The Importance of Biological Diversity in Economic Terms

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Abstract

The environmental movement, which started in the 1970s, had been changed to the view of biological resources. It is understood that Biological resources are not enough resources as economical, which is perceived as inexhaustible goods till this period. Therefore it has come into question the conservation and sustainability of these resources. When to be included in the economical politics, biological diversity started to be taken measures about ensuring sustainable use is a guarantee of continuity of human life's continuity and biosphere. Protection measures can be taken as an essential condition of success is the possible loss of biodiversity and biodiversity of the economic importance, and it is possible to know the value. The potential loss of biological diversity, as it is ecological processes, can cause loss of power that is immendable and in economic and socio-cultural processes. In this context, primarily the goods and services provided by these services' biological diversity to identify and ecological, economic and socio-cultural processes need to display the possible values. This is possible by combining ecological functions of the financial position in sustainable economic policies under the same roof. However, in this case, efficient resource use can be assured of effective policies. Especially in some countries, which have rich biodiversity, in making a rational choice, in developing countries' resources, it needs to display the economic importance that goods and services provider of biological diversity. İn this study, it has determined that goods and services provided of biological diversity and have been trying to put the biodiversity and loss of biodiversity of the economic importance were assessed with the ecological processes.

Keywords: *Biodiversity*, *Economic Importance*, *Loss of Biodiversity*, *Sustainable Developing*, *Economic Policies.*

A. INTRODUCTION

Since the 1980s, the concept of biological diversity, which includes the variety of species, genes, ecosystem, and ecosystem functions, has begun to develop within a particular social, economic, and cultural context. In time, modern biotechnology aims to provide more benefits to humanity by using genetic resources has increased the value of biological diversity and its components by maximizing the services such as food, medicine, energy, and raw materials (Boyle, 1994). Biodiversity is a vital commodity element in meeting the spiritual and emotional needs of people such as a beautiful landscape, green forest, different plant species, clean air, as well as basic needs such as medicine, food, and energy, and in ensuring the continuity of these needs, its importance and weight vary from person to person also means an economic value. In terms of the resources in question, the matter can be expressed as the relative importance attributed to a good or service (Limburg, 1997).

One of the tools used in the evaluation of biological resources is implicit (monetary) evaluation. Every public or private decision or practice that impacts biodiversity means we put an economic value on that resource (De Groot, 2002). Even if this value is minimal, it is imperative to perceive and realize the positive value and benefit of biological diversity and its components.

Assessment of biological diversity provides information on the structure and functioning of biological diversity at the micro-level on the one hand. It contributes significantly to revealing the complex role biological diversity plays in the process of enhancing human welfare, on the other (De Groot, 2006). On the other hand, macro-level evaluation enables us to monitor how the change of biological diversity as a result of human activities affects the integrity of the human and natural environment, making it easier for us to create indicators on human well-being and sustainability (Kumar, 2004).

One of the indicators of sustainability is the richness of biological diversity and its components. Regions with rich biological diversity have a high contribution to resource utilization. From this point of view, our country, which has more than ten thousand species, three thousand of which are endemic, is in a critical position (Simpson, 1996). Turkey, rich in species diversity, is the subject of trade in some species, ecological and appears to be high when the positive contribution to economic processes or the use of certain types of medical potential assessed in terms of transport (Turner, 1999). It has been revealed that 40% of the global economy is related to biological processes. The value of global biodiversity is 2.9 trillion dollars/year, and the importance of goods and services provided by ecosystem functions is 33 trillion dollars/year. These data are quite clear that make a big difference in terms of socioeconomic status of countries like Turkey with biological richness Given. However, determining the total value of the species will provide efficiency to countries in resource use. Species value analysis will also facilitate the applicability of rational policies (Turner, 2000).

The total economic value should be revealed as a whole in the analysis at the decision-making level to ensure the conservation and sustainable use and management of biological diversity based on species and should be included in decision-making mechanisms. However, in this way, in ensuring the sustainability of biological diversity, determining the production, goods, and services offered by natural resources and analyzing their economic value by incorporating them into financial processes, defining the role of these services in ecological and economic processes constitute an important milestone in terms of protecting biological diversity. It is challenging to apply incentives or use existing incentives effectively to preserve biological diversity without determining gene resources' economic dimension. Simultaneously, the calculations on species' physical size, ecosystems, and gene losses are not perceived sufficiently by policymakers. The economic valuation studies that have been/will be carried out are essential, especially for policymakers, in showing what will be protected and how the resource transfer will be, what is

seen as a loss, and what kind of ways can be used to compensate these losses. Such studies are critical in protecting our country's genetic resources, revealing the value of our rich species diversity better, and including them in local or national policies.

B. RESULT AND DISCUSSION

1. Classıfıcatıon Of Bıologıcal Dıversıty And Its Economıc Importance

Generally, diversity; is a dynamic feature that adds color, beauty, flavor to a system and gives stability, strength, and vitality. On the other hand, biodiversity is the expression of a dynamic system that expresses the diversity of life in all living groups and organizational levels and includes the ecosystem and ecological cycles in which plants, animals, and microorganisms survive. Biodiversity with another aspect; It is primarily the diversity of living organisms, which means different numbers of animal, plant, and microbiological species (Dobson, 2005).

Biodiversity is one of the important parameters of sustainable development and guarantees human well-being; It consists of genetic diversity, species diversity, ecosystem diversity, and functional diversity (Kate, 2002). Genetic diversity is the most specific component that allows biotechnological manipulations, showing the difference between species by differentiation of genes, nucleotides, chromosomes, and individuals in each organism. Genetic material manipulations have significant economic value. Species with more genetic diversity are more likely to adapt to changing environmental conditions than other species. In this context, genes are the primary material of modern biotechnology and genetic engineering applications and allow species diversity.

Species diversity is the genetic similarity and mutual reproduction of a group of organisms and the emergence of productive organisms called species. Species diversity is the variation of the species in a particular region or world. On the other hand, ecosystem diversity is an important system that includes living creatures living in a specific area (habitat) and continuously interacting with each other and their non-living environment, encompassing the diversity at the society level, and providing first habitat diversity and then species diversity. The variety of ecosystems in a region and habitats on a smaller scale is an inevitable part of biodiversity.

Functional diversity is the practical dimension of biological diversity. Functional diversity occurs due to interactions between the structure and process of ecosystems (Sharma, 2004). While the ecosystem structure here is concrete structures that make up the ecosystem, such as plants, animals, soil, and water, ecosystem processes express the dynamics of the transformation of matter and energy between living and non-living beings.

The interaction of genes, species, and ecosystems with each other and their environment is possible through ecological processes (Jacquemount, 2002). Diversity in environmental processes such as climate, food, and material cycle

contributes to establishing mutual balance and order between biological diversity components. An essential part of the balance in question is human. It aims to obtain maximum economic benefit from natural resources by using nature and its members for its purposes with an anthropogenic approach. The contribution of biological processes to the economy has started with the history of humanity. It has reached enormous dimensions in terms of nutrients, pharmaceutical raw materials, industrial raw materials, and tourism revenues.

The most concrete example showing the economic value and importance of biological diversity is that it is the plant and animal food source. In millions of years of evolution, humans have obtained food by hunting animals and fish as hunter-gatherers. Also, they survived by collecting wild vegetables and fruits. Different varieties from wild forms are developed through agricultural production, and the benefit of biological diversity has been maximized by the use of highly productive plant species in modern agriculture.

An essential contribution of biological diversity to economic processes is that it can be used as pharmaceutical raw material. Globally, people need or use medicines derived from plants to live healthily. Today, 25% of prescription drugs sold in Europe are ephedrine, ergotin, etc., obtained from plants. It contains active raw materials, between 20 thousand and 70 thousand plants are used in traditional medicine or pharmaceutical raw materials. The market value of commercial herbs used for medicinal purposes is 5 billion $/year.

Fransworth and Soejarto (1985) found that 16 out of 5000 plants grown in the USA have potential medical use-value, and each of the 16 plants is worth $ 203 billion, and the total value for 16 plants is $ 3248 billion. Principe (1989) estimated that the prescription value of 40 plants in 1985 in the USA was $ 11.7 billion. The average value for each plant was $ 290 million, and the importance of each plant's contribution to the life scale was $ 6 billion. When evaluated with these data, it is seen that biological diversity is an essential element of value in the market as a direct drug active ingredient or as inert additives in terms of medical resources. When the benefit obtained from such plants is evaluated in terms of human health and life scale, quantitative expression of the benefit's value in question is quite tricky. The cost of a drug obtained from a plant or the market value of the drug will always be low compared to the benefit value to be obtained from the drug (Aguilar, 2003). However, the said cost may not ever meet the value of the benefit to human life. In this respect, it is still possible to say that plant resources constitute a market value and contribute directly or indirectly to the economy.

Likewise, the raw materials of many agricultural, industrial products are of vegetable origin, and they are used for clothing, ornaments, various dyes, etc. Especially agricultural biological diversity, the development of varieties with thousands of different genetic characteristics is essential in agricultural diversity. Besides, biotechnological manipulations of the genetic material and the resulting goods and service processes are of great economic value (Fowler, 2001). Also, national parks, Mediterranean monk seals, sea turtles, and whales are crucial

economic value elements of the biological diversity that provide income for tourism. The value in question here is economical and an ecological value that results from these resources' existence and is very difficult to measure in monetary terms. Although people may not see whales, they may be happy about their presence and attribute significant value to them.

As can be seen, biodiversity and its components have a significant potential for sustainable living. Especially endangered species, economically important ones, because they are rare, higher market value will result in higher socioeconomic benefit. In terms of ecosystem functionality, the value of endemic plants' value and services is higher due to the rarity and scarcity of these plants or habitats. In this context, it is an inevitable fact that developing countries rich in endemic diversity make a significant difference in socioeconomic terms. Turkey is in a very fortunate position in that respect.

Considering the settlement history, which goes back about 10 thousand years, the relationships between vegetation and human, it is striking that Anatolia is the homeland of many naturally occurring plants (Smagadi, 2006). Being the center of many civilizations, Anatolia has a rich plant diversity in its geographical location and the intersection of gene centers due to its geological structure. Anatolia over 10 thousand plant diversity and more than 3400 endemic species contribute to global biodiversity and global economic processes with its 34.4% endemism rate. In particular, 40% of the global economy is related to biological products and operations, the global economic value of biodiversity is $ 2.9 trillion/year, the value of goods and services offered by ecosystems is $ 33 trillion/year, and this is only about diversity that can be identified, Anatolia's high contribution to global diversity and economy is striking.

An essential condition for determining the value of biological diversity rationally and ensuring its sustainability is the necessity of precisely determining the production, goods, and services produced by the existing variety for ecosystem services. Biodiversity, which is an essential public property and its historical and cultural richness, has many service flows such as nutrient, material cycle, pollination, medicine, climate regulation, soil formation, prevention of erosion, reproduction, tourism, aesthetic and cultural value in ecological processes. These service flows are an essential part of environmental processes and contribute to economic processes (Davalos, 2003). According to researches, the number of species in the world is estimated to be between 5 million and 300 million, 1.5 million of these species have been identified, 20% of the entire diversity, and less than 0.5 million of the identified species have been found to have economic benefits. However, species groups with monetary value (fungi, lichen, bacteria, etc.) are still under investigation, which creates a significant deficiency in indicating the species' importance. However, this situation does not affect the fact that species diversity is included in the economic benefits flow and forms a vital value function in the market economy.

2. Biological Diversity Losses and Its Economic Importance

The relationship between the essential components of biological diversity such as genes, species, ecosystem, and functional diversity has played a vital role in forming ecological balance and maintaining this balance. Damage to these components will affect the system as a whole, bringing both environmental and economic losses, and these losses are often difficult to compensate. The magnitude of losses is inevitable, especially if endemic species and ecosystems are questioned (Lesser, 2000).

Determining possible losses in biological diversity can be possible by choosing potential losses in essential components, especially genetic diversity losses. In this context, it can be said that the loss in biological diversity is mainly dependent on the magnitude of the loss in genetic diversity and the amount of loss in gene information. Since genetic diversity guarantees the continuity of the species and the continuity of other ecological processes in the species, possible destruction or loss of genetic diversity will directly affect the species. The species' failures may disrupt the natural balance by affecting the ecosystem diversity and the ecosystems' functional diversity (Tyagi, 2006). For example, the B species' extinction in the food chain in an ecosystem for various reasons.

While it will cause an increase the amount, it will cause a decrease in the amount of C type that comes after it. In this case, assuming that type A is an agricultural pest, the economic and ecological benefit obtained from the product X to be received will be minimized. Another striking example in this area is the increase of ticks and the spread of the Crimean Congo disease due to the extinction of birds and chickens due to bird flu and other changes in environmental conditions (Blaustein, 2006). Here, the difference in ecological conditions put human health at risk and caused an increase in the economic process and health costs. As can be seen, possible losses in ecological processes make it inevitable to experience financial operations losses. Studies conducted reveal that 27 thousand species of the species identified so far have disappeared due to various reasons, and these species will not be replaced (Copp, 2005). While the contribution of different environmental factors such as temperature, rainfall, etc., to this extinction, the human donation is too high to be ignored.

Considering the fundamental economic reasons of biological resource losses, the human factor comes to the fore. It can be seen that the leading cause of damage is due to individuals' decision to use biodiversity products and service flows (Coombe, 2003). The fact that biological resources cannot be priced in the economic process causes excessive consumption by creating supply and demand. This situation can be explained by the "unpaid scarce resource" and "lack of property rights" of biological and endemic diversity. In this case, there is an "externality" 1 in terms of economy (Kassas, 2002). This means that the social value of different biodiversity goods and services flows is not reflected in market prices or reflected insufficiently. The market system provides a state of "optimal welfare" for society if the economy is perfectly competitive. However, if

monopolistic structures, incomplete information, or public goods, hence "externalities" in the economy, the market system starts to create "non-optimal" solutions and market failures. This situation is the unwanted supply of these goods and services flows and the inability to provide an optimal position (Mauro, 2000). The necessary measures are not taken despite the many benefits of biological diversity for humans because many biological diversity resources are available for use as "public goods" without market costs. For example, having the right to collect and use a flower in nature as much as desired without paying the price is because it is public property. In other words, being a "free public good" increases the damage, unnecessary consumption, and pressure on biological diversity and harms sustainability.

When these data are taken into account, it is seen that the loss of biological diversity is based on two critical economic reasons (Glowka, 2000). The first is associated with 'market failure', the second with the absence of 'property rights'. There is no full market price mechanism for many of the benefits of biodiversity, such as providing clean air. In other words, the market has failed to internalize biodiversity conservation benefits. Lack of property rights is seen as a more straightforward fundamental reason. Human beings have the motive to own the resources they benefit from and develop applicable protection measures for these resources to the extent that they own them. For example, a plant, a tree that grows on land you own, has value for the individual, especially commercially important. Benefit maximization can be achieved by directly protecting it. The protection measure in question is also continuous, depending on leaving it to future generations. However, if the individual does not have the resource in question, the consumption and pressure will increase with the "free rider logic." This situation endangers the sustainable use of biological resources (Müller, 2000).

The most crucial solution in ensuring sustainable resource use by preventing biological and economic losses; perceiving all components of biological diversity as a whole and determining the value functions of production, goods and services offered by biological diversity. In this way, possible resource losses in ecological and economic processes can be minimized by ensuring biological diversity's rational sustainability.

3. Productions, Goods and Service Value Functions Of Biological Diversity

To fully demonstrate the value and importance of biological diversity, the functions of biological diversity and its value components must be determined. Parts can be defined as biological diversity and the possibility of using its essential elements to benefit humanity or as goods and services produced by natural resources. Putting forward the production, interests, and service values provided by biological resources, which are the public economic goods, making the economic value analysis of the said service flows is an essential landmark in the correct

functioning of political mechanisms and ensuring the sustainability of economic policies and producing rational solutions. Value functions of biological resources can be classified as given in table 1.

Table 1 Value Functions and Flow Chart of Goods and Services Offered by Biological Diversity

1. Regulatory Functıons	**3. Productıon Functıon**
Regulation of atmospheric gases	Nutritional value
Climate regulation	Raw material value
Food regulation	Genetic resources
Water supply and regulation	Medical resources
Waste control and regulation	Decorative resources
Soil formation	Use value in traditional medicine
Prevention of erosion	Use value in biotechnology
Biological control	Commercial use value
Pollination	
	4. Informatıon Functıon
2. Habıtat Functıon	Aesthetic knowledge
Shelter function (for breeding etc.)	Rekreasyon
Biodiversity value	Artistic and spiritual values
Endemic diversity value	Cultural and historical values
Protection value	Use for scientific and educational purposes

As can be understood from Table 1, biodiversity can be examined in 4 main categories: regulator, habitat, production, and information function. Regulatory functions from these main categories; These are the functions that arise due to ecosystem capacities that regulate basic ecological processes and life support systems. These include regulating atmospheric gases, climate regulation, nutrient and material cycling, water supply and waste control, soil formation, erosion prevention, biological control, pollination, etc.

Habitat functions; ecosystems produce by creating a suitable space and environment for both the system itself and humans. Procedures such as breeding and sheltering are considered in this group. Production functions; It is about processes and resources derived from biological diversity (Chaytor, 2002). It uses physical resources for food, raw materials, genetic resources, medical resources, or decorative purposes. The fact that biological species are the raw material of genetic engineering and biotechnology and the use of many plants in pharmaceutical production is significant in revealing the necessity of sustainable use of biological diversity. Information function; These are functions that do not contain a physical effect or output resulting from any natural source but contribute to human happiness and well-being in spiritual, cultural, historical, and individual terms (Bail, 2000). Anatolia has been the homeland of many plants for centuries throughout its

historical development. Anatolian people have lived with these plants for centuries, and they have embroidered plants into their poems, songs, patterns, and motifs. Therefore, biological resources have become an essential part of the Anatolian culture (Cicin, 2005).

When the production, goods, and service value functions are evaluated as a whole, it is seen that biological diversity is an integral part of human cultural, historical, social, and economic values. Production and information function value from these function regulatory functions and habitat functions constitute the indirect use value of biological diversity while establishing the direct use value of biological diversity. All these service flows have a monetary or non-monetary value and significance in the market economy. Measuring these values requires different valuation methods (such as market analysis, conditional valuation). Any public or private decision or practice that impacts biodiversity means that we put a monetary value on that resource. This minimum value is essential in perceiving and realizing the current positive value and benefit of biological diversity. In this way, each value category can be included in economic processes, minimizing biodiversity losses on the one hand. On the other hand, the contribution of biological diversity to human welfare can be thoroughly evaluated.

Assessment of biological diversity provides information on the structure and functioning of biological diversity at the micro-level on the one hand. It contributes significantly to revealing the complex role biological diversity plays in enhancing human welfare, on the other. Macro-level evaluation, on the other hand, enables us to monitor how the change of biological diversity as a result of human activities affects the integrity of the human and natural environment, making it easier for us to create indicators on human well-being and sustainability.

The possible contribution of these values to human welfare is given in figure 1.

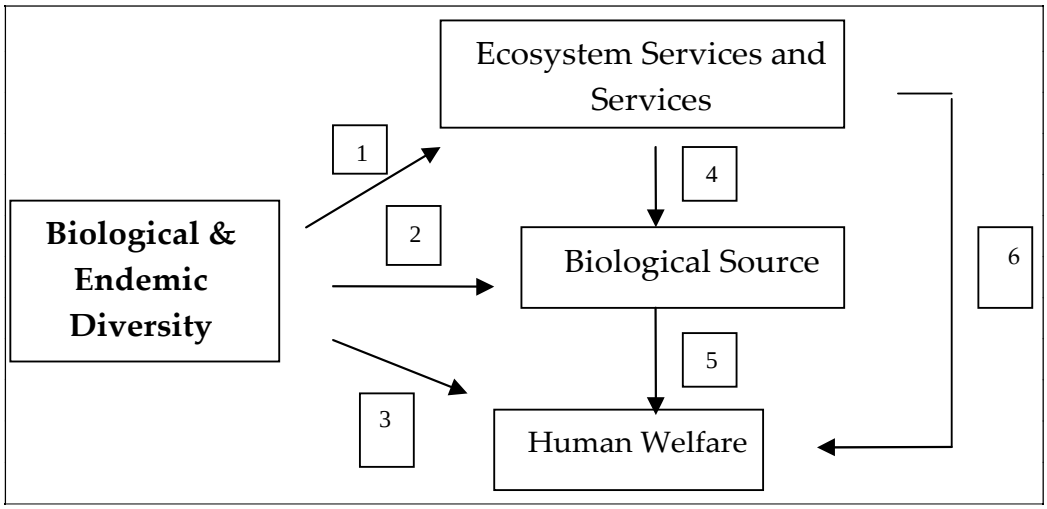


Figure 1 Value Classes of Biological and Endemic Diversity Regarding Human Welfare

These values are classified into four stages, as seen in figure 1. The first stage can be illustrated by the link between 1-6, which expresses the benefits of biological and endemic diversity with ecosystem functions and services. The variety of positions can be attributed to the demand for goods and services by ecosystems. From 1 to 4, from 4 to 5, expresses the biodiversity value with the conservation of natural habitat. The third stage is explained by the relationship from 2 to 5 and includes the benefits of providing species diversity from beginning to end. This value category is used as an input to the production of market goods.

It represents the indirect value of biological diversity—for example, the development of new drugs and new products. The fourth is associated with stage 3 and is associated with inheritance and asset value, which is the passive or untapped value of biodiversity. As can be seen, the total economic value of biological diversity; is expressed as the result of collecting different uses and new values and reflecting the variety of human motivations and ecological processes. However, the economic assessment of biodiversity primarily considers the need to base social values on individual matters, regardless of whether individuals are experts in biodiversity issues.

Human beings have the power to ensure the sustainability of the biological resources they are a part of at all times and under all conditions. While the user preference of humans ensures that the resources are sufficient for today's needs, it does not have the opportunity to take away future generations' opportunity to meet their own needs. As can be seen, human well-being depends on the sustainable use of biological resources. However, it should not be overlooked that sustainability is not harmony but rather a change.

C. CONCLUSION

Increasing deterioration and depletion in biological and endemic diversity and widespread anthropogenic activities today have led to an increasing interest in the intersection and overlap of environmental policies with economic policies. It has also put efforts to investigate the causes of excessive use of biological resources within the market economy framework and determine economic policies to be implemented against the danger of degradation and depletion of these resources. In this way, it has become clear that nature and the resources we live in cannot be considered separately from economic life. There are a mutual interaction and interdependence between nature and the economy. Our way of managing the economy affects wildlife, and nature determines financial performance.

According to classical economic theory, one of the reasons for the destruction of biological resources is evaluating the goods and services provided by biological resources as "free goods." Physical resources considered within this framework are associated with the existing demand regardless of their capacities. The most important principle to be accepted here is that biological

diversity and its essential components have economic functions and these functions have positive economic values. Otherwise, excessive use and damage of these resources and loss of resources are possible. Determining the rational value of biological resources, the goods, and services it offers, and integrating these values with economic policies enable the sustainable use of these resources and meets the needs of today and future generations. This situation should be followed to protect, develop and transfer biological resources to future generations.

It is an expression of the necessary integrated and systematic approach. The prerequisite for success in this approach is creating a management plan that is based on sustainable ecology and economy, integrates with the needs of society, and ensures the broad participation of local people. Also, inventories for gene resources should be taken, registered, and integrated into management plans. Otherwise, developing countries with rich diversity do not have the opportunity to benefit from global economic processes in an equal, fair and equitable manner unless they are aware of their gene resources and take the necessary protection measures within the framework of sustainable economic policies.

Considering the effects of all costs and benefits of decisions on biological resources in management planning at an international level, and more importantly, at local levels, it has been understood that careful use and protection of biological diversity can be achieved. This shows the inevitability and necessity of addressing the issue's economic aspect, more precisely within the market economy. For this, it is necessary to "Combine environmental and economic data under the same conceptual roof" and to determine the value of biological resources and their goods and services. Revealing the goods and services resulting from the functions offered by biological diversity or their values and pricing these values with various techniques developed will result in the fact that these values can easily be included in the benefit/cost analysis of all kinds of applications, projects, and activities and affect decision-making mechanisms. This is an essential step for the national economy in the effective and sustainable use of biological diversity and minimizing losses.

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