




Article

Embracing the Non-Wood Forest Products Potential for Bioeconomy—Analysis of Innovation Cases across Europe

Gerhard Weiss ^{1,2}, Alice Ludvig ^{1,2,3} and Ivana Živojinović ^{1,2,3,*}

¹ Institute of Forest, Environmental and Natural Resource Policy, University of Natural Resources and Life Sciences, Vienna (BOKU), Feistmantelstrasse 4, 1180 Vienna, Austria

² European Forest Institute, Forest Policy Research Network c/o, University of Natural Resources and Life Sciences, Vienna (BOKU), Feistmantelstrasse 4, 1180 Vienna, Austria

³ Centre for Bioeconomy, University of Natural Resources and Life Sciences, Vienna (BOKU), Peter-Jordan-Straße 82/II, 1190 Vienna, Austria

* Correspondence: ivana.zivojinovic@boku.ac.at

Abstract: This article focuses on the potential role of non-wood forest products (NWFPs) which are so far largely neglected within forest-related bioeconomy research and policy. From an innovation system perspective, we look at the barriers for NWFPs development and propose how they can be supported. We analyse 20 innovation cases in Europe, based on the analysis of documents and semi-structured interviews with experts involved in the cases. Results show that there is no “one” innovation system supporting NWFPs, but support is given rather erratically through certain programmes from various sectoral or regional innovation systems (forestry, agriculture, nature conservation or rural or regional development). There is a pronounced neglect of the institutional system towards NWFPs, resulting in a lack of statistics, research, education and training programmes and focused support structures. However, our results show rich potential of NWFPs in the forest bioeconomy for private forest owners and producers. These activities can range from a collection of NWFPs for subsistence to collectively organized production relevant to rural areas. Most of these are product innovations, some are service or social innovations, while some combine different innovation types. From some successful examples we derive suggestions for how to improve innovation support structures.

Keywords: case studies; Europe; innovation system; institutional innovations; policy; non-timber forest products; social innovations



Citation: Weiss, G.; Ludvig, A.; Živojinović, I. Embracing the Non-Wood Forest Products Potential for Bioeconomy—Analysis of Innovation Cases across Europe. *Land* **2023**, *12*, 305. <https://doi.org/10.3390/land12020305>

Academic Editors: Stefanie Linser, Martin Greimel and Andreas Pyka

Received: 23 December 2022

Revised: 16 January 2023

Accepted: 20 January 2023

Published: 21 January 2023



Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Over the years the concept of bioeconomy has developed and today is one of the main strategic policy agendas of the EU [1]. Its main aim is the transformation process of the current economy to a bioeconomy in which fossil resources should be replaced by biogenic materials to mitigate climate change, contribute to sustainability, protect environment, and conserve natural resources. Research and innovation are supposed to enable this transformational process [2–5], with the help of transformative policies, access to finance, risk-taking capacity as well as new and sustainable business models and markets [6]. The bioeconomy principles are addressed in the 2018 update of the European Union (EU) Bioeconomy Strategy [1]. The strategy has five main objectives: ensuring food and nutrition security; managing natural resources sustainably; reducing dependence on non-renewable resources for energy; mitigating and adapting to climate change; and strengthening European competitiveness and creating new jobs. With this strategy, EU paves the way to its long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050 [7]. According to this strategy, bioeconomy relies on all primary production sectors and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy, and services [7]. Forestry,

agriculture, fisheries, and aquaculture play a fundamental role in providing these bio-based substitutes for non-renewable sources [8,9].

Forestry is seen as one of the key sectors of the EU bioeconomy [10]. In the last years, publications on a forest bioeconomy have rapidly increased, confirming that international policies and academic research on forest bioeconomy prove forestry as one of the solutions for sustainable economic growth and green job opportunities, and has a key role in targeting challenges such as climate change, food security, health, industrial restructuring, and energy security [2,11]. The forest-based sector can promote novel and innovative wood-based bio-materials such as construction materials, chemicals, bio-plastics, packaging materials, and bio-textiles [12–14] and can contribute to a sustainable and inclusive biosociety [12,15].

It is however surprising that the social aspects of the bioeconomy were less discussed in literature or in practice discussions [16]. This is also discussed in the paper of Ludvig et al. [15] which states that the social benefits of the bioeconomy and its potential to create green jobs should not be forgotten and undervalued [16]. Transition processes to bioeconomy and reduction of operations in fossil industries will create the need for new types of jobs, and these can be replaced by bioeconomy-related activities that can bring skilled jobs to rural areas and contribute to their development [17–19]. Thus, diversified activities within the bioeconomy are also needed. Jankovský et al. [12] point further to the need for cooperation, support, and learning from other sectors that can support a smoother and friendlier transition to bioeconomy. The wide spectrum of activities, in the forest-based sector with various forest products and services, and innovative ways of using and promoting these, can contribute to a just transition that could provide opportunities to diverse actors (such as small forest owners, entrepreneurs, and individual households) and not just forest industry. Such products and services are also related to non-wood forest products and services (NWFPs) that are recognised as an important contribution to the bioeconomy [10,20]. “NWFPs are defined as wild and semi-wild non-wood forest species and products thereof, as well as products in early stages of domestication, e.g., fruit trees, bushes, orchards, and with reference to specific services related to NWFPs such as wellbeing and tourism” [21] (p. 9). NWFPs are in most cases perceived as a niche product with limited potential for added value and scalability, with a wide range of contributions to forestry’s economic output, tourism, and rural development [21]. NWFPs are often termed “side-products”, “niche markets” or even “non-market” goods [21]. As a result, the field of NWFPs and related business opportunities are hardly visible and recognized, although they seem to be bigger than often thought. The level of NWFPs’ contribution to the bioeconomy is unrecognised by both policymakers and forestry practitioners and their production is rarely considered a forest management objective [10], except for some specific products in specific countries (like chestnuts in Italy, or mushrooms or cork in Spain and Portugal) [22,23]. The current and the potential role of NWFPs in the bioeconomy have been discussed in few review publications [10,15,22–27].

This paper aims to go further and emphasize the potential role of NWFPs in the bioeconomy, by analysing existing innovative activities with NWFPs. The reason for taking an innovation perspective is manifold. Innovations of all kinds can play a prominent role in the transformation to a sustainable future forest use [15,28]. Furthermore, innovation systems that exist around these products and services illustrate a complexity of a system, which is a characteristic of the bioeconomy as well [29]. Thus, many of the identified aspects are relevant for supporting the process of the bioeconomy transition (illustrated on European level). By providing an overview of concrete examples of selected innovations in Europe that may have an opportunity to scale up in future alongside a wider transformation process, this paper illustrates in which way NWFPs can contribute to the European bioeconomy. Through this, we attempt to address the gaps in existing research and make important contributions to both forest bioeconomy and innovation literature.

Jankovský et al. [12] showed that the scientific literature on the topic of innovations in the forest bioeconomy so far was mainly focused on the necessary adaptation of policies, while innovations were mainly focused on specific fields, such as: biorefining, biotechnol-

ogy, and production of various biomaterials, as well as innovations of business models and stakeholder interactions. Bioeconomy as a knowledge-driven concept [30], relies on strong science and technology, as well as utilisation of innovative approaches, where support from the public sector, market, industry, investors as well as by policymakers and civil society is needed [12,31]. Therefore, a whole spectrum of innovations is needed to deploy a functioning and efficient bioeconomy [12,32], both on the supply and the user side [33,34]. This paper thus contributes to illustrating various innovation types coming from NWFPs, exemplifying the manifold ways in which these can be of importance in bioeconomy. By integrating different literature streams and combining NWFPs with the innovation system (IS) approach in the analysis, we believe that this paper will make a significant academic contribution.

Purpose of the Paper

The partial neglect of the presumably higher potential of NWFPs stems from, first, a limited marketability, connected to the often-found public good character of such products but, second, a limited attention of established sectoral innovation systems, thus providing only limited support of or even barriers against their development [23]. The paper starts from the second observation and aims to analyse with empirical examples what this unfortunate environment means for innovations. Particularly we ask: What do innovation systems around analysed NWFPs cases look like? Then we elaborate on: What is the NWFPs' potential and contribution to the bioeconomy? and What support from the innovation system is needed to unlock the potential of NWFPs for the bioeconomy?

2. Methodology

This paper conducts a comprehensive analysis of innovation processes in 20 NWFP-related cases across Europe. Innovations are understood broadly, comprising new products and processes, new organizational or marketing methods [35,36] as well as institutional or social reconfigurations [37–39].

The United Nations FAO generally understands NWFP as “products of biological origin other than wood derived from forests, other wooded land and trees outside forests” [40]. However this definition excludes all other woody raw materials such as chips, charcoal or fuelwood, resin, Christmas trees, or even cork. For the purpose of our study, we broadened the perspective of NWFPs and include smaller wooden products or other materials from forests that are used for artisanal goods. This way, our study takes into account all wild and semi-wild products such as chestnuts, resin or game [21]. However, we exclude products from intensive cultivation which qualify as agricultural crops.

2.1. Case Selection and Data Collection

The case study analyses were conducted in the frame of a European-wide research project (FP7 *StarTree “Multipurpose trees and non-wood forest products: a challenge and opportunity”*) which allowed the collection of numerous in-depth cases across European countries by using a common research design and a coordinated data collection and analysis process. The study presents 20 cases from 8 European countries (11 administrative regions) across a wide range of products (plant and animal foods, chemical extracts, decorative materials, handcrafted products) as well as innovation types [36].

The cases were collected in a bottom-up process by local experts (via the project's expert panel) from partner countries to represent situations in different European regions (Austria, Finland, Germany, Italy, Serbia, Slovenia, Spain, UK). Our cases cover regions with different significance of NWFPs, different regional economic situations and different governance characteristics, including countries with economies in transition. The selection of cases was performed in order to reflect typical developments in the countries and to illustrate multiple innovative aspects in the field of NWFP development.

For each case, data were collected by the local researchers in local languages and following a common data collection guide which covered the analysis elements mentioned

above. Data comprised of documents (e.g., relevant legal documents or information on the projects and companies) and semi-structured thematic interviews [41] with experts involved in the innovation cases. Depending on the complexity of the case studies, around one or three interviews were conducted, foremost with the innovator or entrepreneur in each innovation case and with relevant actors, such as implementing agencies of innovation or rural development support programmes. On the basis of the collected data, the local researchers produced case reports which were analyzed by the project team responsible for the innovation analysis.

The research design combined deductive and inductive elements as it started from the state-of-knowledge on innovations in NWFPs and the analytical framework as described (deductive framework) but was open to discover new or specific factors and patterns from the in-depth analyses of the single cases and from the following comparative analysis (inductive elements). The inductive dimension was secured through a semi-structured interview guide that allowed freedom for follow-up open questions.

Specific aspects of the innovation processes in some of the selected cases have been analysed and published elsewhere, for instance, on the role of entrepreneurship [42], institutions [43] or social innovation [15,44], the role of policies in a transition context [45], and in a product-specific [21,22] and a region-specific analysis [46,47]. This article adds to the previous analyses by a comparative analysis across all cases and through a comprehensive analysis of all dimensions of innovation processes. It strives to carve out characteristic innovation patterns within the various elements of analysis as well as across all dimensions. From this comprehensive analysis, we derive typical support needs to foster innovation in NWFPs in Europe and illustrate with concrete examples their potential to contribute to the overall transformation to a bioeconomy.

2.2. The Innovation System Approach

In this paper, we used the innovation system (IS) approach to analyse cases. According to Rametsteiner and Weiss [48], the main elements of IS are actors and institutions and their interactions. Actors are usually considered organizations, that are the “players of the game” and that together play a major role in influencing innovative performance [38]. Institutions are the “rules of the game” that are maintaining interactions between actors [49]. Institutions are set of habits, rules, laws, or regulations that shape the relations and interactions among actors [50]. Innovation thus occurs within networks of diverse actors (public, semi-public or private organizations) that are embedded in a system of institutions that support them. IS approach can focus on national, but also on local, rural or regional innovation systems or networks [51,52], or which particularly include institutional and social processes and factors (embeddedness, grassroots, social, institutional, [53,54]). Framework factors include: ecological (e.g., climate and site conditions), economic (e.g., wealth and innovativeness), political-institutional (legal regulations, political culture and informal norms), and social (e.g., social change). Within the innovation processes, we particularly focus on the role of knowledge/information, financing, and cooperation/coordination of actors [55], understood as different kinds of support measures which may be provided by various public or private actors of the innovation system. Throughout the innovation process, we follow especially from which spheres (rural or urban) and from which sectors (forestry or other sectors) the ideas or support measures were provided. We assume that NWFPs differ from other rural products because of their specific entrepreneurial, institutional, and social contexts. With NWFPs, we very often find smaller firms and lower levels of professionalization, commercialization, and institutional support structures when compared with large-scale forestry products or agricultural crops [43,47,56–58].

2.3. Operationalized Analysis Elements

For the comparative analysis of the cases, we operationalized the described innovation system approach and previous findings on innovation processes in forestry and specifically on NWFP [38,59,60] in order to develop our analytical structure, i.e., the main actor being

the innovating company/organisation (a), knowledge source (b), sectors involved in the innovation (c) and its support (d), administrative/policy level (e) and type of support (f) (Table 1). The specific analysis criteria and categories within each element were developed inductively in order to capture the relevant factors.

Table 1. Overview of cases and main analysis elements.

Case Nr	Case Code	Case Description	Type of Organisation	Type of Knowledge	Type of Sector	Support/Sectors	Support/Level	Support/Measure
1	ATGAME	Game meat marketing label	PULO + ENTR	RUR	C	CROSS	LOC; NAT-LOC; EU-LOC	INF; FIN; COO
2	ATNPS	Wild food specialties from Nature Parks	TRALO + INST	RUR + URB	C	CROSS	LOC	INF; FIN; COO
3	ATLEAD	New forest products from a LEADER Region	INST	RUR + URB	C	CROSS	EU-LOC	INF; FIN; COO
4	ATXMAS	Cut your own Christmas tree	TRALO	RUR	F	SECT	LOC	INF
5	DEGAME	Direct game marketing	PULO	RUR	C	SECT	NAT-LOC	INF; FIN
6	ESGOUR	Mushroom restaurant and gourmet products	ENTR	RUR	C	CROSS; NONS	NAT; EU-LOC	INF; FIN; COO
7	ESHOT	Mushroom hotel	TRALO	RUR + URB	C	CROSS	LOC; EU	INF; FIN
8	ESRES	Natural pine resin products	IND	URB	C	CROSS; NONS	LOC; NAT	INF; FIN; COO
9	FIBIR	Innovative birch sap production	NEWLO	RUR + URB	O	NONS	LOC; NAT-LOC	INF; FIN
10	FIGIFT	Gift packages	ENTR	RUR + URB	C	NONS	LOC; NAT-LOC	INF; FIN
11	ITMAR	Regional marketing around chestnuts	INST	RUR + URB	C	CROSS	LOC	INF; FIN; COO
12	ITTURP	Adapted regulations for larch turpentine collection	ENTR	RUR	C	NONS	LOC	REG
13	SLOCLI	Wooden holds for climbing walls	ENTR	URB	O	NONS	NAT	INF; FIN
14	SRBTEA	Tea spoon shaped tea bags	ENTR	RUR + URB	O	NONS	NAT	INF; FIN
15	UKCOPP	Coppice wood management training	SOC	RUR + URB	O	CROSS	NAT	FIN
16	UKFINE	Local hand-plucked tea	NEWLO	RUR + URB	O	CROSS	LOC; EU-LOC	INF; FIN
17	UKPICK	Foraging products and tours	ENTR	RUR + URB	O	NONS	LOC	INF; FIN; COO
18	UKSKIL	Teaching woodland management	NEWLO/SOC	RUR + URB	O	CROSS	LOC	FIN
19	UKWILL	Willow weaving courses	ENTR	RUR + URB	O	CROSS	LOC; EU-LOC	INF; FIN; COO
20	UKWINE	Country wines	ENTR	RUR + URB	O	NONS	NAT-LOC	FIN

Legend: Type of company/organisation: institutional actors (INST), public land owners (PULO), traditional farm owners (TRALO), new land owners (NEWLO), not land-owning micro-entrepreneurs (ENTR), industrial companies (IND) and social entrepreneurs (SOC); type of knowledge: traditional rural knowledge (RUR), urban skills and knowhow or scientific knowledge (URB); type of sector: forestry (F), outside/other sector (O), cross-sectoral interaction (C); support—from which sector: forestry sector (SECT), other sectorial or rural development support (CROSS), non-sector specific (NONS); type of support—from which policy/administrative level: regional or local (LOC), national (NAT) or European Union level (EU). higher level programme administered on the local or regional level (NAT-LOC; EU-LOC); type of support—which kind of measure: information (INF), financial (FIN), coordination/networking (COO), adaptation of the regulatory framework (REG).

a. *Type of company/organisation:* The innovators in our case studies were often companies, with or without own land resources, but also include a few non-profit organisations

which we categorized as institutional actors (INST). The companies were divided into (large) public landowners (PULO), traditional farm owners (TRALO), new landowners (NEWLO), not land-owning micro-entrepreneurs (ENTR), industrial companies (IND) and social entrepreneurs (SOC). In certain cases, these categories overlap, for instance, when traditional farmers worked through a specific association, or when landowners founded social enterprises.

- b. *Type of knowledge:* We distinguish if the innovators applied their traditional rural knowledge (RUR) or if the innovations were predominantly driven by urban skills and knowhow or scientific knowledge (URB). We remark if both types contributed significantly so that the innovation was only possible through a combination of both (RUR + URB).
- c. *Type of sector:* We assess if the innovations were initiated from within forestry (F), from outside such as tourism, hunting, food, cosmetics, nature conservation, etc. (O), or if they needed specific cross-sectoral interaction (C).
- d. *Type of support—from which sector:* Innovation support may have come from within the forestry sector (SECT), from other sectorial support programmes such as agricultural or rural development support (CROSS), or from non-sector specific innovation, start-up or regional development support (NONS). In many cases, multiple support programmes were relevant which is why we find combinations in this and the following categories.
- e. *Type of support—from which administrative/policy level:* Support was granted on regional or local (LOC), national (NAT) or European Union level (EU). In many cases, support programmes stem from a higher level but are administered on the local or regional level (NAT-LOC; EU-LOC). By the latter categories we indicate the source of the means but also how near the programme administration is to the innovative actors.
- f. *Type of support—which kind of measure:* We indicate which kinds of support measures had a significant role in the innovation projects: information, financial or coordination/networking (INF, FIN, COO). In addition to those measures that are often part of regular support programmes, we discovered another type of support—the adaptation of the regulatory framework (REG) which was crucial in one case.

In addition to this structured comparison, influential factors on the innovation processes in the single case studies were taken into account in the analysis.

3. Results: Comparative Analysis of Case Studies

The case studies are briefly described here and in the following Table 1, including the sources of the idea and the main support measures:

1. Game meat marketing label, Austria (ATGAME)

Game meat from a National Park area is marketed under a label for high quality regional foods. The direct marketing initiative is led by a provincial State Forest holding and a local butcher and received support through various programmes, including the local LEADER LAG, an agricultural direct marketing organisation and label of the Chamber of Agriculture (Gutes vom Bauernhof) as well as an umbrella label of the Ministry of Agriculture (Genussregion Österreich). It started under the name “Xeis Edelwild” and was later renamed “Gesäuse Wild”.

2. Wild food specialties from Nature Parks, Austria (ATNPS)

Under the label of “Naturparkspezialitäten” (“Nature Park Specialties”), farms in Austrian nature parks market local, traditional farm products, including wild food specialties from forests. The label was developed under the frame of the Austrian Nature Parks Association and is seen as a tool to support their main aim of sustainable regional development of cultural landscapes with high natural value. Together with a regional development consultant, the Association had the idea and supported the farmers through small feasibility studies, networking, training workshops and joint marketing.

3. New forest products from a LEADER Region, Austria (ATLEAD)

The EU LEADER Region “Zirbenland” (“Land of the Stone Pine”) supports the development of new products around this regional characteristic mountain tree, including essential oils, filled chocolate specialties, pillows with pine wood filling, tourism activities, etc. The Leader Action Group is supported by a full-time regional development expert and the support measures range from scientific and marketing studies to small financial investment grants and networking activities.

4. Cut your own Christmas tree, Austria (ATXMAS)

A young and cosmopolitan mountain farmer couple sells Christmas trees with the option for the clients to cut their trees themselves. This service is often used by Viennese costumers for whom this is a special adventure with their children. In Austria, Christmas tree marketing is supported by provincial-level associations that offer information and training and a label for domestic Christmas trees.

5. Direct game marketing, Germany (DEGAME)

A State Forest enterprise started the direct marketing of game meat under a specific label “Wild vom Förster” (“Game from the Forester”). The meat is from the State land and is produced by the use of their own resources and staff (foresters, hunters, butcher), the marketing concept has been financed and developed by a regional unit and the headquarters of the State Forest company.

6. Mushroom restaurant and gourmet products, Castilio and Leon, Spain (ESGOUR)

A group of local women from a rural Spanish municipality established the cooperative “Del Monte de Tabuyo” to run a specialised rural restaurant and specialties shop with mushrooms and other wild food gourmet products. Advice and funding support was granted through the EU Leader programme and a consultation company as well as a national economic development programme.

7. Mushroom hotel, Catalonia, Spain (ESHOT)

A Catalanian rural tourism enterprise (hotel and restaurant) established “The Monegal Mushroom Hotel” with mushroom-picking licences in their own forest. The licence system was the first established in the region, against the opinions of municipality and tourism actors, but with support from a regional forestry research institute. A mushroom educational path was installed in the frame with the support of a European development project in collaboration with the research institute.

8. Natural pine resin products, Segovia, Spain (ESRES)

The impulse for the renewed pine resin production by the company “Resinas naturales” (natural resins; Sociedad de Resinas Naturales, S.L.) in the Spanish province of Segovia came from a cosmetic company with a demand for sustainable and natural products. The project was implemented in cooperation with landowners and forestry agencies and was supported by national and regional institutions, a regional development agency grant, and through a regional cross-sectoral roundtable with public and private representatives.

9. Innovative birch sap production, Finland (FIBIR)

The owners of the company are a couple who moved to the countryside and first worked in the field of their expertise (marketing). They then also wanted to utilise the birch stand on their land and developed a new collection method for the birch sap which gives this traditional product a longer shelf life without adding any preservatives. They acquired the necessary traditional and new knowledge through their own networking activities, trial-and-error methods, and consulting experts. They were furthermore supported by a small applied-research grant.

10. Gift packages, Finland (FIGIFT)

The owner of the Finnish start-up company sells luxury company gift packages containing forest products. The marketing specialist with experience in various fields such as agriculture and tourism aimed to live in the countryside and used his experiences and networks from former occupations to develop his ideas. He received various start-up support provided by local agencies, including business plan advice, entrepreneurial training and a start-up grant from a national programme.

11. Regional marketing around chestnuts (marroni), Trentino, Italy (ITMAR)

The chestnuts (marroni) of Castione di Brentonico is a regional marketing brand which was initiated by a few passionate locals who wanted to preserve the regional chestnut tradition in times when the unprofitable use and marketing of the chestnuts were about to be abandoned and forgotten. The initiative found very strong regional political support and today, the chestnuts have become the regional product which is also used in the regional touristic marketing. The regional chestnut is protected by the DOP label of origin, and specific chestnut dishes, sweets and liquors have been developed over the years. The manifold cross-sectoral activities that receive financial support from the regional government are organized by the association “Associazione Tutela Marroni di Castione.” These comprise the annual chestnuts festival “Festa della castagna”, a regular cartoon exhibition as well as numerous gastronomical, wine, poetic, arts and other competitions and events.

12. Adapted regulations for larch turpentine collection, Veneto, Italy (ITTURP)

By own interest and initiative, this entrepreneur fought for re-establishing the old traditional production of natural larch turpentine and resin, among others, used for natural paints. The resin collection had been legally banned to protect the mountain forests but by proving the sustainable harvest this State law was successfully adapted. This was achieved through the passionate engagement of the entrepreneur and the effective support of the local government. For re-establishing the production and marketing, the entrepreneur (“Servizio di raccolte resine”) did not need external support.

13. Wooden holds for climbing walls, Slovenia (SLOCLI)

A start-up entrepreneur developed climbing wall holds made from wooden knots. He benefited from collaboration with a university institute and another company and received a small start-up grant from a national support programme.

14. Teaspoon-shaped tea bags, Serbia (SRBTEA)

The rural start-up company Adonis produces herbal tea with innovative packaging. The teaspoon-shaped tea bags were developed from their own ideas in a learning-by-doing process, and in cooperation with a design company, a university, and the chamber of commerce. The financing was sourced from a combination of their own capital, a bank loan, and a national export promotion grant.

15. Coppice wood management training, Wales, UK (UKCOPP)

“Coppice Wood College” is a charitable organisation to promote traditional, sustainable woodland management. It provides courses related to coppice management, traditional products and the use of the required tools. The founders, a couple, moved from the city to the countryside but one of them had woodworking knowledge from the father and previous experience in nature conservation. The college employs a few trainers and receives the main income from course fees. It is, however, also supported by a landowner who provides the land and by The Ernest Cook Trust, an educational charity organisation.

16. Local hand-plucked tea, Wales, UK (UKFINE)

The owners of “Fine Pluck” are a couple who grew up in the countryside, but originally worked as a food technologist and a graphic designer, life coach, and permaculture designer. When they moved to Wales, they developed foraging courses and became passionate about making tea from local resources, a passion which gradually grew into a business. This was supported by some funding through the EU LEADER programme.

17. Foraging products and tours, Wales, UK (UKPICK)

The micro-enterprise “Wild Pickings” offers foraging walks and sells specialty products online and on local markets. The founder is a trained horticulturist who became personally interested in foraging and producing specialties from wild products. The business slowly developed alongside her part-time employments and with gaining knowledge and experience in production, marketing, and entrepreneurship, and through networking activities. The owner received business advice from a local social entrepreneur and a micro-business support grant.

18. Teaching woodland management, Wales, UK (UKSKIL)

The “Woodland Skills Centre” provides woodland courses as a social enterprise with the aim to make woods accessible to people without degradation. It was founded by a retired schoolteacher who purchased a piece of land and invests his time in this voluntary work. The centre has been supported by the Wales Cooperative Centre, the regional Tourism Investment Fund and the Sustainable Development Fund of the local Area of Outstanding Natural Beauty organisation. It cooperates strongly with local third-sector organisations, such as mental health charities, special schools or the job centre.

19. Willow weaving courses, Wales, UK (UKWILL)

“Out to Learn Willow” offers willow weaving courses to schools, community groups, therapeutic groups, and—in cooperation with the local council—for regional cultural activities, etc. The two women owners who previously worked as a teacher and a graphic designer founded the company out of their interest. They had experience in marketing and social networking, acquired the traditional weaving knowledge over time through courses and received support for the company start-up through the EU LEADER programme and a regional fund for rural development which benefited the promotion and marketing and the acquisition of equipment.

20. Country wines, Scotland, UK (UKWINE)

The owner couple of a small rural company made a new business (“Cairn O’Mohr”) out of their hobby—making fruit wines from elderberries, oak leaves, etc. They acquired traditional knowledge and added their ideas for new recipes and marketing. They received small financial business support grants from a locally managed national programme.

On the basis of in-depth reports on the single case studies, the analytical elements of our comparative analysis are assessed as shown in Table 1.

3.1. Type of Company/Organisation

As shown in Figure 1, only two of our cases were (larger) public forest holdings, three were traditional farm owners and we had no other large landowner case represented. We know from other studies that—although such cases exist—NWFP or services are often not seen as a business opportunity by forest holdings, except if they focus on traditional products such as Christmas trees, gravel, or game (e.g., Rametsteiner et al., 2005). Three of our cases can be characterized as traditional forest products and only two were exclusively carried out within forestry (the Christmas tree ATXMAS and one game marketing case DEGAME). One game marketing case (ATGAME) collaborated with a butcher, in the Nature Park Specialties (ATNPS) the traditional farmers work together with nature conservation and the mushroom hotel (ESHOT) was created by a forest and hotel owner.

The three new landowners either were motivated to live in the countryside (immigrants from urban areas in FIBIR and UKFINE) or bought the land specifically (UKSKIL). Their cases have been developed completely outside forestry. Similarly, the cases of the not land-owning entrepreneurs were from outside forestry (5) or in cross-sectoral collaboration (4). The enterprises were founded with rural knowledge (3), urban (1) or a combination (5). In the two social enterprise cases, the impulses and support came from outside, but forestry knowledge was also necessary.

In the industry-led case (ESRES), the interest came from a cosmetics company but the collaboration with forestry was necessary for organizing the renewed collection. The three institutional cases were all motivated by the aim to support regional/rural development through providing capacities for collaboration through the association of the Nature Parks (ATNPS), a Leader Action Group (ATLEAD), or the municipality (ITMAR).

We learn from these results that traditional, larger, or smaller landowners are rather oriented towards traditional forestry products but that collaborations outside the sector may be helpful or necessary in certain cases. Ownership of forest land is not always necessary but a collaboration with landowners or their organisations can be very purposeful or even a prerequisite, particularly in larger-scale projects. We find cases with significant institutional support both with small-scale landowners and entrepreneurs as well as larger forest holdings and companies. Although institutional actors may help small businesses

with their knowledge resources, networking possibilities or funding, not all projects depend on this external support. Larger companies may have such resources in-house but may as well benefit from institutional actors who are of particular importance in more complex projects and in scaling-up processes [43].

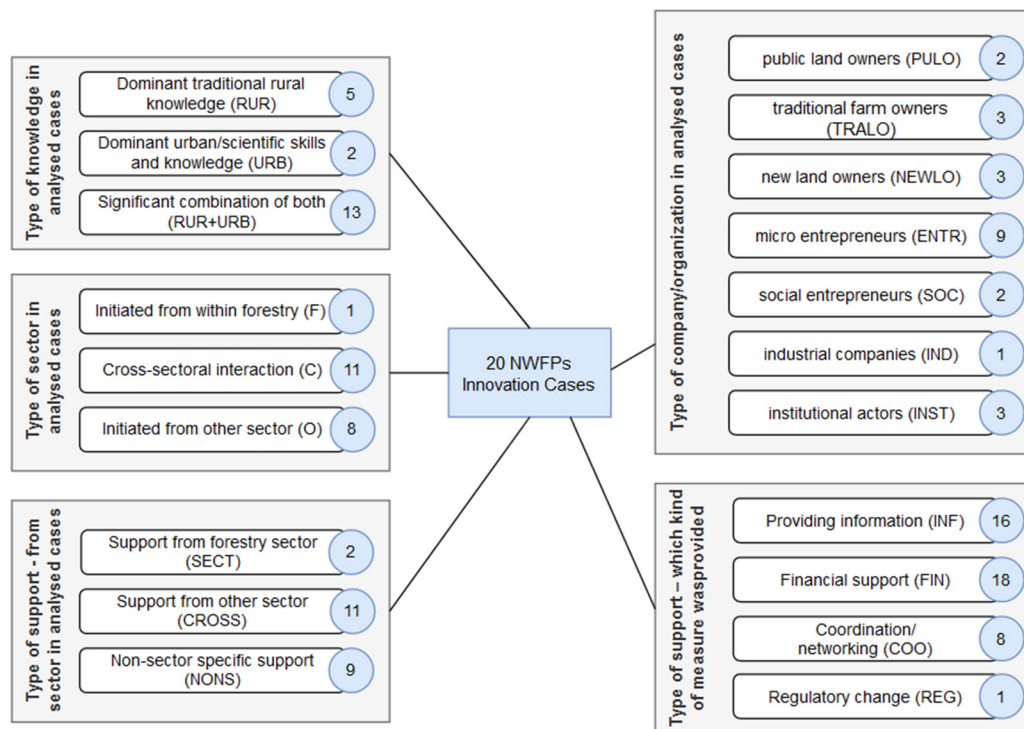


Figure 1. Analysis of NWFPs innovation cases (number in circles illustrate number of cases fitting into the category).

3.2. Type of Knowledge

The results show (Figure 1) the eminent importance of the traditional knowledge about NWFPs although only one case can well be characterized as a poor sectoral forestry innovation (ATXMAS)—and even here the world travelling experience of one of the owners may have had a crucial role. The other rural cases were cross-sectorally initiated and/or supported. In most of the combined cases (10), the impulse came from the urban sphere, e.g., from non-rural entrepreneurs or institutions. The NWFP innovations, thus, are predominantly initiated from urban actors or knowledge (12) although they then strongly depend on acquiring the necessary rural knowledge. One of the urban examples did not significantly rely on traditional know-how (SLCLI), for the other cooperation with forestry was still important (ESRES). Thus, mutual understanding of values or preferences, exchange of knowledge or combination of skills, or initial collaboration of urban and rural actors was found important in almost all cases (18).

3.3. Type of Sector

As presented in Figure 1, only one of our cases was initiated purely from forestry, while more than half of the cases were initiated through a cross-sector interaction between forestry and other sectors, e.g., with butchers (ATGAME, DEGAME), foods or drinks (ESRES, ITMAR), nature conservation (ATNPS), tourism (ESHOT), cosmetics or chemicals (ESRES, ITTURP), handcrafting (FIGIFT), or multiple collaborations (ATLEAD). Eight innovations were from outside, for instance, entrepreneurs with various backgrounds. Such entrepreneurs may have had relevant backgrounds (e.g., working in a state forest company before (SRBTEA)) for their new business such as horticulture (UKPICK), food technology (UKFINE), but many come from other fields such as graphic designers or former

teachers but started their new engagement by personal interest (e.g., FIBIR, UKWILL) or social engagement (UKCOPP, UKSKIL).

3.4. Type of Support—From Which Sector

Only in two cases, support was provided from within forestry—the Christmas tree association (ATXMS) and the State forest company headquarters (DEGAME). Most cases received other sectoral support (11), non-sectoral development support (9) or from both (ESGOUR, ESRES) (Figure 1). Other sectoral support includes other sectors (2 agricultural direct marketing, 2 charities, 1 nature conservation) or cross-sectoral rural development support such as through EU LEADER (4) or regional platforms (2). Non-sector-specific support included in our cases national or local level start-up/micro-business support (7), export promotion (SRBTEA) or support by the municipality (ITTURP).

Relation of the sources of knowledge and sources of support, as shown in Table 2, mirrors the sectoral logic of support programmes. Forestry support was given to projects with rural knowledge, and most cross-sectoral (rural development) support was directed to projects that combined urban and rural knowledge. Non-sector-specific business support spread across all categories of knowledge sources but was particularly important for urban knowledge projects. The fact that rural knowledge projects received support from all categories can be seen as a good sign when those projects find out about those possibilities or are perceived as important enough to be supported from outside the sector (the larch turpentine initiative ITTURP supported by the municipality, and the mushroom restaurant ESREST which received a start-up grant).

Table 2. Relations between sources of knowledge and sectoral support (remark: cases add up to 22 because two innovation cases received support from two different sectoral categories).

Sources of Knowledge	Support from Which Sector			
	Forestry (SECT)	Cross-Sectoral (CROSS)	Non-Sectorial (NONS)	
Rural (RUR)	2	2	2	(6)
Combined (RUR + URB)	0	8	5	(13)
Urban (URB)	0	1	2	(3)
	(2)	(11)	(9)	(22)

From the relation from which sectors the innovation projects were initiated and supported (Table 3), we see similarly clear sectoral relations. The forestry project (and a cross-sectoral project) received forestry support, the majority of the cross-sectoral projects received cross-sectoral (rural development) support (7 out of 12) and the projects from other sectors mostly received support from non-sector specific (business support) programmes or actors (5 out of 9). In a number of cases, cross-sectoral initiatives received non-sector support (4 out of 12) and other sector businesses also benefitted from cross-sectoral programmes (4 out of 9). We may interpret these figures so that the programmes do follow their sectoral preferences without being too strict in their implementation. Vice versa, it may be a good sign when NWFP businesses find opportunities in rural development and/or business support structures.

Table 3. Relations between sectoral initiation and sectoral support (remark: cases add up to 22 because two innovation cases received support from two different sectoral categories).

Initiation from Which Sector	Support from Which Sector			
	Forestry (SECT)	Cross-Sectoral (CROSS)	Non-Sectorial (NONS)	
Forestry (F)	1	0	0	(1)
Cross-sectoral	1	7	4	(12)
Other sector (O)	0	4	5	(9)
	(2)	(11)	(9)	(22)

3.5. Type of Support—From Which Administrative/Policy Level

In our cases, as shown in Table 4, institutional level support for innovations in NWFP was overwhelmingly provided by local-regional or national entities. On a local level, the support is sometimes given by local governments in singular measures (e.g., advisory support in ITTURP) or initiatives (regional marketing in ITMAR) or by regional public administrations on the county or district level (regional development support in the Finnish and several UK cases) or sectoral associations (e.g., in the Austrian cases). National support usually comes under business development programmes which are partly centrally administered and are partly decentralized. EU support has been granted in most cases through the LEADER instrument for rural development which has a decentralized implementation structure. The importance of support from the local-regional level becomes particularly clear when adding up all programmes with decentralized administration: 23 out of 29 support measures in all our cases.

Table 4. Administrative level of support programmes—level of policy formulation and implementation.

Level of Support Programme—Policy Formulation	Level of Support Programme—Policy Implementation			
	European Union	National	Local	
European Union	1	0	5	(6)
National	0	5	5	(10)
Local	0	0	13	(13)
	(1)	(5)	(23)	(29)

We furthermore indicated which kinds of support measures had a significant role in the innovation projects (INF, FIN, COO) (Figure 1). The provision of information and financial support has been reported as the most frequent support measures in our case studies whereby the interviewed representatives often especially emphasize the importance of information. Financial support was often rather small such as in the case of start-up grants or the contribution to smaller investments through rural development programmes. Such small grants are often described by the entrepreneurs as not crucial but extremely helpful for the further development of their businesses. All interviewed programme managers support the conclusion that such small grants, especially when given on the basis of a joint analysis of needs or as part of an integrated support package can be very effective. Networking was in most cases provided in a package with information and financial support through specialized regional or rural development agencies or other regional support structures or platforms. In addition to those measures that are often part of regular support programmes, we discovered another type of support—the adaptation of the framework (REG) which was crucial in one innovation case, the Italian turpentine collection. Institutional innovations such as the formation of an association are often of indirect influence [43] but in this case the policy change was part of the innovation project and had a direct impact.

4. Discussion

The analysis of the presented innovation cases of NWFPs can help decision-makers take more informed decisions about the role of forests, and the forest-based sector in future (forest) bioeconomy strategies. As Giurca et al. [61] point out, many of European countries and their governments will engage in future in designing (or improving) national strategies to advance and strengthen their bioeconomy approaches. These bioeconomy strategies need to be based on the prerequisites of the country in focus [62], which are not orientated just on harvesting and use of timber products. In some countries, this means that many opportunities to expand to forest bioeconomy-related products and process will expand the forest sector and disciplines. Gorriz [24] illustrates that these interactions already take place in a more or less structured manner with agriculture, food industry, nature

protection, material industry, health sector, labour, and trade sectors. This, according to the same author, opens chances for joint value chain development and alliances. Sectors such as biochemistry or bioengineering can help in unlocking the NWFPs potential in bioeconomy, by creating bio-based solutions that can tackle global challenges (as climate change adaptation) [26]. In contrast to for example Finland and Sweden, where the timber industry plays a central role, in Mediterranean countries, there are strong agroforestry sectors, NWFPs, as well as other ecosystem services associated with different land use systems [61,63]. In Southeastern and Eastern European countries use of NWFPs is as well common (and historic) activity in rural areas, however not always formally recognized [45]. NWFPs are used for self-consumption (keeping and changing of habits) but also as a business opportunity. These aspects provide chances for a better recognition of NWFPs, especially when developing comprehensive forest bioeconomy strategies [64].

When relating the analysed cases to the main objectives of the EU Bioeconomy Strategy [1], we see that these innovations in NWFPs can support bioeconomy pathways in multiple ways. These innovations are not only an opportunity to support job creation and competitiveness of rural areas as usually addressed in literature. In the Table 5, we assess the potential contributions of NWFP to the four objectives, based on the analysed cases, other literature, and further considerations.

Table 5. NWFPs potential contribution to EU Bioeconomy Strategy main objectives.

EU Bioeconomy Strategy Main Objectives [1]	How NWFPs Can Contribute to These Objectives	Contribution Detected in Case Studies (Amount and Type of Business)
<i>Ensuring food and nutrition security</i>	Food and nutrition produced within small business, such as mushrooms (<i>ESGOUR</i> , <i>ESHOT</i>), berries (<i>country wines</i> , <i>UKWINE</i>), chestnuts (<i>ITMAR</i>), game (<i>ATGAME</i>), birch sap (<i>FIBIR</i>), Stone Pine (<i>ATLEAD</i>), hand-plucked wild teas (<i>UKFINE</i>), foraging (<i>UKPICK</i>), wild food from forests (<i>ATNPS</i>).	10
<i>Managing natural resources sustainably</i>	Management of forests in diversified business portfolios: Christmas tree plantations (<i>ATXMAS</i>); Direct game marketing (<i>DEGAME</i>), Agroforestry use (e.g., for truffle production) Natural pine resin products in cosmetics (<i>ESRES</i>), Stone Pine for e.g., essential oils (<i>ATLEAD</i>) Sustainable regional development of cultural landscapes with high natural value (<i>ATNPS</i>) Natural larch turpentine and resin, among others, used for natural paints (<i>ITTURP</i>)	6
<i>Reducing dependence on non-renewable resources for energy</i>	NWFPs can potentially be used as renewable resource (branches, pine cones etc.)—NWFP can possibly be used in co-production with energy (Charcoal production [65])	
<i>Strengthening European competitiveness and creating new jobs</i>	NWFPs offer various job opportunities in rural areas, and in this way, they keep outmigration and ensure sustainability of rural areas: Mushroom restaurant and gourmet products by local women (<i>ESGOUR</i>) Finnish start-up company sells luxury gift packages from forest products (<i>FIGIFT</i>) A start-up for climbing wall holds (<i>SLOCLI</i>) The rural start-up for herbal tea with innovative packaging (<i>SRBTEA</i>) Experiential services: Cut your own Christmas tree (<i>ATXMAS</i>) Mushroom hotel, rural tourism enterprise (<i>ESHOT</i>) Coppice wood management training (<i>UKCOPP</i>) Teaching woodland management (<i>UKSKIL</i>) Willow weaving courses (<i>UKWILL</i>)	9

Any sustainable bioeconomy strategy must build on both natural land-based resources and knowledge prerequisites [61] in a certain place. Here, the territorial character [66] of many NWFPs is important and relates to the previously discussed issue of a need to “place-adapt” bioeconomy strategies. Furthermore, their public good character, even though it is limiting their marketability and direct economic use [67,68], becomes relevant in bioeconomy because an increased use and awareness of NWFPs contribute to the change of users’ perceptions towards the use of natural products and bring them closer to nature. This on a long-term scale can influence their consumption patterns and preferences towards bio-based products and economy. As explained by Giurca [69] bioeconomy proponents count on the change in lifestyle choices and preferences of individual consumers. In this way, citizens are not just customers or users but are as well co-creators and decision-makers in a larger transformation process. These changes could also lead to sustainable consumption, which in turn helps to save CO₂ and contribute to the objective of the EU Strategy in mitigating and adapting to climate change.

Jankovský et al. [12] showed that most studies on innovations in the forest bioeconomy dealt with the necessary adaptation of policies, and innovations were mainly focused on biorefining, biotechnology, and production of various biomaterials, as well as innovations of business models and stakeholder interactions. From the NWFPs sector, we learn that there is a range of innovation types being relevant to transitioning processes. Therefore, in the following Table 6, we present the potential spectrum of innovations based on analysed cases and previous works [70] (p. 162).

Table 6. Types of innovation with NWFP examples that can support bioeconomy (adapted from [70] (p. 162)).

Type of Innovation	Example from NWFPs
Product innovation	New uses of NWFPs for clothing; medicinal or pharmaceutical products from wood, bark, fruits, leaves or the broad range of forest plants;
Process innovation	Change/diversification of forest management practices —main aim of management is use of forest for cosmetics/pharmaceutical industry (resin, pine seeds, turpentine, etc.) Specific forest management —to enhance production of mushrooms or berries, selection of tree species such as nuts or fruit trees (in peri-urban areas), agroforestry systems (Portuguese montado system), or plantation of wild or grafted fruit trees or shrubs such as chestnuts, hazelnuts, elder, sea buckthorn; Improved processing to improve the product quality —for instance, the natural ingredients or the shelf life of the products.
Organisational innovation	Horizontal cooperation of small producers —common brand allowing for a joint marketing Vertical integration or cooperation —secure a higher value added for the primary producer (farmers’ direct marketing) or to allow for a traceability of the product chain (e.g., high quality game meat or other products from natural production).
Marketing innovation	New marketing methods and approaches—reaching new customer groups through different design, packaging, advertising or distribution channels Use of internet platforms and social media networks for small producers to reach distant clients; Creation of brands for local, natural, wild products
Policy innovation	New or adapted regulatory frameworks in the field of the products (e.g., official recognition as a forest or agricultural product; license systems for collection) or in innovation support (e.g., the European Union LEADER instrument). Innovative financing schemes (micro loans) Public private partnerships or Involvement of third sectors (foundations, citizens groups etc.)
Institutional innovation	New certification schemes, Regional marketing approaches or the creation of new lobbying organisations for public awareness raising or for research, education and training programmes, or other political-institutional support.

Table 6. Cont.

Type of Innovation	Example from NWFPs
Service innovation	Experiential services such as foraging or mushroom collection tours, wild fruits cooking courses or manufacturing workshops.
Social innovation	Bottom-up initiatives with NWFPs by people and volunteering organizations Changing lifestyles —close to nature, new practices such as foraging and bush craft activities, survival training or the rediscovery of old skills and traditions; the redefinition of traditional wild food products from being seen as a poor people’s food to a healthy and stylish gourmet food.

This list of possible innovations (Table 6) suggests many possibilities in which forests could be used in the bioeconomy. This is especially important if we take into account the high share of privately owned forests and many small, in some cases abandoned and unmanaged, properties [71,72]. For small forest owners who do not see interest in managing forests for timber, this diversity of options for developing various businesses with NWFPs could be of relevance. As suggested by Weiss et al. [46] forest owners have a key role to play in the future forest-based bioeconomy. Thus, future strategies and policies should address the different ownership types by combining policy instruments, including information, incentives and legal and institutional frameworks [46]. Furthermore, if we look at the justice aspects, the use of NWFPs is for some people, a source of food and is important for living, thus it would be purposeful to adapt forest management for these different purposes. Here attention should be placed on assuring sustainable production of NWFPs, especially when it comes to expansion of production and intensively cultivated NWFPs. Intensively cultivated NWFPs were not focus of this paper, but potential of NWFPs would be even higher if these are considered.

Transitioning to the bioeconomy is a matter of many small steps, some of which are more evident than others [29]. It assumes a shift away from the prevailing rules of the game, expectations, cultures, and consumer behaviour. It will need changes in many spheres, which demands not just for disruptive or radical but also a magnitude of incremental innovations. It is this multitude of mutually reinforcing and simultaneously evolving changes that form the essence of transitions, which is first and foremost a challenge of innovation on the institutional level [29].

In this paper, we showed how these different innovation types, many of them incremental and niche innovations, in the sphere of NWFPs could contribute to the overall bioeconomy transition process. However, for this, many identified barriers in the IS need to be tackled.

Unlocking the NWFP Potential in Bioeconomy by Improving Innovation Support Structures

The institutional frameworks for supporting innovations in forestry in general, and for NWFP specifically, are relatively weak [73,74]. Since the field of NWFP is not developed as a distinguished sector, specific support structures on the public and private sides are largely missing [47]. From the public side, statistical data or any other information, research, education, and training services are very limited. From the private side, only weak support exists, since the established interest groups of forestry or agriculture do not have NWFP in their focus (except for some specific products, for example game). Forest owners’ interest groups tend not to support those products because the benefits are often not with the landowners [46]. Only rarely, have specific interest groups been founded for NWFP as such or for a range of such products. An example would be the Scottish Wild Harvests Association. Interest groups for specific NWFP usually develop only once a certain economic significance is recognized and reached (e.g., for truffles or cork in Mediterranean countries). The formation of producers’ associations is often an important step for fostering the production knowhow, spreading product knowledge to consumers, or lobbying for favorable regulatory provisions.

The critical phase, however, is before that, in an early phase in the adoption life cycle of a new product, known as the innovation chasm [75]. Some of analysed cases show that in that phase, companies have to rely on more general support structures and have to be very proactive in searching for relevant information, networks or funding possibilities. It is mostly not the forestry sector but actors and programmes from agriculture (e.g., agricultural direct marketing associations and vocational schools in Austria), rural, regional or business development (e.g., LEADER regions in Austria and Wales; regional development in Finland; start-up grants from national support programmes in Serbia and Slovenia) or nature conservation (e.g., the Reforesting Scotland association; Austrian Nature Parks Association) that provide support [43–47,76].

In order to make an economic impact, innovations must spread and be adopted by other companies (diffusion). For this process, the formation of associations (of various interested actors) is highly useful—an institutional innovation which benefits itself from institutional support or from prior social capital [43,44].

From these 20 innovation case studies we can infer that the relevant institutional frameworks for NWFP businesses do differ across the European regions. We found that special attention on (specific) NWFP does exist in Mediterranean countries (Italy, Spain, Portugal) where some of these products have a strong tradition and economic significance, such as cork, pine kernels, pine resin, truffles or mushrooms. We furthermore found relatively strong general framework conditions for rural or regional development in other European countries (Finland, UK, and Austria). Moreover, in contrast to these western countries, the institutional structures for business support in rural areas in the former socialist countries in eastern and southeastern Europe are not so strongly developed yet [76–78]. However, in these countries, due to the rich tradition of using NWFPs innovativeness, the potential for these products is huge [77–79]. Thus far, the analysed IS around case studies showed that need exist to recognize the potentials of NWFP for reaching the strategic goals of a bioeconomy; most importantly with different focus on the region's specific needs for each type of business in concern. These depend on the type of landscape, biological resource patterns, economic and demographic conditions and local types of land ownership.

In order to meet their full potential in the bioeconomy, the relevant innovation support structures for NWFPs must become more open to more risky, more disruptive and complex innovations encompassing different policy spheres and sectors. The good examples in the analysed cases correspond to regionally networked innovation systems [51] or networked regional innovation systems [80] which, in other words, provide top-down support for bottom-up innovations [47]. They represent open and flexible support programmes and systemic structures for tailor-made support. Examples include various approaches such as specific regional support structures centred around NWFPs (regional marketing initiatives) [81,82], nature parks or similar regional organisations or associations [43], or regional development agencies such as under the European Union LEADER instrument [42].

5. Conclusions

The potential contribution of NWFPs in bioeconomy, as illustrated in this paper, is so far mostly neglected, or insufficiently recognized by policymakers and forestry practitioners. This wide spectrum of possibilities could be considered in the first place in future forest management planning, when future objectives are set. In the second place, they must be considered in the forest bioeconomy strategies that should open up and support the creation of new value chains, other than those related to timber use. Rich and historical experience of the use of NWFPs in some countries, as in Mediterranean or Eastern and Southeastern Europe, could be used and developed further. In the creation of this enabling environment, various IS could be engaged, from different sectors or existing on regional levels. Fostering cross-sectoral interaction and the creation of diverse and targeted financial mechanisms should be the main focus of future policies. Envisioning system-wide innovation support that cut across economic sectors and that extend along value chains is needed. In order to embrace all these possibilities, different ownership types should

be taken into account, as well as diverse types of entrepreneurs and companies (often small-scale). Supporting smaller projects and activities could empower landowners in rural areas and help them in diversifying their products and services, thus allowing them to have wider sources of support for their living. In doing this, recognizing different innovation types, including social and institutional is very important. This, in the long run, could support entrepreneurial activities, development and proliferation of rural areas.

Author Contributions: G.W.: Supervision, Conceptualization; Methodology; Data synthesising and analysis; Writing—review & editing. A.L.: Conceptualization; Data synthesising; Methodology; Writing—review & editing. I.Ž.: Conceptualization; Data synthesising and analysis; Methodology; Writing—original draft, reviewing & editing; Visualization; Submission and Correspondence. All authors have read and agreed to the published version of the manuscript.

Funding: The research was undertaken within the STARTREE project (“Multipurpose trees and non-wood forest products: a challenge and opportunity”) and has been funded by the European Union Seventh Framework Programme for Research, Technological Development and Demonstration under grant agreement No. 311919.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study in the frame of STARTREE Project.

Data Availability Statement: Data will be made available on request.

Acknowledgments: We are thankful to all interview partners and all the project partners who supported the data collection work. We thank to all four reviewers for constructive comments.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. *A Sustainable Bioeconomy for Europe: Strengthening the Connection between Economy, Society and the Environment, Updated Bioeconomy Strategy*; European Union: Luxembourg, 2018; p. 107.
2. Biancolillo, I.; Paletto, A.; Bersier, J.; Keller, M.; Romagnoli, M. A literature review on forest bioeconomy with a bibliometric network analysis. *J. For. Sci.* **2020**, *66*, 265–279. [\[CrossRef\]](#)
3. Kleinschmit, D.; Lindstad, B.H.; Thorsen, B.J.; Toppinen, A.; Roos, A.; Baardsen, S. Shades of green: A social scientific view on bioeconomy in the forest sector. *Scand. J. For. Res.* **2014**, *29*, 402–410. [\[CrossRef\]](#)
4. Pfau, S.F.; Hagens, J.E.; Dankbaar, B.; Smits, A.J.M. Visions of sustainability in bioeconomy research. *Sustainability* **2014**, *6*, 222–1249. [\[CrossRef\]](#)
5. Bugge, M.; Hansen, T.; Klitkou, A. What is the bioeconomy? A review of the literature. *Sustainability* **2016**, *8*, 691. [\[CrossRef\]](#)
6. Palahí, M.; Pansar, M.; Costanza, R.; Kubiszewski, I.; Potočník, J.; Stuchtey, M.; Nasi, R.; Lovins, H.; Giovannini, E.; Fioramonti, L. *Investing in Nature as the True Engine of our Economy: A 10-Point Action Plan for a Circular Bioeconomy of Wellbeing*; Knowledge to Action 02; European Forest Institute: Joensuu, Finland, 2020; p. 58.
7. Jonsson, R.; Rinaldi, F.; Pilli, R.; Fiorese, G.; Hurmekoski, E.; Cazzaniga, N.; Robert, N.; Camia, A. Boosting the EU forest-based Bioeconomy: Market, climate, and employment impacts. *Technol. Forecast. Soc. Change* **2021**, *163*, 120478. [\[CrossRef\]](#)
8. Ollikainen, M. Forestry in bioeconomy—Smart green growth for the humankind. *Scand. J. For. Res.* **2014**, *29*, 360–366. [\[CrossRef\]](#)
9. Roos, A.; Stendahl, M. The emerging bioeconomy and the forest sector. In *Forests, Business and Sustainability*; Panwar, R., Kozak, R., Hansen, E., Eds.; Routledge: Abington, PA, USA; New York, NY, USA; New York, NY, USA, 2015; p. 23.
10. Lovric, M.; Mutke, S.; Górriz Mifsud, E.; Martínez de Arano, I.; Pettenella, D.; Vidale, E.; Prokofieva, I.; Mavsar, R. Non-timber forest products and the European bioeconomy: Status and transition pathways. In *The Bioeconomy and Non-Timber Forest Products*; Smith-Hall, C., Chamberlain, J., Eds.; Routledge: London, UK, 2022; p. 298. [\[CrossRef\]](#)
11. Aggestam, F.; Giurca, A. Implementing Circular-Bioeconomy Principles across Two Value Chains of the Wood-Based Sector: A Conceptual Approach. *Land* **2022**, *11*, 2037. [\[CrossRef\]](#)
12. Jankovský, M.; García-Jácome, S.P.; Dvořák, J.; Nyarko, I.; Hájek, M. Innovations in Forest Bioeconomy: A Bibliometric Analysis. *Forests* **2021**, *12*, 1392. [\[CrossRef\]](#)
13. Ragauskas, A.J.; Williams, C.K.; Davison, B.H.; Britovsek, G.; Cairney, J.; Eckert, C.A.; Frederick, W.J.; Hallet, J.P.; Leak, D.J.; Liotta, C.L. The path forward for biofuels and biomaterials. *Science* **2006**, *311*, 484–489. [\[CrossRef\]](#)
14. Paletto, A.; Bernardi, S.; Pieratti, E.; Teston, F.; Romagnoli, M. Assessment of environmental impact of biomass power plants to increase the social acceptance of renewable energy technologies. *Heliyon* **2019**, *5*, e02070. [\[CrossRef\]](#)
15. Ludvig, A.; Živojinović, I.; Hujala, T. Social Innovation as a Prospect for the Forest Bioeconomy: Selected Examples from Europe. *Forests* **2019**, *10*, 878. [\[CrossRef\]](#)

16. Johnson, F.X.; Bessonova, E. *Forest Resources are at the Heart of the EU's Bioeconomy Strategy. How Can they Be Used Sustainably?* Stockholm Environment Institute: Stockholm, Sweden, 2021; Available online: <https://www.sei.org/perspectives/forests-eu-bioeconomy/> (accessed on 10 December 2022).
17. Lainez, M.; González, J.M.; Aguilar, A.; Vela, C. Spanish strategy on bioeconomy: Towards a knowledge based sustainable innovation. *New Biotechnol.* **2018**, *40*, 87–95. [[CrossRef](#)] [[PubMed](#)]
18. Stadler, T.; Chauvet, J.M. New innovative ecosystems in France to develop the Bioeconomy. *New Biotechnol.* **2018**, *40*, 113–118. [[CrossRef](#)] [[PubMed](#)]
19. Refsgaard, K.; Kull, M.; Slätmo, E.; Meijer, M.W. Bioeconomy—A driver for regional development in the Nordic countries. *New Biotechnol.* **2021**, *60*, 130–137. [[CrossRef](#)] [[PubMed](#)]
20. *New EU Forest Strategy for 2030*; Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions; COM(2021) 572 Final; European Commission: Brussels, Belgium, 2021; p. 27.
21. Wolfslehner, B.; Prokofieva, I.; Mavsar, R. *Non-Wood Forest Products in Europe: Seeing the Forest around the Trees. What Science Can Tell Us 10*; European Forest Institute: Joensuu, Finland, 2019; p. 114.
22. Weiss, G.; Emery, M.R.; Corradini, J.; Živojinović, I. New Values of Non-Wood Forest Products. *Forests* **2020**, *11*, 165. [[CrossRef](#)]
23. Weiss, G.; Ludvig, A.; Asamer-Handler, M.; Fischer, C.; Vacik, H.; Živojinović, I. Rendering NWFPs innovative. In *Non-Wood Forest Products in Europe: Seeing the Forest around the Trees. What Science Can Tell Us 10*; Wolfslehner, B., Prokofieva, I., Mavsar, R., Eds.; European Forest Institute: Joensuu, Finland, 2019; pp. 77–97.
24. Gorizz, E. NWFPs in a bioeconomy spectrum: Opening opportunities for cross sectoral links. In *Non-Wood Forest Products in Europe: Seeing the Forest around the Trees. What Science Can Tell Us 10*; Wolfslehner, B., Ed.; European Forest Institute: Joensuu, Finland, 2019; pp. 100–103.
25. Prokofieva, I.; Bouriaud, L.; Buttoud-Kouplevatskaya, I.; Corradini, G.; Górriz, E.; Nichiforel, L. The Role of Institutions in NTFP Development: Current State and Historical Changes. Project Deliverable D4.1. StarTree Project (EU Project 311919). 2014. Available online: <https://www.star-tree.eu/results/deliverables.html#wp-4> (accessed on 3 July 2021).
26. Prokofieva, I.; Lovric, M.; Pettenella, D.; Weiß, G.; Wolfslehner, B.; Wong, J. *What is the Potential Contribution of Non-Wood Forest Products to the European Forest-Based Bioeconomy? What Science Can Tell Us 8*; European Forest Institute: Joensuu, Finland, 2017; pp. 132–140.
27. Purwestri, R.C.; Hájek, M.; Šodková, M.; Jarský, V. How Are Wood and Non-Wood Forest Products Utilized in the Czech Republic? A Preliminary Assessment of a Nationwide Survey on the Bioeconomy. *Sustainability* **2020**, *12*, 566. [[CrossRef](#)]
28. Weiss, G.; Ludvig, A.; Živojinović, I. Four decades of innovation research in forestry and the forest-based industries—A systematic literature review. *For. Policy Econ.* **2020**, *120*, 102288. [[CrossRef](#)]
29. Pel, B.; Achten, W. Transitioning into Circular Economy; appreciating the little steps of system innovation. In *Transitioning to a Circular Economy. Changing Business Models and Business Ecosystems*; Mansy, J., Verga, G.C., Pel, B., Messagie, M., Lebeau, P., Achten, W., Khan, A.Z., Macharis, C., Eds.; ASP: Brussels, Belgium, 2022; pp. 49–73.
30. *The Bioeconomy to 2030: Designing a Policy Agenda, Main Findings, and Policy Conclusions*; OECD: Paris, France, 2009; p. 323. [[CrossRef](#)]
31. Aguilar, A.; Wohlgemuth, R.; Twardowski, T. Perspectives on bioeconomy. *N. Biotechnol.* **2018**, *40*, 181–184. [[CrossRef](#)]
32. Purkus, A.; Hagemann, N.; Bedtke, N.; Gawel, E. Towards a sustainable innovation system for the German wood-based bioeconomy: Implications for policy design. *J. Clean. Prod.* **2018**, *172*, 3955–3968. [[CrossRef](#)]
33. Bröring, S.; Laibach, N.; Wustmans, M. Innovation types in the bioeconomy. *J. Clean. Prod.* **2020**, *266*, 121939. [[CrossRef](#)]
34. Giurca, A.; Späth, P. A forest-based bioeconomy for Germany? Strengths, weaknesses and policy options for lignocellulosic biorefineries. *J. Clean. Prod.* **2017**, *153*, 51–62. [[CrossRef](#)]
35. Edquist, C. Systems of Innovation: Perspectives and Challenges. In *Oxford Handbook of Innovation*; Fagerberg, J., Mowery, D., Nelson, R.R., Eds.; Oxford University Press: Oxford, UK, 2005; pp. 181–208.
36. *The Measurement of Scientific and Technological Activities: Guidelines for Collecting and Interpreting Innovation Data: Oslo Manual*, 3rd ed.; OECD: Paris, France, 2005.
37. Polman, N.; Slee, W.; Kluvánková, T.; Dijkshoorn, M.; Nijnik, M.; Gezik, V.; Soma, K. Classification of Social Innovations for Marginalized Rural Areas, Report D2.1. Social Innovation in Marginalised Rural Areas Project (SIMRA). 2017, 32p. Available online: <http://www.simra-h2020.eu/wp-content/uploads/2017/09/D2.1-Classification-of-SI-for-MRAs-in-the-target-region.pdf> (accessed on 5 December 2022).
38. Weiss, G.; Ollonqvist, P.; Slee, B. How to Support Innovations in the Forest Sector: Summary and Conclusions. In *Innovation in Forestry: Territorial and Value Chain Relationships*; Weiss, G., Pettenella, D., Ollonqvist, P., Slee, B., Eds.; CABI International: Oxfordshire, UK, 2011; pp. 303–319. ISBN 978-1-84593-689-1.
39. Howaldt, J.; Knopp, R. Shaping social innovation by social research. In *Challenge Social Innovation. Potentials for Business, Social Entrepreneurship and Civil Society*; Franz, H.W., Hochgerner, J., Howaldt, J., Eds.; Springer: Berlin/Heidelberg, Germany, 2012; pp. 43–55.
40. *Terms and Definitions. Forest Resource Assessment*; Working Paper 180; FAO: Rome, Italy, 2015; Available online: <http://www.fao.org/docrep/017/ap862e/ap862e00.pdf> (accessed on 22 December 2022).
41. Berg, B.L. *Qualitative Research Methods for the Social Sciences*, 4th ed.; Allyn & Bacon: Boston, MA, USA, 2001; p. 304.

42. Ludvig, A.; Tahvanainen, V.; Dickson, A.; Evard, C.; Kurttila, M.; Cosovic, M.; Chapman, E.; Wilding, M.; Weiss, G. The practice of entrepreneurship in the non-wood forest products sector: Support for innovation on private forest land. *For. Policy Econ.* **2016**, *66*, 31–37. [CrossRef]
43. Ludvig, A.; Corradini, G.; Asamer-Handler, M.; Pettenella, D.; Verdejo, V.; Martínez, S.; Weiss, G. The practice of innovation: The role of institutions in support of non-wood forest products. *BioProducts Bus.* **2016**, *1*, 73–84.
44. Ludvig, A.; Weiss, G.; Sarkki, S.; Nijnik, M.; Živojinović, I. Mapping European and forest related policies supporting social innovation for rural settings. *For. Policy Econ.* **2018**, *97*, 146–152. [CrossRef]
45. Živojinović, I.; Nedeljković, J.; Stojanovski, V.; Japelj, A.; Nonić, D.; Weiss, G.; Ludvig, A. Non-timber forest products in process of transition: Innovation cases in selected SEE countries. *For. Policy Econ.* **2017**, *81*, 18–29. [CrossRef]
46. Weiss, G.; Lawrence, A.; Nichiforel, L. How does forest ownership in Europe affect the forest-based bioeconomy? In *What Science Can Tell Us 8*; Winkel, G., Ed.; European Forest Institute: Joensuu, Finland, 2017.
47. Weiss, G.; Ludvig, A.; Živojinović, I.; Asamer-Handler, M.; Huber, P. Non-Timber innovations: How to innovate in side-activities of forestry—Case study Styria, Austria. *Austrian J. For. Sci.* **2017**, *134*, 231–250.
48. Rametsteiner, E.; Weiss, G. Innovation and Innovation Policy in Forestry: Linking Innovation Process with Systems Models. *For. Policy Econ.* **2005**, *8*, 691–703. [CrossRef]
49. Edquist, C. *Systems of Innovation. Technologies, Institutions and Organizations*; Pinter: London, UK; Washington, DC, USA; Washington, DC, USA, 1997.
50. North, D.C. Institutions. *J. Econ. Perspect.* **1991**, *5*, 97–112. [CrossRef]
51. Asheim, B.T. Territoriality and Economics: On the Substantial Contribution of Economic Geography. Economic Geography in Transition. In *Economic Geography in Transition*; Jonson, O., Olander, L., Eds.; The Swedish Geographical Yearbook: Lund, Sweden, 1998; Volume 74, pp. 98–109.
52. Wellbrock, W.; Roep, D. The Learning Rural Area Framework: A Heuristic Tool to Investigate Institutional Arrangements which Support Collaboration in Rural Areas. *Sociol. Rural.* **2015**, *55*, 106–124. [CrossRef]
53. Morgan, K. The learning region: Institutions, innovations and regional renewal. *Reg. Stud.* **1997**, *31*, 491–503. [CrossRef]
54. Van der Ploeg, J.; Marsden, T.K. Unfolding Webs: The dynamics of regional rural development. *Rural. Sociol.* **2008**, *2008*, 262.
55. Edquist, C.; Johnson, B. Institutions and organizations in systems of innovations. In *Systems of Innovation*; Edquist, C., Ed.; Technologies, Institutions and Organizations, Pinter: London, UK; Washington, DC, USA, 1997; pp. 41–60.
56. Schulp, C.J.E.; Thuiller, W.; Verburg, P.H. Wild food in Europe: A synthesis of knowledge and data of terrestrial wild food as an ecosystem service. *Ecol. Econ.* **2014**, *105*, 292–305. [CrossRef]
57. Scoones, I.; Melnyk, M.; Pretty, J.N. *The Hidden Harvest: Wild Foods and Agricultural Systems. A Literature Review and Annotated Bibliography*; The Sustainable Agricultural Programme; International Institute for Environment and Development: London, UK, 1992; p. 256. ISBN 0905347935.
58. Laird, S.A.; McLain, R.J.; Wynberg, R.P. *Wild Product Governance: Finding Policies that Work for Non-Timber Forest Products*; Routledge: London, UK, 2010; p. 422, ISBN 9780415507134.
59. Rametsteiner, E.; Weiss, G.; Kubeczko, K. *Innovation and Entrepreneurship in Forestry in Central Europe*; Brill: Leiden, The Netherlands, 2005; p. 179, ISBN 978-90-04-14589-4.
60. Kubeczko, K.; Rametsteiner, E.; Weiss, G. The Role of Sectoral and Regional Innovation Systems in Supporting Innovations in Forestry. *For. Policy Econ.* **2006**, *7*, 704–715. [CrossRef]
61. Giurca, A.; Nichiforel, L.; Stancioiu, P.T.; Dragoi, M.; Dima, D.P. Unlocking Romania’s Forest-Based Bioeconomy Potential: Knowledge-Action-Gaps and the Way Forward. *Land* **2022**, *11*, 2001. [CrossRef]
62. Staffas, L.; Gustavsson, M.; McCormick, K. Strategies and Policies for the Bioeconomy and Bio-Based Economy: An Analysis of Official National Approaches. *Sustainability* **2013**, *5*, 2751–2769. [CrossRef]
63. Pülzl, H.; Giurca, A.; Kleinschmit, D.; Arts, B.; Mustalahti, I.; Sergent, A.; Seccco, L.; Pettenella, D.; Brukas, V. The Role of Forests in Bioeconomy Strategies at the Domestic and EU Level. In *Towards a Sustainable European Forest-Based Bioeconomy-Assessment and the Way Forward*; Winkel, G., Ed.; European Forest Institute: Joensuu, Finland, 2017; pp. 36–51. ISBN 9789525980417.
64. Di Cori, V.; Robert, N.; Franceschinis, C.; Pettenella, D.M.; Thiene, M. Framework Proposal to Quantify the Contribution of Non-Wood Forest Products to the European Union Forest-Based Bioeconomy. *Forests* **2022**, *13*, 362. [CrossRef]
65. Rogelja, T.; Ludvig, A.; Weiss, G.; Prah, J.; Shannon, M.; Secco, L. Analyzing social innovation as a process in rural areas: Key dimensions and success factors for the revival of the traditional charcoal burning in Slovenia. *J. Rural. Stud.* **2023**, in press. [CrossRef]
66. Slee, B. Innovation in Forest related Territorial Goods and Services: An Introduction. In *Innovation in Forestry: Territorial and Value Chain Relationships*; Weiss, G., Pettenella, D., Ollonqvist, P., Slee, B., Eds.; CABI: Wallingford, UK, 2011; pp. 118–130. [CrossRef]
67. Mantau, U.; Merlo, M.; Sekot, W.; Welcker, B. *Recreational and Environmental Markets for Forest Enterprises. A New Approach towards Marketability of Public Goods*; CABI Publishing: Wallingford, UK, 2001; p. 544.
68. Mavsar, R.; Ramcilovic, S.; Palahi, M.; Weiss, G.; Rametsteiner, E.; Tykkä, S.; Apeldoorn, R.; Vreke, J.; Wijk, M.; Janse, G. Study on the Development and Marketing of Non-Market Forest Products and Services (FORVALUE). Study Report for DG AGRI. Study Contract No. 30-CE-0162979/00-21. 2008. Available online: https://www.researchgate.net/publication/313103563_Study_on_the_Development_and_Marketing_of_Non-Market_Forest_Products_and_Services (accessed on 20 December 2022).
69. Giurca, A. Why is communicating the circular bioeconomy so challenging? *Circ. Econ. Sust.* **2022**, 1–10. [CrossRef]

70. Amici, A.; Beljan, K.; Coletta, A.; Corradini, G.; Danila, I.C.; Da Re, R.; Ludvig, A.; Marceta, D.; Nedeljkovic, J.; Nichiforel, L.; et al. Economics, marketing and policies of NWFP. In *Non-Wood Forest Products in Europe. Ecology and Management of Mushrooms, Tree Products, Understory Plants and Animal Products*; Vacik, H., Hale, M., Spiecker, H., Pettenella, D., Tomé, M., Eds.; BoD—Books on Demand GmbH: Norderstedt, Germany, 2020; pp. 125–209.
71. *Who Owns our Forests? Forest Ownership in the ECE Region*; Geneva Timber and Forest Study Papers; UNECE: Geneva, Switzerland, 2020; p. 195. [[CrossRef](#)]
72. Weiss, G.; Lawrence, A.; Hujala, T.; Lidestav, G.; Niciforel, L.; Nybakk, E.; Quiroga, S.; Sarvasova, Z.; Suarez, C.; Zivojinovic, I. 2019 Forest ownership changes in Europe: State of knowledge and conceptual foundations. *For. Policy Econ.* **2019**, *99*, 9–20. [[CrossRef](#)]
73. Weiss, G. Innovation in Forestry: New Values and Challenges for Traditional Sector. In *Encyclopedia of Creativity, Invention, Innovation and Entrepreneurship*; Carayannis, E.G., Ed.; Springer: New York, NY, USA, 2013. [[CrossRef](#)]
74. Lawrence, A. No forest without timber? *Int. For. Rev.* **2003**, *5*, 87–96. [[CrossRef](#)]
75. Moore, G.A. *Crossing the Chasm: Marketing and Selling Technology Products to Mainstream Customers*; NY Harper Business: New York, NY, USA, 2002; p. 227.
76. Živojinović, I.; Ludvig, A.; Hognl, K. Social Innovation to sustain rural communities: Overcoming institutional challenges in Serbia. *Sustainability* **2019**, *11*, 7248. [[CrossRef](#)]
77. Štěrbová, M.; Šálka, J.; Sarvasova, Z. How does the innovation system in the Slovak forestry service sector work? *Allg. Forst Jagdztg.* **2018**, *189*, 16–29. [[CrossRef](#)]
78. Jarský, V. Analysis of the sectoral innovation system for forestry of the Czech Republic. Does it even exist? *For. Policy Econ.* **2015**, *59*, 56–65, 79. [[CrossRef](#)]
79. Sacchelli, S.; Borghi, C.; Fratini, R.; Bernetti, I. Assessment and Valorization of Non-Wood Forest Products in Europe: A Quantitative Literature Review. *Sustainability* **2021**, *13*, 3533. [[CrossRef](#)]
80. Cooke, P. Regional innovation systems: Origin of the species. *Int. J. Technol. Learn. Innov. Dev.* **2008**, *1*, 393–409. [[CrossRef](#)]
81. Rovira, M.; Garay, L.; Górriz-Mifsud, E.; Bonet, J.-A. Territorial Marketing Based on Non-Wood Forest Products (NWFPs) to Enhance Sustainable Tourism in Rural Areas: A Literature Review. *Forests* **2022**, *13*, 1231. [[CrossRef](#)]
82. Pettenella, D.; Secco, L.; Maso, D. NWFP&S Marketing: Lessons Learned and New Development Paths from Case Studies in Some European Countries. *Small-Scale For.* **2007**, *6*, 373–390. [[CrossRef](#)]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.