Biodiversity Protection, Farmers and Breeders Right

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Lecture 01: Concept and Scope of Biodiversity Protection

Welcome to the week one of the course on biodiversity protection breeders rights and farmers rights. In this lecture we will take up the aspect of basic concepts of biodiversity and the scope of biodiversity protection. So the course lecture will deal with the aspects of basics of biodiversity from the definitions and conceptual understanding, importance of biodiversity, the value of biodiversity and its scope, what are the different threats to biodiversity and how those threats to biodiversity provide a mandate so far as international protection and at the domestic context. First and foremost we need to understand what the term biological diversity means. From the context of the international framework, the Convention on Biological Diversity in 1992 in its article 2 defines biological diversity as the variability among living organisms from all sources including inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. This includes the diversity within species, between species and of ecosystems.

The average term of biodiversity is also commonly used in generally all the areas of research as well as in written documentation. There are different levels of biodiversity. When we look at any particular place we identify the variation in different species whether it is in the plant context or whether it is in the animal context or even in sex. So living organisms are organized into an ecosystem.

Sometimes they present diversity of different nature. So diversity can be at species level which is species biodiversity, genetic level they can be diversity and at the ecological level also one can study diversity. Each of these forms of diversity are further organized into specific types of diversity. For instance if you look at genetic diversity we have phonetic diversity and allelic diversity. Now taxonomists, researchers world over are studying on

species diversity.

So the context of species diversity takes into consideration the frequency and diversity at the species level. So how different species are different with respect to each other. For instance a commonly known vegetable tomato if you take that as an example. So here we are looking at different diversity in the tomato species. Given under this particular illustration is the scientific name of one of the species Lycopersicon esculentum.

When we say lycopersicon is the genus esculentum is the species. So plant diversity is very huge because plants form the bottom of the ecological pyramid. And then of course we have diversity at all different levels. Another example is of spiders. In this illustration you can see several different species of spiders.

And what is given to you as one of the names is this species Paracetyria tepidorium. This is the common house spider. So if you look at the organisms around you, you will find a lot of species diversity. So many of the species are domesticated and they form what is the domesticated species. There is a lot of species again in the wild.

They are wild species. So each of these species have unique characteristics which is what brings the difference between these species. Now when we study species, they typically form between the genus and the subspecies level. This is a subject which is studied by biodiversity researchers, by taxonomists and today policy makers are concerned about the diversity of species because the diversity of species is an indicator for biodiversity richness. Now let us look at the context of genetic diversity.

Now genetic diversity is what we look at the genetic level, that is at the level of genes. In the earlier times when genetic diversity was studied, it was studied more at the level of the chromosome that there are specific regions of the chromosome which code for or which are marked for certain characteristics or traits. So quantitative trait loci became the starting point for understanding that there are specific regions in the chromosome which are related to certain traits. Today with the advances of technology, we are able to pinpoint, we are

able to understand the grammar of those genes and understand how these genes contribute to diversity and that is what is genetic diversity. In this illustration, you find the different MACE-CORPs.

This difference is also a difference in the trait encoded in the genes, by the genes. While we are looking at genus diversity and species diversity, we also need to take into consideration that a given area or an ecosystem is itself diverse. That means we are looking at the variability in the entire ecosystem. Today, the conventional biological diversity advocates for what we call ecosystem approach. If we need to look at the conservation goals with respect to a species, it is but imperative that we need to take into consideration the ecosystem as a whole for a more meaningful long term protection of biodiversity.

So here I present to you an illustration taken by one of our teaching assistants of the course. So here what you see is the ecosystem diversity, the milieu of where different organisms are coexisting with respect to each other. Then we come to the context of having understood around us that there is lot of biodiversity, we need to remind ourselves of the very simple functions of biodiversity because these are the ones which are now under threat. We need biodiversity because the air that we breathe, the water that we drink, the food that we eat, all are as a resultant of the interaction between biodiversity and the environment. This interaction is a necessity to sustain life.

And so therefore, if you are looking at sustenance of life and livelihoods, biodiversity protection is centric to that. The role of integrity of forests, grasslands and marine ecosystems has taken centered stage internationally. We today have categorization of different types of biodiversity. Understanding the adaptive functions has also become very important because we need to not only understand the basic functions of biodiversity but also how biodiversity changes, how environmental changes impact biodiversity. For instance, we are looking at climate extremes on one end, changes in hydrological cycles, soil erosion.

Then also today we understand from the Paris Agreement the commitments in relation to global warming. And so regulating temperatures in urban areas has become a priority given that food security and livelihood support continue to be important and more important not only at the international level but also at the domestic level. We now come to the aspect of reminding ourselves the goals of food security.

And I quote Dr. M.S. Swaminathan, the father of Green Revolution, our national food security depends on our ability to conserve all our biological wealth. So biodiversity protection is a continuum when it come to the context of protecting the entire ecosystem. There are several reports which announce the status of the loss of biodiversity at different levels and that loss of biodiversity is now at a very alarming rate. What you see here is the living planet report 2022 on the overall decline specifically in relation to freshwater populations and how is it that we are losing so much of biodiversity despite commitments.

That means we have an urgent need to understand the context of conservation in the different realms of biodiversity. So threat to biodiversity poses a threat to the value of biodiversity that we can gain. Again I would like to bring you back to the preamble of the Convention on Biological Diversity, the first convention that made biological diversity a global obligation, the conservation as a global obligation. In the preamble the emphasis on the intrinsic value of biodiversity has been emphasized and the value of its components from the point of view of ecological, genetic, social, economic, scientific, the educational, cultural, recreational and aesthetic value of biological diversity. So the value that we can derive out of biological diversity is in various forms and the conventional biological diversity makes us conscious of the values of biological diversity and therefore an imperative need to preserve biological diversity.

Another way of categorizing the value of biodiversity is to look at direct values and indirect values. Direct value is that where we derive biodiversity components for consumption, for productive use in terms of tradable commodities. Then we have indirect value of biodiversity where we are looking at the aesthetic value of biodiversity and the potential value of biodiversity for the future which is what is the undetermined value of biodiversity.

Biodiversity has value merely by its existence that means it is also our commitment to keep this biodiversity for future. So the existence value of biodiversity has been realized more now compared to earlier.

There are also non-consumptive uses or value of biodiversity which are inherent to the ecosystem functions. For instance, we are looking at waste assimilation, nutrient recycling, the aspect of constitutive functions, for instance photosynthesis is a constitutive function. Now biodiversity has several non-consumptive use values. So more and more research that is happening in the area of biodiversity gives us newer facets of these values. Today when we look at deriving value out of biodiversity, we need to understand that there is a context of looking at appropriate use or rather sustainable use of biodiversity.

We now come to the aspect of understanding of the threats to biodiversity and thereby understanding the scope of protection. The Intergovernmental Platform on Biodiversity and Ecosystem Services 2019 report which is a report that has brought together the various assessment of the status of biodiversity gives us a very alarming picture that one million animal and plant species are threatened with extinction something that is a grim picture for us. I mentioned to you about the living planet report. If you just look at the context of some of the biodiversity, in itself there is a huge loss of biodiversity. The rate of reduction in the number of species has been phenomenal and it is at this stage I would like to mention the spontaneous loss of biodiversity is much lesser compared to the anthropogenic based loss.

So anthropogenic factors have been recognized as a distinct factors for the alarming rate on biodiversity. This calls for understanding at the individual and at the national level on what is it that we can do to commit to mitigate or reduce the loss of biodiversity. These are some statistics in relation to how the loss of biodiversity is affected by several factors. Land degradation is one important factor. The loss of pollinators is also reducing crop species diversity.

Industrial development, pollution, all these are contributing in a large way to devastation

of the land system and also the habitat. And more recently the proximity of humans to the microbial system because of development being one of the reasons is also contributing to an increase in zoonotic diseases. As Wilson had suggested the acronym of HIPPO, the principles of it are very necessary to understand where do we really look at the factors contributing to biodiversity loss. So habitat loss, invasive species, pollution, human population, uncontrolled and over harvesting are the clear contributors to the loss of biodiversity. So this is where we need to understand the several factors.

Now this is the sum and substance of the IPBS report 2019 and what is important from this illustration is to understand the percentage of decline of definite type of biodiversity. So put together this brings in an important need to look at how do we now look at the scope of protection on biodiversity. The IUCN has provided the classification of the threats to biodiversity in its index, the Red List index. It has also several other indices by which the species are organized into either not of concern, threatened, extinct, critically endangered and so on so forth. In organizing the conservation goals in relation to biodiversity, we come to this important aspect of looking now at biodiversity protection.

I think now we are very clear that biodiversity needs to be urgently protected. Given that who are the stakeholders for biodiversity protection, we are all of us in it together. It is not only the concern for scientists and experts, public authorities world over are also concerned not only about the rural scape but also about the urban scape. International commitments are coming up. We have local communities concerned about biodiversity loss because they are integrally linked with the their immediate resource and the loss of resource means loss of livelihoods.

Industrial associations who continue to utilize resources are also concerned about the biodiversity access due to domestic legislation as well as international commitments. We have a lot of observers, we have lot of non-governmental organizations also participating in this context of biodiversity protection. So the IUCN continues to move its mandate with respect to conservation of nature and provides very comprehensive information when it comes to the global conservation status and the goals that we need to take up. So in the

IUCN Nature 2030 program, we have several targets and also different players who will need to look at the overall conservation goals with respect to certain type of biodiversity. For instance, the IUCN species commission is looking at a definite number of species and the group commitment in relation to management of ecosystem and those species.

We continue to see more and more species listed under the red list. Have we done enough? Is the question obviously that we need to ponder. On one end we are leading with invasive species which are entering as introduced species in an ecosystem. On the other end we are looking at conservation goals. This is yet another point to ponder on how do we really look at threats to biodiversity on one end and conservation goals at the other end.

So the IPBES report is a very important report to look at what are the kind of assessments that have been done and how those assessment provide us the work plan for the future. Now the IPBES report has been considered under the Convention on Biological Diversity to be included under the strategic plan and the goals related to the Aichi biodiversity targets which you will be learning more about in the subsequent weeks. Now this is how we look at the context of the work on biodiversity in terms of its scope of protection. This is just one representative of an organization which is looking at the interface of the context of science, policy and law and engagement with stakeholders because today biodiversity is a multidisciplinary subject. It is very dynamic and complex because of its ramifications.

The IPBES is supported by its work on four components. One is the assessments, another is the policy support. Also building capacity and knowledge to various groups and very important function of communications and outreach. I would urge you to go through the IPBES report to understand how in a minuscule or a representative sense you understand how biodiversity protection is looked at. And this is more or less the same with respect to other groups or other intergovernmental organizations that are working.

Their components may be different, but generally when you work at the interface of science, policy and the legal interface you see this kind of a context emerging. UNEP, the United Nations Environment Program is the first one which laid the fingerprint for the

Convention on Biological Diversity. Today what we know as the beginning at the Earth Summit, UNEP continues to support the mandates on biodiversity and it is linked with its work with respect to several international conventions and many of those conventions are related to biological diversity. Listed some of those conventions on this particular illustration as you can see are not only on the general aspects of biodiversity, but also on specific types of biodiversity. For instance you are looking at the sites which deals with the Convention on International Trade in endangered species for wild fauna and flora.

So today when we look at the context of biodiversity protection or the scope of its protection, it can be looked at two levels. One is the international context, another is the domestic context. At the international context we are looking at the conglomeration of several different international conventions which are very relevant for the overall biodiversity protection. And so this illustration is to give you that instance of today biodiversity is a shared goal and its conservation and sustainable use is to be looked at from the related work of these conventions. Never earlier have we seen the context of so many different conventions moving the single mandate on conservation and sustainable use of biodiversity.

On this illustration are listed some of the different conventions, some dealing with species, other dealing with the environment in relation to the species and many others dealing with both together. A quick glimpse of some of these is as follows. When we look at the International Whale Commission it is about really conserving the wale stocks and where we are looking at the balance in the marine system. This also feeds into the whaling industry and its goals with respect to trade. The International Plant Convention provides for protection in relation to plant varieties and plant resources.

The standards for phytosciences measures are also announced which provide a very important mechanism in terms of looking at the national context. The Ramsar Convention on wetlands is a very important convention which looks at wetland as a very important resource to sustain biodiversity. And then we come to the context of the World Heritage Convention. Today we are looking at bio resources also being part of the cultural context

and also how to preserve the heritage in different listed sites under this convention is also adequately important to understand the context of biodiversity protection. And several other conventions in relation to different species provide the emphasis on the protection, sustainable use of those species and the mandates in relation to that and their habitats.

Sites has been a very important convention particularly to taking into consideration international trade with respect to wild animals and plants and the regulation of that. We also have the conventional biological diversity which will be the center point of this particular course. In the subsequent weeks you will be understanding more about that. The international treaty for plant genetic resources, food and agriculture is a very important treaty which has its linkages with the convention on biological diversity. It covers plant genetic resources particularly with respect to food and agriculture.

It provides also a multilateral system for access and benefit sharing to the crop species listed under its annex 1. For those who are interested in biodiversity and understanding the evolution of biodiversity, it may be important to also look at the food and agriculture organization and how you see the evolution of the context of food and agriculture being the backdrop of today what we know as crop genetic resources. With this we come to another context of the beginnings of understanding of crop biodiversity protection as well. So in the subsequent weeks you will be learning about the international convention for the protection of plant varieties, the Yipav convention. The focus of it is with respect to promoting plant variety protection and also enhancing the context of the improvements of plant variety with respect to breeders and also the protection of farmers in relation to the rights over the breeding on the genetic material.

So while we are looking at conservation and sustainable goals, we are also concerned about food security and the understanding of or the scope of biodiversity protection should also advance this understanding of taking into consideration food security and also supporting the innovations in this particular sector. So I hope you have been able to understand the basic concepts and the context of biodiversity. We now come to the summary of the lecture 1, where we once again I would like to emphasize biodiversity support to live and

livelihood becomes very critical to this understanding. We are looking at the need to preserve diversity in living organisms. Understanding the loss of biodiversity has become imperative to look into what are the ways in which species survival can be ensured.

Each of the factors in the loss of biodiversity have become very important indicators to study individual commitments in relation to conservation goals. Biodiversity protection and its scope need to be understood from the overlapping context of science, policy and law. And this is where we look at international conventions, mandates and also the domestic mandates with respect to biodiversity. Thank you very much for your patience listening. These are a few references which will be useful to understand the lecture 1. Thank you.