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**SEASON 1 EPISODE 4: How Biodiversity and Forest Ecosystem Services shape our world**

**EPISODE TRANSCRIPT**

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*What does Southeast Asia – especially Malaysia and Indonesia –, Madagascar, the Andes, Central America and the Caribbean, just to name a few, have in common? They are biodiversity hotspots, so regions characterized both by exceptional levels of plant endemism (meaning species that only grow there) and a particularly vulnerable environment.*

***Intro***

**JOSE:** Welcome back to Branching out: the forest podcast, where we connect forests, science and people. Brought to you by the International Union of Forest Research Organizations, IUFRO. Let's discover the role of forests and trees for people and nature, while we unravel complex forest topics and keep you up to date with forest research.

**JOSE:** So far, we have covered general information about the IUFRO World Congress 2024 in Stockholm, forest resilience and adaptation, and responsible forest bioeconomy. And we will talk today about biodiversity, because forests are home to most of biodiversity on land, that is all the life forms found in forests, not just trees, but other plants, animals and microorganisms, and yes, their DNA (which we have already mentioned in our second episode). And, quite importantly, we will also talk about ecosystem services, meaning all the benefits that forests provide to society, because they are closely linked to biodiversity. I am your host, Jose Bolaños from IUFRO HQ and today here to cohost is **Peter Edwards from Manaaki Whenua - Landcare Research, New Zealand**, welcome, Peter!

**PETER:** Hello Jose! I am delighted to be here with you today. As a bit of background for our listeners, I am a senior researcher at Manaaki – Federal Landcare Research, one of New Zealand's state-owned research institutes. My work primarily sits at the interface of humans and the natural world, particularly forests. As a social scientist, I work a lot with policy – for example, how to properly incentivise forest restoration and planting, and impact – how do we take a lot of great fundamental forest research and ensure that it gets to the right people, who are going to be able to use the outcomes. Ecosystem services are one of those 'things' that I try to work with policy makers to encourage policy makers to think beyond the physical products, but the services that forests provide, too.

***Introduction to forest biodiversity and ecosystem services***

**PETER:** So, what exactly is the problem? The problem is that we are losing biodiversity and this has negative effects on other ecosystem services. Deforestation and forest degradation, i.e., forests that can no longer support their functions well, continue to take place at alarming rates, which contributes significantly to the ongoing loss of biodiversity. And its loss reduces nature's resilience, which we spoke about on our second episode, and thus it becomes more vulnerable to the impacts of climate change.

**PETER:** **Sally Aitken, IUFRO Scientific Achievement Awardee at the 2014 World Congress and Project Leader** of two large scale projects studying adaption, namely AdapTree and CoAdapTree at University of British Columbia, is here to give us a perspective on forest ecosystem services, how they are interconnected and consequences of a decline in forest biodiversity. Welcome, Sally, please tell us how big of an issue is it really?

**SALLY:** Well, we're facing twin crises of climate change and biodiversity loss, and both of these issues are really impacting species around the world and ecosystems around the world. And it's challenging to find solutions for both the biodiversity loss and for climate resilience, climate change adaptation. These are huge issues. Especially in Western North America we've seen enormous losses of forests due to forest fires, droughts and certainly these accelerated by climate change have had huge impacts on biodiversity as well.

**PETER:** Can we consider forest biodiversity key for ecosystem services? How does one link to the others?

**SALLY:** The forest trees we find in forest ecosystems are foundation species. That is, you don't have a forest without that architecture and having a diversity of species really creates many different habitats for other aspects of biodiversity, the other plants and animals that live in forests, but diversity also creates resilience against environmental change and of course, as humans, we're relying on for us as well for ecosystem services, including carbon sequestration, clean water, clean air, and all of the other services that forest provide. And all of those are dependent on having healthy and resilient forest ecosystems.

**PETER:** In which ways can research on biodiversity and ecosystem services contribute to sustainable forest management practices and the Sustainable Development Goals?

**SALLY:** One of the key areas for research is to better understand the carbon sequestration and the distribution of carbon in forest ecosystems and also the fluxes that are happening with the changes we're seeing with forests globally. And one of the big questions is for example, soil carbon: soil carbon relates directly to soil biodiversity. So these are really frontiers of exploration, if you will. Other areas are how can we assist the adaptation of forests to new conditions, because what we have are assemblages of species that are adapted to past conditions, past climates and that makes them vulnerable to the extremes we're seeing in climate right now. And so are there ways that we can assist that adaptation to new conditions without severely disrupting those systems in the process? These are very difficult questions. We can look at forest diversity and think about how we are restoring those ecosystems, how to incorporate more diversity in those ecosystems if possible species and genetic diversity. Because it's very difficult to forecast what species and what populations will do well under future conditions. There's a lot of research going on in that area, especially on the species side, through species distribution modeling, but also incorporating that work with genetic analysis and understanding the capacity of populations to adapt to new conditions. So we really need to combine these different tools at species levels and genetic levels to understand if we are planting trees for restoration or for reforestation, what the likely conditions are going to be, but also buffering those predictions of future conditions because we don't know exactly what climate trajectory we're on, we don't know what other insects diseases are going to invade these ecosystems. So, there's many things to think about, many ways that research can contribute to better understanding how we can generate more resilience in these systems.

**PETER:** That's already a great introduction to our next guest, who will speak more about genetic resources. But before we move on, you will be a keynote speaker during the World Congress next year, could you tell us what we might expect from that presentation?

**SALLY:** We need to change our perspective on managing diversity in forests, whether those are more conservation or multi-purpose forests, or whether those are more tree farms for fiber. We need to embrace species diversity and keep a very close eye on genetic diversity and manage genetic diversity in those systems because of the uncertainty that we're facing. And we need to be very careful about relying on forests for our future carbon sequestration to help us deal with climate change. Because climate change is moving at a pace where forests in many areas are giving off more carbon than they are sequestering, because of extreme climate events. So we need a lot of research in all of these areas and we need fundamental shifts in at least some parts of the world in how we manage forests. Thank you!

***Forest genetic resources and biodiversity***

**JOSE:** Next, we would like to discuss some efforts being made to conserve and manage another important aspect of biodiversity, forest genetic resources, with **Marjana Westergren, from the Slovenian Forest Institute, and Deputy Coordinator of the Physiology and Genetics Division of IUFRO**. Hi, Marjana!

**MARJANA:** Hi! Thank you for having me here!

**MARJANA:** I think I have to explain you actually what forest genetic resources are.

**MARJANA:** The term refers to all genetic diversity of actual or potential value between and within species with a continuum from domestic gene pools to wild gene pools. And in forestry domestic gene pools would mean varieties or trees that are bred for plantation forestry. And wild gene pools would mean wild populations, actually the majority of global forests today are undomesticated. And genetic diversity is the cornerstone of all diversity, the ones that we see and the ones that we don't see. So, there would be no ecosystem services without forest genetic resources.

**JOSE:** How do forest genetic resources contribute to the adaptation of forests in the face of changing environmental conditions, mainly climate change, and to securing other ecosystem services?

**MARJANA:** We need to understand that forestry species grow in very different environments and that they have been growing in these different environments for a very, very long time. So, the same tree species, for example, if I take sessile oak from Europe, which grows almost across the entire continent, will have both populations in drier and warmer climate and in cooler and wetter climates. So the populations of this same tree species, which we often call provenances in forestry [SFX], will survive and they will thrive in different environments and they will carry adaptations to these environments because they have been growing there for a long time adapting over generations at least since the last ice age.

**MARJANA:** If there is enough genetic diversity for natural selection to act upon, they will be also able to adapt now and in the future. The tricky part is whether there is enough time for this adaptation to occur.

**JOSE:** Are there untapped potentials of forest genetic resources in maintaining ecosystem services?

**MARJANA:** Yeah, absolutely! There is really a lot of untapped potential hidden in the forest genetic resources.

**MARJANA:** If I take Europe again, because I'm coming from Europe, in continental Europe, there are 265 native tree species and we only know the distribution of genetic diversity for a few dozen of them. And knowledge about this genetic diversity, how it translates into adaptation, into better growth, into resistance to diseases and other ecosystem services is even sparser.

**MARJANA:** A lot of modeling and there are also some trials underway, but much more effort is actually needed to validate the results of these models and to test them in less studied or unstudied tree species.

**MARJANA:** Experiments are being carried out, new experiments are being established for example, also in a Horizon Europe project called OptFORESTS where we are looking at species and provenance mixtures together and trying to discover their hidden reaction norms.

**JOSE:** How can a better understanding of forest genetic resources lead to more diverse and sustainable uses, particularly in the context of climate change adaptation and mitigation?

**MARJANA:** For example, in a declining forest, foresters would often think that the solution to a healthy forest again that provides all the desired ecosystem services would be to change the declining tree species. Sometimes this may be the best option, but often the same goal can be achieved just by replacing the provenance.

**MARJANA:** We would certainly disturb the habitat of associated organisms to a lesser extent. There would be no danger of the species becoming invasive and also, we wouldn't be changing the livelihoods of communities of people living in and from this forest.

**MARJANA:** If we take forestage genetic resources from drought tolerant populations, we can incorporate them into breeding programs, making the new generation of tress more drought resistant. And this is the case, actually, what is happening in maritime pine, where the French breeding population is being infused with the genetic diversity from the Corsican population because the Corsican population is more drought tolerant.

**MARJANA:** Also, with the increased movement of people and goods, environmental conditions are changing, on one side, and then new pests are spreading.

**MARJANA:** We can look for tolerant or resistant trees in the forest, put them in the same place, make a breeding population and plant the offsprings coming from this breeding population back into the forests, making the forests more resistant and this is exactly what is happening with the ash in Europe.

**JOSE:** Finally, what are the key strategies and safeguards required to ensure responsible use of genetic resources, including equitable sharing of benefits and protection of traditional knowledge?

**MARJANA:** I think it's really good that there are safeguards and the legislation to protect the genetic resources and traditional knowledge so that the local communities actually have benefits from their genetic resources. But I actually think that the key to the responsible use of forest genetic resources is knowledge and its accessibility and open sharing of that knowledge.

**JOSE:** Thanks a lot for your time here at Branching Out, Marjana.

**MARJANA:** Thank you for inviting me and letting me share a bit of my views on forest genetic resources and their connection to ecosystem services.

***Case study Sri Lanka***

**PETER:** Current negative trends in biodiversity and forest ecosystems will undermine the progress towards the UN 2030 Agenda for Sustainable Development. And specifically, Sustainable Development Goal 15, which is devoted to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss". To illustrate this, here is **K.M.A. Bandara, Conservator General of Forests from Sri Lanka**, where IUFRO's Special Programme for Development of Capacities together with local partners promoted a forest landscape restoration project. Can you briefly describe the forest landscape restoration project that you've been involved in?

**BANDARA:** Basically, what we have done is we trained our forest officers and the related other officers in the forest landscape area.

**BANDARA:** And after that using those trainers, we have done several training programs for field officers who are doing the practical work on the field. We trained around four hundred people for field officers to do this work in the field. So that is how we have done the training program. Actually, this is a practical work, so we have done three practical training programs for these project areas, we identified three project areas. One is in the dryer zone of the country and the other two training programs are done in the wetter part of the country. We have developed three management plans for those three project areas. Those are the three areas where we have done our forest landscape restoration project.

**BANDARA:** We documented all those training programs so that we have the training manuals now with us and we have developed those management plans for three landscapes so we are having three management plans with us and we have translated some of those training materials to local languages basically Sinhalese and Tamil language so we have training materials as well as the management plants.

**BANDARA:** We have removed some of the invasive alien species from the forest. We have done some income generation work for surrounding areas, so the people who are living around the forest. And we have developed some of the so-called ecotourism activities, so the income generation activities in those forest patches. Using those things so we were able to protect the forest areas. But we first thing is to protect and to improve the forest areas using this forest landscape restoration.

**PETER:** And what were the key biodiversity-related goals and objectives of this forest landscape restoration project?

**BANDARA:** One of the major threats we are having in the biodiversity is the spread of the invasive species or alien species in those forest areas. In the places we have selected for this project some of the areas were completely invaded with this invasive species. The scientific name of those species is *Lantana camara.* Because of that the animals cannot move through the forest. So, what we have done in this project is removal of this invasive alien species. That it has reduced the pressure by these in invasive species and it has had a positive impact on the biodiversity and a positive impact.

**PETER:** Have you already seen some results from the restoration efforts, and how did these changes impact forest ecosystem services in the area?

**BANDARA:** Livelihood development of the rural people around the forest. We have given some income generation activities within their home gardens by incorporating some of the agriculturally important species such as fruit species, some of the commercial timber species as well as some of the other medicinal important species. So, it will generate some incomes from their own gardens in the future. So it definitely impacted positively for biodiversity conservation within our forest. And the second thing is the ecotourism activities we have generated some of the ecotourism activities.

**BANDARA:** Because of the removal of this invasive species they are having a free access to the area, that means the elephant has a very good access to the area. The first thing and because of that thing that the number of visitors for that ecopaths, the areas we call ecopaths, the income of the ecopaths are very high.

**PETER:** In your view, what are the key ingredients for the success of a forest landscape restoration project, in terms of biodiversity outcomes?

**BANDARA:** The key ingredients or the key things we have identified in this project is that definitely we have to have a very good legislative and the policy support for this program. So, if the policy is there that means that the forest area will be remain as it is. It will not be converted to other land use patterns. So that is the basic thing we have to have at the beginning and we have to have a very clear objective and the tasks. And a holistic plan and the involvement of the all-important stakeholders in the planning stage.

**PETER:** Thanks, Bandara! And let me remind our listeners that the SPDC will have a range of activities related to forest landscape restoration planned for the exhibition area at the IUFRO World Congress 2024.

***Society's role in biodiversity conservation***

**JOSE:** Biodiversity conservation and sustainable forest management need effective governance; integrated policies for interrelated issues; land-tenure security; respect for the rights and knowledge of local communities and indigenous peoples; and enhanced capacity for monitoring, as well as innovative financing modalities. **Nazmus Sadath from Khulna University, Bangladesh**, who works on tropical forestry, policy and governance and is also Deputy Coordinator of the Community Forestry Working Party of IUFRO, is here to give us some insights into the topic of society's role in biodiversity conservation. Welcome, Sadath, how critical is it for society to reverse pressures on forest biodiversity and forest loss?

**SADATH:** It is critical nowadays because especially I am from the tropics, so in tropics the deforestation rate is so high and with the deforestation, the forest biodiversity is going down. When you lose the diversity then you lose the forest services from the forest. What in one hand, the national economy loses from many sides. You can talk about from ranging from the genetics to the medicine, to the diversity of products and on the other hand, the subsistence and livelihood of the local people, there are a huge number of populations that depend on the forest. So, when you lose the diversity, you have the chance of that their livelihood might be at risk.

**JOSE:** What is being done to reverse the pressures leading to forest loss? What has been more effective?

**SADATH:** The UN already declared this the decade of forest landscape or ecosystem restoration. So, every country abides by that. They are trying to do their own things. Like other countries, my country is also doing this. The first thing is for to reverse the situation should be. We have to change our force management regime from one to another, like one is converting the forest into high yielding timber production towards more biodiversity conservation... People participation should be there. If you cannot get people on board, you cannot be successful in your any kind of restoration project.

**JOSE:** Speaking of people, how can different stakeholders collaborate?

**SADATH:** Talk about stakeholders in policy terms, we actually have a thin differentiation in between the stakeholders and the actors. You know, somebody is taking the decisions and somebody is also impacted by the decisions. So, the collaboration is imperative for making the forest landscape restoration successful. So, in that collaborations you have to find a situation where everybody thinks that they get something. So, they win something like if you do not give something in your restoration component, that means species wise or plantation wise or monetary wise, incentive wise to the local people, they will not support you. If they do not support you, then you cannot fight the deforestation by illegal means because you need the people. In the tropics you will find the forest guards alone cannot protect the forest. So need wholehearted peoples' support. To get that, you have to talk to them meaningfully. I would say meaningfully, not just for talking. Get their impression, get their interest in your account, what they are actually looking from the forest. Are they looking for only protection? Fine. Or are they looking some kind of subsistence livelihood from the forest? Then you have to accommodate. You have to choose. Choose the component of your forest scientifically, taking the considerations of the peoples will and design your restoration package. I can give you one short example because we are short in time what we are doing in Bangladesh right now. It is a big project called SUFAL, which is for sustainable livelihood and forest restoration. Together they are addressing I was responsible for their beak of like, let's say 40,000 hectares, forest land restoration planning. So, we bring in called SSP: site specific planning. So what we did there we assess the land, we assess the historical data, that's what forest was there, and now the present conditions, the environment and also we talked with the people, we had the beneficiaries there, we had the multi-level stakeholders from the crossroad to the upper level. That's what the Forest Department is looking for, what's their will and what the people are looking for then we prescribed for a particular forest bit, that's what kind of restoration project should be there depending on the forest condition and the peoples will.

**JOSE:** If we focus on challenges, potential, barriers, what are the major approaches to restoration?

**SADATH:** This is a very good question and I was waiting for this question because my IUFRO session is on one of the challenges. Because my session is dealing with SDG and in other hand forest conservation and I'm looking at it from the policy lenses because in the tropics, as SDG is a big thing so you have to satisfy all the goals here, especially 1, 2 and 3 is a very important goal which is dealing hunger and prosperity. And on the other hand, the forest is a resource and there are goals also which is talking about the conservation of forest. So you have to calibrate it. So it's the challenge is one. In one hand is how much trade off you can do. In some cases, you will find there is complete conflicting in between the two goals of the SGDs and some there will be synergies. But synergies are good. For the forest, but where there is conflict, you have to come with some sort of trade-off. You have to leave away some sort of the aspect of the forest and have to leave away some of the development. So this is one of the biggest challenges of keeping with the development goal of a country: economic development, I'm meaning industrialization. I'm talking about the tropical countries and added on this climate change challenge and having the forest back. So, this is a big challenge you have to you have to synchronize it in such a way, you have to find the correct trade-off. That's in my opinion is the biggest challenge for having our forest back.

***Key takeaways***

**JOSE:** Thank you very much, Sadath, and thanks to all of our guests and listeners. And before we go, I always have a take-home message, so Peter what is your take-home message for today?

**PETER:** The key take-home messages from today from my perspective is that we need to recognize the extent of biodiversity and the services that forests provide beyond the physical products. It's an absolute sort of gem of services and products that can help us as humans and we need to really to sustain and manage those, particularly in the light of climate change.

**JOSE:** Thank you very much again for being here. Listen to Branching out wherever you listen to podcasts. And rate and review us. Next time, we will explore the topic of forest for sustainable societies. And check out more content from IUFRO at iufro.org or click on the link in the show notes.

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