Biodiversity Protection, Farmers and Breeders Right

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Lecture 39 : Biodiversity, ecosystem functioning, ecosystem services

Welcome to the lecture 39 on Biodiversity, Ecosystem Function and Ecosystem Services. In the earlier lectures, you have understood the aspect of how biodiversity is impacted by loss due to several factors. International understanding and cooperation is helping move the mandate on biodiversity. So, central to that understanding is the ecosystem approach which we discussed in the earlier lectures. For the well-being of human beings and also the environment, it is important to understand ecosystem functions and ecosystem services. These are the concepts that will be covered in the lecture, what is ecosystem functioning.

The from the perspective of the post-2020 global biodiversity framework, how do we see mandates appearing for understanding better the ecosystem functioning and its implementation. What are ecosystem services, how are they categorized, some of the positive and negative impacts to ecosystem services, and what is the policy and regulation with respect to ecosystem services that is necessary from the national, regional, and the international perspective. These are the few keywords for the lecture. We begin with the understanding on what is ecosystem functioning.

Every ecosystem is run by activities that are associated with the organisms at different levels and their interaction with the environment. So, ecosystem functioning reflects the collective life activities of plants, animals, microbes, and their effects. So, when we look at ecosystem functioning, we are also looking at the subset of ecological processes and ecosystem structures. In general, when we study ecosystem functioning, we are looking at the productivity, the energy flow the nutrient cycling, and what are the degradative processes. So, when we look at ecosystem functioning, ecosystem functioning somewhere directly or indirectly impacts human needs.

So, in order to maintain a balance in the ecosystem functioning, it is important to understand the various facets and their understanding of those facets and its inclusion into policies helps move the mandate so far as ecosystem functions and conservation is concerned. So, when we look at a functioning ecosystem, we are looking at what are all the biological processes that are involved and what are all the chemical processes involved. Ecosystem functioning and biodiversity has been an area of research for many decades, where qualitatively and quantitatively various researchers have studied how the changes

to ecosystem can affect ecosystem functioning. Many researchers have also studied the interlinkages of how organisms survive in a changed ecosystem. So, today we realize the value of ecosystem functioning more and more from the context of biodiversity as there are studies which indicate that the number of species that decrease in a community can significantly affect the ecosystem functioning.

And so, therefore, ecosystem functioning can be affected by both abiotic and biotic factors. All of us are aware of the various targets under the Convention on Biological Diversity and in the earlier lectures you have studied about the Aichi biodiversity target. A significant number of the Aichi biodiversity targets could not be met in the 2011 to 2020 period. That set off the need for looking at how a global biodiversity framework can be developed, which can take care of looking at the advanced or the advancing of the conservation and the management strategies. This would mean that the participating nature of the GBF has come to the forefront.

There are four long term goals of the post 2020 global biodiversity framework. One is about maintaining ecosystem integrity and as we just discussed the need to decrease loss of species and safeguard genetic diversity. Another goal is about how biodiversity can be valued from the various valuation methods and what are the preservation and sustainable aspects in which we look at the contribution of nature to people. Goal C deals with the aspects of equitable utilization of benefits arising out of biodiversity resources. Goal D takes into consideration how implementation gaps and finance can affect biodiversity and conservation and restoration activities.

The global biodiversity framework therefore, looks into the aspect of ecosystem recovery and halting the loss of biodiversity by 2030. In the ongoing implementation of the post 2020 global biodiversity framework, there are a total of 21 targets being proposed and countries have been looking at implementing some of these with respect to achieving the compliance. In brief these are the targets in relation to the global biodiversity framework. One is in particularly in relation to land and sea use change, the need for restoration of degraded ecosystems, terrestrial freshwater and marine, the enhancing the protected area network for conservation of biodiversity and deriving benefits. To address the issue of XC2 strategies with respect to conservation and lessening the impact when it comes to human wildlife interface.

One of the targets deals with the aspect of sustainable and legal harvesting of wild species. Invasive alien species as we discussed in the earlier lecture are an area of concern and the management of invasive alien species is also identified as one of the targets. Reducing pollution and its entry into the various aspects of the food chain, mitigating the impact of climate change on biodiversity, how provisioning of ecosystem services can be understood

from the point of view of benefit sharing particularly in the context of indigenous and local communities. The sustainable management of agriculture, aquaculture and forest areas are some of the targets. From the perspective of ecosystem services, the need for enhancing regulation in order to sustainably use the ecosystem services has been identified.

How to enhance cultural or the recreational aspect of ecosystem services particularly in the urban areas? What are the measures required to include indigenous and traditional ecological knowledge into conservation activities? How the value of biodiversity can be looked at it from the cross-sectoral approach are some of the other targets. From the perspective of biodiversity and business, the need to understand the impact of business and the supply chains on biodiversity is one of the targets. Chapter 16 talks about the aspect of sustainable consumption patterns and the identification of responsible choices. The advances of biotechnology could impact biodiversity. One of the targets is about understanding how to reduce and manage this.

What are the positive intentions to biodiversity? Understanding the inputs from the point of view of scientific, technological and financial aspects for a greater capacity in relation to biodiversity management. Identifying the role of indigenous and local knowledge, awareness and research in biodiversity management and the increased participation of indigenous and local communities in the entire biodiversity management are the other targets. So, what you can see in these 21 targets are several mandates on biodiversity which are at different levels and which are also with respect to specific focus areas. One of the concepts in relation to ecosystem functions that has been identified is what we call the essential biodiversity variable or the EBVs in short. So, the essential biodiversity variables help in understanding what are the different components of biodiversity from the point of view of monitoring.

The compositional, structural and the functional aspects, this was identified by the group of Earth Observations Biodiversity Observation Network. A working group on the ecosystem functions has been identified which has several activities which include the identification and implementation of the EBVs, providing data set support so that researchers across can use this information. Linking the EBVs to several aspects of monitoring and the global indicators, providing guidance to national biodiversity networks in order to carry out in-situ monitoring with respect to essential biodiversity variables. That is in short ecosystem functioning. So, ecosystem functioning has several implications from the point of view of scientific aspect which drives the aspect of feeding into the conservation mandate.

The measures need to be taken out in order to support positive aspects of ecosystem functioning and lessen the negative aspects. And regulatory measures are necessary in

order to provide aid to the ecosystem functioning. We take up another aspect which is biodiversity and ecosystem services. We are well aware that ecosystem services provide several primary services. For instance, provisioning services, all the food that we derive, the needs with respect to humans and animals are part of the provisioning services.

So, in order to look at ecosystem services, what you see in the panel here are ecosystem services can be specific to each type of biodiversity. They may include several types of biodiversity which are could be in a grouped manner. So, when we study ecosystem services, we are also looking at the role of these different types of biodiversity and the levels of these biodiversity as well. Broadly, ecosystem services are of four types provisioning services, regulating services, cultural services and supporting services. Before we discuss the individual aspects, it is important to note that the major aspect of ecosystem services comes from these three core areas of biodiversity.

And statistics indicate that there is a greater dependence on these three types of biodiversity and hence, the greater need for preserving these is a policy mandate. As we mentioned, ecosystem services are essential for food production and to agriculture. So, agriculture subsists based on ecosystem services. So, if you look at provisioning services, we are looking at deriving biochemicals, food fiber and fuel, freshwater aspects and the genetic resources for use. Ecosystem services also provide cultural value by providing for education and inspiration, the understanding of different knowledge systems with respect to biodiversity, recreational and aesthetic values, spiritual and religious values.

Ecosystems also provide supporting services to provisioning and other areas and these supporting services sustain the ecosystem. For instance, nutrient cycling, primary production, the levels of atmospheric oxygen, creating the habitat for nurturing the type of biodiversity, soil formation and retention, water cycling. An increasingly important area is the area of regulating ecosystem services and this is where we find the need to understand the mandates that are coming up in policy and the various legislations in the world to ensure that ecosystem services are undisturbed and they continue to provide the support to the environment and human well-being. Within the regulating services, there are there is climate regulation, regulation of disease, regulation to prevent erosion, support herbivory, how to look at invasion resistance, what are the natural hazard protection mechanisms, regulation of pests, pollination, seed dispersal and water purification. It is important to build policy and regulation with respect to ecosystem services for a greater accountability.

Today's sustainable utilization with respect to ecosystem services needs to be looked at it from the policy and the regulation perspective as well. So, with the greater demand in ecosystem services, there are adequate concerns on how the sustained supply of ecosystem

services can be ensured. It is at this stage we need to understand the positive and the negative effects that against ecosystem services. Positive effects could be those where habitats are supported for wild species and their recreation of different landscapes. Resources and their conservation help in the maintenance of aquatic ecosystems and the ability to derive reliable clean water sources.

The source of nutrients and soil fertility from the excreta, the need for inclusion of sustainable and integrated aquaculture, improvement of mangroves functionalities to help against floods. There are also negative effects that can impact ecosystem services, environmental pollutants, pesticide use, homogenization of landscape reduces biodiversity and therefore, impacts ecosystem services. Deportation is effects are wide and complex when it comes to sustaining biodiversity. There is greater loss of biodiversity is known with respect to deforestation. The excessive and poor management of animal excreta can lead to pollution, water pollution thereby disturbing aquatic biodiversity.

Overharvesting is a huge concern particularly in the case of overharvesting of fishes that can lead to severe changes in the aquatic ecosystem and the effects of that. There are several other effects that can impact ecosystem services. Remarking of the positive and the negative effects is necessary when we are looking at the maintenance of ecosystems. There are several estimates that have been given with respect to what is the value of ecosystem service and increasingly it is been found that ecosystem services have great value with respect to event trade. It is in this context that we need to recall the definition of sustainable use under the CBD, the such that the rate at which it is being used should not lead to the long term decline of biological diversity.

Keeping this in mind it is necessary therefore, to look into how ecosystem services can be utilized without the loss of biodiversity, keeping in view the replenishing value, so that the needs of ecosystem services can be realized even for the future generation. So, in brief we were discussed ecosystem services. Now for each of these ecosystem services whether that is provisioning services, cultural services, regulatory services, there are several mandates identified under the CBD. And if one goes to the CBD website you can look at the several case studies that have also been displayed. For a better understanding of how each of those aspects are studied.

From the point of view of ecosystem services several concepts have come up, particularly the economics of ecosystem services. And it is at this stage that we talk about that biodiversity is now valued from the point of view of economics. The concept of payment for ecosystem services builds into its core the need to responsibly use ecosystem services. There are several PES models that have been identified. And today the context of ecosystem services has grown into not only the conservation aspect of it, but also looking

at how ecosystem services can be also traded.

It is important to emphasize on the need for policy with respect to ecosystem services. The policy analysis takes into consideration several aspects. The food and agricultural organization has been leading several efforts with respect to identifying policy, creating the context of policy analysis, dialogue and partnership and awareness as the three core aspects. Several policy briefs and reports have been identified which can be useful in terms of the studies. For instance for 12 different countries pollinator friendly policies have been already identified.

And it must be emphasized that the value of pollination to the entire global food supply is very important to understand, thereby the development of the pollinator friendly policies is a very important contribution. So, when we look at the context of awareness, there is greater awareness that is being brought in based on the studies. And country wide, region wide studies have been carried out to enhance the relevance of agriculture and its development with respect to providing the provisioning for ecosystem services. So, this is the conceptual framework for the work program under the IPBES which is the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services.

This was established in 2012. The United Nations Environment Program provides the secretarial service to the IPBES. This is a very important platform in the context of the science and policy interface for biodiversity and ecosystem services. There are several fact sheets that have been identified by the IPBES based on the studies and those help in assessing the knowledge, building capacity, strengthening the knowledge foundations, providing support to policy, providing an engaging platform and thereby providing studies for with respect to the framework. There are several drivers that have been identified for instance the direct drivers, anthropogenic drivers, assets from the point of view of anthropogenic assets. The interlinkages is what is the important aspect with respect to the work program of the IPBES.

So, to conclude ecosystem functioning is assessed based on the processes as well as the structure and functional aspects of the organisms present at different levels in an ecosystem. There is extensive research in the area of biodiversity and ecosystem functioning and those provide important leads into how ecosystems have changed with time. Understanding ecosystem functions is important to reverse the loss of biodiversity. There are different categories of ecosystem services and ecosystem services are affected by several factors. It is imperative to have a policy and regulation framework for the ecosystem services for their sustainable utilization.

Understanding the policy and the regulatory aspects of ecosystem services at the international, national, regional and local frameworks would help in incentivizing and bringing greater accountability in the use of ecosystem services. These are a few references for the lecture. Thank you.