics

Economics deals with the analysis of the use of limited and scarce natural resources to achieve various human needs. In this context 'Biodiversity Economics' addresses issues related

to the use of biodiversity goods and services (which are getting scarce) for fulfilling various human requirements. The basic bio-economic challenge in recent decades is, how the scarce bio-resources (which are renewable) should be allocated to various requirements to achieve human satisfaction. The subject matter of Biodiversity Economics includes: (a) valuation of biodiversity, (b) damage assessment of biodiversity and ecosystems, and (c) application of various economic instruments, both incentives (compensation and subsidies) and disincentives (taxes, fines, and penalties), for the effective management of biodiversity. In brief, Biodiversity Economics emphasizes the economic approaches to assess, understand and take effective policy decisions towards managing biodiversity for its sustainable utilization, and achieve the maximum economic and human development.

For biodiversity and many biological resources, the absence of apparent value combined with absent or poorly defined property rights creates a problem of over exploitation and unregulated use (OECD, 2002). In the absence of an economic value for biodiversity and many biological resources, they fail to compete on a level playing field. The CBD's Conference of the Parties (COP) Decision IV/10 acknowledges that "economic valuation of biodiversity and biological resources is an important tool for well-targeted and calibrated economic incentive measures", Hence CBD encourages the Parties to "take into

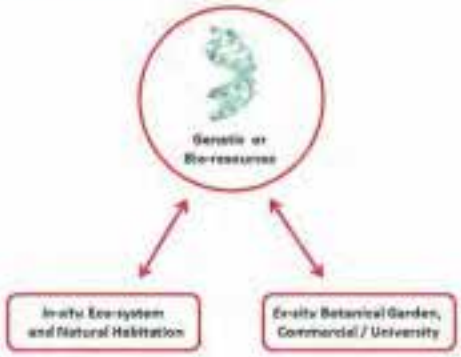
account economic, social, cultural, and ethical valuation in the development of relevant incentive measures" to preserve biodiversity. The CBD declared that 'Access and Benefit Sharing (ABS)' is one of the three main objectives and act as an incentive mechanism to local communities in conserving and preserving the biodiversity and it resources potential.

However, understanding the non-marketed benefits of biodiversity and the true value of bio-resources are critical for initiating effective policies towards the conservation and sustainable use of biodiversity besides securing ABS meaningfully.

4. Nature and Characterises of Bio-resources

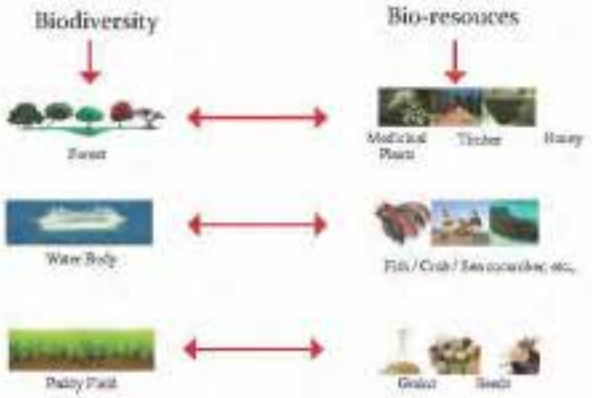
Origin of the bio-resources is from nature and is considered as the free gifts of nature or in other words it has manufactured by nature with its unique and intrinsic ability. Biodiversity exists in *in-situ* and *ex-situ* situations. In *in-situ* conditions, genetic resources exist within ecosystems and natural habitats. *In-situ* conservation is significant, where conservation of ecosystem and natural habitats and the maintenance and recovery of viable population of species in the natural surroundings and in the case of domesticated and cultivated species, in the surroundings where they have developed their distinctive properties. In the case of *ex-situ* conservation, conservation of the components of biological diversity take place outside their natural habitants such as zoos, botanical gardens, and seed banks (see Figure 4).

Figure 4 - Types of Genetic or Bio-resources



Bio-resources are renewable and can consider as a subset of biodiversity. Bio-resources and biodiversity are highly interlinked. One can interpret biodiversity as a stock and bio-resources as the flow from it; they are mutually interrelated in their existence and function as interpreted in the following figure (figure 5). Hence, the earth's biodiversity stock should be maintained intact through its sustainable utilization (extraction should be less than or equal to its regeneration) for fulfilling various human requirements for ever.

Figure 5 - Linkages between Biodiversity and Bio-resources



5. Economics of Bio-resources

In the modern global economy bio-resources are utilizing in produce energy, fuels, chemicals, and different consumer products. 'Bio-resources based Industries' with advanced biomass processing are emerging in a significant level. Agricola (2012) indicated that "If the 20th century can be called 'the age of geology', with tremendous growth in prosperity built on the exploitation of fossil fuels, then the 21st century will be called 'the age of biology'. Powerful drivers are fuelling unprecedented interest in applying emerging technologies to the manufacture of energy, fuels, chemicals and materials from renewable resources – transforming biomass into the new staple goods of the modern global economy".

Bio-resources plays significant role in economic development through income and employment generation, particularly in a developing country like India. Biological diversity is a global asset with tremendous economic values to present and future generations. The resources coming out from the biodiversity or ecosystems are having huge economic potential. Unfortunately this element is still poorly understood and accounted for. Globally more than 1.3 billion people depend on biodiversity and on basic ecosystem goods and services for their livelihoods (CBD, 2012). Biodiversity is base for many manufacturing sectors such as pharmaceuticals, agriculture, horticulture, cosmetics and biotechnology.

6. Property Rights and Markets for Bio-resources

Bio-resources exist in a natural environment (common lands) as well as manmade environment (private lands). For example, forest, river, estuary, ocean, etc. are common properties. Hence, the bio-resources from these sources experience market failure or distortions and the current market price at its collection point does not represent its real or true value. The community, who have the traditional rights on these resources are, historically collecting these resources and provide to the immediate users (traders, industries, research organizations, etc.) at free of cost or at meagre amount.

In other words, due to the market imperfections bio-resources are under-priced. Therefore, the existing price for bio-resources received by the local communities cannot act as an incentive for their conservation. On the other hand, bio-resources such as grains, cereals, vegetables, fruits, fishes from aquaculture ponds and life stocks, that exist in private lands (fields and gardens) are controlled by private entrepreneurs and priced in better manner. These cultured or cultivated products' market prices reveal their cost of production and act as an incentive to flourishing agri-business (see figure 6). However, our main concern in ABS perspective is on the bio-resources existing in the common property areas, where its management is became a great challenge.

Figure 6 - Bio-resources : Property Rights

According to OECD, only a limited number of biodiversity products and services are traded in the marketplace, mostly at prices that do not reflect their full value. Many biodiversity products and services display some public good characteristic; they are either non-rival in consumption, or non-excludable, or both. Non-rivalry in consumption means that one person's consumption of the good does not reduce its availability to anyone else. Non-excludability entails that once the good is provided, the provider is unable to prevent anyone from consuming it. The public good characteristics of biodiversity

induce market failure by precluding its products and services from being easily traded in markets; therefore, prices do not reflect the full value of biodiversity to society (OECD, 2003).

In other words, the market for bio-resources at this stage (first stage of transaction) is weak or highly imperfect. The non-excludability character of open access resources, like bio-resources, will often make a market price close to zero, when the actual value is quite large. Since the bio-products are non-rivalry in character, there is no (not much) competition of these resources, hence the market price will be inaccurate. Non-excludability is the essence of a public good. If the good is freely available to one person, it is freely available to all. In such a situation, the question will arise why would a consumer pay to acquire this particular good or service? Further, the Non-excludable and non-rivalry characters of bio-resources reflects the "off-site effects" and the resources often flow to wider communities to different provinces and countries skewing the well below market prices than the actual value.

Bio-resources values are implicit rather than explicit, and thus are often not captured by markets. In the case of biological resources, the absence of apparent values combined with their "public good" characteristics in the absence of well-defined property rights, have created problems of over-exploitation and unregulated use. Moreover, increasing development pressures have led to an unprecedented rate of biodiversity loss.

In order to create markets, clear property rights are fundamental. If property rights are clearly established and enforced, and if trading is permitted, markets can in principle develop. A perfect competitive market occurs if all of the following conditions are satisfied simultaneously:

- there are numerous small buyers and sellers;
- a standardised product is traded (also referred to as a homogeneous product);
- perfect information flows among all buyers and sellers;
- no collusion amongst buyers and sellers;
- all economic agents can freely enter and exit the market;
- consumers maximise their preferences and sellers maximise total profits;
- the product is transferable.

However, in the case of bio-resources, most of the above conditions are not fulfilling primarily due to the public good characteristics and the absence of well-defined property rights of bio-resources. It is very clear a huge number of bio-resources are collected by the local communities from different ecosystems (forests, wetlands etc.) and supplying to different users (industries, research organizations etc.) in domestic and international level. However the perfect knowledge regarding the bio-resources and its markets and economic potential is not revealed mutually by the buyers and sellers.

Most of the time the transaction is taking place through brokers / traders. The peculiar functioning of transaction and market may led to the exploitation of local communities (through pay a negligible or a low price for the resources), who normally put their hard work and unique knowledge in mobilising the resources.

Majority of the bio-resources are public goods belonging to the state and the local communities are involving their collection. Hence they are having constrains in bargaining and obtaining the fair price from the user. However, in some bio-resources case, certain area specific cooperative societies are functioning in most transparent and effective manner. Broadly, bio-resources are the base for manufacturing different consumer products. Further bio-prospecting is a multi-billion business and a profit option for the large number of business community.

7. Bio-resources Trade and Emerging Challenges

Bio-resources are free gifts of nature. Earlier, bio-resources extraction and use were limited in volume, and does in an environmentally sustainable manner. Bio-resources related economic activities were then at a subsistence level, and mainly confined to certain regions. Since the providers and users are not divergent, benefit sharing was not a serious concern. But over time, population growth, rapid economic development, progress in trade, globalization and the emergence of intellectual property regimes changed the scenario. Bio-resources are

extensively extracted and used for divergent purposes, and have become emerging commercial products for entrepreneurial development. Bio-resources are the base for several industries (such as pharmaceuticals, agro-processing, textiles, fisheries, cosmetics, bio-technology etc.) contributing to the global economy and human welfare. In this context global food and health securities depend on biodiversity. Further biodiversity or bio-resources is the source of employment and livelihood for millions of poor in developing countries like India.

A large part of the world's biodiversity is in the developing world. Huge quantities of bio-resources from these parts of the world are being collected for meeting the global requirements. Local and indigenous communities are involved in the collection with their hard work and unique knowledge. However, the transaction of bio-resources at the collection point is does in the traditional fashion. Provider/sellers and buyers have limited knowledge and information about the product. Normally information is disclosed by both the parties (sellers and buyers). In the exchange, the users of bio-resources (the companies or their representatives) have better knowledge about their significance and value than the providers. However, the local communities are being exploited by providing only a meagre price by the traders and companies who make substantial profits from the business. At this stage, the current price represents only an exchange rate and not the real value of the resources, and

does not act as an incentive in its conservation. Consequently, it leads to over-extraction and extinction of species, becoming a threat to biodiversity. But local communities may be the only stakeholder in the bio-resources conservation, management and sustainable use.

8. Ecosystems Specific Goods and its Economic Significance

(a) Forests

Forests are important renewable ecosystems capable of providing a wide range of benefits (environmental, economic, social and cultural) to the society. Forests provide raw-materials for food, fuel and shelter. In forests, ecosystem components such as microorganisms, soil and vegetative cover interact to purify air and water, regulate climate and recycle nutrients and wastes. Hence forest attributes significantly in global life support system, economic growth and the environmental conditions of the country. Large numbers of bio-resources (goods) are coming out from the forests as timber and non-timber forest products and are exchanged at low price at forest gate. The following table (table 1) provides a broader picture about the various goods and services provided by the forest ecosystem.

Table 1 - Primary Goods and Services Provided by Forest Ecosystem

Goods	Services
• Timber • Fuel Wood • Drinking and irrigation water • Fodder • Non timber forest products • Food (honey. mushrooms, fruit, and other edible plants; game) • Genetic resources • Cultural resources	• 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

However, forest resources are used as input factor for manufacturing various value added products having huge market potential. For examples see Figure 7.

Figure 7 - Timber and Non-timber Forest Products

(b) Wetlands

Wetlands are one of the most productive ecosystems in the earth. Wetland includes: (a) estuaries – where rivers meet the sea and salinity is intermediate between salt and freshwater (e.g., deltas, mudflats, salt marshes), (b) marine – not influenced by river flows (e.g., shorelines and coral reefs), (c) riverine – land periodically inundated by river overtopping (e.g., water meadows, flooded forests, oxbow lakes), (d) palustrine – where there is more or less permanent water (e.g., papyrus swamp, marshes, fen) and (e) lacustrine – areas of permanent water with little flow (e.g., ponds, kettle lakes, volcanic crater lakes). The major components of a wetland includes biotic (plants and animals) and non-biotic (soil and water). The interactions between the components make wetland as functions, including nutrient cycling and exchange of water between the surface and the groundwater and the surface and the atmosphere

(hydrological cycle). The system also has attributes, such as the diversity of species (Table 2).

Table 2 - Primary Goods and Services Provided by Different Welland Ecosystems

Ecosystem	Goods	Services
Coastal Ecosystems	• Fish and shellfish • Fish meal (animal feed) • Seaweeds (for food and industrial use) • Salt • Genetic resources • Cultural resources	• Moderate Storm Impacts (mangroves; barrier islands) • 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 provide recreation
Freshwater Ecosystems	• Drinking and irrigation water • Fish • Hydroelectricity • Genetic Resources • Cultural Resources	• 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 provide recreation

Source : OECD, 2003

Wetland species (animals and plants) are having huge economic value and ABS potential (Figure 8).

Figure 8 - Wetland / Marine Species and Products

(c) Agriculture

Agricultural biodiversity is an essential component for global food production, livelihood security and sustainable development. Agricultural biodiversity includes: harvested crop varieties, livestock breeds, fish species and non-domesticated ('wild') resources within field, forest, rangeland and in aquatic ecosystems; (b) non-harvested species within production ecosystems that support food provision, including soil micro-biota, pollinators and so on; and (c) non-harvested species in the wider environment that support food production ecosystems

(agricultural, pastoral, forest and aquatic ecosystems).

Agricultural biodiversity emerged from the interaction between the environment, genetic resources and the management systems and practices used by culturally diverse people resulting in the different ways land and water resources are used for production. It thus encompasses the variety and variability of animals, plants and microorganisms which are necessary to sustain key functions of the agro-ecosystem. In brief, agricultural biodiversity is essentially the interaction of knowledge and genetic resources used for food, biological support or ecological services.

The following table (Table 3) provide comprehensive information about the primary goods and services provided by agriculture and grassland ecosystems.

Table 3 - Primary Goods and Services Provided by Agriculture and Grassland Ecosystems

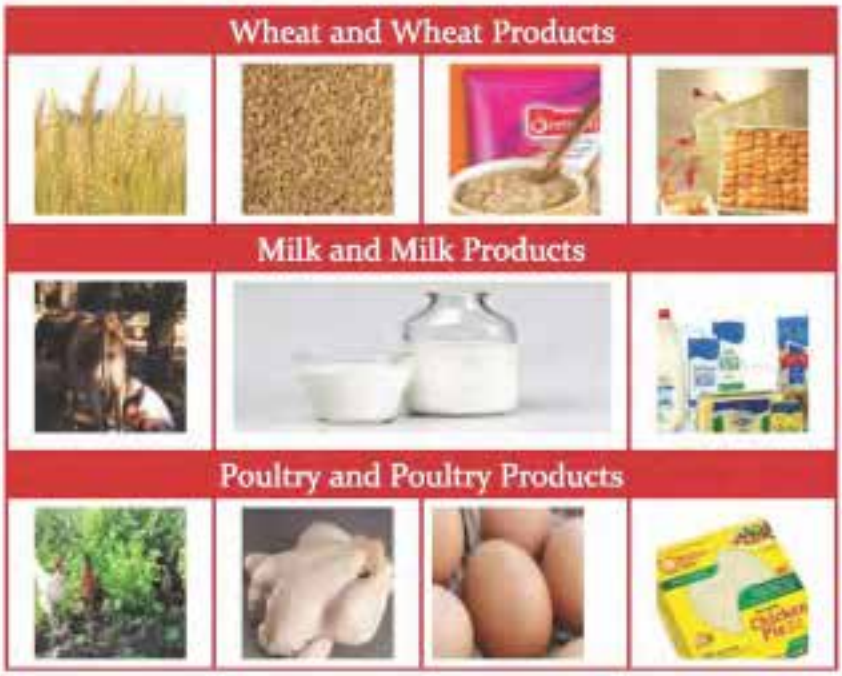
Ecosystem	Goods	Services
Agro Ecosystems	• Food crops • Fibre crops • Cropgenetic resources • Other crops (energy, fodder, etc) • Cultural resources	• Maintain limited watershed functions • Provide habitat for humans, birds, pollinators, soil organisms important to agriculture, maintain biodiversity and cycle nutrients. • Sequester atmospheric carbon • Provide employment • Contribute to aesthetic beauty and provide recreation

Ecosystem	Goods	Services
Grassland ecosystems	• Livestock (food, game, hides, fiber) • Drinking and irrigation water • Genetic resources • Cultural resources	• Maintain array of watershed functions (infiltration, purification, flow control, soil stabilization) • Cycle nutrients • Remove air pollutants, emit oxygen • Maintain biodiversity • Generate soil • Sequester atmospheric carbon • Provide employment • Provide human and wildlife habitat • Contribute to aesthetic beauty and provide recreation

Source : OECD, 2003

Agriculture products or outputs are having huge market and business potential and is playing a significant role in manufacturing different food items and achieving food security (see Figure – 9).

Figure 9 - Agriculture Resources and Products



9. Access and Benefit Sharing (ABS) Mechanism

ABS is emerging as an innovative approach and an incentive mechanism in biodiversity conservation and its sustainable utilization. The ABS framework provides a formal guidance for the way in which biological or 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). The ABS philosophy proposes that providers of bio-resources are entitled to receive fair benefits from the users. In this context ABS balances the rights of the users of bio-resources with the rights of the providers of

such resources. Further, the ABS can manage biodiversity as a community asset and support biodiversity-based businesses in an effective and sustainable manner (see figure 10).

Figure 10 - CBD and Biological Diversity Act: Objectives

It is vital that both users and providers understand and respect the legal, administrative and policy frameworks at the national and local levels, as well as those outlined in the Convention of Biological Diversity (CBD) and the Nagoya Protocol on ABS. The ABS is based on prior informed consent (PIC) being granted by a provider to a user, and negotiations between both parties that result in mutually agreed terms (MAT). The negotiation between a provider and a user of resources should be based on the true/actual value of the resources. Hence, understanding the real value of bio-resources is a pre-requisite for equitable benefit sharing and signing of ABS agreements.

As a party to the CBD and as one of the mega-diverse countries, India enacted the Biological Diversity Act in 2002, and notified the Biological Diversity Rules thereunder in 2004. The objectives of the Biological Diversity Act are similar to those of the CBD and "fair and equitable sharing of the benefits arising out of the use of biological resources and knowledge associated thereto" is the key. The National Biodiversity Authority (NBA), the State Biodiversity Boards (SBBs) and the Biodiversity Management Committees (BMCs) oversee the implementation of the Act and Rules at the national, state and local levels respectively. ABS agreements under the Biological Diversity Act are divided into four categories, and necessitate the signing of legally binding arguments through various forms. Form 1 deals with the direct access to biological resources and / or associated traditional knowledge; Form 2 deals with the transfer of the research results relating to biological resources from India; Form 3 deals with the applications for intellectual property rights; and Form 4 deals with the transfer of biological resources and/or associated traditional knowledge to third parties by individuals/entities, who have accessed these resources and knowledge through Form 1.

Under Section 3 of the Act, all foreigners, non-resident Indians, and any corporate body, association or organization, that is either not incorporated in India or incorporated in India with non-Indian participation in its share capital or management,

have to obtain the approval of the NBA, before they access / use biological resources and associated knowledge occurring in India or obtained from the country, for commercial or research purposes or for the purposes of bio-survey or bio-utilization. More than 100 ABS agreements have been signed so far by NBA and the benefit sharing process is progressing.

However, increasingly it is being recognized that for determining appropriate benefits, especially monetary benefits, there is a need to suitably value the biological resources. So that the real – true value of such resources can be ascertained for benefit sharing components fixed that does not look purely arbitrary. At present, the NBA is following the criterion of fixing 2-3 % of the sale value of the final products derived from the bio-resources, as royalty for benefit sharing. NBA is currently re-examination of the criterion for fixing the royalty or assessing the value of bio-resources for purposes of ABS.

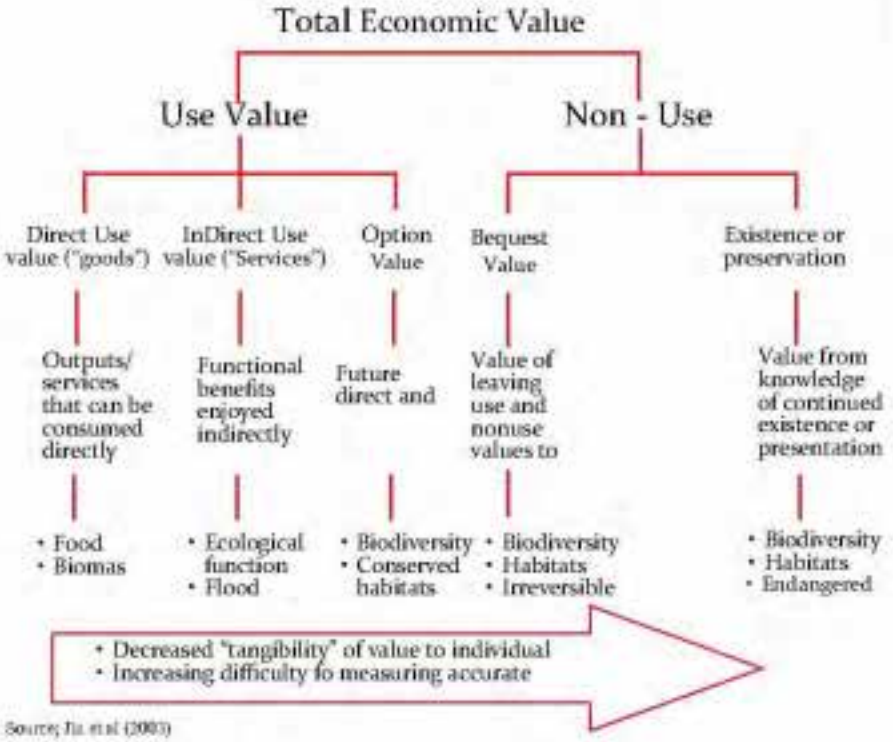
10. How Bio-resources Valuation for ABS Differs from the 'Ecosystem' Valuation?

Valuation of biodiversity goods is a fundamental step towards operationalizing the "Access and Benefit Sharing (ABS)" philosophy. Through the on-going GEF – ABS project in NBA an attempt towards valuation of ABS potential bio-resources from the above mentioned ecosystems such as: forests, wetlands and agriculture in the 5 project implementing states in India is being made.

An ecosystem is defined as "a community of plants, animals and smaller organisms that live, feed, reproduce and interact in the same area or environment". Ecosystem/biodiversity is providing innumerable services which are the core aspect behind the existence of human life. Broadly, ecosystem services are the service people obtain from the environment. In other words, ecosystem services are the transformation of natural assets (soil, plants and animals, air and water) into things that we use or required. They can be viewed as provisioning such as food and water; regulating, for example, flood and disease control; cultural such as spiritual, and recreational, benefits; or supporting like nutrient cycling that maintain the conditions for life on Earth (MEA, 2003).

Ecosystem services also include, "ecosystem goods" such as food, medicinal plants, construction materials, tourism and recreation, and wild genes for domestic plants and animals. A common taxonomy for environmental asset valuation is presented in Figure 11.

Fig. 11 Total Economic Value of Biodiversity



Source; Jia et al (2003)

Conceptually, total economic value (TEV) of an environmental resource (ecosystem) consists of its use value (UV) and non-use value (NUV). A use value is a value (in the form of commodities and services) arising from an actual use made of a given resource. This might be the use of a forest for timber and non-timber forest products, or of a wetland for recreation or fishing, and so on. Use values are further divided into direct use values (DUV), which refer to actual uses such as fishing, timber extraction etc; indirect use values (IUV), which refer to the benefits deriving from ecosystem functions such as a forest's

function in protecting the watershed; and option values (OV), which is a value approximating an individual's willingness to pay to safeguard an asset for the option of using it at a future date, like an insurance value.

Non-use values (NUV) are more problematic in definition and estimation since these are non-marketed services of ecosystem. NUV are usually divided between a bequest value (BV) and an existence or 'passive' use value (XV). The former measures the benefit accruing to any individual from the knowledge that others might benefit from a resource in future. The latter are unrelated to current use or option values, deriving simply from the existence of any particular asset. An individual's concern to protect, say, the blue whale although he or she has never seen one and is never likely to, could be an example of existence value (Pearce and Dominic, 1994).

Thus in total economic value:

$$TEV = UV + NUV = (DUV + IUV + OV) + (XV + BV)$$

Even if valuation of ecosystems has highly debated, last two decades economists are involved in developing valuation methodologies with consider its increasing role in natural resources management and policies. However there are constrains (resources and data) in applying methods and some of them work better for certain services. Ecosystem valuation methods can broadly be classified into 6 categories (table 4).

Table 4 - Components of Valuation Methods

Group	Method	Summary
Direct Market Price	i. Market prices	i. Observe market prices
Market Alternative	I. Replacement costs ii. Damage cost avoided iii. Production function	i. Finding a man-made solution as an alternative to the ecosystem service. ii. How much spending was avoided because of the ecosystem service provided? iii. How much is the value-added by the ecosystem service based on its input to production processes?
Surrogate markets	i. Hedonic Price Method ii. Travel Cost Method	i. Consider housing market and the extra amount paid for higher environmental quality ii. Cost of visiting a site: travel costs (fares, car use etc.) and also value of leisure time expended
Stated preference	i. Contingent valuation method ii. Choice experiments	i. How much is the survey respondent willing-to-pay to have more of a particular ecosystem service? ii. Given a 'menu' of options with differing levels of ecosystem services and differing costs, which is preferred?
Participatory	i.Participatory environmental valuation	i. Asking members of a community to determine the importance of a non-marketed ecosystem service relative to goods or services that are marketed
Benefits transfer	i. Benefits transfer (mean value, adjusted mean value, benefit function)	i. 'Borrowing' or transferring a value from an existing study to provide a ballpark estimate for current decision

Source : TEEB, 2010

Certain ecosystem goods and services have a market. For example: timber, fish, and vegetables have economic values that can be calculated with little statistical analysis. Markets for tangible ecosystem services are also emerging. However, most ecosystem goods and services do not have readily observable market prices.

In brief, through valuation, the value of ecosystem goods and services can placed in decision making and action. A careful application of valuation does not only seek out the 'right numbers' to input; but also sensitive to peoples' cultural and spiritual values. Generally, the 'purpose of valuation' determines which method is most appropriate. However consider the options such as: (a) who the end-users of the analysis will be, (b) who the affected stakeholders are, and (c) what resources are available, before design a valuation exercise.

In the ABS perspective we are not involving the TEV estimation of a particular ecosystem such as forests, wetlands or agriculture. Here the direct use value of the ecosystem or biodiversity, particularly the goods, which are having huge market potential and business scope or utility, is significant (see the following table/figure - 12). However these goods are part of ecosystems. For example a rich forest ecosystem only can provide substantial amount of timber or other non-timber forest products. In brief, from an ABS perspective, use value - particularly direct use values - in the forms of goods / resources which are tangible or visible is significant (Fig 12).

Figure 12 - With and Without Perview of ABS Valuvation

Not Needed	Needed	
	What	Based on
		
		
		

Historically these bio-resources, which include different genetic materials, are extracted by local communities with the help of their unique and traditional knowledge and sells to the companies at low or negligible prices. Since there are no proper markets for bio-resources at its collection point, the existing price for the product is not revealing its actual value. Actual value may be more than the existing market price. In this context only, valuation of bio-resources and signing of ABS agreements are significant. This will facilitates in obtaining reasonably better share of the overall benefits of bio-resources related economic activities to the local communities, who are involved in its collection and management.

When market prices are available for bio-product and genetic resources, they may be *either undervalued or distorted.* Distortions in the market (subsidies, price regulations, taxes) may produce incorrect values which must be accounted for in an effective valuation analysis, which is the prime objective of the 'valuation of biodiversity' component in ABS project. When the market is weak or not exists for certain ecosystem services, valuation methods like market alternatives and other non-market valuation methods are used for obtain the real value of the goods and services.

11. Need for a Paradigm Shift in Valuation for ABS

The valuation of bio-resources for ABS differs from the normal 'ecosystem valuation' about which environmental economists are generally familiar. The ecosystem valuation is emphasized on specific site (such as areas covered with forests, mangroves, corals, wetlands etc.) with Total Economic Value (TEV) Approach. In TEV, both the goods and services provided by an eco-system are taken in to account. But the valuation required for ABS is primarily for the visible and tangible goods or products, which are coming out from the ecosystem. Biological resources are simply those components of biodiversity which maintain current or potential human uses.

From the ABS perspective, the use value of tangible and visible bio-resources is significant, since it is directly involved in trade and acts as the basic raw-material or input factor in

manufacturing. Currently, the benefit sharing arrangements on these products are based on a fixed percentage of gross sales of a commercial product as the minimum requirement, and do not fully reflect the economic potential of the resources. The estimation of the real value of bio-resources will help in determining the realistic benefits, which should be shared by the providers or local communities. Generally, different actors – including 'direct actors' such as local communities (who share the knowledge and resources) and researchers, institutions and government - are involved in the bio-resources based production process. Further, in the production process, different factors of productions are involved. Hence the income / benefits derived from the commercial use of bio-resources should be distributed as 'returns' to the various factors of production, where a considerable amount should be given to the local communities. This is the fundamental principle behind the implementation of the ABS.

The negotiation between a provider and a user of resources can never be entirely based on the nature and quality of resources to be used. Both user and provider need to know the true value of the resources that is in discussion to meaningfully arrive at a conclusion on the quantum of benefits that can be generated and subsequently shared. However, many times, the real economic value of biological resources is hardly understood by the providers as well as users, primarily due to the complexity

in valuation and methodology deficiencies. This becomes a fundamental problem in arriving meaningful and suitable ABS agreements. In general, the provider (either the local community and indigenous group or the country) believe that they obtain a meagre share of the real resource value since they don't have a proper base value to bargain or negotiate the benefits.

12. ABS: UNEP GEF MoEF Project in NBA for Strengthening the Biological Diversity Act

The project on "Strengthening the Implementation of the Biological Diversity Act and Rules with focus on its Access and Benefit Sharing provisions" deals with assessing and quantifying the economic value of biological resources, using appropriate methodologies to determine benefit sharing, which will help in better implementation of the Biological Diversity Act, and inform national decision makers on prioritizing conservative action.

The identification of bio-resources or genetic resources, with potential for ABS from selected ecosystems, such as forests, wetlands and agriculture, and their valuation (estimation of the real value) is an important task in this project. The major activities coming under this head, include: (a) Developing standardized economic valuation methods for valuing bio-resources, (b) Organizing three national workshops and five state level workshops on understanding the valuation methodology, and using the same in decision making, (c)

Developing a methodology for using the economic valuation in deciding ABS permits, and (d) Developing a data base covering the economic valuation information in finalizing the ABS agreements. The project is implemented in 5 states in India (Andhra Pradesh, West Bengal, Sikkim, Himachal Pradesh and Gujarat) with the collaboration of the State Biodiversity Boards and Biodiversity Management Committees.

13. Conclusions

Biodiversity is has significant economic values, which are implicit, in general, rather than explicit. Most of these values are often not captured by the market; hence, their economic potential is underestimated, which is considered as one of the factors for the rapid depletion of biodiversity and extinction of species. Most of our biodiversity is on common land and its property rights are not clearly defined. Hence, the goods and services derived from biodiversity experiences market failure. Even if bio-resources (biodiversity goods) have a market, they are imperfect and experience market distortion. The demand, supply and price mechanisms do not function effectively as they do in the case of other commodities. Hence, the existing price of bio-resources at the collection point does not reveal its real value.

Valuation of biodiversity goods (bio-resources) and ecosystem services is a fundamental step towards realizing the goal and objectives of ABS framework. With 194 countries around the

world agreeing on an international protocol related to ABS – the Nagoya Protocol on ABS – under the Convention on Biological Diversity (CBD), time has come for environmental economists, planners and governments to understand and apply principles of Environmental Economics to real on the ground action to achieve the objectives of ABS.

With India chairing the CBD and ABS process at global level as COP President, the National Biodiversity Authority currently working to develop a workable model to address un-ambiguous valuation methods biodiversity, goods through a Global Environment Facility supported project in 3 ecosystems (forest, agriculture, and wetlands) at 5 states (Andhra Pradesh, Gujarat, Himachal Pradesh, Sikkim, and West Bengal).

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About the Project:

The Objective of the UNEP-GEF MoEF project on ABS is to increase the institutional, individual and systemic capacities of stakeholders to effectively implement the Biological Diversity Act, 2002 and the Rules 2004 to achieve biodiversity conservation through implementing Access and Benefit Sharing Agreements in India.

This project is implemented in the 5 states of India namely Andhra Pradesh, Gujarat, West Bengal, Himachal Pradesh and Sikkim. The executing organisation includes NBA in collaboration with 5 SBBs, Botanical Survey of India (BSI), Zoological Survey of India (ZSI), United Nations Development Programme (UNDP), United Nations Environment Programme - Division of Environmental Law and Conventions (UNEP/DELC), United Nations University – Institute of Advanced studies (UNU-IAS) and Global Environment Facility..

The main components of the project are:

- ✓ Identification of biodiversity with potential for ABS and their valuation in selected ecosystems such as forest, agriculture and wetlands.
- ✓ Development of tools, methodologies, guidelines, frameworks for implementing ABS provisions of the Biological Diversity Act.
- ✓ Piloting agreements on ABS
- ✓ Implementation of policy and regulatory frameworks relating to ABS provisions at national level and thereby contribute to international ABS policy issues.
- ✓ Capacity building for strengthening implementation of the ABS provisions of the BD Act.
- ✓ Increase public awareness and education programmes.


10
Anniversary
2003 -2013

About NBA

The National Biodiversity Authority (NBA) was established in 2003 to implement India's Biological Diversity Act (2002). The NBA is a Statutory, Autonomous body and it performs facilitative, regulatory and advisory functions for Government of India on issues of conservation, sustainable use of biological resources and fair and equitable sharing of benefits arising out of the use of biological resources.

The Biological Diversity Act (2002) mandates implementation through a decentralized approach with the NBA focusing on advising the Central Government on matters relating to the conservation of biodiversity, sustainable use of its components and equitable sharing of benefits arising out of the utilization of biological resources; and advising the State Governments in the selection of areas of biodiversity importance to be notified under Sub-Section (1) of Section 37 as heritage sites and measures for the management of such heritage sites besides supporting conservations and sustainable management of biodiversity.

The State Biodiversity Boards (SBBs) focus on advising the State Governments, subject to any guidelines issued by the Central Government, on matters relating to the conservation of biodiversity, sustainable use of its components and equitable sharing of the benefits arising out of the utilization of biological resources. The State Biodiversity Boards (SBBs) also regulate, by granting of approvals or otherwise requests for commercial utilization or bio-survey and bio-utilization of any biological resource by Indians.

The local level Biodiversity Management Committees (BMCs) are responsible for promoting conservation, sustainable use and documentation of biological diversity including preservation of habitats, conservation of land races, folk varieties and cultivars, domesticated stocks and breeds of animals and microorganisms and chronicling of knowledge relating to biological diversity.

The NBA with its headquarters in Chennai, Tamil Nadu, delivers its mandate through a structure that comprises of the Authority, Secretariat, SBBs, BMCs and Expert Committees.

Since its establishment, NBA has supported creation of SBBs in 28 States and facilitated establishment of around 33,000 BMCs at local level.

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