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ORIGINAL RESEARCH

Forest Owners' Perspectives Concerning Non-Timber Forest Products, Everyman's Rights, and Organic Certification of Forests in Eastern Finland

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Abstract

Global trends towards the bioeconomy and multidimensional ecosystem-based approaches are transforming our understanding of forests and expanding access to forest management. The demand for non-timber forest products (NTFPs) is increasing due to the current trends in lifestyle and consumption. Forest owners play a key role in the supply of NTFPs. However, many forest owners are not committed to production or aware of the opportunities for production of their forests. Understanding better the family forest owners' behaviour and decision making regarding NTFPs is needed to strengthen the role of NTFPs in the Finnish bioeconomy. In this study, forest owners' perspectives concerning NTFPs, Everyman's Rights, and organic certification of forests were identified. The survey data were collected by emailing the questionnaire to North Karelian forest owners and analysed by creating forest owner typologies based on their forest ownership motives and perspectives concerning NTFPs. Regarding forest ownership motives, four owner groups of relatively equal size were identified and named as recreationist, conservationists, timber producers, and resigning owners leaving the forest property to the next generation. Regarding their use of NTFPs and interest in producing NTFPs four groups of owners were identified: owners who 1) harvested NTFPs for household use or 2) sale, 3) would allow the harvesting of NTFPs not covered by everyman's right, and 4) need more information on the joint production of timber and NTFPs not covered by Everyman's Rights. Most owners were household users. The results can be utilised to promote NTFP production and advocate for the more effective organic certification of forests for different forest owner groups.

Keywords Non-timber forest products · Forest owners · Multiuse of forest · Organic certification · Everyman's' Rights · Joint production

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Introduction

The forest-based sector is shifting towards more diverse forest exploitation and opening itself to a circular, bio-based economy built on a more holistic economic system and new forms of income generation (Hetemäki 2014; Pülzl et al. 2014; Hetemäki et al. 2017; Winkel 2017). Global trends towards the bioeconomy and multidimensional ecosystem-based approaches are transforming our understanding of forests and expanding access to forest utilisation (Sheppard et al. 2020). There are indications of new demands for wild and natural products and intangible products promoting therapeutic values and wellbeing, as well as recreation and tourism facilities in relation to forest values (Weiss et al. 2019; Vacik et al. 2020; Wong and Wiersum 2019; Pettenella et al. 2019).

Forest utilisation in numerous ways opens opportunities for private forest owners to earn income from their forests, not just from wood production. Non-wood forest products (NWFP), i.e., products of biological origin other than wood derived from forests, other wooded land, or trees outside forests as defined by FAO (1999), have been used throughout history in rural households for food and nutritional diversity, as well as income (Weiss et al. 2020; Sheppard et al. 2020). Non-timber forest products (NTFPs), which is the term used in this research, also include fuelwood and small wooden objects (e.g., wooden arts and crafts) is the main difference between NWFPs and NTFPs. The importance of NTFPs has been neglected in most forest-based value chains and has been overshadowed by timber production as an economic possibility (Wiersum et al. 2018; Wong and Wiersum 2019; Wolfslehner et al. 2019). Currently, NTFPs are generating renewed interest as business opportunities for private forest owners, due to their increasing use in the food sector, cosmetics, and medical use as well as in recreational and tourism facilities (Wong and Wiersum 2019; Weiss et al. 2020).

Forest owners play a crucial role in producing and providing NTFPs as holders of the raw materials in Finland. They can gain financial benefits from collecting and selling raw materials and selling licences for picking and gathering permits. For example, berries and mushrooms may be picked freely under Everyman's Rights but special collection products (e.g., birch sap, spruce sprouts, and resin) requires forest owner's permission to collect them. Selling recreational services may also represent a substantial source of income for forest owners in some highly productive forest areas traditionally managed for wood production. Selling special collection products and services that used to be considered "secondary products" can become the primary source of revenue for forest owners (Merlo and Croitoru 2005).

Demand for sustainable and environmentally friendly products is increasing globally (Lober and Misen 1995; Burrows and Sanness 1998; Lloyd 2007). Natural products are often associated with the concept of pure and healthy products (Meadley 1989; Amos et al. 2014) and are experiencing greater demand because of new fashions (e.g., the "Mediterranean diet", organic farming, natural medicine, aromatherapy) (Pettenella et al. 2007). In European countries, the focus is increasingly on NTFPs as niche products or as wellbeing products embedded

in recreation and pedagogical services (Wiersum et al. 2018). Organic labelling has been found to affect consumers' perceptions of a product. For example, food products with an organic label are perceived as healthier (Lee et al. 2013) or tastier (Apaolaza et al. 2017) than conventional ones. Although non-timber forest products are associated with healthy products in their own right, organic labelling may gain surplus market value (McFadden et al. 2017).

To enable growing NTFP markets, forest owners play a key role in the supply of natural products and providing permission to collect them. The availability of raw materials has been a bottleneck for natural product entrepreneurship and growth in product supply (Rutanen 2018). In many cases, forest owners are neither committed to production nor aware of its opportunities in their forests. The perspectives of forest owners concerning the multi-use and certification of organic collection areas of forests are sparse and often inaccurate. Understanding forest owners' perspectives would serve NTFP-friendly forestry policies and support the NTFP supply chain, and consequently the development of the NTFP sector in rural areas.

The aim of this research is *to create a better understanding of the reasons behind forest owners' behaviours and perspectives regarding NTFPs in Finland*. More precisely, this study aims to identify forest owners' perspectives concerning (1) producing non-timber products (NTFPs) in their forests, (2) harvesting NTFPs (berries and mushrooms) covered by Everyman's Rights, and (3) certification of organic collection areas of forests. The perspectives were assessed by a questionnaire sent to forests owners in North Karelia, Finland. The relationships among the forest owners' ownership motives and perspectives regarding NTFPs were investigated, and forest owner typologies were created. Finally, we studied the role played by forest owners' demographics and ownership motives in how they thought about NTFP production, Everyman's Rights, and certification of organic collection areas of forest. The results can be utilised to promote more effective NTFP production and advocate for organic certification of collection areas among different forest owner groups.

Literature Review

Forest owners' behaviours and perspectives concerning NTFP-related issues vary for several reasons. To forest owners NTFP production and harvesting may be a recreational activity, a supplementary income source or a commercial production (Weiss et al. 2019). The role of Finnish forest owners in NTFPs supply chains also varies depending on NTFPs.

Harvesting Everyman's products (e.g., wild berries and mushrooms) is often done in forests managed primarily for timber production, while special collection products (e.g., birch sap resin, spruce sprouts, and birch leaves) require multi-product forest management and decisions and measures taken by forest owners. These NTFP product categories have different supply chains in which Everyman´s products are harvested by public or commercial pickers and sold to industry and in the case of special collection products, forest owner harvests the crop and sells it to industry or sells the rights to harvest to industry.

The joint production of timber and NTFPs in the same forest area may be compatible or in conflict (Miina et al. 2020). However, full compatibility (a lack of trade-offs) or full incompatibility (timber production preventing the production of NTFPs or vice versa) are rare. A variety of NTFPs are economically important to forest owners, but due to Everyman's Rights, the harvesting of wild-gathered berries and mushrooms in Finland cannot be controlled by Finnish forest owners. Thus far, the organic certification of privately owned forests has been limited, and there may therefore be suspicion and scepticism among forest owners. Overall, forest owners' perspectives concerning non-timber forest products, Everyman's Rights, and organic certification of forests collection areas are complex and highly interrelated issues (Fig. 1).

Non-Timber Forest Products

Non-timber forest products (NTFP) are an integral element of the goods provided by forests. NTFPs comprise a wide range of materials which all have a unique nature as a material for many uses in the food sector (Rowland et al. 2017; Rasolofoson et al. 2018), cosmetics (Fernandez Ponce et al. 2013; Mahesh et al. 2019), and medicine (Lahlou 2013). NTFPs include berries, mushrooms, aromatic and decorative plant material, and saps and resins (FAO 2020; Lovric et al. 2020). Collecting non-timber forest products has a long tradition in many countries, both for household and commercial uses (Genin et al. 2013; Sheppard et al. 2020; Wolfslehner et al. 2019). In Europe, 90% of households consume NTFPs, and about a quarter collect them (Lovric et al. 2020). In addition to enriching people's diets, NTFPs collection is often recreational, cultural, and social.

Growing market demand for NTFPs has increased their economic importance (Wolfslehner et al. 2019). When looking at two different NTFP categories tree water and specialty mushroom market, the new product launches worldwide had increased six-fold between 2012 and 2016 (Vanhanen and Miina, 2018) for tree waters. Similar increase has been witnessed in specialty mushroom products such as chaga (sterile conk of *Inonotus obliquus*, aka Pakuri) of which new global product launch activity

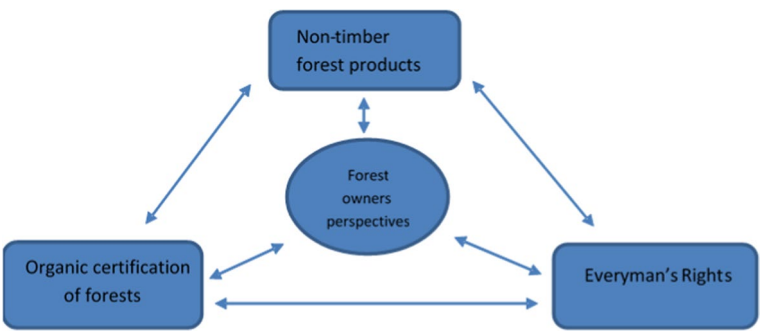

Fig. 1 Forest owners' perspectives concerning non-timber forest products, Everyman's Rights, and organic certification of forests are highly interrelated

has increased 100-fold between 2001 and 2020 main category for novel products being in cosmetic sector (Isokangas 2021).

Nevertheless, official reporting of production volumes of NTFP is sparse, erratic, or inaccurate due to a complex and opaque system with inadequately understood value chains (Sheppard et al. 2020). There is no accurate knowledge of the amount or value of collected NTFPs, and the statistics are scattered or incomparable among countries (Vantomme 2003; Wiersum et al. 2018; Lovric et al. 2021) because NTFPs are largely the domain of the informal sector, and the range of NTFPs is diverse. Definitions and standardisation vary across sources and countries (Wahlén 2017; Wiersum et al. 2018; Wolfslehner et al. 2019). However, the economic value of NTFPs is estimated to have been about USD 7.71 billion in 2015 (FAO 2020), but this does not include self-collected products and informal NTFP use (Vantomme 2003; FAO 2014, 2020; Wolfslehner et al. 2016). This means the real amount of collected NTFPs is likely much higher.

In Finland, NTFPs are currently a minor forest product in terms of their direct monetary value compared to timber. However, NTFPs play an important cultural role, because 65% of Finns annually collect wild berries, mushrooms, and herbs, mainly for household use (Sievänen and Neuvonen 2011). One reason for the active utilisation of NTFPs for both household and commercial use is the public access right to forests, i.e., Everyman's Rights. In quantity and value, the most important NTFPs in Finland are wild berries and mushrooms harvested under Everyman's Rights (MARSI 2020). Depending on the annual berry harvest, Finns collect between 34 and 56 million kilograms of berries for household use. The amount collected for sale (15 to 18 million kg) remains low compared to the amount collected for household use (Turtiainen et al. 2015).

The production of special NTFPs not covered by Everyman's Rights (e.g., birch sap, spruce sprouts, chaga, and resin) requires forest owner's permission to collect them and can generate significant additional income for forest owners compared to timber production alone. The joint production of timber and NTFPs often calls for changes in forest management practices (Miina et al. 2020), and forest owners may therefore have various perspectives concerning NTFP production in their forests.

NTFPs currently play a marginal role in Finland's bioeconomy, despite their potential use in products with high added value. Such value addition would require a constant and secure supply of raw materials to NTFP-related businesses. The challenge is therefore how to increase the production and commercial utilisation of NTFP raw material resources in Finland.

Everyman's Rights

The collection of NTFPs is relevant not only to forest owners but to other forest users and actors. In many European counties, the right to extract NTFPs from forests is based on Everyman's Rights. Everyman's Rights mean the right to use nature, regardless of who is its owner or holder. Public access to private land is much wider in Finland than in most other countries. There is no targeted legislation for Everyman's Rights but the limits to execute Everyman's Rights are set by different acts

such as Nature Conservation Act, Waste Act, The Criminal Code of Finland, Rescue Act, Off Road Traffic Act, Water Traffic Act etc. For NTFP´s legislation allows to pick wild berries, mushrooms and flowers without landowner's permission for recreation or commercial use but denies cutting down or damage trees, collect moss, lichen, soil or wood (Ministry of the Environment 2016). The forest owner's permission is required to collect natural products not covered by Everyman's Rights.

In Finland, NTFP harvesting and production are supported with financial incentives. Harvesters are tax-exempt, and berries and mushrooms can be sold tax-free in a marketplace and to restaurants or wholesale buyers, for example. Selling NTFPs not covered by Everyman's Rights are also tax-free for harvesters if NTFPs are picked in nature, sold for human consumption, or used as an ingredient in a medicinal product, and not processed before being sold. There are also associations and trade groups, sponsored by the Finnish Government, that directly focus on berries and mushrooms, which provide support for business development (Prokofieva et al. 2019).

Berry picking has a long tradition in Finland, both for households and commercially. Recently, urbanisation and the rising standard of living has meant interest in picking has decreased in Finland, and today recruited foreign berry pickers pick about 90% of wild berries for organised markets (MARSI 2020). Everyman's Rights generally apply to foreign citizens as well, which has enabled berry industries to use foreign labourers. This has prompted lively discussions about the limits of Everyman's Rights, and inhabitants' rights to local natural resources. Critics claim that commercially organised berry picking makes it difficult for inhabitants to fully use natural resources (Peltola et al. 2014). The criticism has mainly been directed at organised commercial berry picking, where a large group of foreign pickers pick berries from a forest area very efficiently. From the forest owner's perspective, the acceptability of commercial picking and Everyman's Rights may depend on whether they collect berries and mushrooms themselves, and whether pickers are local, non-local, or foreign (Tahvanainen et al. 2016).

Certification of Organic Collection Areas in Forests

Organic certification is a quality system which guarantees that products meet the requirements of the EU organic regulation at all stages of the process. Organic production combines best environmental practices, a high level of biodiversity, the preservation of natural resources, and the application of high animal welfare standards for farm management and food production. Only natural substances and processes are allowed, and the number of additives in processing is limited (Council Regulation (EC) No. 834/2007).

Forests, wetlands, and other potential natural areas associated with them can be certified as organic collection areas (later referred to as organic certification of forests). NTFPs collected from these areas can be called organic if the entire production chain is involved in the organic certification system. The criterion for the approval of organic collection areas is the prohibition of chemical fertilisers,

pesticides and herbicides; the use of these chemicals restricts forest areas from organic use for 36 months (Evira 2018).

The world's largest organic forest collection area, 4.6 million hectares, is in Finland, mainly in state forests in northern Finland (Arktiset Aromit 2020; Fig. 2). The challenge in the natural products sector has been the lack of convergence between the supply and demand of certified organic raw material. The processing industry cannot invest if they lack guarantees of access to the raw material. To secure the continuous intake of raw material, organic collection areas are also needed in southern Finland, because annual and regional variation in NTFPs yields can be large.

The biggest owner group in Finland is private forest owners. In 2016, more than 600,000 private forest owners owned 10.5 million hectares of forestland (Karppinen et al. 2020). Currently, the aim is to make Finnish private forest owners, especially in southern Finland aware of the opportunity for certified organic forests and get them involved. The challenge is that the forest owners who do not utilise the NTFPs of their own forests do not benefit from the certification.

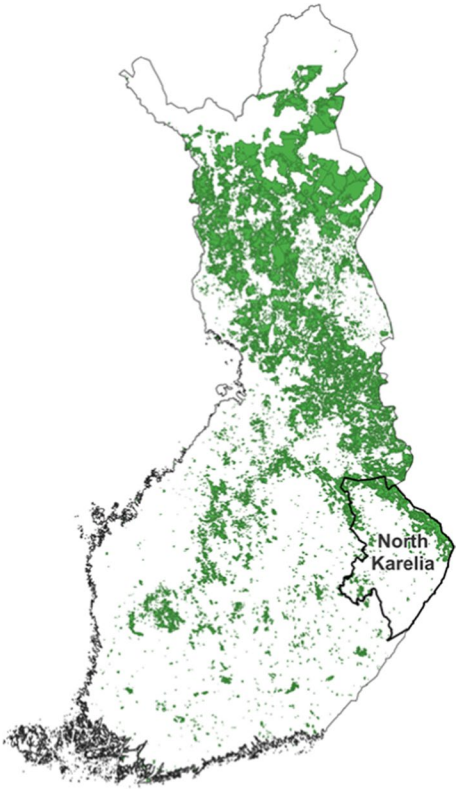

Fig. 2 State-owned forest areas with organic collection areas in 2020 and location of the study area in Finland

Materials and Methods

Data Collection

The study's target population was non-industrial private forest owners having a forest property in the North Karelia region of Finland (Fig. 2), a total population of about 27,500 forest owners according to the Finnish Forest Centre's customer register. The electronic questionnaire was emailed to all adult forest owners (private, estate) who owned a forest property in North Karelia, and who had an email address in the customer register without a marketing ban. This resulted in a sample size of 6,631 forest owners. Two of the addresses proved incorrect. Using e-questionnaires reduced the costs, but coverage error may have occurred when not all forest owners had the same chance to be included in the sample.

The data were collected via email using a Webropol survey in November–December 2018. A link to the survey was emailed in mid-November, and a reminder message was sent to those who had not yet responded to the questionnaire a week and a half later. The response time for the survey was four weeks. A week before the survey closed another reminder message was sent.

A total of 1,132 responses was received, a response rate of 17.1%. Sending reminder messages had a positive effect on response rate, but reminders did not change the overall characteristics of respondents. Inclusion in a lottery for two tablet computers was held for the respondents, which may have contributed to the response rate.

To observe the representativeness of the data collected, the respondents' background variables were compared to the Forest Owner 2020 survey (Karppinen et al. 2020) (Table 1). According to the comparison, the forest owners in this study were an average of three years younger than in the Forest Owner 2020 survey. The proportion of people aged between 55 and 64 was higher than in the Forest Owner 2020 survey and proportion of older people, over 75 years, was lower. The rate of the gender did not differ. The study's respondents had larger forest holdings than respondents in the Forest Owner 2020 survey. The difference with the Forest Owner 2020 survey was that our data also included forest owners owning less than five hectares (4.7% of respondents in this study), whereas these had been excluded from the Forest Owner 2020 survey. Most respondents owned their holdings alone or with their spouse, and the rate was a little lower than in the Forest Owner 2020 survey, whereas the rate of forest partnership was higher, and the share of heirs was half than in the Forest Owner 2020 survey.

In summary, the data's forest owners were slightly younger on average and owned larger forest holdings than forest owners on average. Otherwise, the data of the study did not differ significantly from the population as defined in the Forest Owner 2020 survey.

The questionnaire contained structured and open-ended questions. Four structured questions were formulated to reveal forest owners' ownership motives (Q1) and perspectives concerning non-timber products (Q2), Everyman's Rights (Q3), and organic certification of forests (Q4). Each question consisted of 8–15

Table 1 Comparison of forest owners in the survey data (% of forest owners) with the results of the Forest Owner 2020 survey (% of forest owners) (Karppinen et al. 2020)

	Respondents of the study	Forest Owners 2020 survey
Gender (n = 1,032)		
Male	75.5%	75.8%
Female	24.5%	24.2%
Total	100%	100%
Owner group (n = 1,024)		
Private ownership	77.1%	82.7%
Forest partnership	18.8%	9.2%
Estate	4.2%	8.1%
Total	100%	100%
Age (n = 1,017)		
< 45 years	11.7%	9.3%
45 – 54 years	13.6%	12.2%
55 – 64 years	31.1%	26.3%
65 – 74 years	34.0%	34.3%
≥ 75 years	9.6%	17.9%
Total	100%	100%
Mean age	61 years	64 years
Forest area in region (n = 983)		
0.5–4.9 ha	4.7%	–
5 – 9.9 ha	9.2%	15.7%
10–19.9 ha	12.6%	22.4%
20–49.9 ha	29.5%	34.0%
50–99.9 ha	21.7%	16.8%
≥ 100 ha	22.3%	11.1%
Total	100%	100%
Mean forest area	90.4 ha	47.3 ha

statements (items), which respondents rated using a five-point Likert scale and descending order of scale options. For data analyses, the scale was reversed, with 1 revealing the weakest motive and perspective, corresponding to "Not important" and "Strongly disagree" respectively, and 5 revealing the strongest motive and perspective, corresponding to "Very important" and "Strongly agree" respectively. For analyses, the answers "I cannot say" were recoded as "Neutral" (scale 3).

Data Analyses

The forest owners' ownership motives and perspectives towards NTFPs, Everyman's Rights and organic certification of forests were investigated using principal component analysis (PCA) and subsequent K-means clustering technique being the

most used methods to compress the information and to create forest owner typologies (Ficko et al. 2019). The overall relationships among PCA scores (for example, ownership motives and perspectives towards NTFPs) were analysed using set correlations (Cohen 1982). Here, set correlation was used to describe the amount of shared variance (R^2) between two sets of PCA scores. The role of forest owners' demographics and ownership motives in how they thought about NTFP production, Everyman's Rights, and certification of organic collection areas of forest were analysed and illustrated using Conditional Recursive Partitioning Trees (Hothorn et al. 2006). Conditional Trees (Ctrees) is used to highlight the complex relationships among the typology groups and demographics of the respondents.

Principal Component Analyses

Principal components analysis (PCA) with varimax rotation was used to reveal the factors of forest owner motivations and perspectives. The orthogonal varimax rotation is commonly used to obtain only few items with large loadings by the PC and thus ease the interpretability of PCs (Cooley and Lohnes 1971). PCAs were performed using the FACTOR procedure in SPSS Statistics 25 (IBM Inc. 2017). Separate PCAs were conducted for respondents' forest ownership motives (using the items of Q1), perspectives and utilisation of non-timber forest products such as berries and mushrooms (Q2), perspectives concerning Everyman's Rights (Q3), and perspectives concerning organic certification of forests (Q4).

The scores of the principal components were calculated as linear combinations of all the items of the question and interpreted as normally distributed continuous variables and used in further analyses. To explore the internal consistency of the question's items, Cronbach's alpha coefficients were calculated using the RELIABILITY procedure in SPSS Statistics 25 (IBM Inc. 2017).

K-Means Clustering

Based on the principal component score variables, forest owner typology groups were constructed using K-means cluster analysis (e.g., Boon et al. 2004). The typology groups were formed using the PC scores describing forest ownership motives (Q1), perspectives concerning and utilisation of non-timber forest products (Q2), perspectives concerning Everyman's Rights (Q3), and perspectives concerning organic certification of forests (Q4). K-means clustering was performed using the QUICK CLUSTER procedure (MXITER(50), CONVERGE(0)) in SPSS Statistics 25 (IBM Inc. 2017). To enable a straightforward labelling and interpretation of groups, the number of typology groups (K) was defined as equal to the number of PC score variables and the groups were named according to PC score variables.

Imputation

The PC analyses and K-means clustering were performed using the raw data and listwise deletion of missing data. Listwise deletion was applied to identify the patterns in analyses holding for the complete dataset. However, due to a great proportion

of missing values in the raw data (n = 1,032), imputed data were used in further analyses. The missing values of background information on demographics and forest holding in the raw data, PC score values, and typology groups were imputed. An imputation was performed using the R package missForest (Stekhoven and Buehlmann 2012). The imputation algorithm is non-parametric and is suitable for the imputation of mixed data with categorical, ordered categorical, and continuous variables. The imputation was performed five times, and the average values were used for the continuous variables and the modes for the categorical variables.

Set Correlations

Relationships among the PC score variables of Q1–Q4 were analysed using Cohen's Set Correlation (Revelle 2021) and the imputed dataset. The function setCor in R finds correlations among a predictor (x) and criterion (y) set of score variables, and multiple correlations between x variables and each of the y variables.

Conditional Trees

The relationships among the typology groups and demographics of the respondents were studied using non-parametric Conditional Recursive Partitioning Trees (R package party, Hothorn et al. 2006) and the imputed dataset. The partitioning model was a visual and robust method to characterise the categorical response variables (i.e., typology groups of respondents). The partitioning algorithm selects the most significant predictors among the variable candidates, also considering the relationships among the predictors. The set of independent variables thus affects the result of partitioning.

The independent variables for partitioning were basic demographics (respondent's sex, age, education, and profession) and variables describing forest holding and management such as the location of the respondent's home in relation to the forests (Housing); the distance from the holding if a respondent did not live there (Distance, continuous); forest area (For.area, continuous); forest area in North Karelia (For.area.NC, continuous); form of possession of the holding (Owning); duration of forest possession (Year.own, continuous); membership of the Forest Management Association (FMA); forest management (For.man); forest certification (Cert: Yes, No, I cannot say); forest management agreement (Man.agr: Yes, No, I cannot say); and cuttings undertaken during 2015–2018 (Cuttings: Yes, No).

Results

Forest Owners' Motives for Owning Their Forests

Recreation and outdoor activities, exercise from forestry, preserving biodiversity and the landscape were the most important motives the study's respondents gave for using their forest holdings (important or very important for 67–70% of the respondents, depending on the factor) (Fig. 3). More than half the respondents (53–58%)

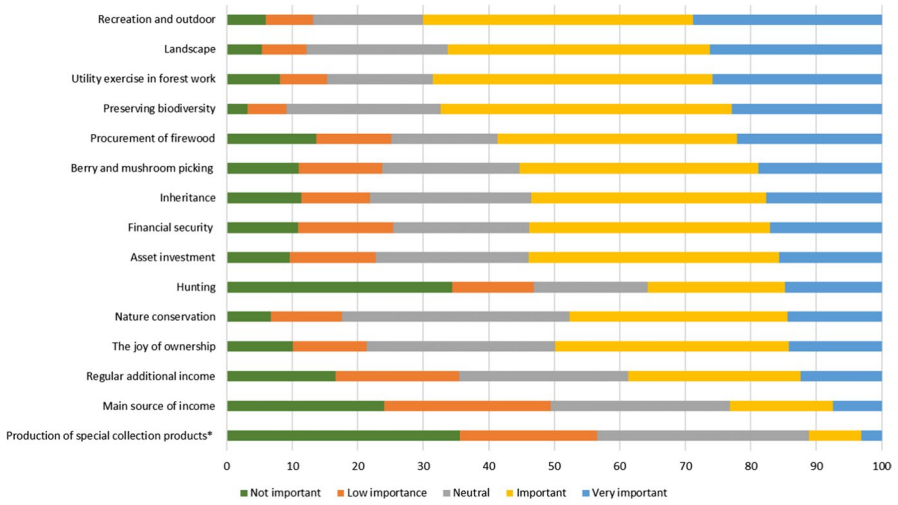

Fig. 3 Importance of the factors (15 items of Q1) in forest ownership. *Special collection products mean e.g., birch sap, spruce sprouts, and chaga which require the forest owner's permission to collect

saw berry and mushroom picking, as well as the acquisition of firewood, as an important or very important factor for their own forest use. Inheritance, financial security, and investment were also important motives (54%). For just over a fifth (23%) of forest owners, the forest was the main source of income, and about 40% considered it a regular additional income. Every tenth forest owner considered it important to collect special collection products (birch sap, chaga, spruce sprouts, resin) from their own forest.

Four principal components (PC) were extracted based on respondents' forest ownership motives (items) (Table 2). The first PC called *Multiple-use, recreation* included: source of firewood; exercise; outdoor recreation; berry and mushroom picking; and hunting. The second PC, *Conservation*, included: biodiversity preservation; nature conservation; and landscape. The third PC, *Timber production*, included: timber production such as regular additional income; financial security; source of primary income; and asset value. The fourth PC, *Inheritance*, consisted of motives such as inheritance and the joy of ownership. The fourth PC was also characterised by a high loading ($\geq|0.5|$) of the asset value item.

Forest Owners' Perspectives Concerning NTFPs

According to the respondents, most forest owners use their forest in a variety of ways, not just for timber production (Fig. 4). Berry and mushroom picking is an acquired habit for more than four out of five forest owners, but only 14% of forest owners collect them for sale. Only a few of the respondents produce special natural products, which require the forest owner's permission to collect for sale, but almost ten times as many see it as an interesting option in the future.

Table 2 The principal component analysis for respondents' forest ownership motives (15 items of Q1, n = 914). The principal components explained 63.8% of the total variance. The principal components are called: P1 = *Multiple-use, recreation*; P2 = *Conservation*; P3 = *Timber production*; P4 = *Inheritance*. Factor loadings ≥|0.5| are in bold

Item	P1: Multiple-use, recreation	P2: Conservation	P3: Timber production	P4: Inheritance	Cronbach's alpha if item deleted
Source of firewood	**0.747**	0.070	0.071	0.053	0.809
Utility exercise in forest work	**0.741**	0.189	0.136	0.163	0.801
Recreation and outdoor	**0.692**	0.490	0.023	0.131	0.799
Berry and mushroom picking	**0.681**	0.452	0.103	0.068	0.797
Hunting	**0.574**	−0.137	0.217	0.038	0.820
Preserving biodiversity	0.129	**0.876**	−0.033	0.077	0.812
Nature conservation	−0.029	**0.864**	−0.046	0.091	0.819
Landscape	0.469	**0.674**	−0.013	0.136	0.804
Production of special collection products	0.215	0.423	0.344	−0.159	0.814
Regular additional income	0.135	−0.008	**0.860**	0.103	0.809
Financial security	0.131	0.085	**0.809**	0.147	0.807
Main source of income	0.101	−0.029	**0.808**	−0.022	0.816
Asset investment	0.064	−0.087	**0.597**	**0.511**	0.814
Inheritance	0.064	0.079	0.212	**0.754**	0.817
The joy of ownership	0.176	0.108	−0.026	**0.719**	0.819
Eigenvalue	4.54	2.61	1.28	1.16	Cronbach's alpha
Variance explained (%)	30.25	17.37	8.50	7.71	0.821

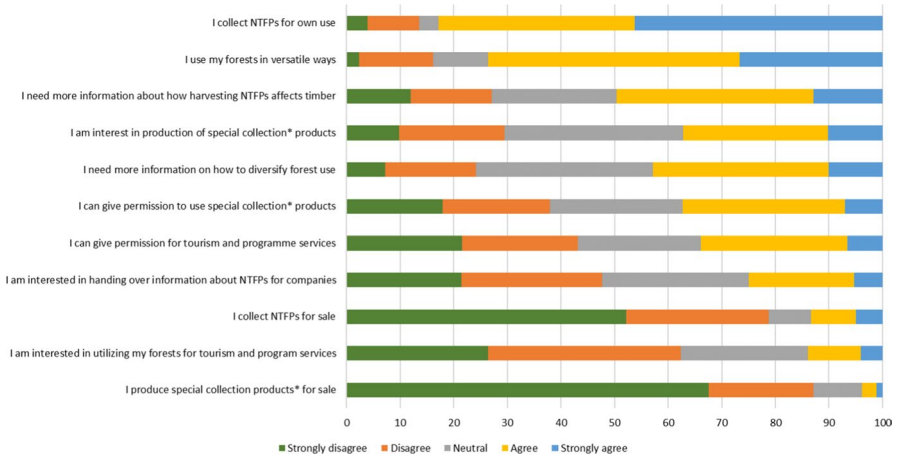

Fig. 4 Forest owners' perceptions of NTFPs and multi-functional use of forests (11 items of Q2). *Special collection products mean e.g., birch sap, spruce sprouts, and chaga which require the forest owner's permission to collect

About a third of the respondents would be willing to give permission to use their forests for both tourism and programme services (34%) and for special collection products (37%). Some forest owners themselves would be interested in exploiting their forests for tourism or programme services (14%). The results show that more information is needed on both the multiple uses of the forest and the effects of the production of special collection products on the forest and its growth.

The PC analysis extracted four PCs for respondents' perspectives concerning utilisation of non-timber forest products (Table 3). The first PC, called *Permission*, included items in which the forest owner was willing to give permission to utilise their forest in tourism or programme services or to utilise special collection products not covered by Everyman's Rights. It also included an item in which the forest owner was interested in handing over information about the potential to produce natural products to entrepreneurs. The second PC, *Additional knowledge*, included dimensions in which forests owners needed more information about how they could use their forests in versatile ways, and how natural product production might affect trees and growing stocks. An item in which forests owners were interested in using their forest to produce special collection products was also loaded to this PC.

The third PC, *Commercial use*, included dimensions of picking both natural products covered by Everyman's Rights and special collection products which needed the landowners' permission to collect for sale. Interest in utilising forests for tourism and programme services was also included in this PC.

The fourth PC, *Own use*, was characterised by items representing the utilisation of the forest in various ways, not only in timber production, and the utilisation of non-timber products like berries and mushrooms for the owner's own use.

Table 3 The principal component analysis for respondents' attitudes towards and utilisation of non-timber forest products (11 items of Q2, n = 970). The principal components explained 73.3% of the total variance. The principal components are called: P1 = *Permission*; P2 = *Additional knowledge*; P3 = *Commercial use*; P4 = *Own use*. Factor loadings ≥|0.5| are in bold

Item	P1: Permission	P2: Additional information	P3: Commercial use	P4: Own use	Cronbach's alpha if item deleted
I can give permission for tourism and programme services	**0.878**	0.146	0.144	0.009	0.792
I can give permission to use special collection products	**0.864**	0.213	0.008	−0.011	0.795
I am interested in handing over information about NTFPs for companies	**0.744**	0.412	0.085	−0.019	0.786
I need more information on how to diversify forest use	0.131	**0.882**	0.081	0.051	0.795
I am interest in production of special collection products	0.274	**0.792**	0.215	0.076	0.784
I need more information about how harvesting NTFPs affects timber	0.339	**0.787**	0.065	0.033	0.787
I collect NTFPs for sale	0.025	0.017	**0.829**	0.139	0.818
I produce special collection products for sale	0.082	0.166	**0.825**	0.034	0.808
I am interested in utilising my forests for tourism and program services	0.427	0.288	**0.500**	0.183	0.792
I collect NTFPs for own use	−0.007	0.031	0.027	**0.862**	0.830
I use my forests in versatile ways	0.013	0.074	0.193	**0.817**	0.821
Eigenvalue	4.17	1.74	1.12	1.03	Cronbach's alpha
Variance explained (%)	37.93	15.86	10.17	9.34	0.816

Forest Owners' Perspectives Concerning Everyman's Rights

Respondents considered the collection of berries and mushroom a good thing (90% of the respondents agreed or strongly agreed) and felt privileged to have Everyman's Rights in Finland (80%) (Fig. 5). Everyman's Rights were seen as important and positive in terms of national image and tourism, and collecting NTFPs covered by Everyman's Rights brought income and vitality to the countryside (73–75%).

However, 65% of the respondents agreed that commercial collection should always be based on contracts. Half of the respondents considered that commercial collection should not be carried out under Everyman's Rights at all, and one in four would restrict Everyman's Rights.

The PC analysis extracted two components, *Positive* and *Negative* (Table 4). The *Positive* component included items where Everyman's Rights were considered, in general, a good thing and a privilege. The component *Negative* included items where commercial activities should be based on contracts made with landowner, commercial activities should not be carried out under Everyman's Rights, and Everyman's Rights should be limited. Cronbach's alpha (0.222) indicated the items had a low internal consistency, i.e., the items were unable to measure the respondents' attitudes towards Everyman's Rights.

Forest Owners' Perspectives Concerning Organic Certification of Forests

Organic certification of forests was quite a new thing for many forest owners. Only 23% of the respondents had heard of certified organic collection areas before. Most had heard about it through newspapers. The media (TV, radio, or internet) was also a good source of information. Some of the respondents were familiar with certified organic forests through their work or education. The Finnish Forest Centre was also mentioned as a source of information quite often.

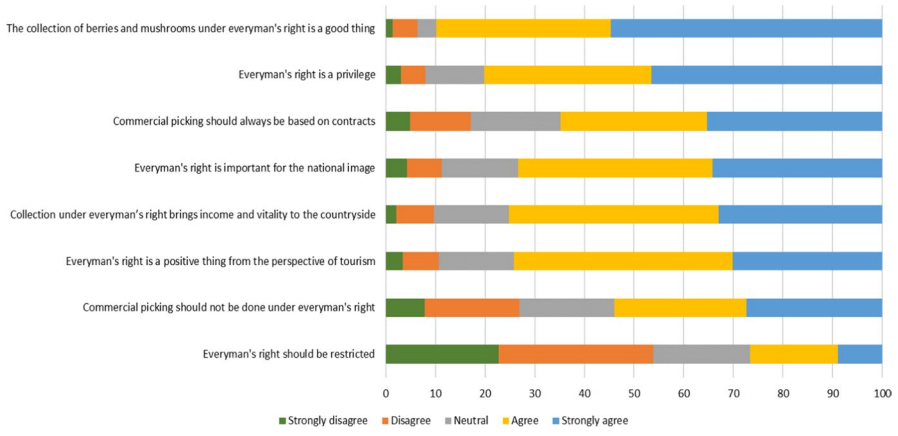

Fig. 5 Respondent's perspectives concerning Everyman's Rights (8 items of Q3)

Table 4 The principal component analysis for respondents' perspectives towards Everyman's Rights (8 items of Q3, n = 991). The principal components explained 65.6% of the total variance. The principal components are called: P1 = *Positive*, P2 = *Negative*. Factor loadings ≥|0.5| are in bold

Item	P1: Positive	P2: Negative	Cronbach's alpha if item deleted
Everyman's Rights is a positive thing from the perspective of tourism	**0.798**	−0.205	0.073
Everyman's Rights is important for the national image	**0.797**	−0.266	0.094
Everyman's Rights is a privilege	**0.740**	0.066	0.053
Collecting berries and mushrooms under Everyman's Rights is a good thing	**0.723**	−0.329	0.160
Collection under Everyman's Rights brings income and vitality to the countryside	**0.686**	−0.238	0.123
Commercial picking should always be based on contracts	−0.101	**0.877**	0.242
Commercial picking should not be done under Everyman's Rights	−0.185	**0.876**	0.290
Everyman's Rights should be restricted	**−0.514**	**0.556**	0.446
Eigenvalue	3.98	1.27	Cronbach's alpha
Variance explained (%)	49.79	15.84	0.222

More than a third (35%) of the respondents would be willing to certify their forests entirely or partly as organic collection areas. Two fifths of the respondents were interested in the certification of organic collection areas if it would provide an economic benefit to the owner. Almost half of the respondents (45%) stated that the certification of organic collection areas was suitable if it did not involve costs or effort for the forest owner. However, half of the respondents wanted more information about the certification of organic collection areas before making decisions about their own forests. Approximately a fifth of the forest owners (22%) were reluctant to certify their forests as organic collection areas.

The study's respondents considered organic collection areas well suited to North Karelia, and that they aptly supported the Finnish country brand as a clean area (about 70%) and as a marketing asset for the province (58%) (Fig. 6). Approximately half of the respondents (48%) saw the certification of organic collection areas as a unique opportunity for the development of the bioeconomy. Half of the respondents saw certification as a way to guide commercial picking further away from houses and holiday cottages, but the other half (46%) feared that certification could add to the pressure for commercial collection in certified organic forests. Two fifths of the respondents considered certification of organic collection areas as necessary when a fifth of the respondents considered them unnecessary.

The analysis of respondents' attitudes towards organic certification of forests extracted three PCs, *Positive*, *Negative,* and *Don't know, no opinion* (Table 5). Five items (see Table 5) indicating a positive attitude towards organic certification were loaded on the first PC, labelled *Positive* attitude. The component *Negative* included the items "I would support organic certification if it limited commercial picking to areas far from settlements" and "The pressure of commercial picking may be directed at the certified organic area". The third PC included only the item "I don't know the issue in question well enough to have an opinion".

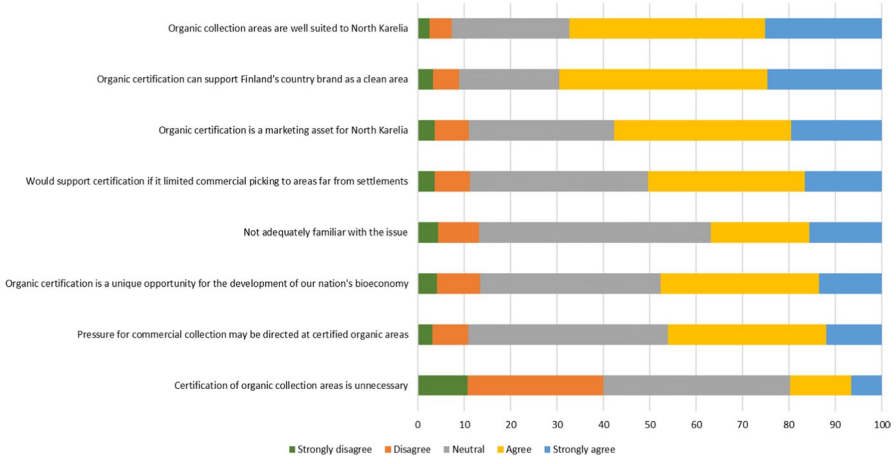

Fig. 6 Respondents' perspectives concerning certification of organic collection areas of forests (8 items of Q4). The negatively stated item "Certification of organic collection areas is unnecessary" was recoded before the analyses

Table 5 The principal component analysis for respondents' attitudes towards organic certification of forests (8 items of Q4, n = 826). The principal components explained 74.4% of the total variance. The principal components are: P1 = *Positive*; P2 = *Negative*; P3 = *Don't know, no opinion*. Factor loadings ≥|0.5| are in bold

Item	P1: Positive	P2: Negative	P3: Don't know, no opinion	Cronbach's alpha if item deleted
Organic certification can support Finland's country brand as a clean area	**0.885**	0.112	0.025	0.663
Organic certification is a marketing asset for North Karelia	**0.866**	0.116	−0.012	0.667
Organic collection areas are well suited to North Karelia	**0.865**	0.151	−0.017	0.668
Organic certification is a unique opportunity for the development of the bioeconomy	**0.848**	0.120	0.022	0.670
Certification of organic collection areas is unnecessary*	**0.762**	−0.156	−0.156	0.712
The pressure of commercial collection may be directed at certified organic areas	−0.076	**0.816**	−0.225	0.788
Would support certification if it limited commercial picking to areas far from settlements	0.271	**0.707**	0.205	0.748
Not adequately familiar with the issue	−0.077	−0.039	**0.956**	0.818
Eigenvalue	3.75	1.18	1.02	Cronbach's alpha
Variance explained (%)	46.87	14.77	12.77	0.751

*The negatively stated item was recoded before the analyses

Relationships among Forest Owners' Motives and Perspectives

The relationships among forest owners' ownership motives and perspectives concerning non-timber products, Everyman's Rights, and organic certification of forests were analysed with canonical correlation (Tables 6, 7 and 8).

Forest owners whose forest ownership motives were *Multiple-use, recreation* harvested NTFPs for their own use (Table 6). Those who were conservationists needed more information about NTFPs, but also harvested for their own use. Timber producers were a more heterogeneous group; the PC score variable describing them was positively correlated with the PC score variables for *Permission*, *Additional knowledge*, and *Commercial use*, even though the correlations were weaker. Those forest owners whose motives were to leave a legacy for their children collected NTFPs for their own use, and their perspectives concerning commercial use were slightly negative. Forest owners with conservation interests had positive attitudes concerning Everyman's Rights (Table 7). Only forest owners with conservation interests had a statistically significant (positive) correlation with attitudes towards organic certification (Table 8).

The analyses revealed that those forest owners who would be willing to give permission for their forests to be utilised in tourism and programme services and information about NTFPs' potential in their forests for companies supported Everyman's Rights (Table 9). Forest owners who needed additional knowledge about such use of their forest also viewed Everyman's Rights positively. Those forest owners who collected NTFPs for their own use viewed Everyman's Rights positively (Table 9) but had a negative view of the organic certification of forests (Table 10). However, permission providers and those who needed additional knowledge and collected NTFPs for their own use were uncertain or had no opinion about the organic certification of forests (Table 10).

Forest owners with positive (negative) opinions about Everyman's Rights approved (disapproved) of organic certification (Table 11).

Forest Owner Typologies and Their Relationships with the Demographics of the Respondent

Using K-means cluster analysis, four clusters of forest owner typologies were constructed based on the PC score variables of Q1, Q2, Q3, and Q4. To enable a straightforward labelling and interpretation of groups, the grouping was done by defining the number of groups to be equal to that of PC score variables and naming the groups according to PC score variables (Tables 12, 13, 14, 15). The results of cross tabulated forest owner typologies, including the test of homogeneity are given in the Supplementary Materials.

The relationships among the typology groups and forest owners' demographics were studied using Conditional Trees (Ctree). The method was used to study the role of forest owners' demographics and forest ownership motives in how forest

Table 6 Interactions among the PC score variables of Q1 and Q2 in the imputed dataset (n = 1,032). Average squared canonical correlation = 0.13; Cohen's set correlation $R^2 = 0.48$. Statistically highly significant coefficients in bold ($p < 0.001$)

Q1: Motives for forest ownership	Q2: Perspectives concerning non-timber products			
	P1: Permission	P2: Additional knowledge	P3: Commercial use	P4: Own use
P1: Multiple-use, recreation	−0.07 ($p = 0.002$)	0.01 ($p = 0.760$)	**0.18 ($p < 0.001$)**	**0.50 ($p < 0.001$)**
P2: Conservation	0.04 ($p = 0.180$)	**0.23 ($p < 0.001$)**	0.07 ($p = 0.022$)	**0.28 ($p < 0.001$)**
P3: Timber production	**0.15 ($p < 0.001$)**	**0.17 ($p < 0.001$)**	**0.19 ($p < 0.001$)**	0.04 ($p = 0.077$)
P4: Inheritance	0.04 ($p = 0.250$)	0.03 ($p = 0.360$)	**−0.11 ($p < 0.001$)**	**0.09 ($p < 0.001$)**
R^2	**0.03 ($p < 0.001$)**	**0.08 ($p < 0.001$)**	**0.09 ($p < 0.001$)**	**0.34 ($p < 0.001$)**

Table 7 Interactions among the PC score variables of Q1 and Q3 in the imputed dataset (n = 1,032). Average squared canonical correlation = 0.04; Cohen's set correlation $R^2 = 0.07$. Statistically highly significant coefficients in bold ($p < 0.001$)

Q1: Motives for forest ownership	Q3: Perspectives concerning Everyman's Rights	
	P1: Positive	P2: Negative
P1: Multiple-use, recreation	0.03 ($p = 0.260$)	0.04 ($p = 0.170$)
P2: Conservation	**0.23 ($p < 0.001$)**	−0.04 ($p = 0.250$)
P3: Timber production	−0.01 ($p = 0.730$)	0.08 ($p = 0.010$)
P4: Inheritance	0.07 ($p = 0.025$)	0.07 ($p = 0.021$)
R^2	**0.06 ($p < 0.001$)**	0.01 ($p = 0.005$)

Table 8 Interactions among the PC score variables of Q1 and Q4 in the imputed dataset (n = 1,032). Average squared canonical correlation = 0.05; Cohen's set correlation $R^2 = 0.14$. Statistically highly significant coefficients in bold ($p < 0.001$)

Q1: Motives for forest ownership	Q4: Perspectives concerning organic certification		
	P1: Positive	P2: Negative	P3: Don't know, no opinion
P1: Multiple-use, recreation	0.00 ($p = 0.980$)	0.04 ($p = 0.210$)	−0.04 ($p = 0.150$)
P2: Conservation	**0.37 ($p < 0.001$)**	0.04 ($p = 0.170$)	−0.01 ($p = 0.640$)
P3: Timber production	−0.04 ($p = 0.200$)	0.01 ($p = 0.860$)	−0.03 ($p = 0.320$)
P4: Inheritance	0.02 ($p = 0.480$)	0.04 ($p = 0.300$)	−0.01 ($p = 0.720$)
R^2	**0.13 ($p < 0.001$)**	0.00 ($p = 0.312$)	0.00 ($p = 0.489$)

Table 9 Interactions among the PC score variables of Q2 and Q3 in the imputed dataset (n = 1,032). Average squared canonical correlation = 0.08; Cohen's set correlation $R^2 = 0.16$. Statistically highly significant coefficients in bold ($p < 0.001$)

Q2: Perspectives concerning non-timber products	Q3: Perspectives concerning Everyman's Rights	
	P1: Positive	P2: Negative
P1: Permission	**0.27 ($p < 0.001$)**	**−0.10 ($p < 0.001$)**
P2: Additional knowledge	**0.22 ($p < 0.001$)**	0.00 ($p = 0.940$)
P3: Commercial use	−0.04 ($p = 0.130$)	0.01 ($p = 0.750$)
P4: Own use	**0.14 ($p < 0.001$)**	0.03 ($p = 0.270$)
R^2	**0.15 ($p < 0.001$)**	0.01 ($p = 0.016$)

owners think about NTFPs' production, Everyman's Rights, and the organic certification of forests.

Regarding forest ownership motives (Fig. 7), forest owners were divided into four typologies: Conservationists (C); Inheritance (I); Timber producers (T); and Multi-objective (M). Timber producers were a heterogeneous group, and their share was quite high in almost every Node. The biggest groups of timber producers lived on the forest holding and had undertaken cuttings recently (Node 10, the highest column, and a high number of respondents). Respondents who were women and did not live or lived only part of the year on the forest holding were usually timber producers or

Table 10 Interactions among the PC score variables of Q2 and Q4 in the imputed dataset (n = 1,032). Average squared canonical correlation = 0.10; Cohen's set correlation $R^2 = 0.28$. Statistically highly significant coefficients in bold ($p < 0.001$)

Q2: Perspectives concerning non-timber products	Q4: Perspectives concerning organic certification		
	P1: Positive	P2: Negative	P3: Don't know, no opinion
P1: Permission	−0.05 ($p = 0.089$)	0.01 ($p = 0.760$)	**0.30 ($p < 0.001$)**
P2: Additional knowledge	0.02 ($p = 0.480$)	−0.03 ($p = 0.290$)	**0.40 ($p < 0.001$)**
P3: Commercial use	−0.02 ($p = 0.510$)	0.05 ($p = 0.100$)	−0.02 ($p = 0.430$)
P4: Own use	**−0.10 ($p = 0.001$)**	**0.11 ($p < 0.001$)**	**0.09 ($p < 0.001$)**
R^2	0.01 ($p = 0.004$)	0.02 ($p = 0.002$)	**0.26 ($p < 0.001$)**

Table 11 Interactions among the PC score variables of Q3 and Q4 in the imputed dataset (n = 1,032). Average squared canonical correlation = 0.19; Cohen's set correlation $R^2 = 0.35$. Statistically highly significant coefficients in bold ($p < 0.001$)

Q3: Perspectives concerning Everyman's Rights	Q4: Perspectives concerning organic certification		
	P1: Positive	P2: Negative	P3: Don't know, no opinion
P1: Positive	**0.51 ($p < 0.001$)**	0.06 ($p = 0.058$)	0.04 ($p = 0.190$)
P2: Negative	**−0.16 ($p < 0.001$)**	**0.28 ($p < 0.001$)**	0.07 ($p = 0.034$)
R^2	**0.28 ($p < 0.001$)**	**0.08 ($p < 0.001$)**	0.01 ($p = 0.046$)

Table 12 K-means clustering solution obtained by the PC score variables of Q1 (n = 914). F-values reveal the contribution of the PC score variables in the clustering. The highest value per group and/or PC score variable in bold

PC score variable	Cluster 1: Motives for forest ownership				
	Conservationist (n = 204)	Inheritance (n = 261)	Timber producer (n = 263)	Multi-objective (n = 186)	$F_{3,910}$
P1: Multiple-use, recreation	−0.925	0.526	0.039	**0.221**	118.29
P2: Conservation	**0.404**	−0.287	0.666	−0.982	189.38
P3: Timber production	−0.864	0.102	**0.804**	−0.332	184.76
P4: Inheritance	0.238	**0.873**	−0.417	−0.896	242.23

conservationists (Node 3). Women who had undertaken cuttings recently and lived in the same municipality or in North Karelia but not on the holding were also usually timber producers (Node 13); but the number of respondents in this node was the smallest.

The share of the Inheritance group (i.e., owners who are resigning and leaving the forest property to the next generation) was highest in Node 12; these forest owners were men, lived in the same municipalities or in North Karelia, and had undertaken

Table 13 K-means clustering solution obtained by the PC score variables of Q2 (n = 970). F-values reveal the contribution of the PC score variables in the clustering. The highest value per group and/or PC score variable in bold

PC score variable	Cluster 2: Perspectives concerning non-timber products				
	Knowledge needed (n = 271)	Commercial picker (n = 207)	Household user (n = 313)	Permit provider (n = 179)	$F_{3,966}$
P1: Permission	− 0.714	0.270	0.479	**− 0.069**	97.78
P2: Additional knowledge	**0.609**	0.253	− 0.623	− 0.124	104.71
P3: Commercial use	− 0.500	**1.498**	− 0.426	− 0.230	519.41
P4: Own use	0.395	0.187	**0.473**	− 1.642	528.59

Table 14 K-means clustering solution obtained by the PC score variables of Q3 (n = 991). F-values reveal the contribution of the PC score variables in the clustering. The highest value per group and/or PC score variable in bold

PC score variable	Cluster 3: Perspectives concerning Everyman's Rights		
	Positive (n = 718)	Negative (n = 273)	$F_{3,989}$
P1: Positive	**0.450**	− 1.184	1,131.43
P2: Negative	− 0.183	**0.483**	96.17

Table 15 K-means clustering solution obtained by the PC score variables of Q4 (n = 826). F-values reveal the contribution of the PC score variables in the clustering. The highest value per group and/or PC score variable in bold

PC score variable	Cluster 4: Perspectives concerning organic certification			
	No opinion (n = 260)	Negative (n = 210)	Positive (n = 356)	$F_{3,823}$
P1: Positive	− 0.115	− 1.090	**0.727**	472.82
P2: Negative	0.033	**− 0.213**	0.101	6.85
P3: Don't know, no opinion	**1.131**	− 0.590	− 0.478	593.12

forest cuttings recently. Multi-objective users were more often men aged under 54 years who did not live or lived only part of the year on the holding (Node 5).

Regarding perspectives and utilisation of non-timber forest products (Fig. 8), forest owners were divided into four typology groups: Knowledge needed (Kn); Commercial pickers (PC); Household users (PH); and Permit providers (Per). In Ctree analysis, the group that needed additional information was large in almost all Nodes. Permit providers were well represented in Node 2. This group consisted of forest owners who had outsourced forest management or could not indicate their forest management practices. Forest owners who collected for personal use were the slightly bigger group in Node 5 in which forest owners undertook forest management themselves or did not manage forests at all. They live more than 60 km away

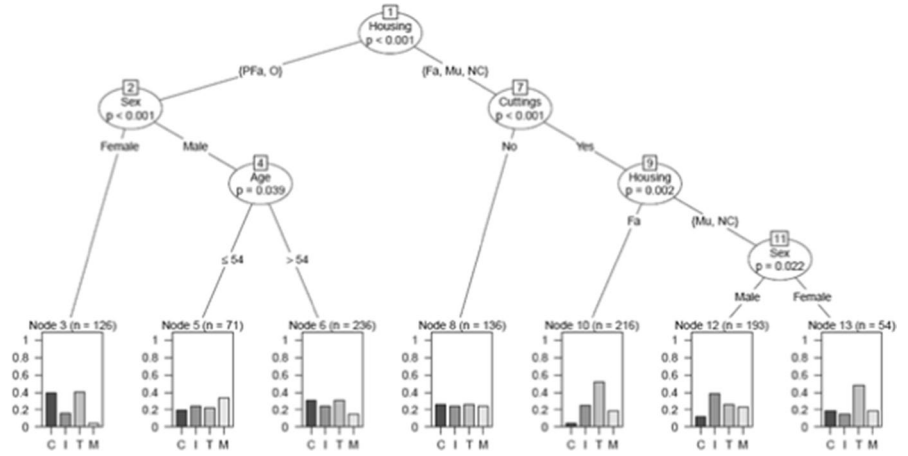

Fig. 7 Ctree analysis for Cluster 1, i.e., forest owner typologies for forest ownership motives: C = Conservationist; I = Inheritance; T = Timber producer; M = Multi-objective. Abbreviations: Housing: Fa = Directly on the holding; PFa = Part of year on the holding; Mu = In the same municipality; NC = In North Karelia; O = Elsewhere; Cuttings = Cuttings done during 2015–2018 (Yes or No)

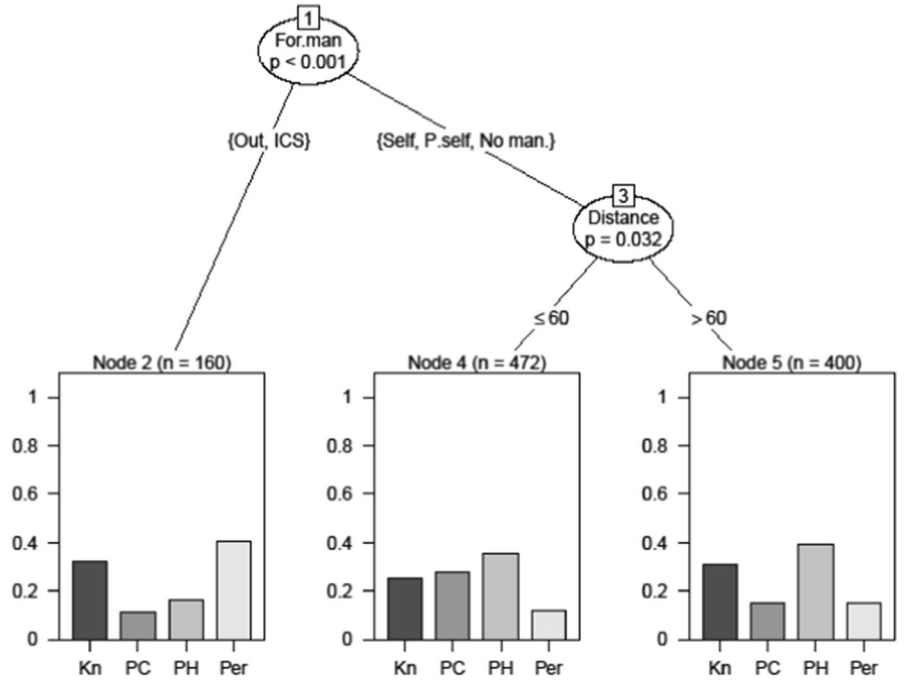

Fig. 8 Ctree analysis for Cluster 2, i.e., forest owner typologies for perspectives and utilisation of non-timber forest products: Kn = Knowledge needed; PC = Commercial picker; PH = Household user; Per = Permit provider. Abbreviations: Forest management (For.man); Out = Outsource; Self = Do myself; P.self = I do partly myself; No.man. = No management; ICS = I cannot say; Distance = Distance from the holding if the respondent did not live there

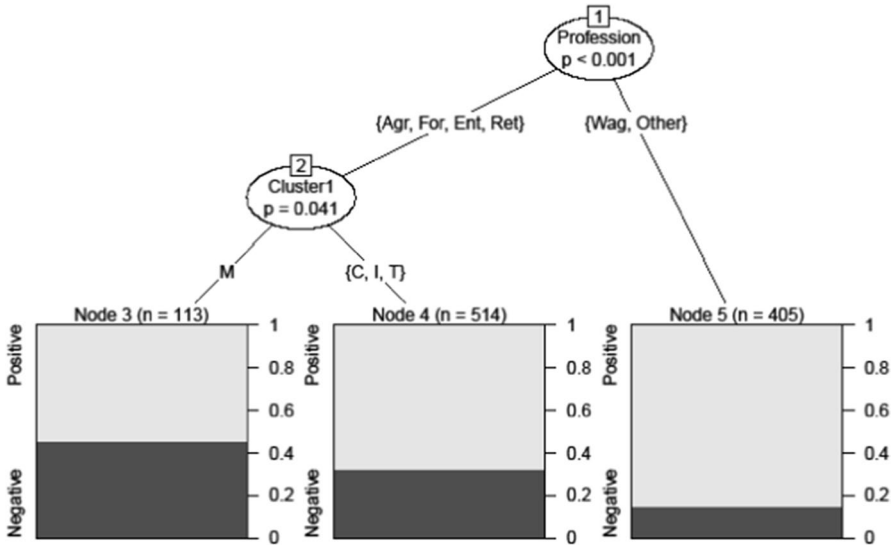

Fig. 9 Ctree analysis for Cluster 3, i.e., forest owner typologies regarding perspectives concerning Everyman's Rights: Negative or Positive. Abbreviations: Profession: Wag = Wage earners; Agr = Agricultural entrepreneur; For = Forestry entrepreneur; Ent = Other entrepreneur; Ret = Retired; Other = Other

from the holding. The group of Commercial pickers was bigger if they lived closer to the holding (Node 4).

Ctree analysis revealed that those forest owners who were wage earners, students, unemployed or people in nursing or job alternation leave (group other) had more positive perspectives concerning Everyman's Rights than entrepreneurs or those

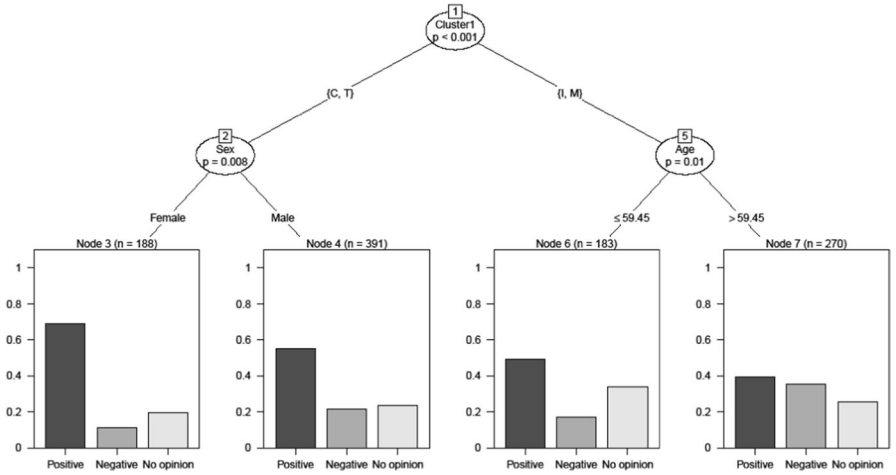

Fig. 10 Ctree analysis for Cluster 4, i.e., forest owner typologies regarding perspectives concerning organic certification of forest areas: Positive; Negative; or Don't know, no opinion

who were retired (Fig. 9). Of entrepreneurs or retired forest owners, whose motives were multifaceted (M in Cluster 1), had less positive perspectives concerning Everyman's Rights.

In general, positive perspectives concerning organic certification of forests were seen in all Nodes (Fig. 10). The most positive perspectives were in Node 3, in which forest owners were more often female and had conservation or timber production forest ownership motives (C or T in Cluster 1). The highest share of negative perspectives was found in Node 7, where forest owners had multifaceted or inheritance forest ownership motives and were over 60 years old.

Discussion

A better understanding of non-industrial private forest owners' behaviour and decision making regarding NTFPs is needed to promote NTFP production and supply, as well as to advocate for the organic certification of forest areas more effectively in Finland. In this study, forest owners' perspectives concerning NTFPs, Everyman's Rights, and the organic certification of forests were identified.

The survey data were collected from a region of Finland, North Karelia, which was chosen for this study based on the importance of NTFPs, especially berries and mushrooms (MARSI 2020), which may oppose some limitations to the generalisability of study results. The applied research method aptly served the study's aim, because it provided relevant information, even though the response rate remained low, which has been the case in some other surveys directed at northern Finland (e.g., Korhonen et al. 2004; Hallikainen et. al. 2010). Using electronic questionnaires, low response rate and the study's data collected from a certain district weaken the possibilities to generalise the results over the whole population. However, the observation of respondents' background variables revealed that the data aptly corresponds to the Forest Owner 2020-survey population. Due to the above-mentioned limitations, this study should be considered primarily as a case study that does not represent the whole population of Finnish forest owners. Widely used statistical methods (Ficko et al. 2019; see their discussion on the limitations of PCA and K-means) were applied to analyse the survey data. Further investigations to other geographical areas with different samples could further validate and improve the credibility of the study results.

Forest owner typologies were created to provide an understanding of the diversity of owners' forest ownership motives and perspectives concerning NTFPs. Regarding forest ownership motives, four owner groups of relatively equal size were identified as multiple-users and recreationists, conservationists, timber producers, and forest owners' leaving inheritance. All these owner groups are commonly found in European studies of private forest owners (Ficko et al. 2019, see also Hallikainen et al. 2010) and in North American ones (e.g., Kline et al. 2000; Majumdar et al. 2008; Song et al. 2014).

Classifying forest owners according to the use of NTFPs resulted in four groups of owners who harvested NTFPs for household use or sale, would allow the harvesting of NTFPs not covered by Everyman's Rights, or needed more information about

the joint production of timber and NTFPs not covered by Everyman's Rights. Most owners were household users. This result is supported by the finding that as many as 72% of the forest owners had a positive perspective concerning Everyman's Rights. However, our statements and forest owners' opinions on Everyman's Rights were partly contradicting or inconsistent (low values of Cronbach's alpha in Table 4). Also, Tahvanainen et al. (2016) revealed that forest owners were generally satisfied with the Everyman's Rights, about two out of three liked practises, but over third were dissatisfied with the use of Everyman's Rights. This may be due to increased commercial berry picking by foreign pickers and the public discussion surrounding this matter.

The relationships among forest owners' ownership motives and perspectives concerning NTFPs and the organic certification of forests were investigated. The results indicated that forest owners with multiple-use, recreation, and conservation motives for their forest harvested NTFPs for their own use. Furthermore, forest owners with multiple-use and recreation motives also harvested NTFPs for sale like timber production-oriented forest owners. These two groups of forest owners could be potential actors in the natural products sector for whom focusing on the development of NTFP production would be most beneficial. For many forest owners who have started an enterprise in the natural product sector, collecting NTFPs has been a hobby in the past (Weiss et al. 2019a; Muttilainen and Vilko 2022). For timber producers, financial motives are often the primary motivation, and they may see NTFPs as an opportunity to earn additional income, even annually, from the forest alongside timber production. For example, besides sawtimber production the needles of longleaf pine (*Pinus palustris*) raked for straw provide a new source of income for landowners in the southern United States (Susaeta and Gong 2019). In general, achieving a higher or additional income is the most frequently mentioned reason for starting a new entrepreneurship (Staniewski and Awruk 2015; Stephan et al. 2015), which was also seen in a study of forest owners' motives for moving into the natural products sector (Muttilainen and Vilko 2022).

Conservationists were an interesting group of forest owners who were the only ones who were positive (statistically significant) about Everyman's Rights and the organic certification of forests. Conservationists collected NTFPs for their own use but needed more information about NTFPs. Collecting NTFPs on their own—but possible also across other's land—for their own use clearly explains their positive perspectives concerning Everyman's Rights (Table 9). Why conservationists were the only motive group with positive perspectives concerning the organic certification of forests (Table 8) needs further discussion and study.

Forest owners who used their forests themselves or were willing to give permission to others to utilise them or needed more information about such use viewed Everyman's Rights positively, whereas commercial use collectors had more negative perspectives. Forest owners collecting NTFPs for sale may fear competition for raw materials, which Everyman's Rights allow. In general, forest owners consider Everyman's Rights to be good and acceptable, but in practical cases, especially in commercial collection, many forest owners are willing to restrict them (Sievänen and Neuvonen 2011; Peltola et al. 2014; Tahvanainen et al. 2016).

The study's results indicate that the organic certification of forests is a new thing for many, and additional information is needed before forming opinions on its use or agreeing to it. However, interest in organic certification was evident, especially among those whose perspectives concerning Everyman's Rights were positive. One third of the forest owners were willing to certify their forests as organic collection areas and it was seen as a positive phenomenon for multi-use of forests and a way to support bioeconomy and sustainable use of forests. However, to increase organic certification in forests, investment in information and communication for forest owners are essential measures to advocate the new form of forest utilisation.

Background of respondents played a role in how forest owners thought about NTFP production, Everyman's Rights, and the organic certification of forests. For example, the use of NTFPs were more familiar to those forest owners who were actively managing forests by themselves. However, the results also indicated that forest owners were heterogeneous with very different backgrounds in different groups. For example, forest owners with various backgrounds considered organic certification of collection areas as positive. Nevertheless, this study has brought a better understanding of the perspectives Finnish forest owners of certain backgrounds have. This knowledge can be used in directing development measures in Finland.

The results of the study cannot be generalised to other countries due to the case-specific nature of the study. To improve the generalisability the study should be conducted in another geographical location in Finland but in other countries as well. Further research should be focused on development measures about the implementation of NTFPs production.

Conclusion

The study revealed that although forest management is shifting towards multi-use and the bioeconomy on a large scale, joint production of NTFPs and wood is often a new thing for forest owners, and more information is required to enable an increase of NTFP production and the implementation of joint production in forest management. In general, forests are used in multiple ways in accordance with forest owners' own uses and perspectives concerning NTFPs. Perspectives concerning NTFPs are basically positive. However, professional NTFP production would be more appropriate for certain groups of forest owners. Timber producers see the economic potential of NTFP production when multiple users can benefit from combining hobbies and financial advantages. The organic certification of forests aroused interest, e.g., timber producers saw potential in it, possibly in the form of added value. However, considerably more information is needed about organic certification of forests, so information will play a major role in expanding areas and increasing exploitation. Recognition of forest owner types and addressing shortcomings will help in understanding their activities and thus guide policymakers and managers in better allocating resources.

The study draws an overall picture, increasing the understanding of the various factors involved in forest owners' decision making and behaviour concerning NTFPs, Everyman's Rights, and organic certification of forests. From a management perspective, the results can be utilised to promote NTFP production and advocate for the more effective organic certification of forests for different forest owner groups, like promoting financial benefits of NTFPs for timber producers or advertising organic certification of forest areas for those who concerned Everyman's Rights positively.

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