

Food and Agriculture Organization of the United Nations

MAXIMIZING NUTRITION IN FORESTRY USING A FOOD SYSTEMS APPROACH







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AN EVIDENCE-BASED LITERATURE REVIEW

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Context

This literature review is one of a series of four sector-specific reviews aimed at informing the development of guidance notes for the integration of nutrition across the crops, fisheries and aquaculture, forestry and livestock sectors in 12 sub-Saharan African countries. The guidance notes will provide practical suggestions on how to formulate programmes and policies that contribute to sustainable healthy diets and enhanced nutrition. Both the literature reviews and the guidance notes form part of a collaboration by the Food and Agriculture Organization of the United Nations (FAO), Action Against Hunger and World Vision to support national decision-makers and programme implementers in strengthening sector policies, programmes and investments for improved food security and nutrition outcomes, especially for those who currently or could rely on this sector for subsistence and sustenance.¹

The present literature review focuses on mainstreaming nutrition in fisheries and aquaculture (hereafter the "fisheries sector"),² using a food systems approach. Food systems refer to the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, marketing and advertising, preparation, consumption and disposal of food products that originate from crop and livestock production, forestry, fisheries and aquaculture, as well as the broader economic, societal and natural environments in which these diverse production systems are embedded (FAO *et al.*, 2019).



Figure 1. Food systems for healthy diets

Source: Adapted from the High-Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security (FAO, Rome, 2017).

² The term "fisheries" refers to wild fish capture systems, and "aquaculture" to farmed fish breeding systems. Both subsectors are covered by the term "fisheries sector" (FAO, 2016).

¹ The project covers the following countries: Burkina Faso, Chad, Côte d'Ivoire, the Democratic Republic of the Congo, Eswatini, Ghana, Kenya, Mali, Mauritania, Senegal, Uganda and Zimbabwe.

The review also highlights discusses challenges faced by the most vulnerable groups in this sector, especially indigenous forest communities and the women and youth within them (FAO, 2015a).

Methodology and structure

In developing this review, a desk study of both peer-reviewed scientific literature and grey literature was conducted. An evidence mapping tool was developed and used to classify the findings across the different components of food systems, resulting in the following overview of the forestry sector's contribution to food and nutrition security, organized across several key questions:

- How do forests contribute to sustainable healthy diets and prevent malnutrition?
- How is the forestry sector organized within the framework of the food system?
- Who are the main stakeholders in forest value chains? What are the drivers of malnutrition and/or poverty in these groups?
- What are the main limitations and drivers that affect the forestry sector?
- What are the most relevant types of interventions that may enhance the contribution of the forestry sector to sustainable healthy diets and improved nutrition", while also addressing the challenges faced by the most vulnerable groups in this sector?

Background

Forests account for one-third of the world's land mass and 80 percent of the world's flora and fauna, providing livelihoods for more than one billion people. These natural reserves are not only a source of food security and nutrition, but also of income, energy (through wood and charcoal) and biodiversity, and play a crucial role in climate regulation (through carbon absorption and tree covers), soil formation and watersheds (FAO, 2016; Sunderland *et al.*, 2013). Annual income from informal and formal/commercial exploitation of forests total up to USD 124 billion and USD 600 billion respectively (Rasolofoson *et al.*, 2018a). Produce from forests are the result of farming, hunting and gathering (Arnold *et al.*, 2011), and forest products support the livelihoods and security of both local and wider communities by providing income, sustenance and security (Dounias and Froment, 2011).

Despite the clear and abundant benefits of forests however, national policies often fail to acknowledge their essential role in the food system and ecosystem. The critical role of forests in the food systems must be acknowledged, and the contribution of forest products to nutrition needs to be recognized in order to achieve the 2030 Agenda for Sustainable Development.

How does the forestry sector contribute to sustainable healthy diets and prevent malnutrition?

Forests provide an array of foods and resources (HLPE, 2017) and – through hunting, foraging and agriculture – can be exploited for fruits, vegetables, roots and tubers, leaves, honey, nuts, mushrooms, eggs, insects, fish and bushmeat, all of which are defined as non-wood forest products (NWFPs). NWFPs in turn can be further divided into two groups: non-food items such as fibres and medicines, and food items such as "wild foods"³ (Charrondière *et al.*, 2013).

³ "Wild foods" is the preferred FAO term for foods from forests.

In rural households, bushmeat and insects may account for 30–80 percent of protein intake, while fruits, vegetables, roots and tubers, and nuts serve as excellent sources of nutrients (FAO, 2013). Wild foods also contribute substantially to vital micronutrient intake (for example, up to 85 percent of iron, 88 percent of zinc, 89 percent of calcium, 93 percent of vitamin A and 100 percent of sodium intakes in women), and to dietary diversity – including up to 25 percent greater dietary diversity in children (Rowland *et al.*, 2017). Despite the abundance and diversity of wild foods however, little is known about their nutritional characteristics. As a result, they are often underutilized, and their contribution to local diets is either unknown or underestimated (FAO, 2017).

The dietary diversity of forest communities often depends on the ecological richness of the forest and its proximity to secondary markets (Rasolofoson *et al.*, 2018b). It is therefore essential that the integrity of the forest ecosystem is preserved and the surrounding infrastructure is developed to support those who rely on forests for subsistence and sustenance (Bebbington *et al.*, 2018).

How is the forestry sector organized within the framework of the food system?

1. Food supply chain

There are a range of ways to access and obtain foods in forests (FAO, 2013), and the forest system is unique in its ability to offer opportunities for both cultivated and wild food (Rowland *et al.*, 2017).

Crops: Forest crops are normally produced using swidden/agroforestry systems (Ickowitz *et al.*, 2016). These systems involve clearing fields for annual or semi-annual crops, then returning to fallow, and subsequently re-clearing in a recurring cycle. These systems rely on the cyclical use of organic forest matter, forest cover and watersheds to produce food crops (such as fruits and vegetables, maize, rice and plantains) for direct consumption, or cash crops (such as palm oil, rubber and coffee) for income (FAO, 2013).

Livestock: The biomass produced from forests can serve as a rich source of browse and fodder (feed) for livestock (FAO, 2017). This form of livestock rearing may be facilitated by crop-livestock-forestry systems where a symbiotic relationship between the three provides biomatter for growth. The livestock reared by these systems may be used either as agricultural labour, as capital assets or as sources of food. It should be noted however, that livestock systems in forests usually produce an inadequate amount of animal source foods (Jin *et al.*, 2017). Forest communities tend to obtain most animal source foods from wild animals and insects, and rarely sell livestock to the wider community.

Fish: Rivers and other water bodies in forested areas provide an important sustainable source of fish for forest dwellers (FAO, 2013). Forests provide tree cover and watersheds, which serve as aquatic habitats for a significant variety of fish species – for example some 5 600 fish species exist in the Amazon rainforest alone (Montag *et al.*, 2019). In some forests, water bodies may even be used for aquaculture. Most of the fish produced through these methods is consumed directly by and within forest communities, rather than sold to the public (Dounias and Froment, 2011).

Wild foods/forage: Wild foods come in the form of fruits, nuts, seeds, leaves, honey, mushrooms, insects and wild animals (FAO, 2013). Many of these are consumed immediately, with little to no additional processing (Ickowitz *et al.*, 2016) – fruits, nuts and seeds, for example, may be eaten raw. Other wild foods however, such as insects and wild animals, may need to be processed (for example, dried or smoked), or cooked before consumption (Dounias and Froment, 2011). The volume of wild foods extracted depends on a community's proximity to forests and the regional location of the forest (i.e. temperate versus tropical). The closer a community is to forests, and the more abundant the forest is, the greater the food and nutrition security (and income) the community may derive from these products (FAO, 2017).

Upon harvest, forest foods are either sold to retailers for commerce or consumed directly (HLPE, 2017). Where processing or preparation is required, the forest provides the necessary resources (Rowland *et al.*, 2017); for example, forest wood, charcoal and water is used to cook, boil, smoke or fry raw foods. An increasing number of projects and value chains are exploring innovative ways for using these techniques to process and package fruits, nuts and seeds for wider consumption (FAO, 2017). These activities improve the safety and quality of forest products and prevent food loss and waste (FAO, 2015b).

2. Food environment

Forest communities often lack the means to transport highly perishable foods to retailers safely and efficiently (Rasolofoson *et al.*, 2018b). In addition, they may be unable to access sufficiently diverse diets from forests alone. The lack of access to markets may therefore inhibit both income and dietary diversity. Findings show that at short distances from markets (up to 62 km) and roads (up to 8 km), the effect of forests on dietary diversity is significantly positive. This effect becomes non-significant at larger distances, as perishable food cannot be extracted without appropriate cold chain infrastructure (HLPE, 2017). It is therefore critical for forest value chain interventions to consider market access when designing policies and programmes.

3. Consumer behaviour

There are two groups of forest food consumers – those who collect and consume forest products directly, and those who purchase forest products from retailers (Rowland *et al.*, 2017). In both cases, consumer behaviour influences the forest value chain through demand, and through the dietary diversity needs of the consumer and those they care for. And in both groups, those who purchase, prepare and serve the forest products are often women (HLPE, 2014). At low education levels (0–1 years of education), the effects of forests on dietary diversity are minimal and/or insignificant, but increase steadily and become more significant as education level increases, indicating the importance of ensuring dietary education for both forest and non-forest communities at a young age (Rasolofoson, 2018a). Consumers who regularly purchase and prepare a diverse range of forest products may improve their dietary diversity, while increased consumer demand can also support the often marginalized forestry sector (FAO, 2013).

More comprehensive guidelines should be developed to educate consumers on safety precautions when purchasing and preparing perishable forest products such as bushmeat and wild fruits and vegetables (Arnold *et al.*, 2011). For forest communities and consumers to fully benefit from forest food systems, policies and programmes should therefore ensure they are empowered and educated on the nutritional benefits, purchase, safety and preparation of highly perishable wild foods.

Who are the main stakeholders in forest value chains? What are the drivers of malnutrition and/or poverty in these groups?

Globally, some 10 million people rely on the informal commercialization of forestry products (FAO 2013). These include indigenous communities with strong sociocultural traditions, skills and knowledge of production systems that are passed down from generation to generation (FAO, 2017). However, these communities have limited influence on forest policies. As a result, most forest policies support the development of timber, commercial cash crops and wood products, rather than the livelihoods of forest communities and their food crops. This degrades traditional forest value chains (such as medicinal plants), upon which 75–90% of people in many low-income countries rely (Arnold *et al.*, 2011). Overexploitation for commercial purposes also leads to loss of natural ecosystem services such as soil, water and tree cover. The average forest per capita has consequently halved from 1.2 hectares (ha) in 1960 to 0.59 ha in 2008 (FAO, 2017). These losses are likely permanent and thus reduce the resilience of forest food systems. It is therefore essential that policies acknowledge and prioritize the livelihoods of forest dwellers over commercial interests.

Women and youth in these communities are further marginalized (Rowland *et al.*, 2017). Men and women tend to have differing tasks and responsibilities in the production and provision of food. Many women spend a large amount of time collecting (and have a great deal of knowledge about) forest and tree foods and about woodfuel, while men seldom have responsibility for collecting and using natural resources for household use. Women also tend to commercialize fewer forest products and have less land access than men; as a result they tend to have a comparatively lower level of income (Sunderland *et al.*, 2014). Moreover, women are typically tasked with a double burden – that of gathering resources and of childcare. The dietary diversity and food security of both women and children is therefore of particular concern in these already marginalized communities. Women also have to contend with gender gaps in access to land, credit, technology, employment and markets for forest products, and even though they are often primary forest users, they typically participate far less than men in forest management and policy decisions (FAO. 2013).

What are the main limitations and drivers that affect the forestry sector?

- a) Forests and their natural resources are being depleted by modern development and agriculture projects. Forest resources and ecosystems are finite, and if no action is taken they will be lost forever (FAO, 2013).
- b) Forests play an essential role in mitigation of and adaptation to climate change, thus contributing to preventing climate-related food insecurity (FAO, 2013).
- c) Governments often fail to recognize the traditional and customary tenure arrangements under which local people have used and managed forests for centuries (FAO 2017).
- d) Forest communities often lack training and business acumen for the processing and retail of wild foods (Dounias and Froment, 2011).
- e) Forest communities, especially those that deal with bushmeat, may be significantly affected by food-borne outbreaks and large-scale epidemics such as COVID-19. They are less likely to be well-prepared for dealing with such outbreaks, and/or for reducing the risk of future wildlife-borne spillover of disease to humans (Pruvot et al., 2019; FAO et al., 2020).



- f) Due to financial and natural resource management concerns, roads and other transport infrastructure are frequently lacking in and near forest areas, often leaving forest communities disconnected from the wider world (FAO, 2017).
- g) Many women in forest communities act as caregivers and gatherers but do not have access to the same resources, income and opportunities as their male counterparts. Likewise, youth are an essential part of the forest community workforce, but often lack access to training as well as to sufficient nutrition (FAO, 2013).

What are the key interventions in the forestry sector that can contribute to sustainable healthy diets and improved nutrition while addressing social inequity?

Based on the issues identified in this review, there are several key interventions that should be considered when designing and implementing forestry policies and programmes:

- a. Implementing forest policies that maintain ecosystem services and sustainable production of wild foods;
- b. Improving forestry governance by including forest communities, especially women, in policy discussions;
- c. Supporting income, market access, business acumen and food and nutrition education in marginalized forest communities;
- d. Expanding research and knowledge on wild foods, including their nutritional characteristics and their contribution to local diets;
- e. Improving wild food handling, processing and transport capacity in forest communities;
- f. Raising awareness, especially among consumers, on the nutritional benefits of wild foods, including instructions on safe handling and preparation; and
- g. Safeguarding the rights and the livelihood opportunities of indigenous forest dwellers, in particular women and children.

This literature review informs and complements the development of an accompanying guidance note on the forestry sector, providing practical suggestions on the formulation of programmes and policies that meet the above targets and contribute to better nutritional outcomes while taking environmental, social and economic impacts into account.

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