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Social networks of forest owners producing non-timber forest products – network structures and dynamics of exchanges

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ABSTRACT

Non-timber forest products (NTFPs), such as berries, mushrooms, chaga, birch sap and spruce sprouts, are widely used for food and nutrition. Their demand is growing in the food, cosmetics, and health sectors at local and international levels. In Finland, most NTFP enterprises are small, family-owned businesses with limited resources. In this, a key issue is to have adequate social networks, about which there is only a little research information available. This study examines the social networks of forest owners producing NTFPs and explores value exchange within these networks. Data was collected through qualitative in-depth interviews with twenty Finnish forest owners. Thematic coding and a social network analysis (SNA) were used to identify key actors, their connections, and value exchange. Findings highlight the significant role of buyers and forest organizations in the forest owners' networks, while connections to NTFP organizations were rare. Forest owners primarily sought information from forest organizations and research institutions. Additionally, social value and support from different actors played an important role. The results suggest a need for a low-threshold organization to facilitate information sharing and guidance. The study increases the understanding of the heterogenic and multidimensional value networks of NTFPs and makes the development targets in the NTFPs value networks visible.

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Introduction

Forests offer employment and income in various value chains relating to wood and non-timber forest products (NTFP), and multiple other forest ecosystem services (Winkel 2017), including recreation and nature-based tourism (Tyrväinen et al. 2017). Forestry is one of the key sectors of the EU bioeconomy, and NTFPs are recognized as an important contribution to the bioeconomy (European Commission 2021).

NTFPs are products of biological origin other than wood derived from forests, other wooded land, or trees outside forests as defined by the FAO (1999). They have been used throughout history in rural households for food and nutritional diversity, as well as being a source of income (Chamberlain et al. 2019; Weiss et al. 2020; Sheppard et al. 2020). Compared to wood production, the economic impact of NTFPs is still underrecognized and underutilized even though the economic potential of NTFPs is high in the future bioeconomy (Weiss et al. 2019b). NTFPs are principally perceived as

an extensive group of niche products with slight potential for added value and scalability, with a wide range of small contributions to forestry's economic output, tourism, and rural development (Wolfslehner et al. 2019).

In recent years, there has been increasing demand for NTFPs globally. The drivers behind the use of and the interest in NTFPs are worldwide trends towards healthy and natural products, well-being, connection to nature and forest recreation, ecology, responsibility and diversification of forest income (Pettenella et al. 2019; Wolfslehner et al. 2019; Wong and Wiersum 2019; Weiss et al. 2019a; Vacik et al. 2020). Many NTFPs play a vital role in the food industry, enhancing traditional dishes with ingredients like chestnuts, berries, and pine seeds. They also serve as spices, such as wild garlic and juniper berries, as well as in teas like valerian and mint, and beverages including berry juices, wines, and birch sap. Beyond culinary uses, these products are crucial raw materials for various industries. For example, pine gum resin is transformed into rosin for

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the paper industry, and is also used in glues, cosmetics, and tannins for dyeing, as well as corks for wine bottles. Additionally, NTFPs contribute to recreation and rural tourism, and find applications in personal care and health products, including pine resin creams and sweet-briar rose balms (Husen et al. 2021).

Lovrić et al. (2020) found that 13.9% of the collected weight of NTFPs was sold, while the rest was consumed within the household or given as gifts in Europe. A total of 89% of European households consumed NTFPs at least once a year. The most frequently consumed product groups are fresh or dried nuts, fresh or dried berries, and frozen and prepared wild berries (Lovrić et al. 2021). In Finland the most harvested NTFPs are wild berries and mushrooms, which may be collected under Everyone's Right (MARSİ 2020). The amount of annually collected berries for household use is between 34 and 56 million kilograms. For sale the amount is between 15 and 18 million kilograms which is rather low compared to the household use (Turtiainen et al. 2015).

Typical enterprises in the NTFP sector tend to be small-scale micro enterprises. Often forest owners who produce NTFPs work alone or within the family. In Finland, 72% of NTFP enterprises are micro-enterprises employing less than 10 people, typically between one and five persons. The share of small enterprises employing between 10 and 49 persons is 23%, and medium-sized or large NTFP enterprises employing more than 50 persons are 5% (Wacklin 2021). The markets in the NTFP sector are heterogenic and dominated by large buying companies. Many buyers require large volumes of production which small enterprises find impossible to respond to. The field is lacking a wholesale channel that could assemble imports from small producers and pass them on to buyers (Muttillainen and Vilko 2022). Often forest owners' NTFP enterprises are located in rural or remote areas. Therefore, customer accessibility can be challenging, especially for products that are sensitive to contamination, such as birch sap (Łuczaj et al. 2014). Thus, NTFP production is typically characterized by short value chains, with products often being used in territorial marketing. In this context, their role is closely tied to social innovation, where the successful integration of NTFPs into the formal market depends on strong collaboration between key actors and the promotion of a local development strategy. In other words, local actors must work together or organize to make this integration possible (Vacik et al. 2020).

In the NTFP markets, forest owners play a crucial role in supplying NTFPs, particularly in the case of products not covered by Everyone's Rights, like birch sap, spruce sprouts and chaga. Collecting these products requires the forest owner's permission (e.g. Prokofieva et al.

2019). Previous studies on the social networks of forest owners have often focused on networks related to timber production and forestry (Knoot and Rickenbach 2011; Korhonen et al. 2012; Stoettner and Dhuháin 2019) while research on the social networks of small and micro-enterprises in the NTFP sector has remained limited. Social networks are essential for micro and small NTFP enterprises as they foster business growth by reducing transaction costs, creating new business opportunities, and facilitating knowledge spillover. These networks range from formal inter-organizational collaborations to informal connections, such as friendships and family ties, all of which influence decision-making and business performance (Turkina and Thi Thanh Thai 2013; Turkina et al. 2016). Understanding the structures of the networks of forest owners who supply NTFPs to markets helps to identify functioning practices and development needs. This knowledge can help enhance the profitability and functionality of NTFP-related businesses.

Aim of the research

The aim of the study is to describe forest owners' networks in the NTFP sector, to explore their structure and dynamics, and to identify value creation within the networks. This includes examining the relationships between actors, the exchange of tangible and intangible resources, and the factors that influence collaboration. This study is made using qualitative analyses with the help of social network analyses (SNA). The two research questions of this study are:

1. What is the structure of Finnish forest owners' networks in NTFP production? The size of the network, different actors in the network and the direction of connection are examined.
2. What constitutes the value of the network? The exchange of tangible and intangible assets between actors are identified and their significance to the network is assessed.

Social network

Enterprises and entrepreneurs are surrounded with variety of social relationships ranging from formal inter-organizational seller-buyer relationships to informal networks such as friendships and family ties. These relationships and networks have all an effect on decision-making and business performance (Turkina and Thi Thanh Thai 2013; Turkina et al. 2016;). Social networks are important, especially for small and micro

entrepreneurs, because they promote business growth by reducing transaction costs, creating business opportunities, and generating knowledge spillovers (Turkina 2018).

Typically, social networks are described as relationships between certain units or nodes. These units or nodes are the network members, for instance individuals or organizations, but they can be any units that can be connected to other units as well, such as web pages or journals. Social networks consist of these connections and the significance and roles of relationships between units or nodes (Wasserman and Faust 1994). In this study, we exclude relationships where there is no interaction with people or organizations.

Social network analysis (SNA) is used to study networks both at the micro or individual level and at the macro level, or from the perspective of whole networks. The macro level describes all the relationships of the whole network when micro level consists of an individual's relationships with other people, or "alters", called an egocentric network (Borgatti et al. 2009). An egocentric network refers to the network of relationships surrounding a specific individual, known as the ego. In other words, it is a subset of a larger social network focused on a particular person/organization and the connections they have with others. The ego is the central point of analysis, and the network includes the individuals directly connected to the ego, known as "alters" (Hanneman and Riddle 2005) (Figure 1). The egocentric network provides a closer examination of the immediate social environment of an individual, allowing exploration of the structure and dynamics of the relationships within that specific context (Wasserman and Faust 1994). Egocentric network analysis is

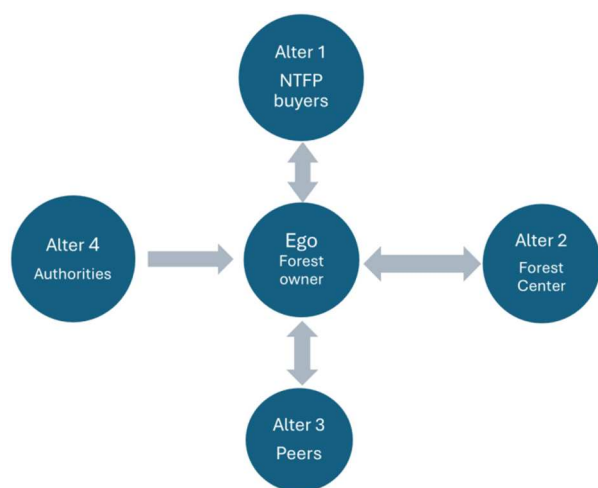


Figure 1. Example of forest owner's egocentric network; ego, alters and the direction of exchange.

commonly used in social network research to understand how individuals interact with their immediate social circles, the types of relationships they maintain, and the influence of these relationships on various aspects of their lives, such as decision-making, behavior, and access to resources. In this study we focus on the forest owner's egocentric network, and thus, the possible relationships between the alters remain unknown.

When analyzing the network structure, different measures, describing the characteristics of the actors and characteristics of the whole network, are calculated (Wasserman and Faust 1994). In an egocentric network the measures that can be calculated are limited (Prell 2011). One of the most usual SNA measures is a degree that describes the number of connections that one actor has with other individuals in the network.

After identifying the network members and calculating the number of connections, the relations between different nodes must be identified. Borgatti et al. (2009) identify four broad categories of relations: similarities, social relations, interactions and flows. Similarities between nodes often stem from shared attributes like demographics, attitudes, locations, or group memberships studied in variable-based approaches. Social relations encompass kinship, commonly defined role relations (e.g., friend, student), affective ties based on feelings (e.g., liking, disliking), and cognitive awareness (e.g., knowing). Interactions involve behavior-based connections like speaking, helping, or inviting someone into one's home, often occurring within the context of social relations. Flows are connections involving exchanges or transfers between nodes, encompassing relations where resources, information, or influence move through networks. In this research nodes are the other actors "alters" in the forest owner's networks producing NTFPs and flows are the values exchanging between them.

Value exchange: intangible and tangible assets

A network analysis also utilizes value network theories to assess the quantity of direct and indirect connections, as well as the number of tangible and intangible transactions involving each network participant (Cavallo et al. 2021). A value network refers to a complex web of connections among individuals, groups, or organizations, where tangible and intangible value is generated through dynamic exchanges (Allee 2000). They provide a way to understand, analyze and improve business ability to convert both tangible and intangible assets into different valuable outputs, thereby enabling it to

amplify its overall value proposition. Intangible assets include relationships, knowledge and knowhow, effectiveness of work groups and trust between the people and different actors. Tangible assets are financial or other capital-based resources traded by the company. For the company's success it is significant how well it can convert one form of value into another (Allee 2008; Hasprova et al. 2019). To grasp the intricacies of value conversion dynamics, it is imperative to broaden our perspective beyond merely viewing intangibles as assets. Instead, we must delve into their roles as tradable commodities and tangible outcomes to truly comprehend their function in the process.

The intangibles create value through different dimensions (Allee 2008). The first dimension concerns the manner in which intangible assets enter the market as exchangeable forms of value. Intangibles function as tradable commodities, signifying their role as negotiable economic propositions. Naturally, one can barter knowledge for monetary compensation through goods or services, effectively transforming intangible assets into tangible ones. Information can also be exchanged for other information or other intangible assets such as benefits or favors. The second dimension is that negotiable items include unpaid or non-contractual intangible actions that help things run smoothly or assist in building relationships. These can be viewed as intangible deliverables, whereas tangible deliverables consist of contracted, mandated or expected parts of the delivery and which generate revenue. The third dimension examines the dynamic conversion of both tangible and intangible assets into alternative forms of value within the business model, as well as how value inputs are utilized to augment both tangible and intangible assets.

Because the network is the primary economic mechanism for value conversion, a network analysis can be used to describe the value creation dynamics of work groups, organizations, business webs, and purposeful networks engaging in both tangible and intangible value exchanges to support the achievement of specific outcomes and to generate economic and social good (MacCauley 1963; Granovetter and Swedberg 2001; Allee 2002, 2003).

Materials and methods

Data collection

The data of the study was collected by using an explorative qualitative research approach with semi-structured interviews. Twenty private forest owners producing different NTFPs were chosen as interviewees with information-oriented selection method (Flyvbjerg 2011) to

highlight their difference in value networks. The essential selection criterion was that the forest owners operated as entrepreneurs in the NTFP sector. This ensured that the interviewees had concrete business networks and experience-based knowledge of business-like activities in producing NTFPs. The interviewees were sought via the researchers' own networks; colleagues, interest groups and stakeholders but Internet searches were also used to find potential informants. The qualitative research approach and information-oriented selection method enabled to maximize the utility of the case and get deeper information of the questions examined. The interviews were conducted in July – December 2020 by phone and they were recorded and transcribed. Three themes were covered in the interviews 1) exchange of values 2) value creation in the networks and 3) the role of the forest owner in the network (Appendix A.). The themes were discussed freely. The interviewer was able to ask supplementary questions or revert to a previous theme (Wengraf 2001).

The interviewees' experience in NTFP production ranged from a beginner level (one year) to extensive expertise (55 years). Many produced some NTFPs as their main product, but several produced other products alongside their primary ones. Six interviewees produced birch sap as their main product, while chaga was also the primary product for six others. Four focused on twigs, and two interviewees each specialized in spruce sprouts, wild herbs, decorative plants, berries, or mushrooms (classified as "other") as their main product (see Table 1). Five interviewees produced only one type of NTFP, while the rest produced between two and seven different products.

Data analyses

To analyze the data from the interviews, thematic coding was used with the help of the NVivo qualitative data analysis software to code and classify the data (Bazeley and Jackson 2013). The first phase of coding was done based on the interview frame, the second phase of coding used aspects that arose from the interviews during the first coding phase.

Table 1. Informants and the main product produced. Group "other" consists of, wild herbs, decorative plants, berries, or mushrooms.

Informants	Main product
2, 3, 7, 9, 16, 17	Birch sap
1, 4, 8, 10, 12, 20	Chaga
11, 13	Other
5, 18	Spruce sprouts
6, 14, 15, 19	Twig

Social network analyses (SNA) were used to support the qualitative analyses and help to reveal the essential actors and their connections. Connections refer to the relationships that the forest owners had with various stakeholders. The interviewer inquired about the forest owners' social networks regarding producing NTFPs with the use of mind mapping tool. Actors, with whom the forest owners were connected to, were compiled into a mind map with Post-it notes. The interaction of the actors was illustrated with arrows between the actors indicating: what exchanges occurred between the actors and what the cooperation was based on. Additionally, the direction of the interaction between the actors was identified. The direction of the interaction can be from the forest owner to the actor (outdegree), from the actor to the forest owner (indegree), or it can be mutual. All the actors (alters) that the forest owners were connected to were calculated and after that categorized into different groups. A single forest owner could have connections to multiple actors within the same category. The direction of connections was examined, and the value of the exchange was identified from the qualitative analyses. The value of the exchange was categorized into intangible and tangible values.

Results

The structure of forest owners' networks in NTFP production

All the respondents had micro-enterprises and they worked individually or with the family. Only a few of them hired seasonal workers occasionally. The network of forest owners producing NTFPs consisted of average of 5.5 individuals or organizations, although the size of network varied between 1 and 10 actors. [Figure 2](#) shows two examples of forest owners' networks: one with only a few connections, and the other with multiple connections. The amount of NTFP produced affected the number of connections. Forest owners who produced more products had more connections to different actors and their social network was larger. The connections with buyers and resellers, including cafeterias, restaurants, and handicraft shops, were the most common, with 12 respondents having contact with at least one of them. Some respondents had connections to multiple actors, bringing the total number of connections to 20 ([Table 2](#)). Industrial buyers (meaning larger buying companies) which make contracts with forest owners, were the second most common connection for forest owners. Selling products to other companies or for further processing was clearly the most important

contact for forest owners, although nearly half (7) sold their products directly to consumers as well.

Forest organizations were fairly well represented in the forest owners' networks. Six forest owners had contact with 8 connections to other forest organizations like the Forest Management Association, Metsähallitus (the Finnish state forest enterprise) or forest service entrepreneurs. The Forest Centre was designated as its own category because it stood out as a key cooperation partner, with numerous connections to forest owners (11). Unlike other forest organizations, it serves as an expert and development organization and is not involved in wood trading. Research and education organization, like universities, research institutes, universities of applied sciences and vocational schools, were also actors to which forest owners had many connections (11). One third of the respondents had contacts with peers who were other producers in the same branch. In some cases, acquaintances and relatives had influenced entering the industry, although they also bought products directly from the entrepreneur.

On the other hand, forest owners had only a few connections (3) with organizations in the NTFP sector and to employees such as collectors and seasonal workers (3).

Value exchange in the forest owner networks

The most common and important connections for forest owners were different buyers, who were divided into *smaller buyers and resellers* and to bigger so-called *industrial buyers*. The direction of exchange was in almost all cases mutual ([Figure 3](#)), and the value of exchange was both tangible and intangible. For industrial buyers forest owners mostly sold raw materials and received compensation in return. Another form of trading was that forest owners bought e.g. chaga inoculation plugs from a supplier and paid compensation for them. Forest owners also provided an area to grow products for industrial actors and received equipment and labor from the industrial buyers. The construction of the cooperation was often based on the fact that there were no other buyers available nearby. Due to the perishability of NTFPs, delivery distances cannot be very long. Delivery agreements were made with industrial buyers, thus securing the sale of the crop. Many chaga producers had acquaintances in chaga companies, through personal or employment relationships and this contributed to the creation of cooperation.

Well, the deal here is that there's a long-term supply contract in place, so the market is secured. (FO7)

Basically, around here, there aren't even any other buyers. (FO16)

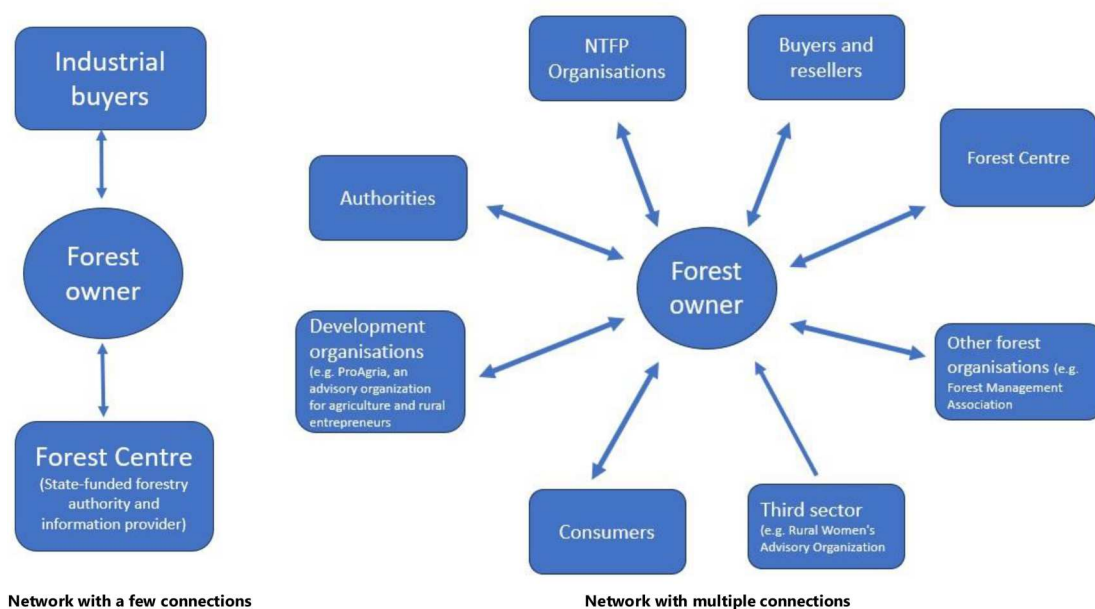


Figure 2. Examples of forest owners' networks with a few connections and with multiple connections.

The knowledge and knowhow exchange were the most important aspects of the intangible value exchange between the forest owners and industrial buyers. The exchange of information was mainly mutual, with the difference that buyers provided research information and advice to forest owners, while forest owners provided experience-based information to buyers.

Exactly, a lot of information has come from them (the buyers), and then with my own observations and everything, they communicate quite openly about it. They've even mentioned that they used to have their own sap collection system back in the day, and that's basically how it all got started. (FO19)

And of course, everything we've developed, we've naturally shared it with the buyers and other producers.

Table 2. Forest owner connections with different actors. In bold are the actors forest owners had most and in italics least connections to.

Actors	Connections
Buyers and resellers	20
Industrial buyers	17
Forest Centre	11
Research and education	11
Other forest organizations	8
Consumers	7
Third sector	6
Peers	6
Relatives and acquaintances	6
Development organizations	6
Authorities	6
<i>Organizations in NTFP sector</i>	3
<i>Employees</i>	3
All	110

That's how the operations and the system have been shaped. (FO16)

Other intangible assets were that forest owners gave visibility to buyers, whereas buyers gave a secure purchase opportunity for forest owners. Both received marketing benefits from each other.

Of course, I'm good for them because I'm somewhat involved in forestry. So, if a forest owner asks me where they could get inocula, I naturally tell them, "Suomen Pakuri." It's just like sponsorships in sports. I get something from them, and at the same time, I promote their brand and basically advertise their operations. (FO4)

When the relationship with the industrial buyers was more professional, with small buyers it was based more on emotion, social relationships, closeness and short delivery distances. Although it was important to sell the raw materials or products and get compensation for them, the social value of the relationship was emphasized, and cooperation as a whole played a significant role. Local products, smooth operations, flexibility, trust, quality and the familiarity of partners emerged as important factors.

It's definitely about being local and domestic, and I'd say customer service as well. Like, making sure deliveries and other arrangements are sorted out, checking in, following up, and meeting specific requests. ... It's all about working as much as possible according to the customers' preferences. (FO14)

It's really about supply and demand. I have raw materials I want to sell, and they need raw materials. Flexibility is a

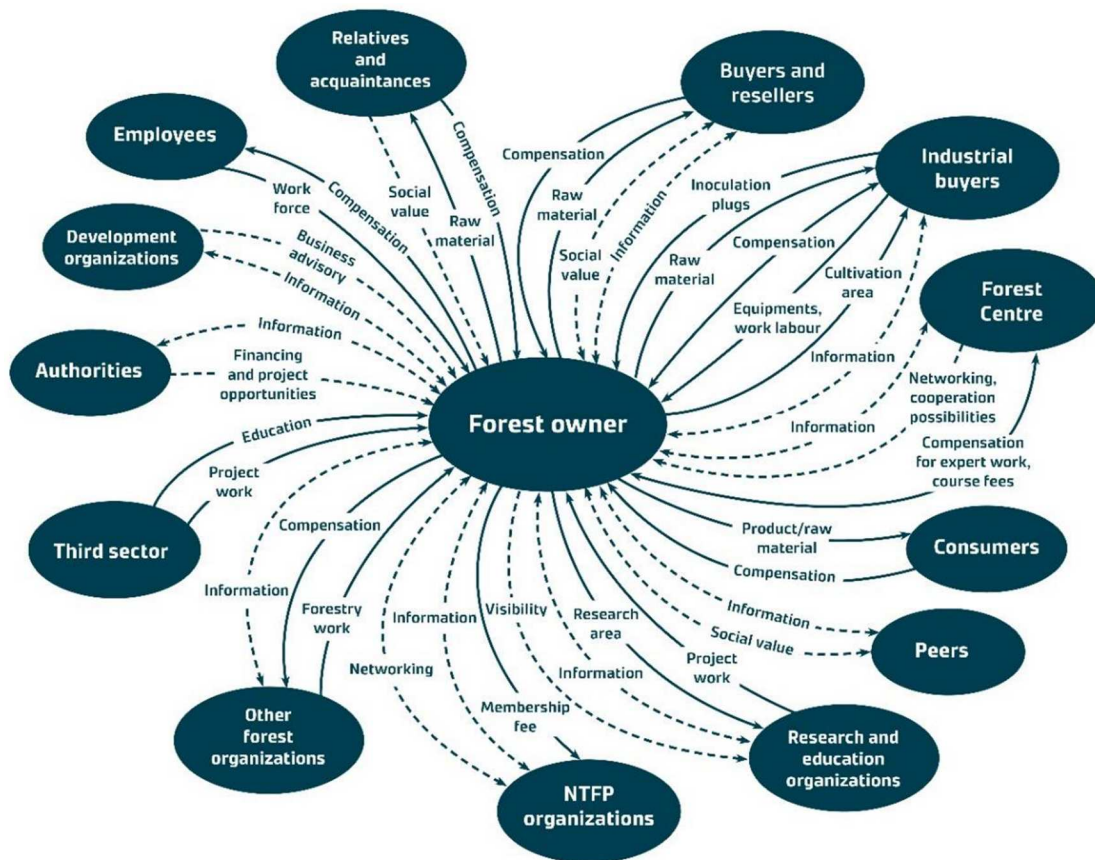


Figure 3. Value exchange between forest owner and different actors of the network and the direction of exchange. Direction can be: indegree – value exchange from actor to forest owner, mutual – both forest owner and actor received value from each other, out-degree – value exchange from forest owner to actor. A continuous line represents tangible exchange, while a dashed line denotes intangible exchange.

big thing here – I can deliver flexibly. Orders even come through Messenger messages, like, “We need this now, bring it when it suits you, I’ll need it by then.” (FO14)

Buyers often ended up being selected by chance as well. They might have met at various seminars or events, and discussions had led to the realization that supply and demand should meet. Even if the cooperation had started with a tender or a general purchase offer, its continuation was based on the fact that the buyers had become acquaintances and the relationship had often deepened to the level of friendship.

This is the kind of place where everyone knows each other. I eat at that particular grill myself, and the lady, Auli, running it is the most wonderful person, such a lovely character. After I’ve picked enough mushrooms for my own freezer, I pick the rest for Auli. She’s happy even with small amounts. She’s always so genuinely thrilled when she gets those mushrooms. Sure, money’s involved, but it’s also a social event when I bring the mushrooms to her. She’s happy, and I’m happy. Over the years, it’s definitely deepened into something more – Auli isn’t just any grill owner anymore; she’s Auli, my friend Auli. (FO19)

Information and know-how were exchanged between forest owners and buyers, but it was as a part of the product, not separately purchased product but like a giveaway product instead.

Well, there’s a service concept in a way, where they order the (conifer) branches and ask me for them, and I deliver to them. And, you know, as buyers, they’re a bit in a position where they can’t really get it themselves. They buy what I offer and bring to them. On my part, it’s kind of like I know more about the branches than they do, so I give them my expertise. And really, I give it to them, so it’s not about exchanging money – it’s on top of the transaction and as a little bonus. (FO14)

Direct sales to *consumers* were mutual and characterized mainly by tangible values, delivery of the product to consumers and the received compensation. Direct sales were mostly carried out through Facebook sales channels, the Reko network which facilitates direct sales of local food between producers and consumers, or at fairs and markets.

Peers meaning other NTFP producers were important connections especially to birch sap producers. The

exchange of values was mutual and consisted of exchanging knowledge, knowhow of practical experiences, ideas and social support. One forest owner had also cooperation plans with other producers. The exchange of information was considered useful because otherwise the practical information about producing was difficult to obtain. On the other hand, some producers did not want to reveal their knowledge and experiences to others because of jealousy.

Kind of like a WhatsApp message group or something like that ... We've had one meeting for sap producers, but now again, Covid stopped that for this spring. So, we'll probably look at next year ... (FO2)

There aren't any producers, no. And there was maybe this thing, that it was the producers' jealousy ... In Tohmajärvi, there were their own producers like Tornator and Martti and Anne. Then when someone from Rääkkylä joined in, there was this so-called Finnish jealousy. Like, "Now they're coming in with such a big area, and they're getting a ton, and so on." We didn't get any help in the beginning, so it was a bit ... strange, and the factory didn't really know how to advise us. (FO2)

The *Finnish Forest Centre* was mentioned most often as an individual actor with which the forest owners were in contact. The Forest Centre is a state-funded organization which promotes forestry and related livelihoods, advises forest owners on how to care for and benefit from their forests and the ecosystems therein, collects and shares data related to Finland's forests and enforces forestry legislation. The value exchange between forest owners and the Forest Centre was both mutual and indegree. The relationship was mainly based on the exchange of information between the actors and various forms of projects and cooperation. The distinction between tangible and intangible was not always clear. In some cases, forest owners had acted as experts in the Forest Centre's courses and were compensated for it. In some cases, cooperation was based on project work and the forest owner gained knowledge, cooperation and networking opportunities through it. However, the exchange of information was in some cases based on the basic mission of the Forest Centre and was free of charge to the forest owner. Intangible information exchange, however, took place in addition to for example project work or courses where there was free discussion about NTFPs and their production. Often, forest owners had been in touch with the Forest Centre regarding other forest-related matters, and discussions about NTFPs had occurred simultaneously.

Interviewee: With the Forest Centre, I engage more in the exchange of information and expertise.

Interviewer: So, you also feel like you give them something, not just participating in training and events, but also providing information to them?

Interviewee: Yes, I feel that way, especially through these projects and personal contacts. And if there was an event somewhere, they would invite me to join, to give a speech or something like that. (FO14)

If I've needed anything, I've been able to call, and since I've been to other events, we've discussed these things there. There's been a positive approach to it, and a clear message has come through that if I need help with anything, I can get in touch. (FO4)

Other forest organizations consisted of the Forest Management Association, Finnish Forest Administration or forest service entrepreneurs. The relationship was based mainly on knowledge exchange through discussion, project work or courses. With loggers and forest service entrepreneurs value exchange was tangible; they gained compensation for the work done.

With the *research and education organization* the relationship was both in- and outdegree but for the most part, however, mutual. Value exchange was often based on project work in which forest owners were involved. In some cases, the forest owner acted as an expert or trainer in the project, in other cases the forest owner offered the research organizations an opportunity to use their land for research and experiments in the project. The value exchange was mainly tangible, with agreed actions within the projects, but there was also intangible knowledge transfer inside the projects and from seminars and workshops. Forest owners received support for developing businesses and brought visibility to the project as well.

"Projects, even though they are quite time-consuming for me, are still positive because they provide research results on a broader scale, showing how things have worked in practice for others. That was definitely positive." (FO20)

Third sector, authorities and development organizations were more active towards forest owners in terms of value exchange. Forest owners received tangible assets like education and project possibilities from the third sector. Authorities provided financing and project opportunities for forest owners, made official inspections, e.g., about organic farming, and imparted knowledge and advice to forest owners as well. One of the forest owners had given expertise to authorities. Development organizations helped forest owners with business development issues and they shared information mutually.

The least connections forest owners had with *organizations in NTFP sector*. Only a couple of the forest

owners had had connections with them. One of the forest owners was quite an active member in one of the associations and the exchange of values were mutual. Tangible values included membership fees paid to the NTFP associations and information received in return. Intangible value included expertise, knowhow and cooperation networks delivered between actors.

It's an exchange of information back and forth, it's two-way. It's not just that I get information from them, but also, since I'm involved in board activities, I feel that they also get information from here in return." An exchange of information. (FO 14)

It's the increase of professional expertise related to nature-based entrepreneurship, the accumulation of it. Also, making contacts through that, being able to gather even more information. Although it's not like they're pouring information out with a bucket or sending it by mail, of course they have newsletters, websites, and such. But through that, you also get contacts through which you can gather more information. And also find customers. (FO 14)

Only a few of the forest owners had connections with *employees* and with them the direction of the connection was mutual and value tangible; compensations was paid for the work done.

Discussion

The aim of this study was to analyze the networks of NTFP-producing forest owners in Finland and how value is created within the network. The study was based on qualitative interviewee data gathered from 20 private forest owners with the support of an SNA analysis. The number of interviewees was rather low, but semi-structured interviews gave a possibility to clarify questions and go back to previous questions, which enabled the researcher to deepen the information. This was especially important, because in self-reported relationship data, challenges may arise due to limitations in the interviewees memory or their desire to present themselves favorably (Rickenbach 2009; Marsden 2016). This can result in overstating connections with certain individuals while overlooking others, potentially affecting the accuracy of the data (Marsden 2016).

Although the number of interviews was not particularly large, the saturation point appears to have been reached, as no new significant themes emerged in the final interviews. However, the production of different NTFPs naturally influenced the themes discussed, and conducting additional interviews for each product type could have enhanced the reliability of the findings.

Interviewees' selection primarily via researchers' own networks by an information-oriented selection method could have led to an overrepresentation of more active forest owners in the data. This was also reflected in the interviewees' active participation in various projects. However, this selection approach had advantages in capturing a comprehensive picture of the NTFP sector networks, as it enabled access to well-informed forest owners with diverse roles and valuable insights within the value chains.

The data collection was primarily conducted by a single researcher to ensure that the questions were consistently asked in the same manner, thereby minimizing potential biases in the data collection process. Due to the possible biases and limited number of forest owners studied, the results are descriptive and cannot be generalized to represent all forest owners in Finland. Nevertheless, the findings provide valuable insights into phenomena that are likely to be relevant and prevalent among forest owners engaged in NTFP production.

The study focused on the forest owner's egocentric network, and thus, the possible relationships between the alters remained unknown. Critics argue that egocentric networks do not qualify as true "networks" because they cannot be depicted as a square array of actor-to-actor connections (Hanneman and Riddle 2005). Nevertheless, when examining egocentric networks, it is still possible to adopt a structural or network perspective to comprehend the roles of actors within the network (Hanneman and Riddle 2005). SNA analyses and egocentric approaches have been used more frequently in survey research (Korhonen et al. 2012), but also successfully applied in qualitative studies (e.g. Knoot and Rickenbach 2011) 2012). In this study, the egocentric approach gave valuable information about the egos, here forest owners, their neighborhood, and their positions in the network.

Heterogeneity in NTFP networks

Most of the forest owners had connections both to industrial buyers and to smaller buyers and resellers. Smaller buyers consist of various enterprises like cafeterias, restaurants, farm stores etc. and some of the forest owners sold directly to consumers as well. This variety of buyers indicates that NTFP markets were heterogenic by nature, as could be expected. Diverse types of buyers create value differently to producers. From the larger buyers the producers got safety and security in terms of delivery contracts in addition to compensation. It is notable that to create security, formal agreements were not always needed, but also verbal promises, e.g.,

to buy a chaga when the crop is ready, were sufficient. This indicates trust between different actors. Trust is an expression of a high degree of social capital, both within the organization and externally expressed as reputation and brand (Allee 2008). Thus, even though the relationship with larger buyers was characterized with straightforwardness and more tangible values, there were also intangible values within.

For smaller buyers, the overall value of the relationship was greater than the exchanged goods. The relationship encompassed many intangible social values that created a unique and deeper connection, not solely based on transactions. Producers were committed to ensuring that the products were of excellent quality and that the delivery and trade were smooth, even though monetary compensation might have been higher elsewhere. Overall, the value derived from the relationship exceeded its monetary worth.

Both large and small buyers are needed in NTFP markets because NTFPs and their production and collection methods vary greatly. NTFPs cannot be considered as “one product”, but their variety is huge. This complicates the understanding of product specific industries’ operations and requirements. Production of wild herbs is very different in nature from, for example, chaga or birch sap. The chaga harvest may take several years, while birch sap is tapped annually, with a short and intense tapping season. Wild herbs, on the other hand, can be collected throughout the summer. Smaller buyers and resellers may also accept even smaller production volumes which are easier for small producers to respond to.

Contact between forest owners and employees was very limited, as many forest owners are either not able or not inclined to hire external workers, preferring instead to handle operations on their own. This approach impacts production volumes, which in turn limit opportunities to scale up and enter larger markets. Expanding collaborative efforts and support structures could help address these challenges, opening pathways for forest owners to increase production and market presence (Turkina 2018). Additionally, with the internationalization of the workforce, ethical challenges can be caused not only by social issues, but also by land use issues, in which the perspectives of the forest owners should be taken into account (Tahvanainen 2020).

In this study also the value of buyers located close to the entrepreneurs was emphasized. The closeness with actors was important because NTFP’s markets and supply chains are largely undeveloped and the key problem lies in the transfer of the product, either formally or informally, from the forest to the first formal

economic actor in the supply chain (Pettenella et al. 2019). Due to the perishability of products, among other things, transport distances cannot be very long, or it would require certain equipment for refrigeration, for example. Additionally, this is because the delivery is usually not outsourced and the entrepreneurs deliver the products to the buyers themselves, which can be resource intensive. NTFPs are often perceived as ecological and environmentally friendly, which local food often represents as well (Weiss et al. 2019b). Restaurants, cafeterias and well-being entrepreneurs often prefer local food, it gives them marketing value and supports their image as responsible actors (Shafeizadeh and Tao 2020). This provides a win-win situation for both of actors.

Knowledge needed

The need for information was clearly highlighted in this study. Both forest owners and buyers, as well as producers and experts were in need of information. Information was acquired in various ways by purchasing courses, seminars, and training sessions, but it was also exchanged in mutual communication for free. Often, the acquisition of information was the most significant aspect of stakeholders’ connections within the network; without it, the connections would not have existed. Information was sought from research and educational organizations through their organized seminars and other events, but many forest owners had also actively participated in various projects related to NTFPs. This demonstrates the forest owners’ activity in the field and their desire to acquire information and contribute to the advancement of the industry.

Information was also sought extensively from forestry organizations, with the most prominent being the Finnish Forest Centre. Finland has traditionally had a strong tradition of expert-driven forestry, where forest professionals from governmental organizations have provided information, guidance and advice to forest owners with the aim of engaging and encouraging forest owners in terms of decision making regarding their forests. There has been a societal need to develop governance practices to manage and regulate the actions of private forest owners (Jokinen 2006; Peltola and Åkerman 2011). Due to this, forestry organizations are often familiar to forest owners and for this reason, it is easier for forest owners to turn to forestry professionals also for matters related to NTFPs, although the expertise of forestry professionals may not necessarily extend to NTFPs. In some cases, the situation was the opposite. The forest owner acted as an expert in the forest organization.

Information was also sought from other producers, peers. However, acquiring information was not always straightforward, and some forest owners had found it difficult, possibly due to envy and the withholding of information in the name of business competition. Generally, connections with peers were perceived as positive and beneficial for both actors. Getting knowledge from peers, so called peer learning, is defined as a “two-way reciprocal learning process” (Boud et al. 2001), where equals, matched companions, or individuals from similar social groups work and learn from each other without the involvement of a professional (Boud et al. 2001; Topping 2005). Finland has a long tradition of collecting NTFPs (Pouta et al. 2006; Peltola et al. 2014), for example the commercial collecting of lingonberries started already in the 19th century (Peltola 2014). But the generally known traditional knowledge usually concerns products that can be collected under Everyone’s Rights. Practical knowledge about the production and collection of products collected with the forest owner’s permission may be limited. Sharing practical knowledge thus contributes to preserving traditional knowledge, thereby increasing the value of the information (e.g. Haq et al. 2024). Additionally, globally, sharing practical knowledge associated with e.g. the production and management of NTFPs requires more focused attention (Wong and Wiersum 2019). This is also important because the ongoing structural changes in ownership will mean that increasing numbers of “new” forest owners will lack the traditional knowledge that their predecessors had (Stoettner and Dhuháin 2019). This is especially seen in forest management, but it applies to the NTFP sector as well. Since knowledge of forestry and the production of NTFPs play a significant role in the forest owners decision making, it is important to find ways to address this knowledge gap among new forest owners (Stoettner and Dhuháin 2019). Forest owner groups could play an important role in this process, as they provide a platform for both new and existing forest owners to connect and share knowledge with their peers (Schubert and Mayer 2012; Stoettner and Dhuháin 2019; see also Hamunen et al. 2015).

It is notable that the connections to organizations in the NTFP sector were very limited. Those who were connected to them were often members of associations and actively involved in their activities, but others had no connections at all to organizations in the NTFP sector. The result indicates that forest owners have not found organizations in the NTFP sector as advisory and development organizations but rely more on forestry professionals in these matters. Collaboration between the forestry and NTFP sector should be strengthened to maximize shared resources and knowledge, drive

innovation, and support the development of the NTFP sector, fostering more sustainable business opportunities (see e.g. Turkina 2018).

Total value: beyond tangible and intangible assets

Understanding the dynamics of value conversion requires expanding beyond the asset view of intangibles to understand the function of intangibles as negotiable goods and as deliverables. At the macro level, the primary conversion mechanism for converting one form of value to another is the network (Allee 2008).

Allee (2008) divided intangible value creation into three dimensions which are all identified in this study. The first dimension concerned how intangible assets enter the market as exchangeable forms of value, acting as tradable commodities and negotiable economic propositions. This was evident in the study, for example, when forest owners acted as experts in courses organized by forest organizations and received compensation for it, or conversely, when they participated as students in courses and paid a participation fee. The second dimension encompassed negotiable items, including unpaid or non-contractual intangible actions that facilitate smooth operations and relationship building, contrasted with tangible deliverables that are contracted and generate revenue. This was highlighted by the importance of social relationships, particularly with small buyers. Practical knowledge was shared between buyers and sellers without tangible exchange, and flexibility in transactions and mutual trust in the quality of service played a significant role. Additionally, deepening the relationship to a friendship level was an important factor in the sustainability of collaboration and it increased trust in the quality of the products and operations. The third dimension explores how both tangible and intangible assets can be dynamically transformed into different forms of value within a business model, and how value inputs are used to enhance both types of assets. The value network of forest owners who produce NTFPs illustrates the third dimension, where the forest owner collects items such as mushrooms, branches, or spruce sprouts and supplies them to processing companies that turn them into food products or decorative items. The network plays an essential role here, as forest owners and companies engage in close cooperation where social relationships and knowledge exchange are of great importance. Through this collaboration, raw materials are transformed into tangible value (raw materials for products and compensation), intangible value (knowledge exchange, friendships, trust), enhancing the income

opportunities for forest owners, supporting the local economy, and contributing to long-term economic and social well-being in the region.

Conclusion

Research on forest owners' NTFP networks has been limited. This study contributes to a deeper understanding of both the structure and dynamics of these networks, as well as the tangible and intangible exchanges between various actors. When developing these networks, it is essential to recognize the wide variety of NTFPs and the challenges this diversity poses. For example, producing chaga is much more straightforward than producing wild herbs or spruce sprouts. Additionally, the number and types of products produced significantly shape the network structures. The perishability of products and the long transportation distances, for instance, create challenges for the network. While the NTFP sector is often treated as a single industry, it encompasses a vast range of products, each requiring distinct network operations. Recognizing these differences is key to effectively advancing the sector.

Moreover, understanding the significance of social value is fundamental to the development of NTFP networks. Social value adds significant benefits to the network's operations and business activities as a whole. It facilitates smoother processes, improves reliability, and deepens relationships between actors. This is particularly critical in networks of small and micro NTFP enterprises, where personal dynamics can have a substantial impact.

Many forest owners are eager and intrinsically motivated to produce NTFPs, but their engagement requires better access to information and guidance. While timber production benefits from well-established support and advisory systems, similar systems are needed for the NTFP sector as well. Both forest owners and experts require more knowledge about NTFP production, which calls for not only formal education but also the exchange of tacit knowledge within networks. Strengthening collaboration between the forestry and NTFP sectors could yield significant benefits. To address these needs, a "low-threshold" organization that would act as a facilitator of knowledge transfer and networking among forest owners would be beneficial. Concrete institutional models could include regional or local NTFP networks and associations that collaborate with forest owners, businesses, and research institutions. The support of these networks could leverage public sector advisory services, which could expand their role by offering tailored advice to NTFP

actors and promoting information exchange among various stakeholders. Key policy instruments could include, among others, the EU Rural Development Programmes, which provide funding and support for collaborative projects and innovation activities. Additionally, national forestry and economic policies could integrate the development of the NTFP sector into a broader sustainable forestry strategy, increasing resource allocation and improving cooperation among actors.

In future research, it would be important to develop a deeper understanding of the value networks specific to each type of NTFPs due to their heterogeneity, as the unique characteristics and requirements of different NTFPs may lead to variations in network structures, dynamics, and the role of social value in each context. This could help tailor even more effective strategies for network development and support within the sector.

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Ethics approval

This study did not require ethical approval, as it did not involve any factors necessitating an ethical approval according to the Finnish National Board on Research Integrity TENK (Statement of the Research Ethics Committee of the University of Eastern Finland No. 12/2025). Participation in the study was entirely voluntary, and all participants were provided with sufficient and accurate information about the research before giving their informed consent. The study does not pose significant risks, harm, or damage to individuals, communities, or other subjects of research. The study did not involve interventions affecting the physical integrity of participants, minors under the age of fifteen without parental consent, exposure to exceptionally strong stimuli, risks of mental harm beyond normal daily life, or threats to the safety of participants or researchers.

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Appendix A

Themes of the interviews with forest owners.

1 Background information on the forest owner and the property

2 Exchange of values

Different actors and connections between them and the forest owner.

Interactions between actors: What exchanges take place between the actors (tangible and intangible)?

What is the collaboration based on?

Which do the actors feel is most important? Who are you in contact with the most? And the least?

3 Value creation in the network

The interviewee's various inputs and outputs for different stakeholders.

How is the production of NTFPs carried out? Why were these specific products chosen?

Why were the partners selected?

What benefits do you perceive from them?

What risks, shortcomings, or problems are associated with them?

Are there sufficient partners, resources, skills, or knowledge?

Who benefits from your activities? Do the beneficiaries perceive the benefits in the same way?

4 The role of forest owner in the network

More general discussion the shortcomings and the actor's perspective on their role.

Forest owners' perceived role in the network, their strengths and weaknesses, and support needs.

Gaps and bottlenecks in the network, as well as in their own operations and the network's activities.

Future prospects and the desired role in the network.