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Non-Timber Forest Products: Potential for Sustainable and Equitable Development In Ontario, Canada

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Abstract

The contribution of non-timber forest products (NTFPs) to community sustainability remains an understudied topic of academic inquiry. Focusing on southern and central Ontario, Canada, the ways in which NTFPs may contribute to sustainable livelihoods are explored, along with how a fragmented sociopolitical landscape and the potential impacts of climate change might impede the development of the sector. Following interviews with twenty NTFP producers, four key themes highlighting the major challenges and opportunities are discussed. This paper contends that for an economically viable, socially just and environmentally sustainable NTFP industry to emerge, political-ecological power relations informed by critical social and environmental justice thinking must be understood and addressed.

Keywords: non-timber forest product, wild edibles, livelihood, value added, sustainable development, climate change, ecosystem management, rural policy

Produits forestiers non-ligneux : potentiel de développement durable et équitable en Ontario, au Canada

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Résumé

La contribution des produits forestiers non ligneux (PFNL) à la durabilité des communautés reste un sujet sous-étudié de la recherche universitaire. En se concentrant sur le sud et le centre de l'Ontario, au Canada, les façons dont les PFNL peuvent contribuer à des moyens de subsistance durables sont explorées, ainsi que la façon dont un paysage sociopolitique fragmenté et les impacts potentiels du changement climatique pourraient entraver le développement du secteur. Suite à des entretiens avec vingt producteurs de PFNL, quatre thèmes clés mettant en évidence les principaux défis et opportunités sont discutés. Cet article soutient que pour qu'émerge une industrie des PFNL économiquement viable, socialement juste et durable sur le plan environnemental, les relations de pouvoir politico-écologiques éclairées par une réflexion critique sur la justice sociale et environnementale doivent être comprises et traitées.

Mots-clés : produit forestier non ligneux, comestibles sauvages, moyens de subsistance, valeur ajoutée, développement durable, changement climatique, gestion des écosystèmes, politique rurale

1.0 Introduction

Non-timber forest products (NTFPs) can be defined as “all of the botanical and mycological resources of the forest other than conventional timber products” (Cocksedge et al., 2007, p. 58). Worldwide, there are between 3.5 billion and 5.76 billion users of NTFPs, with an equal split between the Global North and South and encompassing rural, peri-urban and urban regions. This high global NTFP use demands that the social and environmental services provided are more fully acknowledged and “that the supply, management, conservation and safeguarding of NTFPs take a more central place in sectoral and development policies” (Shackleton

& de Vos, 2022, p. 1). Several authors argue that where NTFPs are developed in a sustainable and equitable manner, they have the potential to support and enhance livelihoods (Belcher et al., 2010; Murphy et al., 2017; Shackleton et al., 2011). The purpose of this paper is to explore the potential of NTFPs to contribute to sustainable livelihoods in southern and central Ontario, Canada.

Especially in the face of broader shocks such as climate change, deforestation and urbanization, the potential contribution of NTFPs to community sustainability remains an understudied academic topic, particularly in a North American context (Shackleton & de Vos, 2022). The contribution to the sustainability of commercially well-established NTFPs such as maple syrup is somewhat better understood (Murphy et al., 2017); however, these are a small subset of the sheer abundance of botanical products harvested from Ontario's forests. The range of NTFPs in Ontario includes forest-based foods such as saps and syrups, berries, nuts, fungi and native understory plants; health and personal care products such as medicinal herbs and essential oils; decorative and artistic products such as Christmas trees, wreaths, traditional crafts and floral greenery; as well as value-added ecotourism activities such as guided foraging hikes and educational wildcrafting workshops.

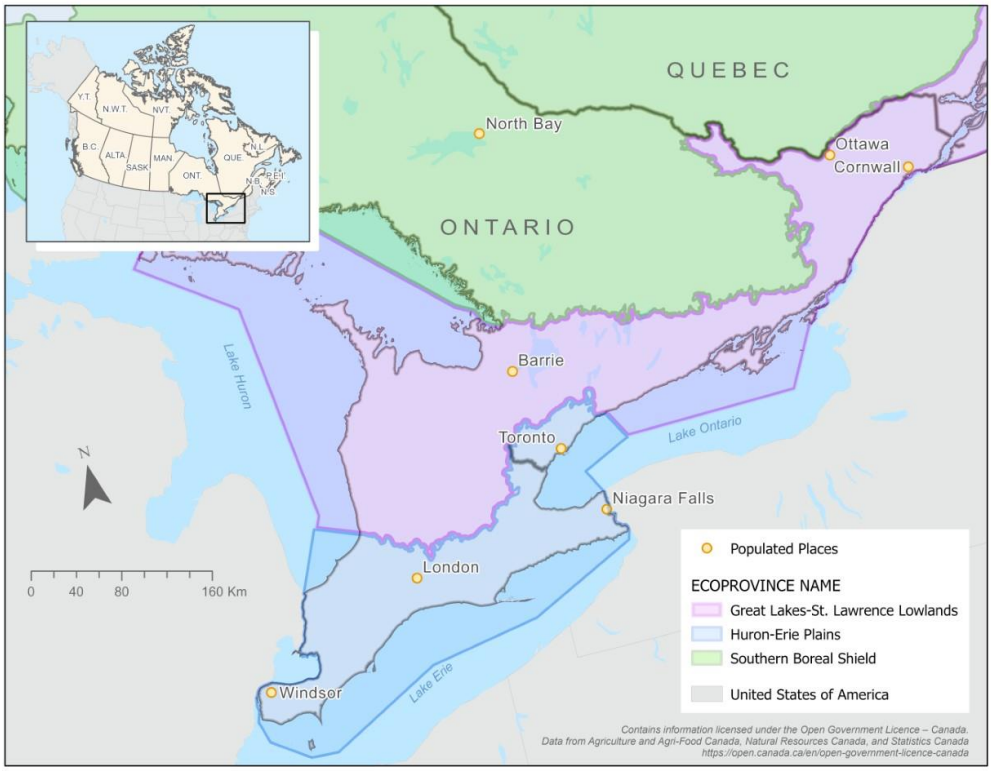
The management of multiple forest uses in Canada mirrors that of regulatory frameworks on a global scale, wherein non-timber resources have largely been ignored and overlooked by government authorities, forest managers, and landowners and regulations are largely inconsistent and reactive (Laird et al., 2010). Seeking to create new opportunities for local forest management, the Ontario Forest Tenure Modernization Act (2011) marked an improvement for multiple-use forestry since it opened the door for non-timber values (Boulet et al., 2014). Still, both the Ontario Ministry of Natural Resources and Forestry and the Ontario Ministry of Agriculture, Food and Rural Affairs have shown limited interest in NTFPs even though these resources serve as a direct local food source in many rural communities, often providing economic opportunities such as seasonal employment at forest food entrepreneurial cooperatives (Stolz et al., 2017). Aside from commercially well-established products such as maple syrup, little regulatory incentives currently exist with respect to business support, training, and information facilitation and limited sector collaboration—internal or external—is present, particularly when it comes to the foraging of wild plants and berries (Boulet et al., 2014).

Prior research in the province of Ontario has heavily focused on northern rural and First Nations communities situated in the boreal forest region (Davidson-Hunt et al., 2013; Milne, 2013; Pengelly & Davidson-Hunt, 2012). Accordingly, this paper highlights a range of perspectives among largely invisible gatherers and producers focusing on peri- and semi-urban localities in central and southern Ontario. This area is considered part of the St. Lawrence Lowlands and is characterized by highly fragmented and urbanized deciduous forests transitioning northward into the coniferous forests and lower population densities on the Canadian Shield (see Figure 1).

In the next section of the paper, we explore the concept of sustainable livelihoods and provide more detail about the Ontario context. We then outline the methods and results in subsequent sections. We identify the ways in which NTFPs may contribute to sustainable livelihoods and explore how a fractured and uneven political landscape and the potential impacts of climate change might impede the development of the sector. Given limited scholarly attention regarding the power-laden political, ecological and justice contexts of those who harvest, produce and

benefit from these resources (Charnley et al., 2018), in the concluding comments we signal the likely environmental justice issues that need further research.

Figure 1. Area of Study: Central and Southern Ontario



Source: T. King, 2022, Wilfrid Laurier University, Waterloo, Ontario.

2.0 Sustainable Livelihoods, NTFPs and the Ontario Context

Livelihood can be broadly defined as "a means of living, and the capabilities, assets and activities required for it" (Chambers & Conway, 1992, p. 25). Livelihoods have often been measured in relation to people's access to a stock of assets (capital)—financial, physical, natural, human, and social—that can accumulate over time (Quandt, 2018). Sustainable and resilient livelihood approaches that embrace equity considerations move beyond these outcome-based metrics to also examine a range of processes, including sociocultural power, justice, human agency, and human-ecological relationships. They assess how communities and households are embedded in uneven structural contexts that can limit access to assets and livelihoods while also recognizing that people have agency in pursuing their individual and collective goals (Charnley et al., 2018). A sustainable livelihood orientation also considers the capacity to prepare for, and cope with, such shocks as climate change, price fluctuations and political instability (Jones et al., 2021; Quandt, 2018). Since sustainable livelihoods depend on a balance between meeting human and non-human needs, NTFPs provide an excellent case study of sustainable livelihood relationships, with forests intimately connected to the social groups who use, transform, and manage them (de Mello et al., 2020).

In Western economies, the term 'non-timber' itself demonstrates the perceived secondary role these products play in scientific management models and forest policy. NTFPs typically retain some relevance within forestry practices when they do not harm timber production, there is industrial demand or when it is of national importance (Wong & Wiersum, 2019). Yet, Baumflek and Chamberlain (2019) state that NTFPs can be cultural keystones, playing a fundamentally important role in shaping the identity of a group of people. These emblematic species can also enhance a region's trademark and tourism strategies (Schunko & Vogl, 2018). Further, the high participation in NTFP use globally requires that frameworks and studies on human-nature interactions ensure that the provisioning and cultural services provided by NTFPs are accounted for (Frey et al., 2019; Shackleton & de Vos, 2022).

The NTFP sector provides various levels of personal, subsistence and financial resources which can help smooth food access and income over seasonal, inter-annual or life cycle variations, serving as a livelihood diversification strategy, particularly for people who lack access to formal economic and political institutions (Kruger et al., 2020). NTFPs support social capital, spirituality and culture through harvester networks, gift giving (e.g., jam), knowledge exchange, rituals, festivals, fundraising and other celebrations. NTFP harvesting may provide access to culturally appropriate goods and activities, strengthen the sense of place, and support better health by providing nutritious food, medicines, and exercise (Chamberlain et al., 2018; Jones et al., 2021). Harvesting NTFPs can strengthen ecological knowledge and deepen connections to nature. Through these mechanisms, NTFPs have the potential to address societal inequities and contribute to personal fulfillment, independence, autonomy, food security and sovereignty while leaving forests relatively intact (de Mello et al., 2020; Jones et al., 2021).

Indigenous peoples have used forest species for food and medicine since long before European colonization. However, limited access to land and resources has reduced Indigenous peoples' capacity to maintain NTFP-based practices and identities. "Many indigenous people struggle to maintain livelihoods that support material well-being while honouring cultural teachings about right relationships among human beings and between humans and the nonhuman world" (Chamberlain et al., 2018, p. 91). In Ontario, an American-Canadian media analysis focused on ramps (*Allium tricoccum* Aiton) found that Indigenous foraging and uses were virtually invisible despite ramps continuing to be a vital food and medicine, with groups having distinctive harvesting practices based on traditional knowledge that may promote sustainability (Baumflek & Chamberlain, 2019). Many are reviving ways of knowing and cultural practices through NTFP harvesting. NTFPs provide inputs for culturally appropriate livelihood strategies, materials for spiritual and ceremonial observances, occasions for sharing stories and teachings, conservation of Indigenous knowledge, connections to nature, and support health strategies to reduce rates of nutritionally related diseases such as diabetes (Chamberlain et al., 2018).

NTFP species contribute to the structural, compositional, and functional diversity within forests and to ecosystem-level processes and services such as water quality and quantity, erosion control, carbon capture, recreation, and landscape values. NTFP ecosystems are impacted by both micro- and macro-scale processes, such as human and herbivore harvesting pressure, insecure land tenure, urbanization and fragmentation, energy development, climate change, invasive species, forest pathogens and wildland fire (Jones et al., 2021; Pomara & Lee, 2021). Although the potential for NTFPs to be exploited remains an ongoing conservation risk, especially

for species that are in high demand (Kruger et al., 2020), attributing declining plant populations to overharvesting downloads the blame onto foragers and deflects discussion away from the role of these wider social-ecological pressures (Jones et al., 2021). Harvesters, especially those with extensive experience, have been documented to adhere to a set of ethical principles that can contribute to sustainability, including rotating gathering sites, regulating harvest intensity and frequency, and minimizing stress to plants by harvesting at appropriate times (Chamberlain et al., 2018).

The extent to which NTFPs may contribute to sustainable livelihoods is dependent on a range of sociopolitical contexts, including access and permission to harvest preferred species, investments in knowledge acquisition, availability of information about potential markets, and whether NTFP species availability matches household needs (Pandey et al., 2016). Beyond private property, access to harvesting sites can be complicated by a patchwork of open access government policies, verbal agreements with landowners and more formal permits. NTFPs can be wild-harvested, forest-farmed with some interventions or actively propagated as agri-forestry crops (Frey et al., 2019; Pandey et al., 2016).

Wild harvesters have been documented to be from low-income and marginalized communities, often located in rural or remote locations experiencing economic distress (e.g., mine closure). They "may not have the interest or organizational, educational, or economic capacity to participate in forest management decisions that directly affect their lives and livelihoods and for the benefit of the forests they harvest" (Chamberlain et al., 2018, p. 110). They are less likely to own land suitable for foraging, have less capital to invest and may be more dependent on their NTFP income as an emergency income source (Chamberlain et al., 2018; Jones et al., 2021; Kruger et al., 2020). Workers tend to receive lower incomes (often as cash), with few, if any, benefits and may experience difficult, unsafe working conditions (e.g., injuries, theft). There may be inter-harvester conflict, especially when the demand for a particular NTFP outstrips local supplies or when a species' population is decimated by logging or other disturbances (Pandey et al., 2016).

Although NTFPs are accessed worldwide, relatively little is known about the organization of NTFP markets, their commercial value, or their contribution to local and regional economies. Most NTFPs are harvested informally for personal and subsistence uses and are not systematically tracked by capital markets, trade associations or governments. Secrecy plays into the limited knowledge as industry participants may not trust authorities or may not want to divulge species' locations (Frey et al., 2019). Involvement in the informal market requires less knowledge and investment, there may be less state oversight, and participants have more agency over their time and labour. Those in the informal market often work in the sector part-time and rarely rely on NTFPs for one hundred percent of their income. They may decline to participate in the formal market because of small harvests, the complexity of business or employment regulations, lack of legal work authorization, avoidance of income reporting or wanting to maintain government assistance (Kruger et al., 2020).

In terms of the supply chain, NTFPs can be consumed as harvested (e.g., eating cranberries), transformed into a value-added product (e.g., cranberry juice) or used as an input into another product (e.g., cranberry muffin). Only when a product is sold does it become part of the formal market. Formal markets have more clearly delineated supply chains and regulatory and reporting structures. Most NTFP

commercial businesses are small, employing one to two people, with owners often reporting low profit margins. Perishability and seasonality may impact market scale and player commitment to particular NTFP products (Frey et al., 2019).

While Weiss et al. (2019) argue that NTFPs could play a more significant role in rural development along the supply chain, these products face several institutional challenges. Since NTFPs often provide a secondary income or serve non-market functions, there tends to be limited ecological and user data to inform policy, and there is little institutional support for entrepreneurs and innovative business development. Sustainability obstacles include a fragmented and complex regulatory landscape, the absence of clear regulations, inconsistent rule enforcement and poor governance practices (de Mello et al., 2020; Weiss et al., 2019). Since NTFPs are often accessed on public land, it is difficult to monitor and control harvesting practices (Chamberlain et al., 2018). Further, different user groups may have different rights and requirements, and land managers and harvesters may have different understandings regarding what constitutes sustainable harvesting practices (Frey et al., 2021).

Although there is considerable uncertainty about projections and impacts, climate change may affect NTFP's utility to sustainable livelihoods, including stress on small business profits, seasonal employment, social cohesion, and well-being. Climatic variability adds the risk of price pressures for scarce NTFPs, the imposition of regulatory barriers due to reduced NTFP availability, and changes to the costs of obtaining NTFPs. Increased food insecurity will likely be more pronounced for subsistence practitioners or those who rely on NTFPs for their dietary needs and for full-time commercial harvesters who rely on NTFPs as their only source of income. Further, loss of species and biological diversity may occur if environmental changes outpace the ability to adapt (Emery et al., 2018).

Across the Great Lakes region, which includes southern Ontario and the more southern reaches of central Ontario, climate change is expected to lead to shorter, warmer winters, longer growing seasons, lower soil moisture, increasing droughts and wildfires, the amplification of existing stressors and the northward shift of forest species ranges. Further north, boreal forests are considered to be highly vulnerable to climate change since species may not be able to adapt quickly enough, and species' colonization of new areas may be limited by landscape fragmentation (Chamberlain et al., 2018; Emery et al., 2018). Despite challenges, climatic variability may bring about new opportunities as changing conditions may reduce the range and abundance of some species while favouring the presence of others (Chamberlain et al., 2018).

From a sustainable livelihood perspective, adaptation will be a function of the intensity, speed and duration of the ecological changes and the capacity of social systems to respond to these changes. While Indigenous peoples' history of adaptation to change may mean that they have the knowledge and wisdom needed to inform adaptation efforts, the ecological shifts may impact their access to NTFPs as a social, cultural and economic resource (Emery et al., 2018).

2.1 Ontario Context

Crown forest tenures in Canada provide rights to harvest timber on public land, although some small tenures include licences to harvest NTFPs and manage for multiple forest use (Haley & Nelson, 2007). Provincial legislation in Ontario

restricting and prohibiting access to NTFPs include the Endangered Species Act, 2007; the Parks and Conservation Reserves Act, 2006; and the Wilderness Areas Act, 1990. Federal legislation affecting access includes the Canada National Parks Act, 2000, and the Species at Risk Act, 2002. The collection of northern wild rice (*Zizania palustris*) and southern wild rice (*Zizania aquatica*) on Crown land is regulated under the Wild Rice Harvesting Act, 1990. This is one of few pieces of legislation in Ontario that exists which directly regulates and explicitly defines access rights for the harvest of NTFPs (Boulet et al., 2014). The act arose following conflict between subsistence and commercial harvesters. The Ontario Ministry of Natural Resources and Forestry issues licensees either a Land Use Permit or a Licence of Occupation for harvesting wild rice on Crown land.

Ontario's Free Use Policy for foraging on Crown land allows for transient use and personal harvesting of NTFP species that are not regulated under the Crown Forest Sustainability Act, 1994. The Free Use Policy requires that harvesting activities be undertaken in an "ecologically and socially sound" manner, but what constitutes foraging in this manner is not explicitly defined, and no further detail is given on what this means in practice (Boulet et al., 2014, p. 15; Jones & James, 2015, p. 10). Furthermore, as many NTFPs are not explicitly mentioned in statutes and regulations concerning the inspection, packaging, grading, and marketing of foods, producers struggle to navigate a fuzzy legal landscape (Jones & James, 2015).

3.0 Methods and Data Collection

In July and August 2018, sixteen semi-structured audio-recorded interviews were conducted with NTFP producers and knowledge holders from various localities across southern and central Ontario. A total of twenty participants were recruited by means of a purposive sampling methodology involving website searches, emails, phone calls and referrals. Four of the interviews were carried out together with either a spouse or significant other.

Purposive sampling was utilized for recruitment because it was essential that participants meet specific criteria: (a) living within the province of Ontario, (b) being eighteen years of age or older, and (c) having knowledge of NTFPs. Ethics approval for the study was granted by the university's ethics board (file # 5755) which emphasizes, among other things, the principle of informed consent. Eleven participants were female, and nine were male, all varying in age. Two participants identified as Indigenous (First Nations, Métis, or Inuit) to North America. Thirteen interviews were conducted in person, and three were held via telephone. Interviews varied in length from forty-five minutes to ninety minutes. Interviews were manually transcribed and entered into NVivo (version 12) qualitative software for thematic analysis (e.g., Jackson & Bazeley, 2019).

There was considerable overlap in the diverse, self-identified roles among participants, with informants falling into six overlapping main groupings. Interviewees comprised sixteen association members, eleven business owners, ten recreational harvesters, seven wild food educators, two Indigenous knowledge holders, and one provincial government industry expert. Business owners, those part of the formal NTFP market, included participants who sold their product directly or indirectly to the public via a farmhouse, storefront, market garden, supermarket, website, farmers' market, seasonal festival, food show, cooperative, or other creative means. These commercial enterprises took the form of either a sole proprietorship, partnership, joint venture, or incorporated entity and were clearly engaged in an

entrepreneurial activity with either paid staff or volunteers. Recreational harvesters included participants who informally foraged for leisure or personal use. Wild food educators included individuals who sold or volunteered their time and knowledge in the form of indoor or outdoor educational experiences (e.g., community events such as guided hikes and hands-on workshops). Educational activities ranged from small meetings with less than five individuals to upwards of twenty people in formal classroom settings, including community colleges, outdoor centres, wilderness survival schools, community gardens and other community groups. Wild food educators were involved in botanical identification, consulting, herbal medicine preparation workshops, as well as traditional living and herbalism skills classes.

With the exception of the government industry expert, informants undertook their activities across a range of public and private spaces. Two respondents exclusively carried out their harvesting activities on Ontario public land. Seven participants stated that they foraged primarily on private property, and six interviewees specified that they collected NTFPs from both private and public lands. Eight participants engaged in 'farming' practices on their properties, growing and/or producing NTFPs for sale. Seven respondents considered themselves to be wildcrafters wherein these individuals relied on other lands (public or private) and did not use or seldom used their own privately held properties for collection purposes.

Deliberately covering a range of both agri-forestry and wild-crafted products, a variety of NTFPs were the focus of this study, including food, health and personal care, decorative and aesthetic products as well as ecotourism services. Food products predominated in the data, given our interest in the potential for sustainable livelihoods and that most prospective study participants initially contacted were individuals who harvested edible NTFPs. Included in the study were two maple/birch syrup producers, one cranberry grower, one recreational wild blueberry picker, one professional wild blueberry harvester, one artisan wild food producer, and one nut grower. Other participants included three Christmas tree farmers, one botanical skincare entrepreneur and one native species tree and plant grower. Loosely speaking, several professional, non- and semi-professional foragers and educational wildcrafters collecting both edible and non-edible NTFPs rounded out our sample.

The findings of this exploratory study are preliminary in nature, and there are limitations that should be considered. Firstly, the sample size is small and may be skewed towards those who were willing to speak about their activities. The sample was also likely biased towards those who wanted to discuss sustainable practices, and these individuals may have been less forthcoming about activities undertaken that could be deemed less 'environmentally friendly' (if any). Secondly, the timing of data collection may have affected the research findings since interviews were conducted during the busy summer picking season and maintaining contact with prospective study participants proved to be quite challenging at times.

4.0 Results

The four themes reviewed in this section were developed primarily through a deductive process guided by the literature review, in combination with inductive coding of emerging ideas. The first two themes represent more immediate livelihood concerns, while the final two broaden the discussion to include societal and dynamic structures and processes. All perspectives are paraphrased to align with ethics board policies.

4.1 Theme 1: Enhancing and Sustaining Livelihoods

For some study participants, NTFP harvesting was their sole source of income. For others, it represented nothing more than a hobby lifestyle with no economic benefit whatsoever. In terms of measuring monetary benefits derived from market sales, at three locations participants stated that NTFP harvesting accounted for 100% of their household income; for one location it accounted for 50%; for two locations somewhere less than 50%; for three locations around 20%; for four locations it contributed 10%; and at two locations the NTFP gathering accounted for close to nothing in terms of financial benefit. There appeared to be no discernable patterns regarding which type of product was more tied to higher incomes, and association membership did not appear to be a factor.

Offering an opportunity to diversify their revenue sources, cash sales of NTFPs were viewed as a safety-net function and diversification strategy for eleven participants. Three interviewees expressed that NTFPs were a growing source of their income and expected their NTFP revenue streams to considerably expand in years to come. For example, a Christmas tree grower stated that agritourism and other value-added activities on her farm might account for the family's sole source of income in the next five to ten years. Additionally, a maple syrup producer stated that birch sap and syrup had the potential to represent half of his business income in the near future. All participants, apart from the government industry expert, demonstrated a myriad of value-added pursuits that enhanced the value of their NTFP activities (see Table 1).

Aside from financial contributions to participants' livelihoods, social and cultural aspects of NTFP harvesting also proved significant. A sense of tradition and the importance of family, generational values, spiritual well-being, and an overall concern for future generations were concepts that emerged. Ten respondents regarded their NTFP activities as not just 'work' in the conventional sense; it was a lifestyle of social labour built through lived experiences passed down from generations of paid or unpaid, formal or informal labour that contributed positively to their livelihoods. Eight participants specifically mentioned that experience with NTFPs had allowed them to raise their family in a setting whereby they could instill their own sociocultural and environmental values in their children. Five interviewees' children were actively involved in NTFP activities, and two participants anticipated their children to one day take over their business.

NTFP harvesting contributed positively to participants' perceived physical and mental health. Thirteen respondents expressed a deep sense of pride and empowerment in being able to use their botanical knowledge to carry out their foraging activities, and ten interviewees felt compelled to share their knowledge with others. Perceived health impacts transcended the individual level to include much broader discussions of healthy communities, which were particularly significant for the two Indigenous participants.

Since time immemorial, Indigenous peoples have used NTFPs for their cultural, social, and economic welfare. Not surprisingly, the social and cultural aspects of harvesting were especially noteworthy and distinct among Indigenous harvesters, as NTFPs served a myriad of medicinal, ceremonial, and spiritual purposes. The two Indigenous respondents were cautiously optimistic with respect to the revitalization of Indigenous culture and the intergenerational sharing of traditional ecological knowledge through NTFP activities, noting that legacies of colonialism have shaped not only the physical practice of NTFP gathering but also the culture around

foraging. Indigenous interviewees shared their concerns about how younger generations have been disadvantaged in terms of learning from their families and communities, mainly due to legacies of social and environmental harms produced by settler colonialism which have continued into the present through intra- and inter-generational forms of trauma. As McGregor et al. (2020) argue, Indigenous peoples in North America have been concerned about environmental destruction since European arrival five centuries ago. Consistent with study results from Kim et al. (2012), with the cultural transmission of knowledge largely diminished by Western culture, NTFPs serve as a way "of putting traditional ecological knowledge into action" (p. 40) for Indigenous communities and as a "tangible means of passing traditional knowledge from generation to generation" (p. 45) to bolster contemporary indigeneity and cultural belonging, Indigenous identities, worldviews, and ways of living.

Table 1: *Value-Added Contributions to Sustainable Livelihoods*

NTFP Product	**Value-Added Pursuits**
Christmas trees	Handcrafted wreaths, swags, bough bundles, and other decorative items; campfire pits and games available for visitors; pony rides and access to other barnyard animals; opportunity for professional photographers and clients to meet on the property
Maple/birch sap	Birch water, smoked maple sausages, birch candies, and chocolate
Cranberries	Wine, ciders, juice, dried berries, herbal teas, spice mixes, desserts, baked goods, and cookbooks; guided farm tours, tutored wine tastings, 'cranberry plunge' photography sessions; ice-skating and snowshoeing activities in the offseason
Nuts	Harvest tools, industry-themed books, and practical guides
Native species grower	Honey, soap bars, and beeswax candles
Artisan wild food	Elderberry syrup, bitters, cocktail and mocktail mixers, infused vinegars, and spices; handcrafted jewelry; ecotourism experiences such as herbal medicine classes and edible plant walks
Botanical skincare	Facial creams, face serums, body butters, oils, baby powder, aromatherapy sprays, lip balm, bath salts, and facial mists and steam kits
Wild blueberries	Jams, jellies, spreads, preserves, and baked goods
Wild food educators	Original recipe books and plant-identification guides; guided hikes, 'weed walks,' and wild food presentations
Other	Recreational harvesters created soups, salad greens, dressings, marinades, fermented foods, jams, pastries, beverages, and other food products

4.2 Theme 2: Sustainability Concerns and Stewardship Practices

Eight respondents worried about the intensive commercialization and overharvesting of some highly sought-after forest foods by wild food purveyors, which can create pressures on individual species and local ecosystems. Four participants explicitly expressed concerns over the unsustainable exploitation of wild leeks (*Allium tricoccum*). Similar to research findings from Charnley et al. (2018), five respondents feared that the broader population would not have the knowledge, skills, ability or ethics to gather sustainably, and three participants echoed concerns in line with McLain et al. (2017) that foraging gaining popularity as a mainstream activity may bring new, less experienced pickers who lack the extensive ecological knowledge that long-term foragers have acquired over generations. When speaking about sustainable production and the development of new markets across Ontario, the government industry expert voiced what he described to be profit-motivated greed on the part of wild food purveyors, middlemen and end users. Fearing that NTFPs are in danger of being exploited and that many forest resources would outright disappear (e.g., wild berries, mushrooms), the respondent stressed the need for close monitoring, regulation, and oversight of NTFPs in general—particularly as niche markets gain momentum and public awareness increases. In contrast to these sentiments, a wild food educator passionately stated that these fears are largely overblown and reiterated that most people do not have the inclination, impetus, or desire to go out into wooded areas to pick, let alone have the collective business acumen or personnel to exert enough pressure to make a significant dent in a given species' population. In this vein, the professional wild blueberry harvester and the recreational wild blueberry picker reported that, generally, there is an abundance of berries, and those who are picking are getting older, resulting in a noticeable decline in the number of pickers each year. To fill these generational gaps, tackle the presence of fewer pickers, and combat the labour shortage in central and near north regions, the professional wild blueberry harvester noted his current reliance on migrant workers and first- and second-generation immigrants.

By and large, interviewees reported that they engage in a variety of intentional stewardship practices and genuinely seemed to care about the health and regeneration of the resource, ecosystem, and land base from which they harvested. Consistent with findings from the broader foraging literature (Charnley et al., 2018; McLain et al., 2017), gatherers participate in numerous precautions to minimize ecological damage and take active steps to enhance plant health. When speaking about these voluntary acts of stewardship, respondents conveyed that their decisions were generally based on what they felt were morally appropriate things to do (i.e., choices built around their own personal sense of ethics and informed by past positive or negative experiences). These voluntary codes of conduct and individual judgement calls included: choosing harvesting sites carefully to avoid disturbing forest ecosystems that they perceive may be under threat; changing locations if they notice that their activities or the activities of others are negatively impacting the landscape; and limiting their harvest volumes, especially in areas where they observe native species population declines. Two personal-use foragers specifically mentioned the "ten percent rule," a self-imposed ethical wild harvesting guideline dictating that they shall take no more than ten percent of any abundant product in a given area—invasive species being an exception to this rule—both to help offset local land pressures and to leave some behind for other foragers. Three invasives

regularly picked were garlic mustard (*Alliaria petiolata*), European stinging nettle (*U. dioica* subsp. *dioica*), and Japanese knotweed (*Fallopia japonica*).

Some participants spoke of the real and/or perceived positive ecological impacts their harvesting activities had on their frequently visited harvesting sites, citing responsible foraging techniques as assisting in this regard. For example, four wildcrafters specifically referred to practicing a "leaf only" picking technique when foraging wild leek. By only removing a few leaves and refraining from digging the bulb out of the soil, foragers ensured the health of the patch for next year's harvest. Spreading seeds of certain plants they worked with was also a common practice.

Respondents growing NTFPs on privately owned farms also discussed positive environmental impacts. The cranberry farmer stressed the compatibility of cranberry growing with natural wetland preservation. For example, a wetland species conservation project has conducted staff training, educational outreach and species monitoring on her farm for several years. Additionally, all three Christmas tree growers spoke of increased biodiversity on their properties as well as the benefits of carbon sequestration in peri-urban areas. Christmas tree farmers also mentioned having to combat environmental misconceptions about the industry. Their view was that when visiting a Christmas tree farm, consumers are not taking a tree from nature without replacement because the crop is raised for that specific purpose. In other words, these trees are meant to be cut and are sustainably designed for the sole purpose of consumption and afterwards can be transformed into mulch or compost at regional recycling centres. The use of pesticides was also discussed among the Christmas tree growers and the nut grower in our sample. These participants communicated that they spray their crops minimally.

Contrary to the broader NTFP literature, access to products was of minor concern, as the vast majority of participants had little to no issues accessing NTFPs. Harvesters accessed NTFPs through formal lease agreements with government to tap trees on public land, to informal verbal agreements to pick berries on private property. Of those who sometimes had difficulty accessing NTFPs, common concerns expressed by a few participants included increasing industrial and residential development swallowing up previously accessible harvesting areas, municipal by-laws prohibiting foraging in parks and other public greenspaces, as well as trouble obtaining explicit permission from private landowners and city administrators. Despite some accessibility challenges, participants seeking to locate, collect and/or produce specific species persevered and were generally able to access the product with few stumbling blocks. Two interviewees of differing backgrounds—a recreational botanical forager and a wild blueberry retailer—both expressed the desire for an NTFP permitting system whereby experienced pickers could become licenced stewards of local ecosystems.

4.3 Theme 3: Climate Change, Extreme Weather and Adaptation

As far as extreme weather events were concerned, many respondents stated that temperature fluctuations and unpredictable weather patterns (e.g., drought, flooding, windstorms) over the past few years, in particular, have negatively affected the quality and quantity of their harvested products. Thirteen participants maintained that warmer weather, intense heat, dryness, and sun exposure negatively impacted their harvesting activities. Eleven participants shared similar concerns with respect to the negative impacts of windstorms. Broadly speaking, erratic weather patterns and seasonal changes affected the selection of harvesting sites and determined

whether some interviewees were able to harvest at all. Respondents took various adaptive measures to mitigate these shocks and stresses, such as adding new or utilizing existing farm equipment, changing locations of their harvesting sites, and strategically increasing production volumes in a shorter time frame due to actual or anticipated changes in weather.

Perceptions of climate change were mixed. Fifteen interviewees thought climate change was a significant contributing factor in causing the extreme weather events and changes in NTFPs they have been experiencing in recent years, while a few others thought it was either not a significant factor or not at all related to climate change. Most participants recognized the complexity of climatic variability, noting that it would be impossible to identify climate change as the definitive culprit based solely on their own personal observations.

Among the business owners, the issue of climate change appeared to be more of a concern for the Christmas tree growers and the maple/birch syrup producers. For example, a Christmas tree farmer in our sample spoke at length about how hot and dry the weather has been in recent years, which not only can negatively impact the quality of the trees but also has the potential to affect the timing of the buying season. Christmas tree growers reported that when there is little to no snow on the ground in November, they often see fewer customers visit their farms during this time. Christmas tree growers also highlighted similar concerns with the maple/birch syrup producers regarding the multitude of challenges that windstorms create. A particularly interesting finding was that the two maple/birch syrup producers felt climate change was the main 'culprit' and the 'driving factor' to any loss in production.

Recreational harvesters and wild food educators were passionate about discussing what they perceived to be climatic changes negatively impacting their picking sites. A few personal-use foragers described what they witnessed to be noticeable changes, such as sunburnt plants and trees. Despite negative influences, wild food educators in our sample encouraged nuanced understandings. For example, one wild food educator, when speaking about the often-touted destructive effects of windstorms, specified that she had seen a notable increase in the fungi population as a result of downed trees, acknowledging some of the positive impacts these events have had on her foraging activities.

A variety of specific adaptive measures were discussed and were of particular importance for business owners harvesting NTFPs on their own land. A maple/birch syrup producer stated that he recently added a monitoring system by placing vacuum sensors on the back of the main sap drop lines. He shared that he gets a notification on his cellphone instantly detecting trouble spots in the tubing where pressure is down, which allows his staff to access quickly and more efficiently some of the more remote locations in the bush to perform maintenance and fix problem spots as they arise. A Christmas tree farmer and the nut grower both spoke of adding tile drainage systems to combat excess subsurface water to allow for better growing conditions and to increase their products' tolerance for changes in weather.

Adaptive measures also proved significant for recreational harvesters. Four participants communicated that, on occasion, they store and preserve their wild edibles, keep seeds to spread for next season, and forage for more than they need as a form of emergency preparedness when anticipating extreme weather conditions. Some personal-use gatherers displayed immense creativity, and

innovation was not strictly tied to business owners. For example, the recreational wild blueberry picker devised a means to mechanically separate twigs and leaves from the berries. The participant reclaimed an old treadmill belt and built an inclined plane to roll the berries downhill, mainly to increase harvesting volumes during time-sensitive periods.

4.4 Theme 4: Structural Contexts and Regulation

With few exceptions, most participants in our sample supported the idea of an improved capacity to engage in constructive dialogue with all levels of government to assist in the development of policies and best practices that positively contribute to their livelihoods, surrounding communities, and local environment(s). Acknowledgement of the NTFP industry—a unique sector with its own sets of needs and challenges—and the specific designation and recognition of wild harvesting practices were frequently cited. Moreover, twelve respondents expressed an overwhelming desire for government recognition and support, and seventeen described a desire for improved capacity for knowledge sharing and industry collaboration. Four participants specifically referred to the importance of the breaking down of governmental silos.

Fragmented regulatory frameworks, unclear laws and policies, as well as a lack of NTFP-specific food safety guidelines for niche products were among the most pressing concerns. For example, the cranberry grower conveyed just how difficult it was to obtain crop insurance for this non-traditional crop. A producer of artisan wild foods revealed that the health inspector, at times, was not even remotely familiar with the types of products being sold. Additionally, birch syrup producers stressed that they were using maple syrup best practices due to the absence of birch-specific production guidelines. Even with identifying the need for best practices across a range of products, participants remained unsure as to how government bodies could start that process. That some of the most knowledgeable individuals in these circles felt uncertain as to what these guiding principles could look like in theory and practice underscores the complexity and diversity of the NTFP industry; it draws our attention to the incredible array of products and services, together with the challenges and opportunities associated with these interwoven, time- and culture-bound activities.

As noted above, several respondents expressed their desire for governmental recognition and support. Describing the lack of support and recognition of the wild harvesting industry, an Indigenous wildcrafter communicated the challenges of paving their own way without a lot of external assistance. A Christmas tree farmer echoed these sentiments, describing his industry as an in-between business with seasonal sales that operates largely in the background of society. Since the Christmas tree industry is partly agricultural and partly forestry, the respondent felt that there is not enough recognition of the industry and the value it provides. The artisan wild food producer and her husband also expressed a desire for her harvesting activities to be better defined and recognized, noting that they are currently lumped in with agriculture while they felt they should be recognized as something separate.

Some study participants identified the challenges of navigating what they described to be a fragmented regulatory framework. A birch syrup producer described difficulties in determining where they fit into licensing and regulations due to the lack of a clear regulatory structure. A wild food educator echoed these concerns, describing their experiences working with the Canadian Food Inspection Agency,

Health Canada, and the Ontario Ministry of Agriculture, Food and Rural Affairs. They found the regulations to be unclear and described receiving different and sometimes contradictory information, which makes it difficult to understand how and what rules should be followed. The provincial government industry expert in our sample indicated that health inspectors visiting a market might call and ask, "how do we know that these are all safe mushrooms?" conceding that they do not know and specified that there is no system in place for that. The government informant noted that sometimes one government agency may set restrictions (e.g., a protective regulation to preserve a wild plant in a forest) to resolve what they identify as a problem, but that perhaps this will do damage to a farm group that is trying to manage that resource sustainably.

The importance of knowledge sharing, particularly as the NTFP industry grows, was emphasized by many of the study participants. An Indigenous knowledge holder felt that increased dialogue about wild harvesting in general would raise its stature in the eyes of government and health agencies. An artisan wild food producer expressed a desire for networking opportunities across different regions, which she felt would be helpful to share best practices and business knowledge. A native species tree and plant grower reiterated this belief, noting that different groups (e.g., conservation authorities, arboretums, nature preserves, etc.) are often siloed, despite having similar mandates and goals around preservation. The respondent expressed that organizations should aim to collaborate on broader goals (e.g., planting an endangered species) to help foster broader public awareness. The respondent felt it is important that these various groups gather to share information with each other and to help promote the industry more broadly.

It was expected that negative comments about increased government involvement and perceived intrusion would likely come up in discussions; however, participants were largely silent on this point. In one instance, an interviewee involved in blueberry harvesting was unwilling to engage in any form of dialogue with government authorities out of frustration with prior discouraging encounters that were perceived to lead to the unfair distribution of profits and did not support picker autonomy and rights. Another participant highlighted the inherent tensions that exist in the desire for increased regulation. On the one hand, government intervention and control could curtail preferred practices that were thought to be sustainable; on the other, regulations could help with a broader understanding of harvesting impacts. Finally, where NTFP harvesting was related to non-commercial activities and values, one participant maintained that regulatory oversight would likely not make sense.

It could be the case that those who were afraid of government involvement and/or wished to remain anonymous declined to be interviewed. In fact, one prospective participant declined due to a past negative experience from participating in a provincial crop study. Some interviewees voiced off-the-record opinions concerning their distrust of the government, and some questioned the motivation for the academic study of NTFPs. Although these articulations were not part of the formal data, this could serve as anecdotal evidence that these products have become highly politicized.

A final overarching idea within this theme was the importance of education and public awareness surrounding NTFPs. All twenty participants shared similar views in this respect, stating that they would like to see more opportunities for people to learn about these taken-for-granted forest resources. Five interviewees spoke of

having to be the ones who educate conservation authorities, park services, municipalities, and other regulatory bodies on the socio-ecological significance of NTFPs in their communities. During these discussions, linkages were often made between tourism and education. Educational initiatives such as guided hikes and wildcrafting workshops can foster concepts of environmental sustainability and stewardship by giving people hands-on experiences with nature (Poe et al., 2014). Fourteen respondents viewed educational ecotourism as an effective way to enhance people's exposure to forest ecosystems and increase public understanding of NTFPs.

5.0 Discussion

This research aimed to explore the extent to which NTFPs contributed to sustainable livelihoods in southern and central Ontario through an exploratory project involving sixteen interviews and highlighting four key themes. In alignment with the most recent international studies (Shackleton & de Vos, 2022), the project identified a wide range of NTFPs actively being used, suggesting that it is essential that communities and policymakers better understand the ways in which these often invisible practices and resources contribute to sustainable livelihoods, across rural and peri-urban forest and agri-forest spaces as well as in more urbanized environments (e.g., Bunge et al., 2019; Kowalski & Conway, 2019).

Respondents indicated that they were involved in both informal and formal market activities, harvesting in both private and public spaces. Especially notable in this study were the myriad ways sector members—from recreational harvesters to business owners—actively engaged with value-added pursuits to support their personal and market-based livelihoods across a range of harvesting strategies from wildcrafting to forest farming and agri-forest operations (see Table 1). Results reinforce observations from other studies (Chamberlain et al., 2018) that NTFPs contributed to local and Indigenous cultures and offered opportunities for independence and agency, often aligned with counter-culture values and the reinvigoration of Indigenous spaces and peoples. Equally compelling and echoing ideas from the NTFP literature (de Mello et al., 2020) were interviewee comments about human/non-human relationships and ongoing efforts to harvest sustainability using ethical guidelines, such as the "ten percent rule."

It is increasingly understood that peri-urban, rural, and Indigenous spaces face enormous challenges in mitigating climate change emissions and adapting to a rapidly changing environment and that these spaces are often under-recognized and under-resourced (Murphy et al., 2017). Study participants clearly identified that while climate change was having a range of impacts, such as drought-burnt trees and opening up new types of habitats (e.g., for mushrooms following trees toppled in a windstorm), they have been able to adapt and continue to obtain the NTFPs they need. NTFP producers are likely to continue to face climatic changes that may undermine current practices and ecological knowledge and impact foragers' livelihoods, as well as their efforts to work within sustainable and ethical frameworks. Going forward, it will be important to address the socio-ecological vulnerabilities in these spaces, recognize all those who have a stake in these multi-use forests, provide mechanisms for adequate consultation, and consider the long-term viability of these harvesting practices and lands.

The project identified a range of disconnected provincial and federal regulations relating to different forestry/agricultural sectors and landscape characteristics. De Mello et al. (2020) argue that local users may have the capacity to build institutions

to manage NTFPs sustainably and perhaps independently of Western concepts of private ownership if non-local institutions work collaboratively to develop broader conservation strategies and regulations. Thus, product-by-product consultation and regulation will continue to be very important for the growth and stability of NTFP sub-sectors. Simultaneously, within the St. Lawrence Lowlands, it also seems vital to adopt a wider landscape lens to develop policies that appropriately include multiple NTFP users and address a wide range of environmental concerns such as urbanization, pollution, and invasive species. Reducing silos between government agencies and perhaps developing citizen science approaches that would see harvesters contribute to a common information pool, could be potential paths forward for these highly valued and utilized spaces.

Academic discussions of NTFPs regarding their capacity to support rural and peri-urban livelihoods have only recently begun to incorporate critical social and environmental justice frameworks (Hansis, 1998; Poe et al., 2014). In an Indian supply chain analysis, Choudhary et al. (2014) demonstrated that power asymmetries left NTFP harvesters with an inequitable share of benefits and profits. In the USA, Kruger et al. (2020) assert that regulations were often developed without NTFP user input or consideration of how the trade works, were often not enforced, and did not effectively manage the resource.

Sze (2018) argues that sustainability and environmental justice problems are 'joined up.' Pollution and environmental destruction (e.g., greenhouse gas emissions, forest clear cutting), lack of access to landscape resources (e.g., sugar maple stands, blueberry patches), and indifference to, or active disregard of, minority group ecological management issues (e.g., ineffective NTFP policies) are always tied to entangled forms of marginalization and disenfranchisement. Poverty, poor information, inadequate processes, and lack of recognition of inter- or intra-generational differences and needs can contribute to both social and environmental inequity and unsustainability. Perhaps Hansis (1998) puts it best, stating, "there is cause for optimism and pessimism in regard to environmental sustainability and social justice in forests utilized by NTFP harvesters" (p. 84) since the need for equitable NTFP policy is really a need for more imaginative and inclusive policy in many areas of natural resource use and rural and Indigenous community development.

6.0 Recommendations and Next Steps

Our project clearly outlines that there is a need for further research into the NTFP sector in Ontario across rural, peri-urban and urban spaces. More in-depth research should be targeted at particular spaces, segments of the supply chain, and specific NTFP sub-sectors, as well as investigating the environmental disturbances and sociopolitical challenges facing the industry. Areas for social and environmental justice-informed future research include but are not limited to: the study of community-based land tenure arrangements; institutional dynamics of property and resource access; insider-outsider conflicts and issues of power and benefit sharing; and NTFPs' relationship with labour practices.

As appropriate, NTFP participants, especially those involved in the formal market, may want to consider working with government authorities to develop industry-wide standards and regulations—both within sub-sectors and across multiple users and spaces. Commercialized operations such as growing Christmas trees and ventures involving food would likely benefit from more robust guidelines to allow food safety oversight, access to best practices, and knowledgeable government officials and

other supports such as adequate insurance. That said, harvesting NTFPs to support non-commercial sustainable livelihoods and Indigenous values was seen as important to several research participants, and these harvesters should be actively engaged when developing these policies.

It can be useful to think of NTFPs as case studies in sustainable and equitable public policy. The NTFP landscape in Ontario, Canada, presents one such case study as this 'new' industry matures and begins to find its place within contemporary society. What was once common knowledge to members of pre-industrial societies is now confined to a relatively small number of present-day gatherers who possess the local and Indigenous knowledge necessary to harvest NTFPs, yet these individuals often lack the political and/or financial clout to express their views—if they choose to speak at all. The Paris Agreement on climate change and the 2030 Agenda for Sustainable Development both include targets to eradicate poverty and restore forest landscapes. Macqueen et al. (2020) assert that forest businesses impact both local and global goods, from foods to greenhouse gas sequestration, and therefore can influence a range of sustainable development goals. Sustainability goes beyond managing the forests—it matters to whom revenues accrue, which relationships are empowered, whose security is enhanced, whose capacities are strengthened, and whose agendas are furthered.

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