

Forests and Food

Addressing Hunger and Nutrition
Across Sustainable Landscapes

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7. Conclusions

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7.1 Forests and Trees Matter for Food Security and Nutrition

Close to one out of every six persons directly depends on forests, with food being one essential aspect of this dependence. An even greater number rely on the ecosystem services of forests – notably soil and water protection and pollination – specifically for their food and nutrition. Forests and tree-based systems are particularly critical for food security and nutrition for the poorest and the most vulnerable, including women.

Forests and tree-based systems have played a major role throughout human history in supporting livelihoods as well as meeting the food security and nutritional needs of the global population. **These systems, ranging from natural forests that are managed to optimise yields of wild foods and fodder, through shifting cultivation and a wide variety of agroforestry systems to single-species tree crop systems and orchards, remain important components of rural landscapes in most parts of the world.**

There is increasing evidence of the importance of forests and other tree-based systems for supporting food production and contributing to dietary diversity and quality, and addressing nutritional shortfalls as underscored in this book. Additional products essential to food production, such as **fuel, fodder or green fertiliser**, are also provided by trees.

Non-timber forest products (NTFPs) and agroforestry tree products (AFTPs), including tree commodity crops within agroforestry systems, are important sources of revenue to local people and governments, which can contribute to food supply. **Tree-based incomes offer a considerably more diversified livelihood portfolio** given the environmental and economic risks of relying on cash incomes from single commodity crops. More is known about the economic value of tree commodity crops

than of other products, although recent initiatives have provided a clearer picture of the “environmental income” from NTFPs.

Forests and tree-based systems also provide valuable ecosystem services that are essential for staple crop production and that of a wider range of edible plants. For instance, many globally important crops require pollinators that are supported by forests and diverse tree-based cropping systems within landscape mosaics. **These systems offer a number of advantages over permanent (crop) agriculture given the diversity of food products derived from them and their adaptability to a broader range of environmental conditions (e.g., soils, topography and climate) and changing socio-economic conditions.**

7.2 Governing Multi-functional Landscapes for Food Security and Nutrition

Forests and tree-based systems are embedded within broader economic, political, cultural and ecological landscapes that typically include a mosaic of different, and often competing food production systems and other land uses. How these different land use patches interact with each other in space and time can profoundly influence the productivity and sustainability of forests and tree-based systems as well as their food security and nutrition outcomes. **The integration of biodiversity conservation and agricultural production goals must be a first step, whether through land sharing or land sparing, or more feasibly through a more nuanced, yet complex, multi-functional integrated landscape approach.** Greater attention to the production of and access to nutrient-dense foods is needed in the debate on the respective benefits of land sharing versus land sparing which has focused to date on the impacts of staple crop yields (one important aspect of food security and nutrition) on biodiversity and forest conservation.

A range of diverse drivers – environmental, social, economic and governance – affect forests and tree-based systems for food security and nutrition, usually by influencing land use and management or through changes in consumption, income and livelihood opportunities. These drivers are often interrelated. Thus, designing appropriate and integrated responses to these complex influences that are effective across multiple, nested scales is a major challenge. **Managing resilient and climate-smart landscapes on a multi-functional basis that combines food production, biodiversity conservation, other land uses and the maintenance of ecosystem services should be at the forefront of efforts to achieve global food security.** In order for this to happen, knowledge from biodiversity science and agricultural research and development needs to be integrated through a systems approach at the landscape scale.

Governance shifts from state-focused government to **multi-sectoral and cross-scale governance present better prospects for integration of different interests and goals related to forest and food systems.** The resulting global emphasis on ecosystem

services can also bring opportunities for improved synergies between forest and food systems, changing management forms and changes in income and livelihood structures. To maximise future potential, **greater attention from the scientific and development communities** is required, particularly **to develop a supportive policy framework that considers both the forestry and agriculture sectors in tandem.**

Current governance arrangements are imperfect and ambiguous. **Complexity surrounding the forest-food landscape interface dictates the need for different solutions on a case-by-case basis.** Structural reforms involving greater intervention from the state to harmonise regulatory regimes, may be required in some instances to achieve more inclusive food systems that not only foster innovation but also value local practices, systems and knowledge. **Co-regulatory approaches that involve both public and private actors also have the potential to enhance the effective governance of forest and tree-based food systems.** Initiatives aimed at enhancing the governance of large-scale investors supporting sustainable practices in the commodity value chain, improved benefit sharing and protection of local people's rights complement state-led regulatory approaches and policy frameworks.

A central governance issue is **how and to what extent policy and regulatory frameworks help ensure equitable access of the poor, women and disadvantaged groups to forests and tree-based systems, and to what extent do these regulatory arrangements recognise the rights to direct and indirect benefits for food and nutritional security.** Richer households with more assets (including livestock) are able to claim or make greater use of forest common property resources; yet, poorer households often have a higher dependence, as a proportion of their total income, on forest resources for food security and livelihoods.

The impacts of interventions are also felt differently, depending on social structures and local contexts, and could improve food security and nutrition for some groups while increasing vulnerability for others. Subsidies and incentives (for tree planting and management) are often captured by larger farmers who are, usually, not food insecure in relative terms. **Responses must be sensitive to these differences, and ensure that they meet the needs of the most vulnerable groups.**

7.3 The Importance of Secure Tenure and Local Control

Improving food sovereignty can help to ensure that local people have better access to food, control over their own diets and are engaged in efforts to improve the nutritional quality of their food intake. Community level engagement with local food and agricultural systems will be particularly important for those people facing a nutrition transition and the burden of malnutrition. It creates a setting ideal for more sustainable management of these food and agricultural systems and the broader landscapes in which communities reside and interact.

Tenure regimes in forests and tree-based systems for food security and nutrition are highly complex, and rights to trees or to their produce may be different from rights to the land on which they are grown. **Different bundles of rights are nested and overlap in these different systems, varying according to geographical, social, cultural, economic and political factors, and affecting the access of different population groups to the trees and their products for food, income and other livelihood needs.**

Policies that support communities' access to forests and that encourage the cultivation of tree products are required. While there is a growing trend towards designating *de jure* land and management rights to communities and indigenous peoples who traditionally hold *de facto* rights to forest, some 80 percent of forest land worldwide remains under state ownership. **Improved security of tenure has significant potential to enhance access to nutritious food.**

Since women represent 43 percent of the global agricultural labour force, and there is evidence of feminisation of agriculture in numerous developing countries, **women's weak and often insecure rights of access to land, forests and trees is undermining their engagement in innovation in forests and agroforestry systems with huge costs for their food security and nutrition, and that of their families.**

7.4 Reimagining Forests and Food Security

Applying an integrated landscape approach provides a unique opportunity for forestry and agricultural research organisations to coordinate efforts at the conceptual and implementation levels to achieve more sustainable agricultural systems. As such, **a clear programme of work on managing landscapes and ecosystems for biodiversity conservation, agriculture, food security and nutrition should be central to development aid.** Agroecology (i.e. the application of ecological concepts and principles in the design of sustainable agricultural systems) appears well suited to these geographies, and an approach that combines biodiversity concerns, along with food production demands, provides a more compelling vision of future food production.

Conservation and restoration in human dominated ecosystems requires strengthening connections between agriculture and biodiversity. In such landscapes, characterised by impoverished biodiversity and in particular depopulated of their medium and large-sized vertebrates, **tree-based agriculture in particular may represent an opportunity, and not necessarily a threat, for conservation and ecosystem restoration.**

Most forest and tree-based systems are underpinned by the **accumulated traditional knowledge of local and indigenous communities.** Traditional knowledge has been crucial to the development and modification of these systems over generations under diverse and changing variable environmental conditions and to meet changing

socio-economic needs, and **this contribution needs to be acknowledged and incorporated into management practices and policy.**

Agricultural and forest scientists, extension agents and development organisations have only recently begun to understand the importance and relevance of forests and tree-based systems, and the traditional knowledge that underpins many of these systems. **Working with farmers to combine the best of traditional and formal scientific knowledge offers tremendous potential to enhance the productivity and resilience of these systems and the flow of direct (food security and nutrition) and indirect (income) benefits to their practitioners.**

By targeting particular species for improved harvest and/or cultivation, more optimal portfolios of species could be devised that best support communities' nutrition year-round. An overall increase in production through cultivation of a wide range of foods, including tree fruits and vegetables, is required to bridge consumption shortfalls. There is further potential for the domestication of currently little-researched indigenous fruit trees to bring about large production gains, although more information is needed on the nutritional value of many of these species.

The development of "nutrient-sensitive" value chains is also needed, which means improving nutritional knowledge and awareness among value-chain actors and consumers, focusing on promoting the involvement of women, and considering markets for a wider range of tree foods. By promoting tree food processing and other value additions, the non-farm rural economy can also be stimulated.

Dietary choices are complex and depend on more than just what potential foods are available to communities in their environments. Rather than assumptions based on availability, assessments of actual diet through dietary diversity studies and other related estimators are therefore crucial, to allow an exploration of the reasons behind current limitations in usage. **There are multiple targets to improve food choices and nutritional knowledge and awareness, with women and children being key targets, as well as actors across the value chain.**

Education and basic awareness play important roles in empowering rural populations and have the potential to generate tangible and fundamental benefits for their households and communities including food security, sustainable forest management, health, education and general household nutrition. For women and other vulnerable groups appropriate education and training programmes can improve their understanding of healthy and nutritious foods and natural resource management practices. Such programmes can also support traditional rural societies in understanding and incorporating necessary changes that enable gender inclusiveness in decision-making and benefit sharing in forests and tree-based systems for food security and nutrition. Technological innovation, in particular mobile technology can help deliver relevant information to rural populations and is seen as critical in improving existing extension services, education and products to enhance food security and nutrition, dietary choices and health.

7.5 Knowledge Gaps

Through the research of this Global Forest Expert Panel, specific knowledge gaps have been identified concerning the contribution of forests and tree-based systems to food security and nutrition. Although there is a growing body of evidence, much remains to be understood as concerns the role of forests and tree-covered landscapes in food security and nutrition and the provision of nutritious diets. Accurately quantifying the role of forests in food security and nutrition (including dietary diversity) is needed. In particular, better quantification of the relative benefits received by rural communities from different tree production categories is required, supported by an appropriate typology for characterisation. Further research is needed to assess the complementarity and resilience of different crops in agroforestry, particularly in the face of climate change and the need for concomitant adaptation to such change.

Research should support food tree domestication options appropriate for meeting smallholders' needs. To support diverse production systems, genetic selection for commodity crop cultivars that do well under shade may be of particular importance. This may require returning to wild genetic resources still found in shaded, mixed-species forest habitats, reinforcing the importance of their conservation. There are also opportunities to develop valuable new tree commodities that are compatible with other crops and that therefore support more agro-biodiversity.

Specific gaps that have been identified related to the management of forests and tree-based systems to enhance food security and nutrition include the need to refine estimates of land cover in agricultural landscape and the extent of agroforestry practices, including their relationship with factors other than climate and population density. There is a need to assess the actual extent of most management systems, the numbers of people who rely on one or more such systems to meet their household food and/or income needs, and the relative value of different forests and tree-based systems on the diets and health of those who manage them. Further research would also be needed to better understand the food values of forest mosaics from shifting cultivation systems.

There are gaps in our understanding of the inter-relations between drivers affecting the role of forests and tree-based systems in food security and nutrition. In particular, improved understanding is needed on the link between economic valuation of ecosystem services, and their incorporation into global commodity markets, and the ensuing risk of local and indigenous communities being dispossessed of land and related rights and access.

Further research is required at the landscape scale particularly when tackling trade-offs between different stakeholders. There is a need to better understand the economic, environmental and other trade-offs for the different sectors of rural societies when the harvesting of NTFPs is commercialised or they are planted (and perhaps are converted to new commodity crops), as the benefits and costs for different members of society vary. The question of how far research can go in providing useful information

about relationships between forest food systems and other land uses at the landscape scale needs to be addressed. In the land sparing/land sharing debate, greater attention is needed on food production and access to nutrient-rich foods.

Gaps remain regarding ways to better link local innovations in resource access and control to a supportive policy and institutional environment. The effectiveness of education-based initiatives for sustainability and food security need to be further explored. More attention is needed on how to effectively link local innovations in relation to management practices, institutions and governance arrangements to an enabling policy environment. Comprehensive information on the complex relationships between land tenure, use, control, ownership and how these relationships impact on food security, forests and tree-based systems is needed to help develop appropriate land tenure policy frameworks (which are also gender sensitive).

7.6 Looking Ahead: The Importance of Forest and Tree-based Systems for Food Security and Nutrition

This book has highlighted the important role that forests and tree-based systems play in complementing agricultural production systems for food security and nutrition. Forests and tree-based systems can contribute to the “Zero Hunger Challenge”. To do this, however, requires a much greater understanding of the forest-food nexus, the effective management of landscapes and improved governance. Recognising the role of different configurations of the landscape mosaic, and the ways in which forests and tree-based systems can be managed to effectively deliver ecosystem services for crop production, provide better and more nutritionally-balanced diets, greater control over food inputs – particularly during lean seasons and periods of vulnerability (especially for marginalised groups) – are critical elements of response to global hunger. Through this book, we have identified important opportunities for greater harmonisation and synergy between policies and global commitments to secure more sustainable landscapes for a hunger-free future for all.

