



Opinion

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Ecological Basis towards a Sustainable Non-Timber Products Forest Silviculture in the Valdivian Temperate Rainforest



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Opinion

Sustainable forest management is important for timber production, and for the provision of other goods and services [1]. One of these vital goods is the Non Timber Forest Products (NTFP), especially because of their important ecological and cultural value and economical capacity [2]. However, there is an increasing global concern about the biological consequences of NTFP extraction on plant populations and ecosystem functioning (i.e., [3,4]). For instance, the removal of plant products from a forest might degrade the quality of the habitat for animal populations [5] or also adversely affect animal-plant interactions, such as pollination or seed dispersion [6]. The resilience of the forest ecosystem after harvesting NTFP would be influenced, among other factors, by the amount of removed biomass from a respective organ we are interested for; as well as, by their biological characteristics, such as life form, growth rate, reproductive biology, habitat specificity and population density [7]. Such information remains unknown for many world forest ecosystems because of their lower valuation regarding traditional timber products, especially those forests in low-income countries and highly diverse hotspot.

The Valdivian Temperate Rainforest is one of the most important world ecosystems hotspot for biodiversity conservation [8], characterized by its high endemism, the dominance of Angiosperms over Gymnosperms, and the presence of lianas and vines [9,10]. The Valdivian Temperate capital rainforest is known for its numerous socio-ecological goods and services that can provide, and the numerous communities that gather different NTFP. However, the land-use change has substituted the native forests along the region, whilst the inadequate forest management have been degraded the remnant of these practices [11], especially in the lowlands.

Advances have been made since early syntheses on the ecology of these forests [9], and research on sustainable management and silviculture for timber production [11]. Current progress about NTFP for the Valdivian Temperate Rainforest is more related to commercialization, certification of harvesting standard and processing non-timber products. Because of economically promising market already established for some species, the Chilean forest service is currently stimulating the commercialization of NTFP, encouraging traditional gatherers to associate and to scale up the productivity increasing the harvesting/income in rural areas. The many compilations that documented the uses of several native plant species had slightly considered ecological attributes, population's dynamics and interactions [12], therefore management regulation lack of scientific basis in order to decrease the negative ecological impacts that increasing harvesting could trigger.

Harvested populations need to be examined in terms of their abundance, distribution, and overall regarding their ecological responses to harvesting treatments in the long-term. To provide an example of the development of ecological information required for the sustainable management method of NTFP species in the Valdivian Temperate Rainforest, I could mention three species with different harvesting methods: *Ugni molinae* cursive (a native shrub species harvested for fruit production), *Lophosoria cursive* quadripinnata (a native fern species where the foliage is harvested for ornamentation purpose) and *Berberis cursive* coralina (a native liana species where the whole individual is harvested for handicrafts). For instance, one could predict that low impact use, such as partial harvesting of the fruits may have a long-term negative effect on the population regeneration or might derive

in a decrement of fauna due to a lack a food supply. In opposite, the extraction of whole individual or the complete extraction of specific parts such as foliage or flowers may have a short-term effect.

Some starting research questions to promote an ecological research program that could help to define adequate management methods of these resources might be: How species with different harvested organ responded to the different silvicultural methods. What factors (i.e., harvesting techniques, life history attributes) are most decisively in determining the regeneration of these plants after harvesting? What ecological interactions with plants and animals may be affected by the harvesting of these NTFP?

Scientist, practitioners and decision makers engaged in sustainable management should be encouraging to develop a research program, different to the timber production, toward a sustainable silviculture in the light of basic ecological knowledge able to support current and new regulation. It is even more urgent in the face of the ongoing climate change affecting the region to avoid a continuous degradation of the Valdivian Temperate Rainforest Hotspot.

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