Genomics of Keystone and Underused Forest Genetic Resources for Their Climate Adaptation, Resilience, Conservation and Sustainable Management

Natural and anthropogenic disturbances, such as deforestation, fragmentation, insect and disease outbreaks and climate and environment change are major threats to the conservation and sustainability of forests, stability and functioning of forest ecosystems and the services they provide. Genetic diversity is the basis of all biodiversity because it provides the raw material for survival, adaptation and evolution of all organisms, especially under changed environment, climate and disease conditions. Therefore, conservation and management of genetic diversity in forest trees is critical for the stability and functioning of forest ecosystems because forest trees are normally the keystone species of many ecosystems, and many faunal and floral associations depend on their existence. Consequently, genetic diversity of forest trees provides the foundation for forest sustainability and ecosystem stability. Our understanding of the genetic diversity and population structure of forest tree species and genetic impacts of forest management practices and natural disturbances is rapidly progressing, but genetic resources of numerous ecosystems and species are endangered and may face extinction. Therefore, it is paramount to understand and harness underused forest genetic resources, and conserve and protect genetic resources of rare and endangered tree species. Such resources include both keystone, rare and endangered species for maintaining ecosystem functions and services. It is paramount to understand how forest genetic resources contribute to ecosystem integrity and promote their diverse and sustainable use to foster adaptation to climate change. Moreover, in order to advance measures to mitigate the negative impacts of climate change by developing and managing well-adapted, genetically diverse and healthy forest resources, it is critical to understand the genetic basis of local adaptation and that of responses and adaptation to climate change in forest trees. Emerging population, functional, ecological and conservation genetics and genomics approaches, enhance the opportunities to address these critical forest genetics research needs. The session will explore the progress and promises of forest genetics and genomics research, including AI and Internet of Things (IOT), for the conservation of forest genetic resources and understanding adaptation in forest trees with the objective to define priorities for future research in order to maximize its impact on genetic biodiversity conservation, adaptation and sustainable forest management, especially under the climate change conditions. The Session will encourage presenters to address issues of improving the livelihoods of local communities through forest genetic resource conservation and breeding, as well as issues access and equitable sharing of benefits derived from genetic resources.

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