THE SIGNIFICANCE AND VALUE OF BIODIVERSITY

This section discusses some of the significance and value of biodiversity that have been partly adapted from economic assessment of biological resources by the Natural Resources Management Program (NRM/EPIQ). Economic valuation deals more with the economic aspect of biological resources, while the values presented here represent the entire value of biodiversity. There is thus a need to distinguish biological resources and biodiversity.

Biological resources are often interpreted as assets to produce products and services only, while biodiversity refers to all aspects of life support system, which includes the social, economic, and environment dimensions, knowledge system, ethics, and the relationship between these various aspects. These values have been acknowledged and known, but they are often ignored because not all these values can always be assigned a monetary value. For example, the meranti timber cut from the forest and then sold to a sawmill has a clear value in dollar. But the meranti tree, which is allowed to grow in watershed areas to prevent erosion and protect soil, clearly has a great significance, but assigning a monetary value to this would be difficult.

Therefore economic valuation of biological resources is needed to assign economic value to all their benefits. Yet not all benefits can be valued economically. Even so, economic valuation is still important as one of the tools to make decisions on biodiversity management options. Biodiversity valuation methods are presented in Box 2.1. The entire significance of biodiversity is described below, while the value of conservation areas is provided in Box 2.2.

Box 2.1

BIODIVERSITY ECONOMIC VALUATION METHODS

Natural resources valuation will enhance the understanding about the value and services provided by natural resources and biodiversity. Valuation can help decision-makers to make alternative development policy choices that will most benefit their region. Valuation would also be useful in identifying and comparing the investment made, opportunity costs, and the benefits produced. A better understanding of who bears the cost and who enjoys the benefits is important in formulating and implementing effective policies for protecting and utilizing natural resources efficiently (NRM/EPIQ).

There are five valuation approaches (IIED 2001 in Vermeulen and Kozziell 2002):

a. Market price approaches, including estimation of profit, consumption and substitution.

b. Surrogate market approaches, including travel cost model, the price of enjoyment and substitution approach.

c. Production function approaches, that emphasize on the biophysical relationship between the functions of forests and market activities.

d. Stated preference approaches, particularly contingency valuation methods together with their variations.

e. Cost based approaches, including compensation cost and cost for maintaining it.

The above methods can provide a relative value estimation, which can compare resources in different locations. This method also assigns monetary value to those values, which cannot be accommodated by the market by making direct comparisons between various products and services.

* The valuation undertaken by some experts in general classify biodiversity value into three categories: direct use value (productive and consumptive benefits), non-direct use value (environmental services, option value), non-use value (heritage and existence values) (Vermeulen and Kozziell 2002). This document tries to present a holistic understanding of the value of biodiversity and so does not use the above classification. All values are considered to have equal significance.
Existence value

In this case, biodiversity is valued due to its existence in a given area (Ehrenfeld 1991). This value is not associated with the potential of a certain organism, but is linked to its right to live as a part of nature. Existence value is sometimes known as intrinsic value, which is associated with ethics, that is a value based on ethics or religion. All religions of the world teach humans to protect God’s creations. By adhering to the existence value, some people feel they get a benefit, in the form of an opportunity to practice their religion.

Existence value is also linked to aesthetic value for humans. For example, many people, whether nature lovers or tourists, are willing to spend money to visit national parks in order to see animals in their natural habitat, although they get no economic benefit from such an activity. A more concrete example is the fact that tourists are willing to pay a lot of money to enjoy coral reefs in their natural form at the Bunaken National Park (NP), whose recreation value indeed amounts to Rp. 9.8 billion per year (NRM/EPIQ nd). Similarly, cave lovers or speleologists are willing to pay a lot of money and to take risks just to enjoy the beauty of the caves in Indonesia.

Although the existence value of biodiversity is hard to quantify in monetary terms, the benefit in increasing the psychological wellbeing of humans is quite clear. This is the reason why some people, particularly in developed countries, are willing to mobilize funds for nature and biodiversity conservation mainly to be able to enjoy their existence value.

Ecological value

Biodiversity provides ecological or environmental services for humans. For instance, forests maintain the hydrological balance thus preventing floods and droughts. Forests also maintain soil fertility by supplying nutrients through the leaf litter, prevent erosion and regulate the micro climate. Coral reef and seagrass provide nursery grounds for various fish and shrimp species. Karst and cave ecosystems provide a place for water storage that is used by the organisms in the surrounding areas and protection for seed dispersing and pollinating bats that are useful for plant reproduction.

The ecological value can be harnessed if biodiversity is considered as one entity, where the components are inter-dependent. For example, the diverse ecosystems provide a place for the food chain to function and a space for species to survive and breed. A well functioning ecosystem can supply and produce environmental services beneficial for the species living in it; these services are, among others, protection of water and soil quality, regulation of local climate. Environmental services are undervalued because it is difficult to quantify. Yet, this value is substantially high, as presented in Box 2.2.

Species diversity makes it possible to create food chain among plants and animals; this guarantees continuity of food supply for each species. Various species also develop mutually beneficial relationship within the food chain. For instance, insects that take nectar from flowers help in the pollination process of plants, or bats that eat durian actually help the dispersal of durian seed.

Genetic diversity is needed by each species to maintain their breeding capability, develop resistance to diseases and adapt to environmental changes. Species need a supply of diverse genes in order to survive in the ever changing environment.

Heritage value

This value is associated with the wish to conserve biodiversity for future generations. For instance, the Kasepuhan community in Halimun Mountain, West Java, stores seeds from each rice variety to be planted in the next season, and to conserve their rice varieties. Among communities in Mentawai (an island off the West Coast of Sumatra) only certain people are allowed to hunt monkeys and turtles to get protein. The number of animals killed is also limited and the meat is equally shared among community members. The intention is to prevent wasteful use of and depletion of resources, to make them available for the next generation.

This value is often linked to the sociocultural and option values. Certain species or area is deliberately conserved and bequeathed from generation to generation in order to maintain the cultural and spiritual identity of certain ethnic groups or so that the next generations maybe able to fulfil their needs.

Option value

This is the value of biodiversity in providing benefits for communities in the future (Primack et al. 1998). Biodiversity has uses and
values, which may not yet be known or cannot be utilized by humans at present. With the change in demands and consumption pattern as well as technological advances, this value will be important in the future. The potential of wild plants as medicinal sources is an example of the option value. Many pharmaceutical companies and government health agencies are intensively trying to discover new medicinal materials from biodiversity in its natural habitat in order to treat diseases such as AIDS and cancer. It should be noted that the 20 most often prescribed drugs in the USA, with an average annual value of US$ 6 billion contain chemicals found in nature (Primack et al. 1998).

Similarly, germplasm collections in the various research centers may not seem to have direct value at present, while the cost of maintenance is quite high. But, in the future, cultivated and wild plant germplasm collections will become very valuable for agricultural plant breeding.

The economic value of most of the world's species may be unknown yet at present, or knowledge on their utilization is limited. If one species with a high option value becomes extinct, even before it can be identified, the loss for human welfare can perhaps be high. If biodiversity were to be considered as a manual for improving the welfare of human beings, then the loss of one species would be like tearing a page of that manual (Primack et al. 1998). When we need information to solve one of our problems, which may be contained in that torn page, only then can we become aware that we have lost that information forever.

**Box 2.2**

**Conservation Areas: Asset or Liability?**

Valuation has been conducted in some conservation areas and areas with high biodiversity in Indonesia, such as Gunung Leuser National Park, Togean Islands, Taka Bonerate NP, Gede-Pangrango NP and Bunaken NP. Results of studies show that the total economic value of these areas is higher than the productive value and other forms of utilization. For example, the monetary value of tourism activities and environmental services (water regulation for agriculture and household use and sedimentation control) derived from the protection of the Gede-Pangrango NP amounts to Rp. 40.80 billion per year (for net present value - NPV or a 10% discount rate) and very much higher than the management costs and the monetary value from timber falling in the area which amounts to only Rp. 27.96 billion. The annual value derived from protecting Bunaken NP is estimated to be 3.6 billion, and Bukit Baka Raya NP is Rp. 10 billion. The economic benefits of protecting water in Ruteng is US$ 35 per household per year and the economic benefit of improving the quality of the water in Ciliwung river is estimated to be Rp. 30 million per year (NRM/EPIQ). Likewise, protecting forest in Gede, Halimun, Pangrango and Salak mountains in West Java will guarantee drinking water supply for the communities and for various economic activities such as agriculture and processing industries in the Jakarta-Bogor-Tangerang-Bekasi area, Sukabumi and Banten.

Figure 2.8. Medicinal plants cultivation is one of the potentials for sustainable development that need further exploration and development.