Chapter 10
Value Creation and Innovation with Non-wood Forest Products in a Family Forestry Context

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Abstract Non-wood forest products (NWFPs) have often-underestimated economic potential, particularly for family forest owners. Their role and value, however, is changing in the global West and so are the business opportunities and innovation needs associated with them. Focusing on industrialized countries, this chapter gives an overview of the broad range of goods and services connected with NWFPs, describing important innovation trends. In the core of the chapter, a number of case study analyses from Europe and North America illustrate the various ways NWFPs sourced through wild collection or specialized management systems can be utilized by family forest owners . We analyze the actor networks, value creation processes, and role of services for supporting such systems. While recognizing the importance of non-market values from NWFPs, our primary emphases are on business and income potential for family forestry. We conclude that the application of a service-dominant logic is helpful for understanding how new goods and services are developed by forest owners in networks of various kinds of public and private actors and within specific institutional and cultural contexts. From the analysis we also derive recommendations on how service providersand policy measures can purposefully support innovations in NWFPs in a family forestry context.

Keywords Actor networks · Case studies · Industrialized countries · Non-wood forest products (NWFPs) · Service-dominant logic · Value creation

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10.1 Introduction

In pre-industrial times, European forests were owned or used in a subsistence context and provided multiple benefits to the users, including food and feed, medicinal products, and building materials, among others. With industrialization, modern forest management systems prioritized market-oriented timber production. These forest management models, however, often neglect other forest goods and services. Post-industrial concepts or paradigms for forest management are refocusing attention today on multiple values of forests under various names, including multi-functional, multipurpose or multiple-use, sustainable or ecosystem-based forest management (Buttoud 2000; Kennedy et al. 2001; Schlaepfer et al. 2002).

In Western economies, non-wood forest products (NWFPs) retained some importance in forestry practices only when it did not harm timber production, when there was an industrial demand or when it was of national importance (Radkau 2012; Sieferle 2001). The very terms "non-wood" or "non-timber" indicate the secondary role allocated to those products in classical forestry education, scientific and management models, and forest policy, each of which places timber at the center of attention. With rising labor costs in industrialized countries and an increasingly globalized economy, the production of NWFPs such as pine resin, mushrooms, herbs, etc., often declined because it was not competitive with cheaper production in other countries, intensified production in agricultural systems, or market substitutes such as petrochemical products (Wong and Wiersum 2019).

However, the *continuing significance of NWFPs for rural populations and incomes in industrialized countries is strongly underestimated* (Emery et al. 2006; Hislop et al. 2006; Vacik et al. 2014). Studies reveal the importance of collecting NWFPs for both commercial and non-commercial purposes. It has long been overlooked that significant proportions of European and North American populations gather NWFPs and that picking from the wild for personal use is a social practice that extends across a wide range of socio-economic circumstances (Pettenella et al. 2019a, b; Robbins et al. 2008; Wong and Wiersum 2019). Gathering (also referred to here as picking, collecting, and foraging) has remained an important part of forest culture in industrialized countries, although our knowledge about non-commercial activities and informal markets is limited and levels of participation may vary over time. For instance, studies from Czech Republic indicate increasing interest and growing engagement of households, while studies from Greece show decreasing interest among younger people (Wong and Wiersum 2019).

Pickers and collectors of NWFPs often are farmers whose lands include some woodlands. In addition to gathering NWFPs, they also may act as processors of the raw materials, as well as traders or sellers through, for example, direct marketing to local restaurants and via on-site sales and farmers' markets. This role of NWFPs is less visible than other sources of farm and forestry income, however, because the

activities partly occur in informal markets and generally are not reflected in national statistics (Pettenella et al. 2019a, b). Furthermore, NWFPs collecting, processing, and marketing often is secondary to other (main) farm production and, consequently, are not regarded by landowners as targets for innovation. Since they are included in official statistics only when the products are sold as commodities and have some national economic significance, NWFPs are not a discrete, recognized sector in most industrialized countries. They are neither specifically recognized by the agricultural sector because the products come from forests, nor by the forestry sector because they are seen as side-products to the main goal of timber production. In consequence, NWFPs usually have a very limited role in national or sectoral innovation systems and lack proper institutional support for innovations and business development (Rametsteiner and Weiss 2006; Weiss 2013).

There are, however, clear indications of a revival or a *reinvigoration of NWFPs use* as a result of various social trends that are creating new demands, including trends for wild and natural products, traditional skills and production methods, retro styles, experiential products, and healthy and sustainable lifestyles (Pettenella et al. 2019b; Weiss et al. 2019; see also Kurttila et al., this volume). Family forest holders accustomed to trading in or utilizing NWFPs for subsistence particularly may benefit from such a revival, since they often have experience with and traditional knowledge about those products and their processing. Additionally, many farm owners have competence with direct marketing or combining farm products with experiential service offers such as farm holidays and related activities. They may have interest in the opportunities additional income sources offer for keeping their farm business independent, and they may have flexible family labor resources to engage in the field, if work and income are unevenly distributed over the calendar year.

NWFPs are therefore assumed to have the income to play a more significant role in rural development. These products present opportunities to generate socio-economic benefits along the entire value-chain (Bonet et al. 2014; Stryamets et al. 2011), strengthening the economic viability of supply chain actors and providing additional income to forest owners willing to diversify forest use and invest in managing for both wood and non-wood forest resources (Cai et al. 2011; de-Miguel et al. 2014; see also Hansen et al., this volume; and Kurttila et al., this volume). A recent study in European countries indicates also that the focus is increasingly oriented on NWFPs as -marketed products or as well-being products embedded in recreation and pedagogic services (Wiersum et al. 2018).

Production systems for NWFPs range from opportunistic to intensively managed, with corresponding levels of control over the production process, including labour and capital inputs (Wong and Wiersum 2019). Control of the production process may be zero when collecting in the wild or in agricultural or forestry systems managed for other species or products, low in agroforestry systems or multi-purpose forestry, or high in horticultural or other plantation systems. Land and/or species management efforts may range from harvest of or from wild species where they grow, to manipulation of population densities or varieties in semi-wild systems, to domestication and cultivation of species in specialized and intensive production systems. In a European

context, half of NWFP species appear to be exclusively collected from the wild, with a majority of the balance collected in both wild and cultivated settings. Only 7% of European NWFPs are exclusively produced under cultivation (Wong and Wiersum 2019). Often, NWFPs come from semi-wild systems where a species is planted or actively managed in systems resembling natural forests. In an industrialized country context, NWFPs often involve consumers in the production, for instance, when the product includes experiential services such as guided tours, fairs or events, or with specialised custom-made products (Wong and Wiersum 2019; Živojinović et al., forthcoming).

Service-dominant logic (S-D logic; Toivonen and Kowalkowski in this volume) has pronounced implications for developing innovations in NWFPs. First, the impetus of S-D logic to see all benefits of forests puts NWFPs in the spotlight alongside timber and biomass for energy (see Kurttila et al., this volume; and Caputo et al., this volume). Second, the call for stronger connections to consumers is particularly relevant when it comes to developing new NWFPs, with new value chains and sectors not yet familiar to forestry (Hansen et al., this volume). These implications are relevant for both forest holdings and service providers, such as consulting systems. They touch on the questions of *how to develop* goods and services for new customer groups, with a need to bridge rural and urban spheres, and *what kind of support services* family forest owners need in such processes. We postulate that looking at these questions through the S-D logic approach is particularly fruitful for identifying new ways to develop and support innovations in the field. In the remainder of this chapter, we examine this by presenting the current state of and trends in the broad and diverse field of NWFPs (Sect. 2), analyzing case studies from several industrialized countries using the S-D logic framework (Sect. 3), and drawing conclusions regarding values and value creation in NWFPs, the roles of service providers, and opportunities for policy to support NWFP business and (Sect. 4). While recognizing the importance of non-market values from NWFPs, including the provisioning of subsistence resources and cultural maintenance, our primary emphasis is on business and income potential for family forestry.

10.2 Current State and Development of NWFPs

According to FAO (2010), several million households world-wide depend heavily on NWFPs for subsistence and/or income. Some 80% of the population of the developing world use NWFPs for health and nutritional needs. In some regions, NWFPs also provide raw materials for large scale industrial processing. Some NWFPs are important export commodities, with at least 150 NWFPs having significant international trade value (Pettenella et al. 2019a). In 2005, the global value of NWFPs was estimated to be US$18.54 billion with the following use categories as the most relevant ones, from an economic perspective (Table 10.1).

According to a recent, extensive study of NWFPs in Europe, over 90% of households consume NWFPs in one form or another, an average 25% of households pick,

Table 10.1 Global value of NWFPs clustered in use categories (FAO 2010)

NWFP category	Value (million US$)
Food	8614
Other plant products	2792
Wild honey and beewax	1805
Ornamental plants	984
Exudates	631
Plant materials for medicine	628
Wild meat	577
Materials for utensils, construction, etc.	427
Hides, skins and trophies	183

with higher shares in rural compared to urban areas, and many also sell NWFPs (Pettenella et al. 2019a). For 0.5% of European households, NWFPs significantly contribute to their overall income (i.e. >50%). According to these figures, NWFPs support people in European rural areas to an extent *comparable with timber production*, particularly in regions where wood is not the most profitable forest forest (e.g., in the Mediterranean area). Surveys conducted in the United Kingdom (Emery et al. 2006; Forestry Commission 2005) and United States (Robbins et al. 2008) indicate that approximately 25% of the populations in those countries also have picked NWFPs.

Nevertheless, production and usage of NWFPs *vary greatly* throughout Europe. NWFPs are often collected for personal use and their collection is perceived largely as a form of recreation or social interaction. Nevertheless, for some households, picking NWFPs provides a significant opportunity to generate income. In such cases, NWFPs are utilized mostly by small- and medium-sized enterprises, but also can be found as internationally established mass market products. The harvested NWFPs not always contribute to the income of forest holdings, e.g., when consumers pick for their own consumption or when enterprises pick on the basis of everypersons' right. Family forest owners do benefit when they are paid license fees for picking permits on their land or when the forest owners engage in harvesting of NWFPs themselves, on their own or others' land. They secure a higher value added for their own when they not only sell the raw product but also process them to refined food or beverage goods or even market the final product.

As a result of increased utilization and production of mushrooms and truffles in recent decades, forest fungi represent one of the principal NWFP groups in Europe. Tree derived NWFPs such as fruits and nuts, barks, resins, and leaves are commonly produced in commercial orchards. Understory plants, harvested in the forest, are widely utilized both privately and commercially. However, nformation on their population dynamics and sustainable yields is scarce. Similarly, the use of products from animal origin, such as honey or game meat is widespread and can be understood as economically relevant, particularly with regard to hunting as a recreational activity or as a means of species population control. The characteristics of these four categories

of NWFPs are briefly described on the basis of the work of the European COST Action FP1203 on NWFPs (Vacik et al. 2019).

10.2.1 Mushrooms and Truffles

Forest fungi are major decomposers and play a key role in forest ecosystem functioning by contributing to nutrient turnover from litter and wood. The most species-rich fungal communities appear in tropical rainforests. While the estimated global species richness is 0.8–5.1 million, approximately 12,500 fungal species grow in Europe (Blackwell 2011; Tedersoo 2014). Fungal fruit bodies have been traditionally used by many civilizations, with more than 1,100 fungal species are consumed worldwide as food or medicine. Wild edible fungi are valued NWFPs throughout the world and wild harvest remains the largest source of commercially important mycorrhizal species (such as truffles, chanterelles, and morels), despite scientific advances in domestication (Rosmiza et al. 2016). Their potential to complement timber production appears promising, particularly from a regional development point of view (Bonet et al. 2014); and in Spain and Italy myco-tourism represents an interesting new source of income for remote rural areas.

10.2.2 Tree Products

Awareness of the value of some non-timber tree products has been gaining relevance over the past decades. Increasing policy measures aimed at promoting substitutes for fossil-based materials to mitigate and adapt to climate change fosters use of renewable raw materials. Vegetable tannins, natural gums, and resins or cork provide multiple opportunities in this context. In Europe for instance, vegetable tannins extracted from the wood and bark of chestnut (*Castanea sativa*), black locust (*Robinia pseudoacacia*) and oak (*Quercus* sp.) are being reinvigorated to supply the leather and food industries. Portugal and Spain lead global trade in cork. Wild nuts and fruits are gourmet products in developed economies and their high values has stimulated their domestication; hazel nuts (*Corylus avellana*) and almonds (*Prunus dulcis*) are almost fully domesticated, while chestnut, strawberry tree fruits (*Arbutus unedo*), etc., continue to be harvested from semi-natural forests.

10.2.3 Understorey Plants

NWFPs from understorey plants comprise a multitude of species with uses that can be categorized as edible, medicinal, aromatic, forage, ornamental, colorants and dyes, utensils, handicrafts, and construction. Between 50,000 and 80,000 flowering

plant species are used for medicinal purposes around the globe, with about 15,000 species threatened due to overharvesting and habitat destruction. In Europe, more than 1300 medicinal plants are used, of which 90% are harvested from the wild (Chen et al. 2016). Wild berries are rich in flavonoids and vitamins, making them among the healthiest resources from forests. Bilberries (*Vaccinium myrtillus*), as an example, are abundant in Northern European countries, where they are harvested in huge quantities to supply global markets as superfoods or other types of health products. Various species that are used as ornamentals have a considerable role in world trade. The international ornamental plant trade has been conservatively estimated at US$1000 million annually. This figure does not capture the very substantial informal or illegal trade (FAO 2010).

10.2.4 Animal Origin

Animals are an intrinsic part of forest ecosystems; however, the fundamental differences between mobile animals and rooted plants mean they have different legal regimes and require different approaches to management. Some of the animals that live in the forest are hunted or used to produce materials for human consumption such as foodstuffs, trophies, hides, fur, bones, silk, lac, musk and other non-edible products. In Europe, since the decline in demand for furs, game meat and honey account for 96% of forest animal products, although there is some use of bristle (wild boar—*Sus scrofa*) and hair (squirrel—*Sciuridae* sp.) in brushes and some manufacture of hide and leather, as well as applications for medicinal purposes (Wong et al. 2019).

10.2.5 Innovations

The diversity of NWFPs presents not only an array of opportunities, but also manifold challenges. One is related to *seasonality* (i.e. availability of the products within a year) and natural fluctuations in supply between the years, which makes systemic development of a business and the development of stable market channels difficult. Another challenge is to get a good understanding of *customer preferences*, since any product must span the gap between the largely rural producers' and predominantly urban consumers' value systems (see Huff et al., this volume). Furthermore, business development and entrepreneurship in the agro-food sector is *increasingly regulated* in Europe, with stricter sanitary and traceability standards, as well as business and tax regulations that are often difficult for small enterprises to fulfil. Institutional support structures are important to overcome such constraints. In the absence of strong specific organizations in the field of NWFPs (falling, as it does, between the established sectors of forestry, agriculture, food etc.), enterprises often develop their innovative businesses with little or no support from institutional actors (Ludvig et al. 2016b). Some potential entrepreneurs may not be bold or persistent enough or lack

capacities for developing products and markets on their own. Others are unable to garner support from the *fragmented institutional system* to assist them in business expansion or replication. As a result, businesses often stay small and diffusion of new market ideas is poor or slow (Ludvig et al. 2016a; Weiss et al. 2017a; Ludvig et al., this volume).

Innovation trends in NWFPs can be seen in two important directions: (a) new commodity-type industrial uses on one side, and (b) non-commodity, personalized products on the other. Examples of (a) *industrial scale commodities* include new uses for the traditional material cork for clothing, handbags, etc. Cork is an atypical example of innovations in NWFPs, since the industry is well organized and invests strongly in innovation activities. Other fields of current innovation are medicinal, pharmaceutical, and body-care products from wood, bark, fruits, leaves and a range of forest plants. Some are rediscoveries of older products such as pine resin, with high quality, natural products gaining new value in response to the growing market segment of environmentally and health conscious consumers. In addition to investment by industry sectors such as pharmaceuticals, textiles, and others, current bio-economy policies are providing a strong push for research and development of products based on renewable materials (Prokofieva et al. 2017). Where NWFPs are the basis for industrial-scale businesses, often the latter organise to influence policy makers to provide *public services* such as R&D, business and innovation support. Industrial demand also often stimulates the process of domestication to facilitate control over quality and origin, as well as production and harvesting costs. The examples of forest fruits and truffles illustrate the tendency for successful forest products to transform into domesticated agricultural products (Pettenella et al. 2019a, b).

Examples of (b) *non-commodity* NWFPs exchanged in formal and informal markets include high-quality, high-priced, small-scale, or manufactured food and drinks; handcraft items; and one-of-a-kind artisanal products. Often, marketing of these products emphasizes non-material, symbolic qualities connected with green, healthy and sustainable standards, local or regional traditions, and hand-made or artisanal production. They have experiential qualities in themselves or are marketed together with experiential services such as foraging or mushroom collection tours, wild fruits cooking courses, or handicraft workshops (Živojinović et al., forthcoming). Producers are often micro-businesses, which are not organized into trade associations and receive less attention from institutional system actors. They could, however, *benefit* a lot from consulting support, networking, or financial grants.

This overview of the significance and characteristics of NWFPs—although focused on the ecological and material qualities, as well as economic value of this broad range of products—shows that they have diverse values to people, with that value highly dependent on geographical context and historical developments. That value is derived from both non-commercial and commercial uses. To more fully understand their social role, we also need to examine their cultural dimensions. Such an analysis reveals that even commercial values depend on social and cultural contexts.

10.3 Value Creation in NWFPs and Services for Family Forestry

As the description above suggests, NWFPs differ not only in their material characteristics, but also in many other respects, including ownership rights, production systems, and market structures. Each of these has implications for their suitability as business opportunities for landowners and users, as well as how production can be organized or the kinds of support services that are needed or helpful. The cases analysed here represent products with differing levels of *consumer involvement* in the creation of experiential value. These range from direct personal involvement (e.g., Christmas tree cutting, participating in a guided tour for collecting herbs or berries in the forest, foraging, or attending the chestnut festival) to indirect involvement through the acquisition of territorial products with specialized markets (e.g., with the domestic Christmas tree label, the green Nature Parks label, or the chestnuts from Castione).

When looking at *production systems* for NWFPs, we consider the full range from wild collection to semi-wild production, and plantations. In addition, NWFPs may be produced in single or joint production systems. This multiplicity of production characteristics leads to diverse forms of connection between producers, consumers, and other actors.

Let's think of the example of foraging—the collection of wild foods or herbs, often by local people who may or may not own the forest land where they harvest. Foraging may take place on land owned by the forager, in public forests, on the basis of everypersons' right, or through a contract with the landowners. In an in-depth case study below, we analyze maple syrup production in the USA as a cultural activity, a hobby, a supplementary income source, and a commercial production on lands with diverse ownership regimes. The other extreme are plantations—where specific management inputs are applied by the landowners aimed at a steady and optimal production of specific products. Those production systems are mostly developed for single products such as hazelnuts, pine nuts, chestnuts, truffles or pine resin, but exist also for multiple products in agroforestry systems such as the *montado* system in Portugal for joint production of cork and livestock. For the analysis of single production systems, we have chosen chestnuts (Italy) and Christmas tree plantations (Austria). The wild collection of NWFPs such as berries, mushrooms, or herbs is often done in forests managed primarily for timber production. Commonly, NWFPs are not included in management decisions because the harvests are not captured by the landowners or because the value of the "by-products" is low, occasional, and/or underestimated. Explicit consideration of all products—timber and NWFPs—in the management system could help to optimize total production and value creation. Such multiproduct management systems would require new and specific expert knowledge that family forest owners rarely have. In our example of a Finnish decision support system below we look at the potential value of an expert tool and how the provision of such an expert service will change the actor constellation in the provision of NWFPs.

In the *case studies* that follow, we discuss the role of services to support inclusion of NWFPs in family forestry in some typical production systems. With special attention to actor networks, we analyze the role of public and private sector participants in production and service functions, as well as institutional frameworks and the role of policy. Primary questions are how value creation differs between types of production systems and what that implies for the types of services that might be offered.

The example of maple (*Acer saccharum*) syrup production in the USA illustrates the diversity of values and actor networks that may develop around a single NWFP. In examples from Austria (Christmas tree plantations and Nature Parks) and Italy (chestnut production), we focus on the role of service providers such as producer associations and an institutional structure with origins in the consumer sector. In a case study from Finland, the initiative for a decision tool to support joint production of timber and NWFPs came from research.

10.4 Co-creation of Value in Wild Collection of Non-wood Forest Products

10.4.1 Foraging Seen from a Service-Dominant Logic

Service-dominant logic shifts the focus of analysis from production and distribution of material goods to the creation of value through interactions between individuals and institutions in specific natural and societal contexts (see Toivonen and Kowalkowski, this volume). In the case of NWFPs and family forests, an S-D logic approach suggests new insights may be gained by augmenting emphasis on the biological material of NWFPs with attention to associated practices and experiences and the values emerging from these. An emphasis on foraging, foragers, chains of connection, and networks of exchange flowing from them provides such a shift in focus.

Here, we understand *foraging* to embrace the harvest of non-cultivar species, which occurs within a suite of associated practices from harvest preparations through processing, distribution, and use of foraged materials (Lake et al. 2018). Foraging practices range from the harvest of materials, the location of which was unknown prior to commencement of the outing in which it occurs, to harvesting wild species from well-known places in which management may occur from the individual plant to landscape scales. This definition of foraging recognizes that humans have long modified their environments to enrich populations of the wild taxa important to them (Peacock and Turner 2000). Thus, foraging occurs along a continuum of human-plant (or fungi) relationships including and between the entirely serendipitous and active tending, but does not involve genetic manipulation (either through conventional horticultural practices or genetic modification) or land cover simplification such as that typical of annual monocrop agriculture (Ford 1985). We use the term foragers to refer

to the individuals who engage in the practices of harvesting plant materials and/or fungi.

Seen through the S-D logic lens, foraging is a knowledge-intensive practice through which *networks* of human and nonhuman actors co-create value from forests (see also Caputo et al. this volume). In the case of family forests, at the micro-scale the basic network of actors includes (Fig. 10.1): (a) forests, forest plants and fungi, (b) family forest owners, (c) forest forest (who may or may not be the owners), (d) foragers, and (e) foragers' personal, professional, and business social networks. Where foraged items or products made with them are monetized and distributed beyond the forager's personal social network, additional actors (also referred to as beneficiaries) will include individuals who might be thought of as consumers and any individuals in a market chain between the forager and the consumer. These intermediaries may include producer associations, equipment suppliers, wholesalers, and retail outlets.

The inclusion of forests and forest plants and fungi as actors may be unfamiliar but intuitive to foresters, particularly as applied to family forests and NWFPs. Scholarship in the tradition of actor network theory has highlighted the agency of nonhuman entities by analyzing the ways that, rather than serving as passive backgrounds or solely as things to be acted upon, the characteristics of plants, fungi, and animals interact with humans (and other nonhuman actors) to produce particular outcomes. Without anthropomorphizing them by attributing intent, this conceptual approach recognizes that the behaviors and properties of plants, fungi, and animals influence the outcome of human interactions with them. That is, their characteristics have the "capacity to produce a phenomenon or modify a state of affairs" (Jepson et al. 2011 as cited in Klenk 2015, p. 103). Thus, we include forests, forest plants and fungi in our analysis of actors.

The material of plants and fungi are essential but insufficient to the production of value from family forests through NWFPs. Rather, S-D logic brings into view the value derived from interactions between foragers and plants and fungi, as well as between foragers and other people with whom the practices of foraging bring them into direct or indirect connection. The meso- and macro-scale contexts of these interactions also play a key role in the co-production of value by actors by, *inter alia,* contributing to the *creation of meaning* from foraging and use of foraged materials and by serving to facilitate or create barriers to these experiences.

Research in locations around the world shows that among the valuess produced by interactions characteristic of foraging are food and other material uses; connections to nature; health and well-being, and economic benefits, including non-monetized economic benefits (Shackleton et al. 2011). In other words, foragers *integrate* (or mobilize) plant materials and fungi with their competences (knowledge and skills), time, and labor to produce value. The values that emerge are both material (e.g., food, medicine, artisanal materials, etc.) and experiential (e.g., time spent in nature, further competence development), with the experiential also offering tangible material benefits in the form of health and well-being.

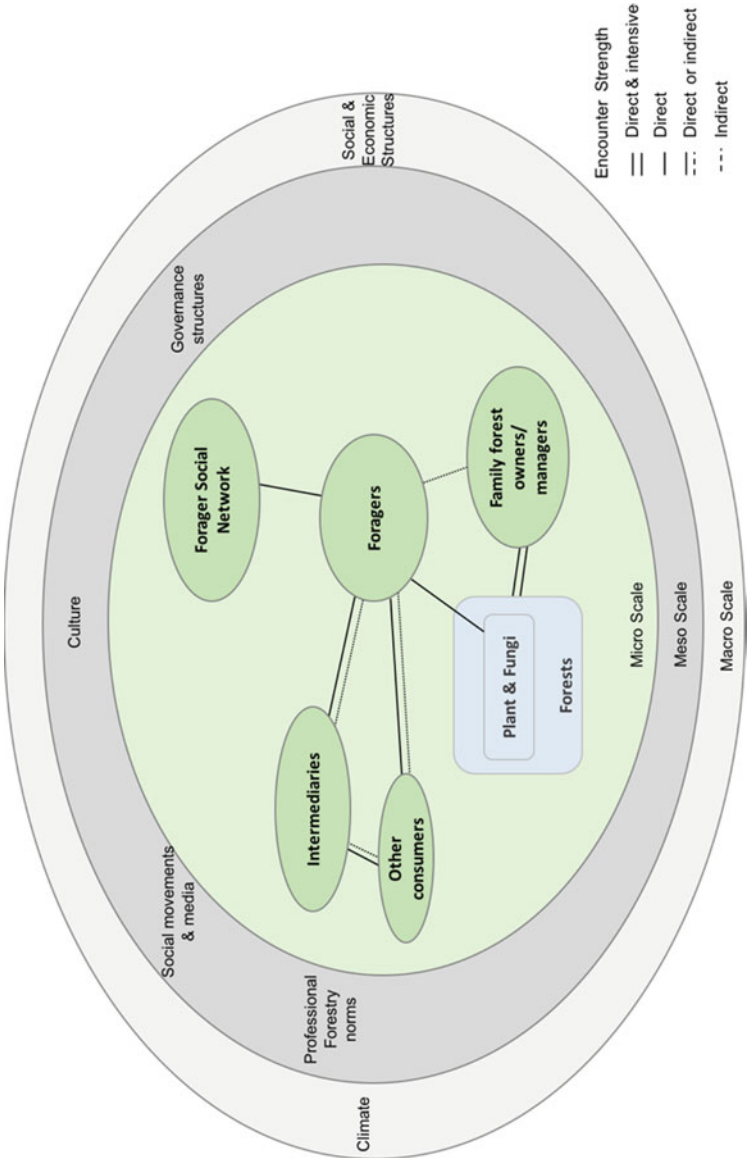

Fig. 10.1 Foraging through a service-dominant logic lens

10.4.2 The Case of Maple Syrup Production

Maple syrup is an iconic NWFP of northeastern North America (Hinrichs 1998; Whitney and Upmeyer 2004), produced by collecting and boiling down the sap of sugar maple (*Acer saccharum*). Further evaporation of maple syrup produces a granular sugar. Sap collection and boiling occur when late winter and early spring weather conditions of freezing nights and above freezing day-time temperatures result in transport of carbohydrate-rich fluids from the roots to the branches of sugar maple trees. Sap is collected by tapping into the bole of the trees and allowing the liquid to accumulate using technologies as varied as open buckets and vacuum tubing (Fig. 10.2). Processing technologies have a similar range oflabor and capitalintensities from boiling in an open pan over a wood fire to use of reverse osmosis equipment to remove water and concentrate sugars in the sap prior to further processing in an evaporator.

Archaeological records suggest North American indigenous peoples were producing maple syrup and sugar prior to contact with European explorers and settlers (Emery 2002; Turner and von Aderkas 2012). A key marker of the changing of the seasons, maple syrup and sugar are the first new sources of sustenance following what historically was a period of late winter food shortages in the northern latitudes where sugar maples are a significant forest species. In addition to being a sweet source of calories, maple syrup and sugar contain chemical constituents with antioxidant properties comparable to those of Vitamin C and may offer other protective health benefits (Li and Seeram 2011; Liu et al. 2017).

Often referred to as sugaring, at the *micro scale* today the contexts within which this NWFP-based practice occurs include *cultural maintenance,hobby, supplemental income, and commercial production* (Fig. 10.3). In the United States, family forests are important sites for sugaring. Applying S-D logic to examine sugaring in these

Fig. 10.2 Collecting maple sap with vacuum tubing. *Source* The University of Vermont Extension

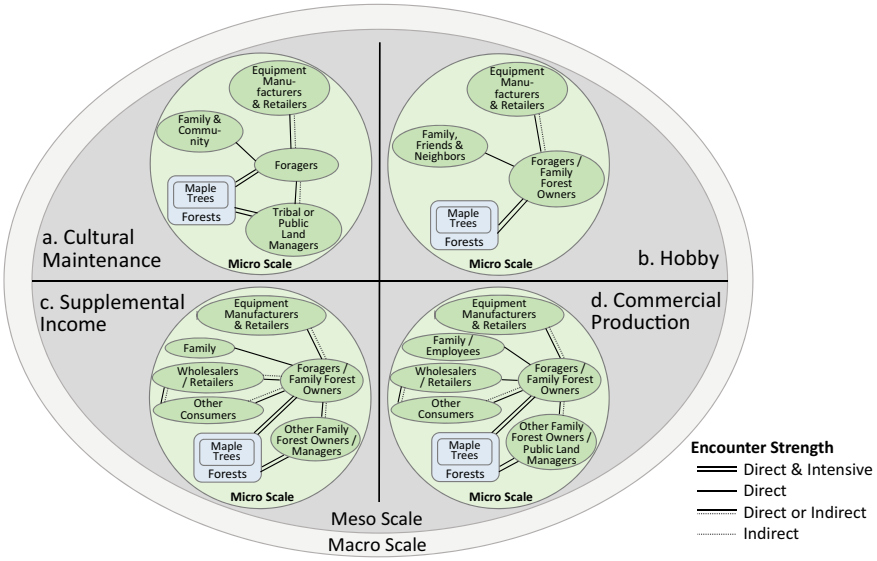

Fig. 10.3 Maple syrup collection in different contexts: Actor networks in sugaring as cultural maintenance, hobby, supplemental income, and commercial production

diverse contexts reveals networks of actors whose interactions create meaning and value as sap is converted to syrup and makes its way through chains of connection to people both geographically close to and far from family forests. For illustrative purposes, in the four following paragraphs we describe interactions and valuess characteristic of each of these micro scale contexts as if they were discrete and exclusive, while recognizing that in practice they may co-occur; for example, a family forest owner for whom sugaring is primarily a hobby may also derive some supplemental income from it, or the participants in an operation structured primarily for profit making purposes may also regard it as preserving local culture.

Cultural maintenance. Maple trees are a cultural keystone species (Garibaldi and Turner 2004) for northeastern North American indigenous peoples and sugaring continues to be an important practice for many *Haudenosaunee* (Iroquoian) and *Anishinaabe* and *Wabanaki* (western and eastern Algonquin cultural groups, respectively) families (Erickson 2006). Sugaring brings together multiple generations to mark a key moment in seasonal cycles, which provide fundamental grounding for many aspects of indigenous culture (Fig. 10.2a; Kimmerer 2013). Describing the practices of one family in the Bad River Tribe, the narrator of a cultural magazine story says:

> My *family* has been using the same maple stand for a very long time. My dad says he can remember going out there with his parents and grandma and grandpa, doing just about the same things we do today. (Erickson 2006, p. 6)

Through the processes of tapping maple trees and processing maple sap, older family members help youth learn to read weather and forests. This time also is an

opportunity to impart traditional teachings about what it means to be a member of the community and how to live in a good way. Through such practices, indigenous foragers mobilize their knowledge of sugar maple phenology and of their culture. The beneficiaries extend beyond those who participate in the process itself, as older members of the community and others who may not be able to get out in the woods will be provided with maple syrup or sugar. Among the many valuess resulting from sugaring in this context, indigenous identity is sustained through production of a culturally significant food, which is part of observing rituals and other traditions. Likewise caring for and maintaining extended social networks through sharing syrup supports the fabric of indigenous communities.

Hobby. In a recent survey of members of a maple sugarproducers' associations in three U.S. states, 90% of Minnesota respondents were family forest landowners and over 20% reported their sugaring operations are for hobby purposes (Snyder et al. 2018). Comments offered by these enthusiasts provide insights into chains of connection and valuess created by a second largely non-monetized maple sugaring context (Fig. 10.2b). Most of these individuals indicate that bringing together family, friends, and neighbours is a key benefit of their sugaring operation. Fun frequently was mentioned as a valued outcome of this direct interaction with weather, forests, maple trees, and other people. For these family forest owners, social cohesion, a sense of emotional wellbeing, and connections to nature and the seasons are particularly important. Reported uses of the syrup produced in this context include self-provisioning, gifts, and charitable donations, indicating that beneficiaries of hobby sugaring extend beyond those who participate in collecting and boiling maple sap to the larger social networks of these family forest owners. Such valuess are illustrated by the comments of two respondents:

> Sugaring is a personal hobby and family tradition. I enjoy being out in the woods in the spring. I love the sounds of migrating birds, the first signs of new life in spring. I love bringing my grandchildren and friends to the woods to enjoy the great outdoors.

> Three families come together on our property to make syrup, non-commercial, donate, gifts, personal use. Guests to the sugarhouse get a free bottle. This is just for fun!

Supplemental income. In a now-classic study of rural residents for whom maple syrup production was a source of supplemental income, Hinrichs (1998) documented intertwined economic, social, and cultural valuess of sugaring in this micro scale context (Fig. 10.2c). For sugarers in the U.S. state of Vermont and the Canadian province of Quebec, the practices of producing and selling maple syrup help family forest owners and others manage economic risk and cope with seasonal income flows and labor demands. Thus, for example, a Québécois with a regular summer job and who owns forest with a high concentration of maple trees indicates, "a big reason we sugar is to fill out the [work] year" (Hinrichs 1998, p. 519). Depending as it does on local forest composition, sugaring also plays a role in defining rural identity in this region. Hinrichs notes that sugaring both emerges from and creates community culture, connecting people to place. For some, the social relationships developed and maintained by maple syrup production for supplemental income may have value regarded as commensurate with the income:

To the extent that it rejoins family now geographically and occupationally dispersed for work with a recreational component, the maple syrup enterprise becomes the setting for shared culture and continuity in the face of change (Hinrichs 1998, p. 524).

Commercialproduction. Among large sugaring operations in the U.S. Upper Midwest, participants in the survey cited above (Snyder et al. 2018) stress the economic purpose of their operations but also note social and cultural valuess similar to those of the other three micro scale contexts (Fig. 10.2d). These large producers own significant forested lands (average 117 acres). In many cases, they also lease the right to tap maple trees in woodlands owned by others and may purchase sap from additional sugarers to augment their own production. Thus, their operations may involve chains of connection to multiple (family)forest owners and forested areas. These sugarers are more likely to have invested in high technology equipment, raising questions for them about access to financing, with its connections to macro and meso scale contexts of economic structures and governance, respectively. As one of these commercial producers noted:

> Our challenges are finding money for sap harvesting equipment and land as well as processing equipment. Lenders do not seem to understand our business…

Other commercial sugarers responding to the survey, many of whom are farmers whose land includes woodlands, feel that differences in national policies affect their operations' viability:

> U.S. farmers (including us) are really hurt by the proportion of maple syrup at very low prices. Canadian farmers are subsidized so it doesn't hurt them.

The distribution of syrup produced by these large commercial producers frequently connects to geographically extensive networks of exchange as they may sell through wholesalers and retail stores. While income is the central goal of these producers, it is not the sole value they derive from sugaring. When asked to rate the importance of ten motivations for sugaring on a scale from one to five, large producers ranked income highest (4.48). However, two other factors ranked close behind: (1) bringing together family and friends (4.01), and (2) maintaining family and/or cultural tradition (4.00). Other factors ranking above 3.5 were getting outdoors, preserving the craft of sugaring, and connecting to land. Thus, commercial production of maple syrup produces important relational valuess in concert with economic benefits.

Meso scale. Each of these micro scale contexts is embedded within meso and macro scales. At the mesomeso scale, professional forestry normsnorms are a factor in shaping forestforest composition, including the presence, age, and health of sugar maple. GovernanceGovernance structures affect who has access to those maples for sugaring. SocialSocial movements and media extolling the virtues of natural productsproducts can affect perceptions of the qualities of maple syrup by individuals far from the forests and processes that produce it, creating both meaningmeaning and markets for it. Likewise, as shown above, cultureculture may imbue maple syrup with special meaningmeaning for those who make or consume it.

Macro scale. At the macro scale, sugaring depends upon climate, requiring diurnal freeze-thaw cycles. In many places sugarers are reporting earlier start dates for sap runs (Kuehn et al. 2016) and climate models suggest that suitable habitat for sugar maple may shift north of its current range (Prasad et al. 2007-ongoing). As with all NWFPs, larger social and economic structures exercise broad influence over the distribution and exchange systems available to harvesters who produce maple syrup. Thus, for example, national agricultural policies may influence the conditions of international commerce in sap and finished syrup.

Turning an S-D logic lens on maple syrup production reveals *multiple chains of connection and networks of exchange* rather than a singular product. In some micro scale contexts financial gain is foregrounded, in others it is inconsequential. In all of those examined here, however, sugaring brings together family and friends through the integration of forests, seasonal cycles, knowledge, and labor. Valuess produced through these experiences include outcomes that have been shown to contribute to human health and wellbeing, including identity formation, social cohesion, connections to nature, and incentives to physical activity (Cocks et al. 2016; O'Brien and Morris 2014). Intertwined with these valuess, sugaring provides a source of sustenance and livelihood resources. Arguably, the most direct, intensive chains of connection and benefits from sugaring are those located closest to the forest. But in some cases, the geographical extent of the practice's beneficiaries is regional, national, or international. It is always conditioned by biophysical and socio-economic forces operating at meso and macro scales. Thus, when considering innovations in NWFPs and family forests it is important to recall the *diverse contexts* of foraging and foragers to formulate policies and programs in support of the full range of material and experiential benefits and beneficiaries.

10.4.3 Support Services in Specialized Production Systems

FamilyFamily forests are often of small scale and owners needneed specific *support structures* to be able to manage their forests, e.g., research, advice, joint marketing, lobbying, etc. (see in this volume chapters by Hansen et al., Ludvig et al., and Staal Wästerlund). Those institutional structures that support them include interest organizations, consulting or extension services, innovation, business and regional development agencies, research and training organizations, etc. They provide direct services to land owners or managers as customers of advice or training but they also produce important indirect services, for instance, the wider promotion of products and lobbying for specific beneficial regulations or funding opportunities, or for public services such as research and educational structures in the field (Ludvig et al. 2016a; Weiss et al. 2017a, b).

S-D logic *broadens the view* on these service providers from an analysis of their "services" for their specific customers to an analysis of the "service" they provide in the value creation process of the products (Vargo and Lusch 2004). In this view, they create value in the frame of the whole production process of a NWFP in a specific

context. The notion of co-creation implies that with any interaction with certain actors they are indirectly interlinked with all other actors involved in the process ("service ecosystems", see Catanzaro and Hamunen, this volume). Service providers act within a complex system of actors and institutional and ecological frameworks (Chandler and Vargo 2011). This systemic view has implications not only for a better understanding of the roles of actors in research but also in managing value creation in practice and in providing services for NWFP businesses (Wieland et al. 2016). Innovations in service provision may come through a new self-understanding of actors when they see themselves within a system of actors and in evolving institutional contexts (Catanzaro and Hamunen, this volume).

10.4.4 Christmas Tree Adventure—An Experiential Product

Christmas tree production is an important forestry activity in Austria and is often done on family farm woodlots. The Reisinger family farm, located in the mountains of Styria province, has a 188-hectare (ha) property, 16 ha of which are agricultural land. The farm is managed full-time by the couple who own it, with timber production the main source of income. In addition to forestry and cattle, they market Christmas trees (mainly spruce—*Picea abies* and fir—*Abies alba*) (Fig. 10.4). The latter is done in an unusual way, as the owners explain:

> It is not the perfectly shaped, standard mass product, that is why we market it more as the 'Christmas tree adventure'. Our customers come to experience our farm.

Fig. 10.4 Christmas tree plantation for the "Christmas tree adventure". *Source* Ivana Živojinović

Compared to other producers that offer pre-cut Christmas trees on their farm or at stands in towns, the Reisinger farm *offers an adventure*: Customers come to the Christmas tree plantation, which resembles a regular forest site, select their favorite tree on the spot, and may even cut the tree themselves. The owners describe how their offering becomes a unique experience for the customers that often come from Vienna or other cities. Getting a tree is usually a family activity. They spend a day in the countryside, on the farm and in nature, and pick their own tree—just like in the old times. Thus, buying a Christmas tree is transformed into a fun, memorable activity; a family highlight every year. The owners are not selling a tree, per se, but an adventure. The good (tree) and the service (adventure) together make the product.

The farm is a member of the Styrian forest association „Waldverband Steiermark" and the association of Styrian Christmas tree producers „ARGE Christbaum Steiermark". The main services that the latter provides are marketing activities to promote domestic Christmas trees, a label and certification system for Styrian Christmas trees, and information and training services. The business idea of the Christmas tree adventure, however, is the farm owners'. The idea came when one of them was in Vienna studying. There he learnt that many people associate Christmas trees with going out in the forest and have a nostalgic desire to get their own trees. He realized that such possibilities hardly existed.

The *value* of any Christmas tree lies first in traditional culture (with the tree having a very central role in the Austrian Christmas tradition) and the association of the tree with the forest (the tree evokes the image of an ideal, natural forest and the connected feelings). The farm owner realized further that there is also a collective memory of how, in former times, every (rural) household would go to the forest to get their Christmas tree. The value of the Christmas tree contains those collective memories of the idealized Christmas celebration, the forest, and the old custom of fetching the Christmas tree. The farm capitalizes on this experiential value by offering the opportunity to perform the desired action as what effectively is a symbolic act. The greater part of the value creation actually happens in the mind of the people during their Christmas tree day.

It is noteworthy that this business idea was not created by the Christmas tree producers' association but, rather, by an open-minded farmer living in the city. The association performs important service with their public relations work for domestic trees but, with their conventional forest-centric and production-oriented view they did not come up with this customer-oriented business model. The encounter of the farmer with potential urban customers made the difference (Fig. 10.5). The innovation resulted from a *rural-urbaninteractioninteraction between the potential producer and potential customers*. Such a producer-customer interaction is apparently not sufficiently institutionalized in the traditional Christmas tree producers' association, which is solely made up of forest owners. In the following example of the Nature Park Specialities, in contrast, the innovation happened through the Nature Park association which connects rural land management with urban nature conservation valuess in an institutionalized form.

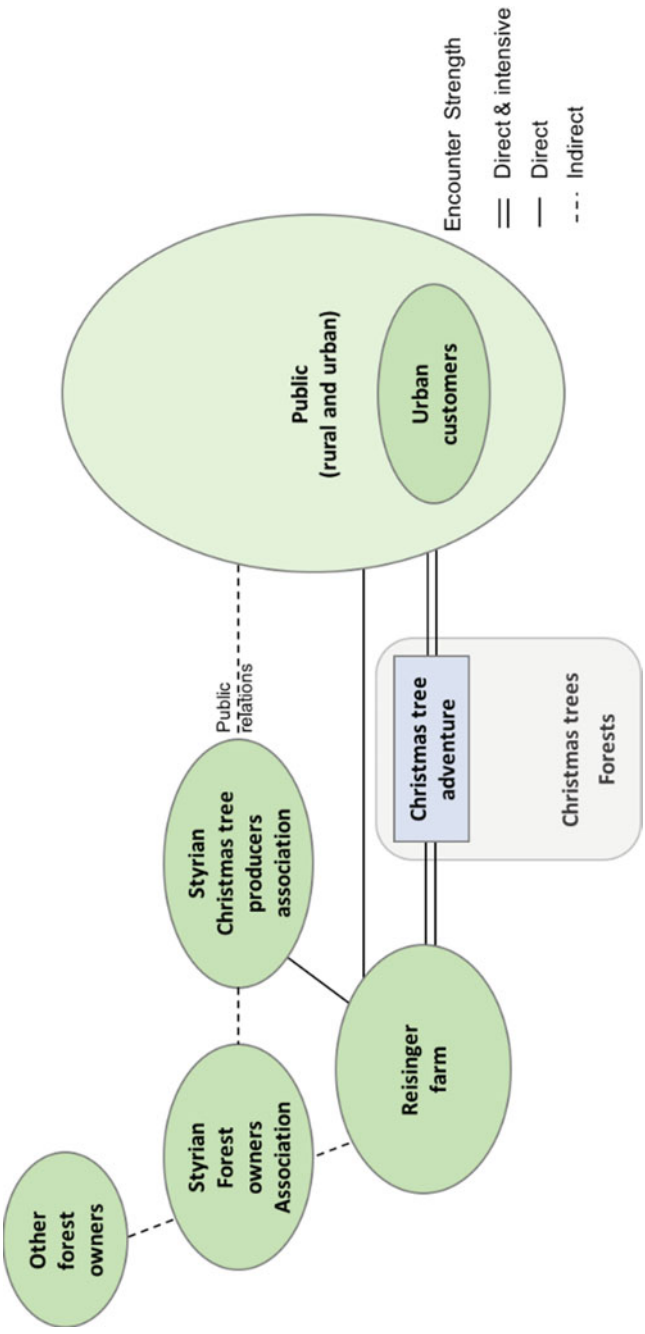

Fig. 10.5 Actor network in the "Christmas tree adventure"

10.4.5 Nature Park Specialities—A Label for Integrated Landscape Management and Marketing

Austrian Nature Parks are a specific legal category of protected areas, which usually are managed by associations of local stakeholders such as municipalities, tourisms boards, and landowners. They aim to preserve cultural landscapes through an integrated development approach that combines nature conservation with sustainable use of natural resources. For this purpose, they promote traditional, environmentally friendly forms of land use and offer various forms of support which include information, awareness raising and training for landowners as well as regional marketing of the Nature Parks and tourism and educational activities. Environmental education includes, among other activities, guided tours and workshops such as "Cooking from the meadows" where a nature guide takes the participants out to collect edible plants and shows them how they can be used for preparing natural drinks or foods (example from the Styrian Nature Park "Mürzer Oberland").

The Nature Parks offer *support for* marketing regional*and environmentally friendly farm products* under the label "Nature Park Specialities" (Weiss et al. 2017a). Since some Nature Parks are strongly shaped by woodland, the idea arose to develop wild forest products in the frame of the label. Examples are cowberries (*Vaccinium vitis-idaea*), rowanberries (*Sorbus aucuparia*) and blackthorn (*Prunus spinosa*), which are made into jams, chutneys or *Schnaps*, other examples are wild honey, oils with herbal extracts, essential oils (Swiss pine (*Pinus cembra*), spruce (*Picea spp*)) and various *bouquets garnis* (partly of wild harvested material), which find a use as teas or bath additives. In most cases, the producers are farmers with small holdings, who process and merchandise directly on their farms, at farmers' markets, to regional food retailers, and through service points at the Nature Parks. In the framework of a European research project (StarTree), and with the help of a regional development consultant, three parks developed their own such activities. In the Styrian project "Colorful hedges and edges of woods", located in the Nature Park "Almenland", trees with colorful fruits and autumn leaves are planted at forest edges or hedges and along roads so that the fruits can be used by farmers and small processors of the region for producing rowanberry *Schnaps* and other products (Fig. 10.6). At the same time, the trees contribute biodiversity conservation and make the landscape (even more) attractive and promote tourism development. A consultant reports on a workshop with farmers (Wong et al. 2016):

> In the Nature Park, there existed already an initiative to promote the planting of certain local trees and shrubs such as rowanberry and blackthorn in private gardens in order to replace exotic species. This idea was now expanded to planting the colorful trees also at forest edges as the fruits can be used for producing rowanberry Schnaps and other products.

In another Styrian Nature Park ("Südsteiermark"), a business plan was developed for joint merchandising and business promotion, in which local farmers might establish their own shop with an assortment of products with a long shelf life (jams, syrups, liquors, herbal teas, etc.), or supply local shops, hotels, restaurants and wineries with a variety of durable products on special shelves. In the Tyrolean mountain

Fig. 10.6 Nature park specialities—selection of jams. *Source* Ivana Živojinović

Nature Park "Kaunergrat", farmers realized that they mostly offer *Schnaps*, but that hard liquor does not fit their customer base, which consists mostly of families that come to hike. They discovered further that for better marketing they need to invest in attractive packaging with a common design and stable product supply throughout the year. As a result, they developed a broader portfolio of products, established a common design, and set up new common processing facilities.

Nature Park Specialities can be seen as *experiential products*, to various extents. In guided tours and production workshops for drinks, foods, soap, etc., service is the primary product, while the self-made goods are more an add-on. When consumers buy Nature Park Specialities with the specific label from the shelves in a supermarket or Nature Park shop, the good is the primary purchase but they pay a higher price for the label that indicates its origin from the Nature Park. The added value is the knowledge they are consuming something from the beautiful nature they have visited or at least are imagining in their minds.

This case study stands out in that the initiative comes from outside the farm and forest sector, namely from nature conservation (Fig. 10.7). With this external impulse and the accompanying support, local resources, traditions and creativity are bundled into innovative activities. Factors in its success include institutional support from the Nature Parks Association, a consultant, and a research project, in addition to the bottom-up approach through which it was applied. From an S-D logic viewpoint, value creation goes beyond a customer-oriented product development process. Rather, it must be seen as the result of a *complex interaction* of natural landscapes, traditional culture and land uses, modern urban valuess, and current legal and institutional frameworks, which include the existence of nature parks, international research programmes, and regional development consulting services. As a result, in addition to new products and better marketing approaches, complex solutions adapted to local contexts and the needs of producers, customers, and landscape

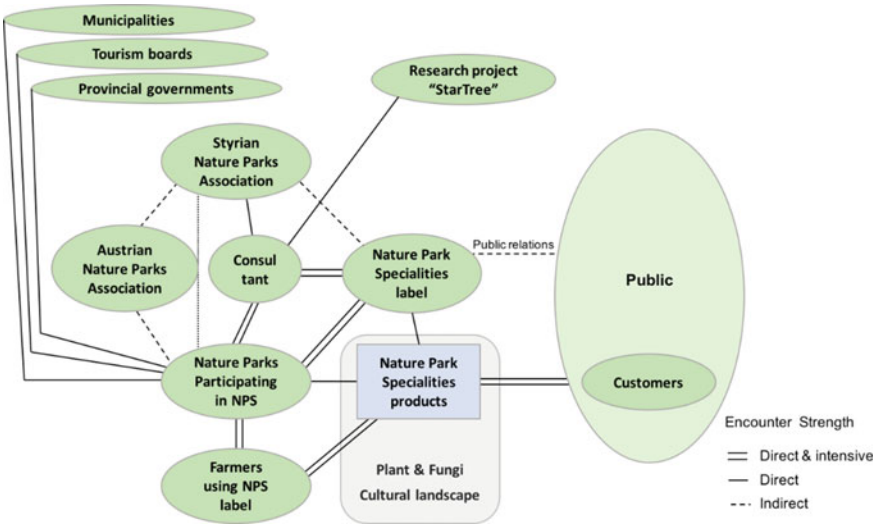

Fig. 10.7 Actor network of the "Nature Park Specialities" label

conservation were created, with innovative measures along the whole length of the value chain, from land management to merchandising. In the following territorial marketing initiative around chestnuts the actor network is even more complex with still more cross-sectoral connections.

10.4.6 Chestnuts—A Traditional Product for New Territorial Marketing

Chestnutcultivation was historicallyan important source of livelihood for people living in many rural areas of Italy; for rural families, chestnuts were considered "*il pane dei poveri*" (the poor's bread) for its high content of starch. In Trentino, a region in Northern Italy, in statistics compiled in 1852 by Agostino Perini, the chestnut was defined as a "fruit tree cultivated with more profit and greater extension in Trentino" (Ministero delle Politiche agricole, alimentari e forestali 2010). However, during the 20th century, chestnut cultivation experienced a dramatic decline, partly due to abandonment of rural areas and partly due to decreasing competitiveness and a restructuring in agriculture.

In the municipality of Brentonico, in the southwestern part of the region, the old chestnut tradition has been re-established recently (Ludvig et al. 2016). Since 1994, local people from the village of Castione have been working together in a specific association (Associazione Tutela dei Marrone di Castione) *to recover the natural heritage* characterized by chestnut cultivation. The association has around one hundred members today, consisting of chestnut growers and other supporters.

Thanks to the efforts of the members, the old chestnut groves that had not been used for many years were restored and are now well managed, deliver profitable production, and remain an important landscape asset of the region.

The association promotes chestnut cultivation, teaches people how to manage chestnut orchards, provides a conservation standard, and defines prices. All of these elements guarantee a high-quality product that is then sold directly by the farmers. The old keystone species of the region now stands in the centre of *territorial activities* to attract tourists and customers. The chestnuts are partly sold fresh and partly processed into various products such as flour or sweets, including a sweet creamy liquor which was invented by a local grappa distillery (Marroncino di Castione). The main part of the chestnut produce is sold during the annual Chestnut Festival in the form of roasted chestnuts and sweets. Recently, the association has played a crucial role in the process of developing and applying a remedy (natural antagonist) against a pest spreading throughout southern Europe since 2002, causing severe damage (*Dryocosmus kuriphilus yasumatsu*). The capacity of the association was needed to initiate research, which was a collaborative effort with support from the Ministry and a research organization. These efforts were able to bring positive results: after years of very low yields, in 2017 chestnut production in Castione finally showed encouraging signs, with about 500q of chestnuts, which represent a high share of the regional annual production (that is around 1000–1500q). The Association was founded by a group of farmers who remembered the almost lost tradition of chestnut cultivation from their parents and grandparents and gathered together with passion and with the aim to conserve their regional culture around the chestnut production.

> To do what we do, first of all there is the need of a predisposition, which you must receive from the family. Your point of origin is important. In your veins the blood of the activity must flow. The true sportsman must have breathed sport. In our case we have chestnuts in the blood. It is transmitted to you in the place where you were born. It is a culture. (Translation of the interview to one member of Associazione Tutela dei Marroni di Castione.)

> In the various Italian territories, people are very jealous of their typical products and of the names of the products linked to the territory of origin. We are jealous too. In the past, Castione artists, specialized in marble sculptures, travelled around Italy and Europe. In addition to offering their professionalism, they brought with them the best products of their land, Castione's chestnuts. They were very appreciated. Why we did not completely abandoned the chestnut activity as it happened in other places? I think that the role of the artists was for us the basis and helped to indissolubly link the place to the product and vice versa. So chestnuts of Castione are, and will be, recognized, both in Italy and abroad. These are things to take seriously. They have a historicity. And I believe that in a globalized world more and more it will be necessary to link the products to the territories. (Translation of the interview to the president of Associazione Tutela dei Marroni di Castione.)

The success of the association is based on a strong network of private and public actors. Most of the work is done on a voluntary basis. The association can count on co-financing and support by public and semi-public bodies, in particular by the Autonomous Province of Trento, the municipality of Brentonico, the Valley Community, the regional Association for the Promotion of Tourism, and a local bank (Casse Rurali).

From the beginning, the chestnut growers recognised the importance of cooperation with the regional tourism sector, and in particular with the Association for the Promotion of Tourism, with restaurants and hotel owners, wine producers, and artists. This network was able to create a territorial marketing strategy that during the fall season attracts tourists in the Brentonico plateau. People visit the orchards and can enjoy local restaurants menus based on chestnuts. The chestnut products and the experience of touristic, gastronomic or artistic services go hand in hand and reinforce each other.

A number of events are regularly organized for promotion of the chestnuts, including gastronomic competitions that involve the best chefs and wine cellars of the region ("Wine and chestnuts: the excellent combination") and the "National Festival of Arts Graphic Humor—the Smile of the Chestnut". The season culminates with the annual chestnut festival.

The association did not only build a local network but it is also an active member of national and European networks: it is a member of the National Association of Chestnut Cities, was a promoter of Castanea, the European network of chestnut growers and processers, and successfully initiated a national chestnuts plan (Ministero delle Politiche agricole, alimentari e forestali 2010), implemented by the Italian agricultural ministry.

The chestnut case from Castione illustrates how *diversetypes of actors collaborate* directly and indirectly for the development of a regional product and for the promotion of the region (Fig. 10.8). The actors span landowners, processors, other sectors, artists, and public bodies. They act within a system of formal institutions (organisations and policies) as well as informal institutions such as traditional culture

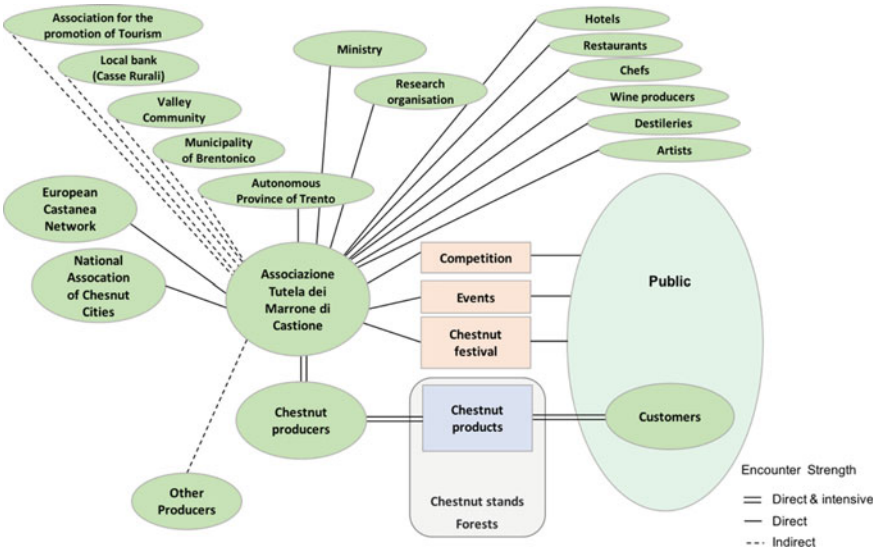

Fig. 10.8 Actor network of the regional marketing initiative of "Castione" around chestnuts

and current regional identity. Innovations occur on micro-level (e.g., invention of the Marroncino), regional level (the association as an institutional and social innovation) and beyond (national and European associations). It would, however, be artificial to separate different innovations, e.g., the product innovations (e.g., Marroncino), service innovations (festivals) (Fig. 10.9), process innovations (e.g., the pest control), marketing innovations (e.g., competitions), institutional innovations (e.g., national chestnuts plan), or social innovations (e.g., volunteer collaboration for reviving the traditional culture and the territorial marketing of chestnut, and redefining the traditional staple food as a gourmet product) since all these are linked to and depend on each other. The value creation can only be understood when looking at the process as a whole.

Like the case of maple sugaring in the United States, our analysis of innovations in Austria and Italy illustrate the interaction of various actors, but particularly highlight the many roles of associations and service providers as *intermediary organizations* that link actors and institutional levels. We learn that successful support of innovative products requires connections across sectoral boundaries and attention to

Fig. 10.9 A chestnut dish at the Chestnut festival. *Source* Associazione Tutela dei Marrone di Castione

customer values. While the highly sectoral Christmas tree association was not supportive in developing the new experiential service (Christmas tree adventure), the regional, bottom-up chestnuts association and the environmentally oriented Nature Parks association were both active drivers of innovative developments.

These examples also illustrate how co-creation processes extend *beyond direct interactions* between actors and depend on both formal and informal institutional frameworks. Any analysis of innovation processes and value creation therefore must include the complex actor networks and institutional and social dimensions which may go far beyond mere product developments or customer orientation towards social goals such as regional development, environmental conservation, or cultural identities.

In all cases, the value of the products is grounded in *cultural values* that are associated with the offered products and motivate consumers to buy. For providers, this implies that they to understand this broader cultural dimension if their work is to be successful. They not only need a customer orientation in their service provision to landowners, but also to see the values of the farm products for the final consumers. Further, in our successful examples the association' and service providers' motivations went beyond consumer satisfaction to broader common goals for the sector (Christmas tree producers' association) or sustainable regional development (Nature Parks association, chestnut producers' association).

10.4.7 Decision-Support Services for Joint Production of Timber and NWFPs

In Finland, several non-wood forest products (NWFPs) are harvested for both household use and sale. The demand for NWFPs such as forest berries (Fig. 10.10) has increased due to their value as nutritional supplements and use in health-promoting products. Besides various environmental factors, forest management affects the abundance and yields of NWFPs. Therefore, forest owners may want to know how forest management may affect the timber and NWFP revenues from their forests and may even see new income opportunities. Specific decision support services and systems (DSSs) developed for forest management practitioners could serve to take into account NWFP yields in forest management (Kurttila and Tahvanainen 2016). At its best, these services enable owners to define and apply forest management that maximizes the profitability ofjoint production of timber and NWFPs.

In recent years, research in Finland has developed DSSs for optimizing the *joint productionof timberand other forestproducts*. The challenges of selecting optimal treatment schedules for individual stands or finding the best combination of treatment schedules for the whole planning areas have been solved, for example, by integrating yield models for wild berries into multi-objective management planning systems (e.g., Kilpeläinen et al. 2018; Miina et al. 2016). Bilberry (*Vaccinium myrtillus*) is an economically important and abundant wild berry in conifer-dominated forests of

Fig. 10.10 Harvesting of forest berries. *Source* Jari Miina

medium fertility in the Nordic countries. The abundance and yield of bilberry are mainly influenced by site and climatic conditions, as well as silvicultural operations. Bilberry suffers especially from clearfellings and does not thrive in sparse seedling and sapling stands or in dense young stands. A moderate supply of light is needed for good bilberry crops.

DSSs have been used to find the stand management that maximizes the total incomes from both timber and bilberries (Miina et al. 2016). Research results are used to develop silvicultural guidelines for managing different kinds of stands to support the joint production of both products. The guidelines indicate that in poor and average bilberry stands it is not profitable to change the timber-oriented stand management, but in good bilberry stands the total incomes can be increased by modified forest management that favor bilberry. In even-aged stand management system, good bilberry yields call for higher thinning intensities, more frequent thinnings, retention of more pine in mixed stands and longer rotation lengths. As a result, the total income from timber and bilberries will be more than twice as high as those calculated without bilberries.

Multi-productstand management guidelines obtained by using stand-level DSSs can be used as the basis for silvicultural prescriptions. Current silvicultural practices widely employed by forest owners and forestry professionals are oriented exclusively towards timber production and do not include information on multi-product stand management (Äijälä et al. 2014). Access to such information could assist forest owners, managers, and consulting services into recognize the existence of alternative management opportunities and also in selecting the management practice most suitable to the forest owners' goals.

In addition, forest*forestlevel calculations* on trade-offs between multiple goal variables (including NWFPs) can be made (e.g., Kurttila et al. 2018; Pukkala 2016) when preparing forest management plans. Production possibility boundaries (e.g., Garcia-Gonzalo et al. 2015) can be drawn to illustrate the production potentials

of selected NWFPs to forest owners. In addition, the rather similar information can be provided to forest owner through alternative forest plans. As an example, such plans were created by using a 150 ha forest holding in Finland and the forest planning system Monsu (Pukkala 2004). Monsu includes several ecosystem service models, including bilberry yield. One forest plan alternative was created to maximize bilberry yield. Profiles of the alternative plans are illustrated as a spider-web diagram, where the axes of the goal variables (e.g., bilberry yield) are scaled between 0 and 1 (Fig. 10.11). In bilberry plan (Max Bil), the amount of clear-fellings is low, but the net present value (NPV) is high. In this plan, the resulting forest management is based more on uneven-aged management principles, which is more suitable for bilberry.

The above two planning levels are interlinked. Forest planning indicates the stands in which the multi-functional management for berries takes place. Stand-level planning gives more detailed information on the efficient multi-purpose management of a given stand. From the forest owner owner's perspective, they need various kinds of expertise and networks for implementing this. A company offering forest-level planning service should be able to quantitatively consider the yields of NWFPs that are interesting to forest owner. A timber buyer should be willing to consider multi-purpose management and make an operational timber harvesting plan for the selected stands. In some cases, consulting forester advice for increasing yields of NWFPs also is needed.

The example of of timber and bilberries demonstrates possible applications of forest DSSs in advising private or public actors to support ecosystem services provision through sustainable forest management. Stand-level expert advice is useful

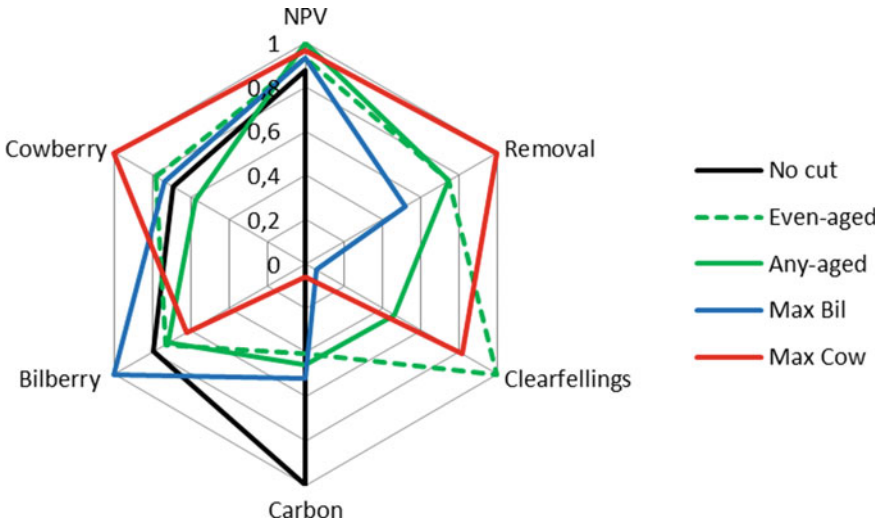

Fig. 10.11 Profiles of alternative plans for a 30-year period created with Monsu, represented as spider-web diagram (3% interest rate is used in calculations)

for forest owners when they plan the next harvesting operation in a specific stand. Such advice would indicate whether it is beneficial to modify stand management for or concentrate on one product or another (timber or bilberry). Consequently, mainly timber buyers or consulting forester who develop and offer this service, are actors who would integrate it into current value networks. At the forest level, DSS represents a business forest for forest planning companies, while forest owners would benefit seeing the production possibilities of the whole forest holding.

Forest management scenarios are prepared also at the regional and national level. In Finland, regional level results on the production possibility of bilberry (Kilpeläinen et al. 2018) may be particularly useful for forest policy formulation and developing regional forestry program targets and actions. At this level, consulting services could be connected to participatory program processes in several regions and countries, in which NWFPs are an important element. However, currently companies offering these services are very rare, at least in Finnish conditions.

In a context of a value network of NWFPs processing, multi-product forest management is a means to secure future bilberry harvests. Berry-pickers and companies involved in manufacturing and refining wild forest berry products are dependent on good and stable annual berry crops, as well as information on where good berry forests are located. This could be provided by further development of the DSSs described above to produce maps of potential berry picking forests to help berry companies organize picking more efficiently.

According to the existing everypersons' right, anyone can harvest wild berries and mushrooms including from any privately-owned forests in Finland. In such situations where any company is allowed to harvest NWFPs, forest owners are not incentivized to produce NWFPs. Hence, managing forests for both timber and NWFPs is only attractive in situations where the owners can control the utilization of NWFP yields. In Finland, examples for such NWFPs not under everypersons' right are birch sap and pakuri (chaga, *Inonotus obliquus*), neither of which can be harvested without damaging the tree. The above examples on decision support services regarding bilberry could be adapted to these products.

Decision support tools such as that described here have the potential to enhance the productivity of forests through the consideration of various outputs. They help in optimizing forest management for in the same stand or in allocating specialized management to specific stands. Further, they can support public policy decisions at regional or national levels. They thus have the ability to *connect directly or indirectly diverse types of actors*—producers and customers, and private and public bodies (Fig. 10.12).

The development of the tool was only possible through the interaction of many of those actors; researchers, European and national research funds, software developers, DSS producers, forest owners and managers, timber buyers and forest service providers, NWFP companies, and regional and national governments. While a public research and development institutes (the University of Eastern Finland and Natural Resources Institute Finland) played a central role in the development of the DSS tools, service providers such as consulting forestry services will be the key actors in application of the tools. With DSS and systems, value networks become more

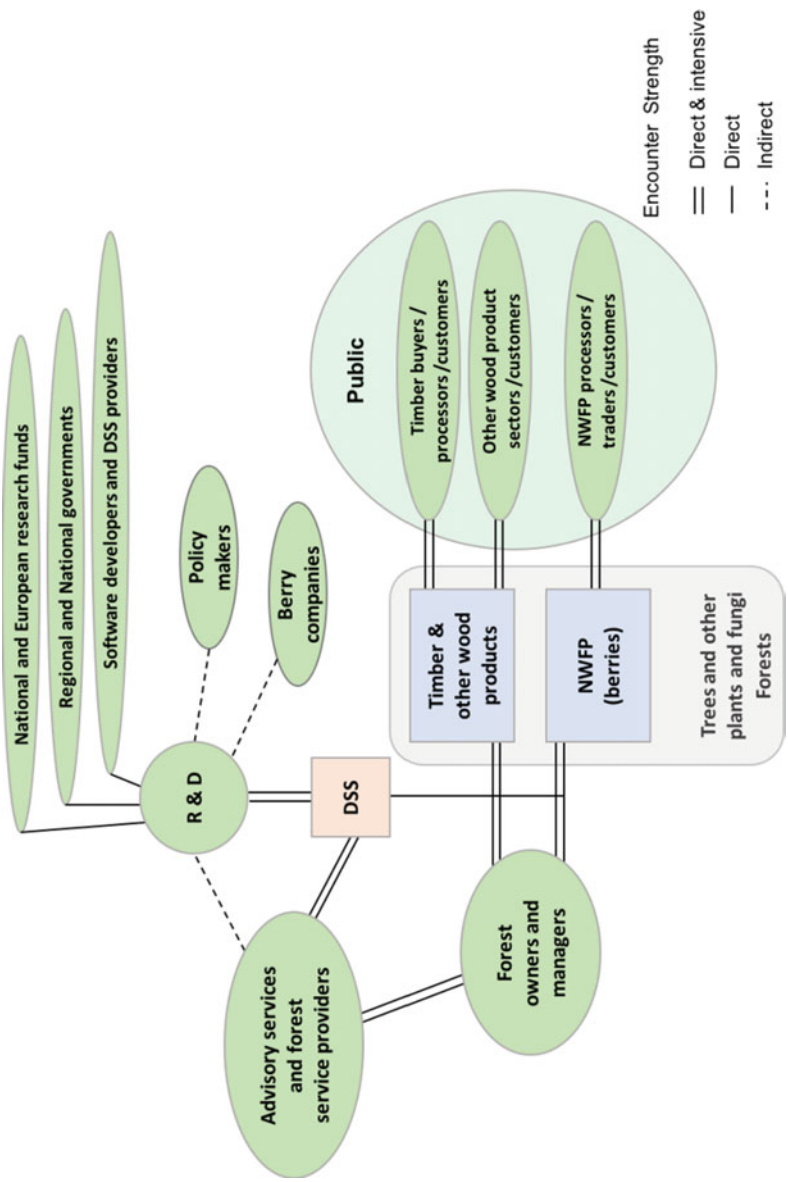

Fig. 10.12 Actor network around the application of a DSS for joint forest management for wood and NWFPs in Finland

complex, including both an additional type of product with totally different value chains, and applications of an IT tool in an advanced consulting service associated with a complex indirect value network resulting from that tool's creation process.

10.5 Conclusions and Recommendations for Support Services for NWFPs in Family Forestry

In order to gain better understanding of services in NWFPs, we have in this chapter analyzed the process of value creation in different NWFPs production systems and the specific role of support services. Applying S-D logic, we look at the creation of value in a system of interrelated actors and institutions in a specific context (Toivonen and Kowalkowski, this volume; Catanzaro and Hamunen, this volume; Wieland et al. 2016). We learnt that institutional, social, and cultural dimensions play a pronounced role in the process of value creation in NWFPs and, thus, in any innovation process. The question arises, what does this imply for service providers and policies to support NWFPs development?

10.5.1 A Broader Understanding of Value in Forest Products

The shiftfrom a goods-dominant to a service-dominant logic (Vargo and Lusch 2004, 2011) helps in understanding the multiple roles of NWFPs in commercial and non-commercial contexts. Only by understanding the cultural dimensions of their value we understand what drives parts of our population to gather in forests and what makes people pay high prices for such products in industrialized countries such as in Europe or the USA.

NWFPs produced in industrialized countries are often non-commodity products with specific qualities for specialized market segments. Values beyond the mere material (nutritional or use) value of the product include, for instance, hand- or home-made qualities, health qualities that are seen to come from wild origins, preferences for nature conservation or environmental protection, nostalgic notions for traditional practices, or even more explicit experiential aspects provided with those products, for instance, when collecting them personally in nature. We grasp the full value of the products when we understand that the value lies in the service that the product provides for the consumer—the individually perceived health value, the reinforced cultural or regional identity, the connection to traditions or to nature, etc. This *inseparable character of goods and services* within a product (Ramirez 1999; Vargo and Lusch 2004) also is called the "total product" (Sundbo et al. 2013) and may be expressed as the experiential quality of any product (Pine and Gilmore 1999). In NWFPs we see a range from the role of the good being predominant over the service—when they are bought for the implicit natural, wild or traditional quality

of the product—to the service being the dominant value, for instance, in bushcraft workshops, guided tours, etc. (Živojinović et al., forthcoming).

10.5.2 A New Understanding of Value Creation

S-D logic postulates co-creation of value by the producer, consumer, and other actors, where all contribute to value creation (Vargo and Lusch 2011). This happens in actor networks with direct and indirect interaction and in specific institutional settings. This approach goes not only beyond a producer-centric view or the analysis of production and marketing, but also beyond a value-chain analysis and, even, systemic innovation models.

Systemic innovation models (see, for example, Edquist 1997; Etzkowitz and Leydesdorff 2000; or Carayannis and Campbell 2009) describe innovation processes as complex interrelations of multiple types of actors beyond the firm and formal and informal institutions (Weiss et al. 2017b). They are, however, relatively pragmatic and a-theoretical when analyzing actor relations or the role of institutions. With the application of a service ecosystems approach (Vargo et al. 2015; Wieland et al. 2016; Catanzaro and Hamunen, this volume) and insights from experience economy (Pine and Gilmore 1999) to NWFPs, we were able *to include institutional, social, and cultural aspects* and dynamics into our analysis, each of which plays a basic role in explaining the values of NWFPs, the process of value creation, and innovation.

The conventional classification of business-related innovations (OECD) and, even, their extension with institutional or social innovations (Weiss et al. 2019) becomes questionable when we learn how those types of innovation go hand in hand. A distinction between product and service innovations in experiential products such as a Christmas tree adventure becomes obsolete when the good (tree) and the service (adventure) are in fact one product. Likewise, when considering innovations at the micro- and macro-scales in chestnut-based territorial marketing of Castione it becomes clear that the sale of chestnuts and the existence of the association are mutually dependent. Without successful chestnut production, the association probably would cease to exist.

Single innovations such as new chestnut products, promotion events, or the new perception of a traditional poor people's food as a gourmet product can only be understood when looking at the whole process—which intrinsically is an institutional and cultural process. Institutional and cultural frameworks for producing and marketing chestnuts have changed profoundly: production changed from a staple subsistence food of a regional agrarian economy to a regional specialty marketed as an entertaining experience to outside tourists in a globally competitive economy.

10.5.3 A New View on Customer Relations

Applying S-D logic and a broad view of value creation to NWFPs, we discover many kinds of *commercial and non-commercial relations* of people to NWFPs. Those sometimes-overlapping relations are based in traditions and other cultural contexts that produce value to people. We argue that the complexity of those values is relevant for business, even if many of those values are intrinsically non-commercial. So, for many people that grew-up with the habit of gathering from the wild, based on traditional practice and everypersons' right, the special value of those goods lies in the non-commercial characteristic and their free availability in nature. Purchasing the products or paying for the right to collect is not an option for them because this would destroy the specific value for them. Examples may be cultural or hobby activities such as described in the maple sugaring case. For others, nostalgic memory can be the impetus for buying goods and paying a higher price when they are locally produced (see the examples of Nature Park Specialities or chestnuts), or for travelling on holiday to where the goods are produced in order to collect or buy them or to attend workshops or guided tours alone or with friends and family (see the examples of the chestnuts festival, the Christmas tree adventure or Nature Park tours and workshops).

Complex cultural values thus create business opportunities, which can only be developed fully when understanding the values behind them—that people are willing to pay because of the non-commodity characteristics of those traditional, regional products. The special value can in many cases be understood as an *experiential service* (Helles and Vedel 2006; Pine and Gilmore 1999; Sundbo et al. 2013). The experiential quality is more explicitly developed in examples where customers are involved in an activity such as educational services (e.g., exhibitions, seminars), and entertainment activities (e.g., Christmas tree adventure, chestnuts festival). The experience is, however, also symbolically included in a product when it is presented as a local, traditional or hand-made product such as with the label of Nature Park Specialities.

The question arises whether there is an actual societal and business trend toward increased importance for experiential services or simply a new analytical perspective that reveals those qualities and relations. We believe it is both. The analytical lense of S-D logic reveals economic processes that are part of any business. It seems, however, that the significance of the "experience economy" is growing (Pine and Gilmore 1999; Sundbo et al. 2013). Several societal trends give new value to NWFPs in developed economies. In industrialized countries, those products have often lost their primary significance for nutritional or everyday use purposes but are gaining new value through their experiential, wild, natural, traditional, or hand-made qualities.

10.5.4 A New Approach for Service Providers

Service providers such as extension services, producers' associations or consultants are among multiple actors involved in a complex value creation process. They are directly linked to the producer, but indirectly contribute to the service that the consumers experience. With their indirect role they are no less important. Rather, they have a special function as they are often those who *interlink producers with other actors in the value chain and with the institutional level*. They are often important in facilitating innovation processes through networking to find business partners or coordination of various public and private stakeholders. They may also link in finance or subsidy agencies, provide information sources, research services, or legal expertise. With their personnel and knowledge capacities, (public or private) service providers are especially suited to utilize advanced information tools and decision support systems that can support small-scale family forest owners with information that would otherwise not be available to them, as suggested in the case of decision support service for multi-purpose forest management.

Since NWFPs open new market fields, there is a need for cross-sectoral thinking (e.g., with food or gastronomic sectors) or connecting across societal groups (e.g., rural/urban). For successful innovation support, service providers need to develop this ability. According to our case studies, the traditional forestry organisations may be less prepared to provide such cross-sectoral, cross-cultural links than regional development-oriented organizations, where multisector actors are incorporated already. The sectoral organizations appear to be more goods-oriented while the innovation and development support organizations are more service-oriented in comparison and thus follow more a service-dominant logic (compare Catanzaro and Hamunen, this volume).

Association provide multiple services that contribute to the value creation, including consulting services for producers and joint business activities (e.g., joint marketing), as well as interest representation vis-à-vis policymakers and public relations activities. Our examples indicate that regional development-oriented organizations (rural development consultants, chestnuts association, Nature Parks) are particularly adept at understanding the needs of the producers and consumers and their role in value creation and economic development. Specific local organizations or producers' associations can provide important institutional capacities for innovation and business development; however, their creation depends on support from other existing institutional structures (Ludvig et al. 2016a), be it sectoral organizations (forest or nature conservation associations) or regional bodies (local or regional governments).

The examples analyzed here suggest that an orientation toward "higher" societal or common goals such as strengthening or establishing a sector or product (e.g., in producers' associations), contributing to jobs and income in a region (e.g., in larger platforms with public bodies), or maintaining natural or cultural environments (e.g., environmental organizations) is an important factor for success of the service provider function. This is facilitated by understanding of co-creation processes or the cultural

dimensions of their role. In developing such a *broadened self-understanding*, consulting and support services get to orient themselves toward both forest owners/holding as their customers and final consumers and societal benefits. By including self-reflection as part of the service ecosystem, service providers enhance their capacity for collaborative innovation (Wieland et al. 2016).

10.5.5 A New Role for Policy

S-D logic also has profound implications for policymaking and for the design logic of support instruments. It calls for stronger stakeholder participation and co-creation mechanisms in the development and implementation of policy measures at all administrative levels. To make that work, we see two basic tasks for policymakers:

1. *Provide a stable institutional framework with sufficient capacities and openness*: To support innovation, a stable and reliable environment is needed, for instance, with regard to property rights, administrative structures, and funding instruments. Good institutional capacities are particularly important for upscaling or diffusing innovations at the scale necessary to produce economic impact for rural development (Ludvig et al. 2016a; Ludvig et al., this volume). At the same time, support programmes need to have sufficient openness and flexibility to adapt to emerging ideas from local actors and bottom-up initiatives. They should emphasize a focus on unusual ideas, cross-sectoral interaction, and early phases of innovation—that is, employ a risk- and innovation-friendly approach (Rametsteiner and Weiss 2006; Weiss et al. 2017b).
2. *Provide flexible support instruments that are able to connect to bottom-up initiatives*: Programmes that offer not only single measures but integrated support structures that can provide information, networking and financial support and can develop tailor-made support measures, are particularly helpful. Examples for support structures able to provide such integrated measures include the EU LEADER instrument, cluster organizations, and other regional or rural development agencies (Weiss et al. 2017a). Implicitly, those systemic support structures have a stronger service orientation than conventional sectoral organizations (Catanzaro and Hamunen, this volume).

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