



**National Biodiversity Authority
Government of India**

Methodology for Economic Valuation of Bio-resources

An Approach Paper
(Draft)



Methodology for Economic Valuation of Bio-resources: An Approach Paper

1. Introduction

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 its resources potential.

A 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 significance of 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. Bio-resources (Bio-products) Based Production and Market

According to CBD biological resources are: "...genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity." In this context biological resources should be considered as a subset of biological diversity or biodiversity. Biological resources have been commercialised ever since humankind created markets and even before the invention of money. During the "*barter system*" most of the transactions were on tangible natural resources/goods. After the invention of money bio-products were started to transacted heavily. In the modern global economy bio-products are utilizing in produce energy, fuels, chemicals, and different consumer products. 'Bio-product 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". The global economy has begun an inevitable shift towards a bio-base driven by twin dynamics. For example: petroleum is a finite resource, while demand for energy and materials continues to increase, creating mounting pressure to switch production of the petroleum-based materials, chemicals and fuels that underpin our economy to renewable resources.

In proportion to the growing need or demand on products (outputs) from biological resources, there is a growth of pure and applied research and development (R&D) in

all bio-products categories, including bio-chemicals and biomaterials that are reaching critical mass.

Generally, understanding the supply chain of the output deriving from the bio-resources is difficult, particularly the complexity of the resources and its pricing policy at the first stage of transaction (from the community – provider - to the trader/industry). 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. In most of the core biodiversity spots (such as: forests, wetlands, marine and coastal zones) the property rights are not well defined. 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.

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. While perfect markets hardly ever exist in the case of bio-resources, it is useful to understand the conditions in which they may thrive.

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. 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 (industry, research organizations) in domestic and international. 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. Since it is a public good (state property) and collected legally or sometimes illegally, the local community has certain in bargaining. Generally these resources are base for manufacturing different consumer products, possess high utility. Further the entire process is a multi-billion business and a profit option for the large number of business community.

3. Access and Benefit Sharing (ABS) Principle

Access and Benefit Sharing (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). Providers of genetic resources can be governments or civil society bodies, which can include private land owners and communities within a country, who are entitled to provide access, negotiate the benefits resulting from their use.

ABS principles ensure that the physical access to genetic resources is facilitated and that the benefits obtained from their use are shared equitably with the providers. Such ABS regimes also need to consider valuable traditional knowledge associated with the resources.

The benefits to be shared can be evaluated in the monetary term. It is vital that both users and providers understand and respect legal, administrative and policy frameworks at national and local levels as well as in those outlined in the Convention of Biological Diversity (CBD) and the Nagoya Protocol on ABS. 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) including provision for fair and equitable benefit sharing.

The process of prospecting biological and / or genetic resources involves a large number of actors and stakeholders ranging from local communities to multi-national companies. Thus there is a need to establish appropriate user provider chain when dealing into ABS issues. 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.

Genetic Resources and Market

The market potential for genetic resources derived from natural resources is well recognised. For example, in the United States alone, 86 of the 150 most prescribed drugs are derived from, or patterned after, natural resources. The CBD recognises this potential in article 15 (paragraph 7) by stating that:

“Each Contracting Party shall take legislative, administrative or policy measures, as appropriate and in accordance with Article 16 [Access to and Transfer of Technology] and 19 [Handling of Biotechnology and Distribution of its Benefits] and, where necessary, though the financial mechanism established by Articles 20 [Financial Resources] and 21 [Financial Mechanism] with the aim of sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources. Such sharing shall be upon mutually agreed terms.”

Moreover, contracts regulating access to genetic resources and benefit sharing (ABS) among the different actors including governments, private sector and civil society, are already in place. The best known example is perhaps the contract between Merck, the world's largest pharmaceutical firm, and Costa Rica's Instituto Nacional de Biodiversidad (INBIO) dating back to 1991. In exchange for a limited number of samples to be used in pharmaceutical research, Merck paid an up-front fee of approximately USD 1 million. If commercial products are developed, INBIO will receive royalties, although the terms of these were not disclosed. Although the details of the Merck/INBIO contract are not fully known, it may be considered a trend-setter in the industry and several others materialised after 1991.

While the market potential for genetic resources is recognised, its regulation and its prospective size among other issues are not without controversy. While the other products discussed here have clear use value, genetic resources are primarily linked to the use of the information they may contain. This increases uncertainty, the potential for information asymmetries and the complexity of policies to address markets for genetic resources.

Source: OECD (2003)

4. A Possible Approach on Understanding the Value of Bio-products

4.1 Economic approaches

Economic approaches to biodiversity valuation consist of three procedures:

1. Using market prices where the prices occur in the market for the biodiversity asset and where prices are 'revealed' in some other market- the *revealed preference* approach.
2. Using willingness to pay estimates derived from questionnaires - the *stated preference* approach.
3. Using values 'borrowed' from existing studies - *benefits transfer*.

However in the ABS perspective, since the target is on bio-products the "Market Price Approach" is relevant. Market values for biological resources are perhaps the most obvious argument for conserving habitats - and hence biodiversity - threatened by some alternative use. There are three valuation approaches based on market values:

1. The observed market value and related goods approach.
2. The productivity approach and
3. Cost-based methods including replacement cost.

These methods rely on the availability of market price and quantity information to derive total values. The productivity, or production function approach requires more analysis to establish a physical relationship between some environmental change, or 'dose' (e.g. deforestation), and an impact or response that can be associated with a monetary value (e.g. Downstream flooding or the health of an estuarine fishery). The replacement approach values the asset according to the cost of replacing it.

Number of studies demonstrate the values of naturally occurring products include genetic material for agricultural products and drugs, minor forest products, etc. Here the market prices used should be adjusted where necessary to reflect economic values. Necessary adjustments can include:

- (a) The difference between gross and net value, i.e. deducting production and transport costs from the observed market price to arrive at the net value of a product.
- (b) Correcting the market prices for any known price distortions or policy failures (e.g. taxes and subsidies) that affect the output itself and any inputs (e.g. labour) that produce the output. If products are traded internationally it may also be necessary to convert ruling domestic prices to border equivalents (i.e. world prices). Correcting for externalities -i.e. the harmful effects of use - may also be necessary. In particular, prices of harvested products should bear some relationship to sustainable yields.

However in ABS perspective the above discussed negotiations or adjustments in determining the price may not be acceptable. What is needed is to estimate or identify the actual or real value of the bio-resources.

4.2 The BioTrade Framework / Approach and Value Chain

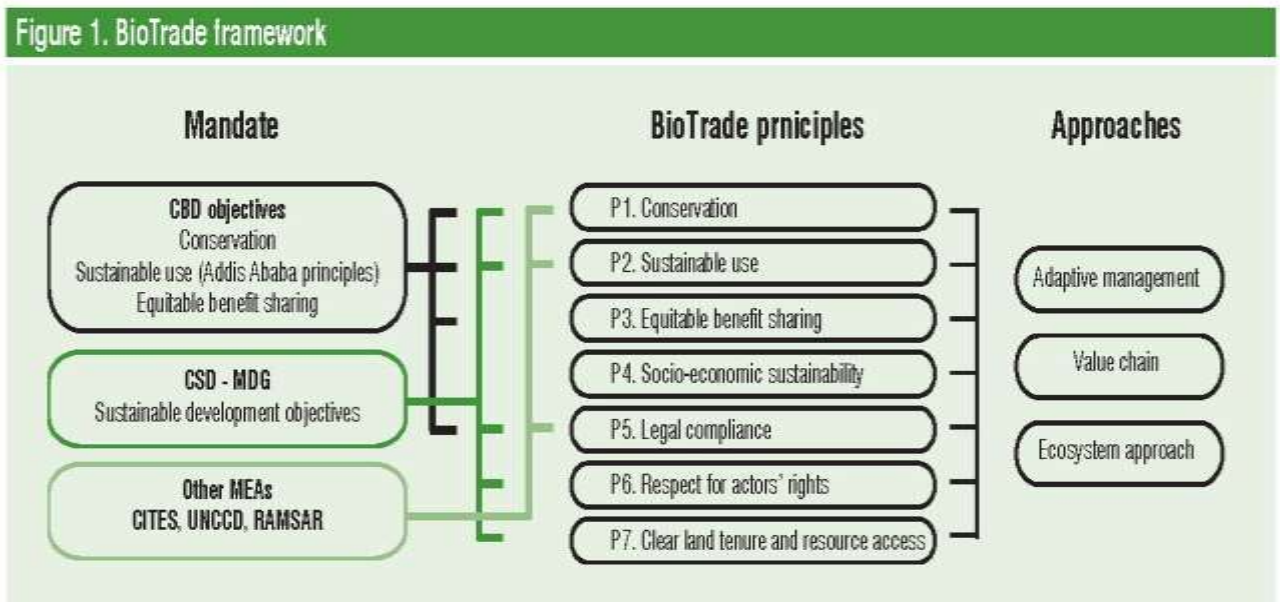
The study carried out by the (UNCTAD, 2012) revealed that the coordination among and between actors involved in the production process of a bio-product does not normally take place. Business relationships are characterized by lack of integration and trust between producers, processors, traders, exporters and government and support organizations. The BioTrade assessments of the natural ingredients for the cosmetic, food and pharmaceutical industries in Latin America, Africa and Asia, identified the following problems:

- Lack of trust among all actors of the value chain -private and public actors, and communities;
- Low quality of products (no quality and planning systems in place, traceability is not done by middlemen, and no guarantee for the sustainable use of the resources and its long term supply);
- Limited processing technology;
- Lack of basic documentation and information of species and products needed to access markets, for instance for taxonomical identification and for preparing Material Safety Data Sheets;

- Gaps and lack of clear application of relevant legislation (permits, quotas); and
- Lack of a tool for environmental authorities to assure the sustainable use of the resources.

Consequently, the actors were informally organized with no short, medium or long term vision. Also, a lack of cooperation and trust was visible between and within actors from each stage of the value chain. In this context the BioTrade approach has significant scope in managing and controlling and capturing the real value addition of the processing or production chain.

BioTrade refers to activities related to the collection, production, transformation, and commercialization of goods and services derived from native biodiversity (species and ecosystems) under the criteria of environmental, social and economic sustainability (UNCTAD, 2012). The BioTrade Principles and Criteria can be applied in different contexts, driving BioTrade processes to promote the conservation of biodiversity through sustainable commercial use (figure 1).



Source: UNCTAD, 2007.

Three basic approaches on BioTrade include:

1. Value-chain approach - where the strengthening of value chain is a critical element in implementing BioTrade Principles and Criteria;
2. Adaptive management approach – when implementing sustainable practices, it is crucial to consider the identification of impacts on species and ecosystems, and the continual improvement of BioTrade initiatives; and
3. Ecosystem approach - the planning of productive processes related to BioTrade initiatives are environmentally and socially responsible with regard to their impact on species, habitats, ecosystems and local communities.

5. Value Chain Development

The value chain approach may use as a methodology to understand the value addition of the bio-product and fixing the fair and equitable benefit sharing ratio. 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 or service from supplier to manufacturer to wholesaler to retailer to consumer. It establishes market-oriented strategic alliances between producers, processors, distributors, traders, and regulatory and support institutions (UNCTAD, 2012). All these actors are attempting towards meet a common agreed goal; development and strengthening of the sector, to access a target market or to satisfy consumer's needs.

With the support of the UN Food and Agriculture Organization (FAO) and ITC (UNCTAD/WTO), the UNCTAD BioTrade developed a methodology to support and/or strengthen value chains for BioTrade products and services.

The BioTrade value chain methodology involves five steps. It starts from the *identification* and *selection* of sectors or value chains based on environmental, biological, social, political, economic, market, technological and infrastructure criteria. Then, a *participatory assessment* of the selected sector/chain is developed, that includes the identification of problems and solutions in accessing current and potential markets. Finally, a *sector strategy is formulated and implemented* to strengthen or develop the sector while promoting the empowerment of companies

and sector associations in the process in the short, medium and long term. A monitoring system is also designed and implemented. Each one of these steps consists of activities that lead to the achievement of concrete results, through an active participation of government representatives, private sector, academia, NGOs, community-based initiatives, and other actors working in the sector. The methodology follows an inclusive bottom-up approach that builds on existing capacities and knowledge, and promotes the sharing of information, coordination of activities and establishment of partnerships - Figure 3 - (UNCTAD, 2012).



Source: Becerra MT (2009 b).

In brief, the BioTrade Initiative sees the strengthening of value chains as a critical element in facilitating the implementation of good practices related to the sustainable use and conservation of biodiversity and in promoting the equitable sharing of environmental, social and economic benefits among value chain participants

Natura Cosméticos and Equitable Benefit Sharing

Access and benefit sharing is one of the three main objectives of the Convention on Biological Diversity and, although the framework under the Convention refers specifically to genetic and not to biological resources, equitable distribution of benefits arising from the sustainable use and trade of biodiversity products and services is a central characteristic of BioTrade.

The Brazilian multinational cosmetic enterprise Natura offers a concrete example on how through BioTrade and other methodologies, fair and equitable sharing of benefits is promoted. Through the launch of the Ekos line in 2000, Natura was the first Brazilian company to commit itself to share the benefits generated by innovation in accessing the genetic assets and communities' traditional knowledge.

Natura currently has 56 negotiated natural asset supply agreements with farms, companies and communities in Brazil and in Latin America. Out of them, 19 natural supply asset agreements are with traditional communities and local providers of genetic assets or associated traditional knowledge regarding native species. Those agreements have benefited 1,600 families. Relationships with communities are assessed on the basis of seven criteria. Among them, one group of criteria refers to the level of understanding by communities of the agreements they enter, the information transparency, the payment punctuality and the satisfaction with the final result. Another criterion examines the participation of communities in price negotiation.

Challenges By ratifying the CBD in 1992, Brazil took on the obligation to define rules to regulate access and benefit sharing of genetic resources, as well as the respect of traditional knowledge of local communities. Several bills were proposed but none of them approved. The share of genetic resources is currently regulated by Provisional Measures 2.052-00 and 2.186-16 (August 2001) which created the Genetic Asset Management Council (CGEN). The Provisional Measures define a contractual requirement for the "owner" of an associated traditional knowledge that would merit benefit sharing. However, traditional knowledge is widely disseminated on vast territories and among many persons. Therefore, identifying the owner of the traditional knowledge is difficult and arbitrary. This legal context makes it challenging for Brazilian companies to work closely with local communities: at any moment, new "owners" might request companies to obtain their share of benefits for traditional knowledge.

Natura has actively participated in the discussions surrounding benefit sharing. Despite difficulties surrounding the legal framework, it has continued working with local communities and the sustainable use of biodiversity.

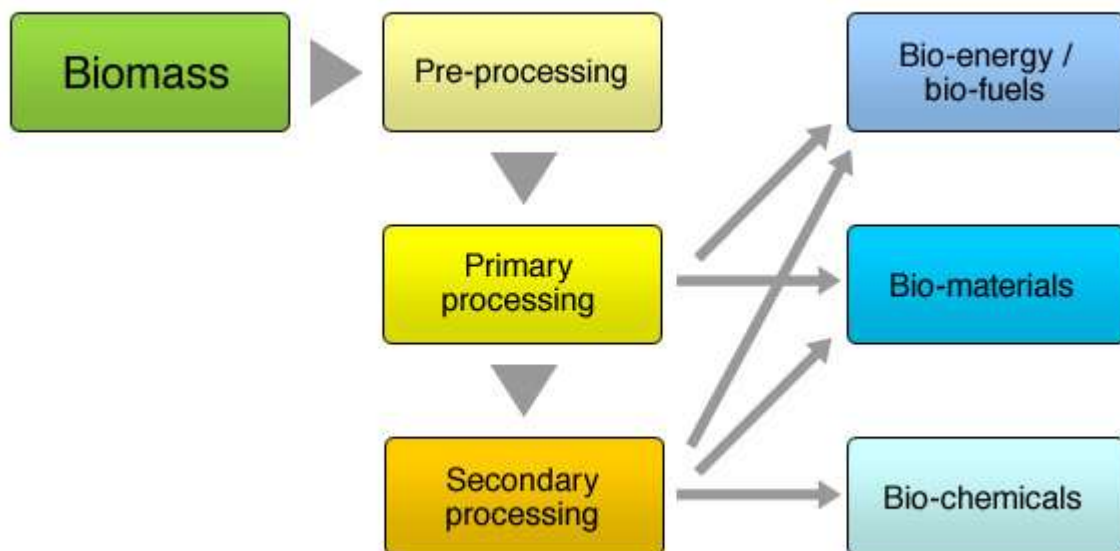
Practice: In practice, through benefit distribution, Natura seeks to generate relationships that empowers the communities they work with. The CGEN has approved eight Benefit Usage and Sharing Agreements from Natura. These regulate the access to breu branco, candeia, cupuazu-manteiga, erva-mate extract, aromatic erva-mate extract, maracujá-proteína, pariparoba and sesbânia. Benefit distribution to the 19 traditional communities that is regulated by the Genetic Asset Access Law, represent 9 per cent of the total payments made either directly or indirectly by Natura.

With these activities, Natura contributes to the generation of income for communities through the purchase of raw materials. The company encourages the development and strengthening of productive chains which generate greater income distribution.

Source: UNCTAD, 2012.

6. An Industrial Bio-products Value Chain

The industrial bioproducts value chain begins with harvesting or collecting a feedstock, which is then transported and amalgamated at a central location for processing into one or more bioproducts. This processing may involve both pre-processing and one or more stages of primary processing and secondary processing, resulting in one or more bioproducts, including energy / fuel, materials and chemicals. However, an expanded bioproducts value chain would also include: (a) feedstock supply, (b) harvesting and pre-processing, (c) conversion and processing, (d) market distribution, and (e) product utilization.



7. Conclusion

The available literature examined the value chain with different perspectives and can be considered as a base for developing the 'value addition method' for bio-products valuation in different eco-systems in the ABS project. The bio-products value chain to be examined from the first stage of transaction (local community / providers / sellers to the immediate buyers) to the final products market price with consider the production function or factor cost approach. From the existing price distribution to different factors of production, one can understand the current benefit distribution pattern (may be unequal) and derive a ratio for the fair and equitable benefit sharing.

Further, the maximum willingness to accept of the community (providers), who own the bio-resources are also to be carried out through a Contingent Valuation Survey. Sometimes the existing market distortions on bio-resources compel the community to provide the resources at a lower price, compare to the eligible price with respect to their unique knowledge and efforts for identifying and collecting the resources.

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