# Toward a Road Map for innovating Wild Nuts and Berries value chains

## Conclusions issued from the Scoping seminar of the Wild Nuts and Berries iNet, Coruche (Portugal), 14 & 15 June 2018

**INCREDIBLE - Innovation Networks of Cork, Resins and Edibles**

**in the Mediterranean basin**

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# 1. Introduction to the innovation networks (iNets)

## 1.1. INCREDIBLE, the European Thematic network on Mediterranean NWFP

INCREDIBLE is a Thematic Network on Mediterranean Non Wood Forest Products (NWFP), funded by European Union's Horizon 2020 Research and innovation Programme from 2017 to 2020.

Mediterranean forests are facing significant challenges at many levels. In the northern Mediterranean, rural abandonment leads to a rapid expansion of unmanaged forests and increased risk of catastrophic forest fires. In the southern and eastern Mediterranean, rural and peri-urban populations are putting pressure on forest resources. The lack of well-developed forest products value chains that can generate jobs and income is a common underlying factor that jeopardises the capacity to sustainably manage forest resources already menaced by climate change. Non Wood Forest Products can be part of the solution, if they contribute to a smart and inclusive bio-based economy that creates value from, and investment streams for, sustainable forest management. Development of existing potentials requires the collaboration and knowledge exchange between NWFP practitioners and scientists, and among regions. The INCREDIBLE network is designed to speed up the flow of credible, salient and useful knowledge from science and experience, in order facilitate innovation to happen.

Interregional Innovation Networks (iNets) are the core tool of the INCREDIBLE network to promote knowledge exchange on NWFP across the Mediterranean basin. The network concept is to identify challenges and needs in practice for each iNet and explore methods to address them by creating the competences and contributions of many various actors within the iNet ecosystem. Key to this is successful stakeholder engagement, allowing the various actors of the iNet ecosystem to be involved and to be a part of the open innovation process.

These networks will allow to seed, collect, co-create and disseminate relevant technological, economic, innovative and research knowledge linked to the main NWFP value chains. The iNets allows individuals to meet and to bring forward and co-create knowledge on selected topics. While being interregional in their structure, iNets will be actively working at the local, national and international scales in terms of dissemination outputs and activities.

INCREDIBLE has developed five iNets for the main Mediterranean NWFP, namely Cork, Resins, Aromatic and medicinal plants, Mushrooms and truffles, and Wild nuts and berries, to better process the issues of NWFP across the Mediterranean basin. Each iNet is gathering the best practical and science knowledge related to NWFP production, transformation and trade channels. Special attention will be drawn to cross-cutting sectorial issues.

The participation of stakeholders relevant to the iNet regional ecosystems in the discussions and decision-making process is the best way to ensure that their own perspective and knowledge contribute to the network's outcomes. Stakeholder participation not only results in a better narrative with a richer picture of the iNet challenges, but also allows to better expressing the innovation objectives and the options to reach these goals. Successful outcome also requires dealing with barriers to the implementation of the innovation. These barriers will be discussed and explored during the activities of the iNet.

## 1.2. Wild nuts and berries iNet narrative

Many species of Mediterranean woodlands offer edible seeds or fruits. Some of them have been traded since Antiquity, but others are only locally used due to limited supply or to perishability. The most emblematic and valuable gourmet nut gathered in Mediterranean forests is the seed kernel of stone pine (*Pinus pinea*), the Mediterranean pine nut. The second highly prized wild fruit are chestnuts, the fruits of the sweet chestnut (*Castanea sativa*), harvested from groves and orchards throughout Mediterranean countries and beyond. Among other wild fruits, blackberries (*Rubus* spp.), bilberries (*Vaccinium myrtillus*), and raspberries (*Rubus* spp.) already have an important development as new crops in Southern Europe, following the way of cultivated American blueberry (*Vaccinium* spp.). However, business opportunities for other berries, such as strawberry tree fruits (*Arbutus unedo*) are still not widespread.

In the last decades, mechanical harvesting of Mediterranean stone pines by specially adapted tree shakers has reduced costs as well as labour risks of manual harvesting by tree climbers. Recently, first elite clones have been legally registered and released as basic materials for scion production allowing for grafted orchards, with genetic gains estimated in 20-40%, but nurseries must still develop the plant supply chain for marketing high-quality grafted trees. The control of yield losses due to the exotic seed pest *Leptoglossus occidentalis* is a major challenge for the sector.

The European chestnut is facing new challenges that could be decisive for the future of the sector in Europe, namely diseases like ink (*Phytophthora cinnamomi*) and blight (*Cryphonectria parasitica*), or pests like the Asian chestnut gall wasp (*Dryocosmus kuriphilus*), as well as orchard management issues and the value chain development.

## 2. Scoping seminar

The scoping seminar was the first official meeting of each iNet. Its main goal was to create a specific road map for better targeting specific issues within its topic. Five seminars were organised by the iNet coordinators and they were held in Tunisia (Aromatic and Medicinal Plants), Spain (Resins, Mushrooms and Truffles), Portugal (Wild Nuts and Berries), and Italy (Cork).

All iNet members were invited and a special attention was given to ensure the participation of key stakeholders. At the scoping seminar, stakeholders from all links of the value chain had an opportunity to validate the previous work, to share their opinion and to bring up problems and difficulties of their sector. They could propose bottom-up, complementary activities, contributing to the iNet future development. The methodology of the seminar was based on a combination of plenary, break-up groups and informal discussions during the coffee breaks, lunch and fieldtrips. Starting point of all discussions was an understanding of all the actors and fluxes involved in the different value chains and their extended ecosystem. The objective was to develop a collective assessment of the functioning of the value chains and the identification of challenges of opportunities for innovation, as perceived by the different actors. It was a chance for everyone to learn about challenges and to get a wider picture of the condition in the sector, e.g. to compare difficulties, qualities and solutions between countries. But also expectations could be managed on what can be achieved within the framework of the INCREDIBLE network.

There was no attempt to generate consensus on a desired scenario for every non-wood forest product sector, as this could lead to roadblocks due to diverging interests among different actors of the value chains. Similarly, no hard prioritising was sought, although in some cases participants were asked to vote priorities as a tool to stimulate discussions. The methodology was designed to rather capture all issues and priorities, and to further process and distil them in an iterative approach, to better understand them and to allow common priorities to emerge naturally.

The number of stakeholders attending scoping seminars (Table 1) was higher than expected in three of the events, which tells us that the stakeholders were well informed and interested in collaboration. Despite the different concerns among participants from different countries, and even among regions in the same country, the participants agreed on the identification of challenges as well as the priority themes for reinforcing the NWFP sector. Most of the stakeholders were from the country where the scoping seminar was organised but international stakeholders were participating too.

Table 1. Number of participants at each scoping seminar.

| | Cork iNet | Resins iNet | Aromatic and medicinal plants iNet | Mushroom and truffles iNet | Wild nuts and berries iNet |
|---|---|---|---|---|---|
| | | | Number of participants | | |
| Spain | 1 | 28 | 4 | 48 | 4 |
| Portugal | 4 | 7 | 1 | | 15 |
| France | | 3 | 2 | 2 | 1 |
| Belgium | 1 | 1 | 1 | | |
| Greece | | | 1 | 2 | |
| Italy | 20 | | | 2 | |
| Croatia | | | | 2 | |
| Tunis | 1 | 1 | 37 | | |
| **Total** | **27** | **39** | **46** | **56** | **20** |

## 2.1. Scoping seminar report of the Wild nuts and berries iNet

### 2.1.1. Summary output

Participants of the scoping seminar were mostly local Portuguese stakeholders, as well as participants from Spanish and French public bodies. The failure to attract value chain actors from foreign enterprises was possibly due to opportunity costs of spending two working days abroad. Unfortunately, two relevant pinecone processors from Spain that were going to assist dismissed the meeting only short-term due to unforeseen issues at their enterprises.

As the main outcomes of the meeting, participants marked issues such as the advantage of an international network that allows for knowing who-is-who in the sector, for an increased exchange of knowledge and ideas, including improved market information, or even for building commercial relationships. A fluid linkage between research results and the sector was considered essential for innovation. Optimistic views on advances along supply chains couldn't deviate the main attention from most serious problems that the sectors of chestnuts and Mediterranean pine nuts are currently facing: damages by severe exotic pests and diseases, yield losses due to increasing droughts, persisting thefts and the persisting lack of certified, traced quality standards "from forest to fork" (traceability actually due for European food since Regulation (EC) 178/2002).

Key consequences for further action in the Wild nuts & berries iNet, namely inter-regional and cross-cutting seminars, open innovation challenges and other dissemination activities, are the marks put on the main challenges that are jeopardizing the sustainable and profitable production of forest-collected gourmet nuts (chestnuts and Mediterranean pine nuts).

First, there is a need to recover a sustained and high production, by deployment of improved, adapted genetic materials, the spread of optimised management techniques, and the development of integrated pest management systems.

Second, concerted actions are required against thefts and persisting black markets that should be complemented with developing protocols, standards or even guarantee labels for traceability, processing standards and product quality. The work can start with a target as elemental as succeeding in arising consumers' (and public authorities') awareness about the differences between genuine Mediterranean pine nuts from *Pinus pinea* and pine seeds from different Asian pine species (*P. koraiensis*, *P. sibirica* etc.) labelled currently indistinctly in retail in spite of their huge differences.

### 2.1.2. Description of better characterised actors and fluxes in the value chain

The insights gained during the scoping seminar for chestnut and pine nut did underline that traditional forest owners or chestnut growers, seldom with full-time dedication, should be clearly differed from a new type, farmers or landowners who do apply a more agronomic approach on new plantations, active management, and intensive treatment practices.

Some issues listed by participants to be reflected in the amplified value chain ecosystem map were:

- Black market (a complete parallel, hidden supply chain, though often entangled with flows of the formal one) implying illegal harvesting or theft, as well as tax fraud;
- Lack of control/effective implementation of regulation and traceability along the supply chain;
- Different national regulation of standards, but a generalised trans-border trade;

- Market competition/confusion and lack of differentiation e.g. with Turkish products, and even with other, different species from China or Pakistan;
- Increasing relevance of new, more productive plantations;
- New/innovative equipment or mechanical harvesting and first transformation;
- Effects of climate change;
- Integration/interaction of agents in the value chain.

Some of these aspects claimed by participant are quantitative trends in time, or purely conceptual, and cannot be reflected properly in the value chain scheme, though the current persistence of informal actors along the supply chain, activities and flows outside the regulatory framework set up by public authorities has been added. As example, the updated value chain map for Mediterranean pine nuts below (Figure 1).

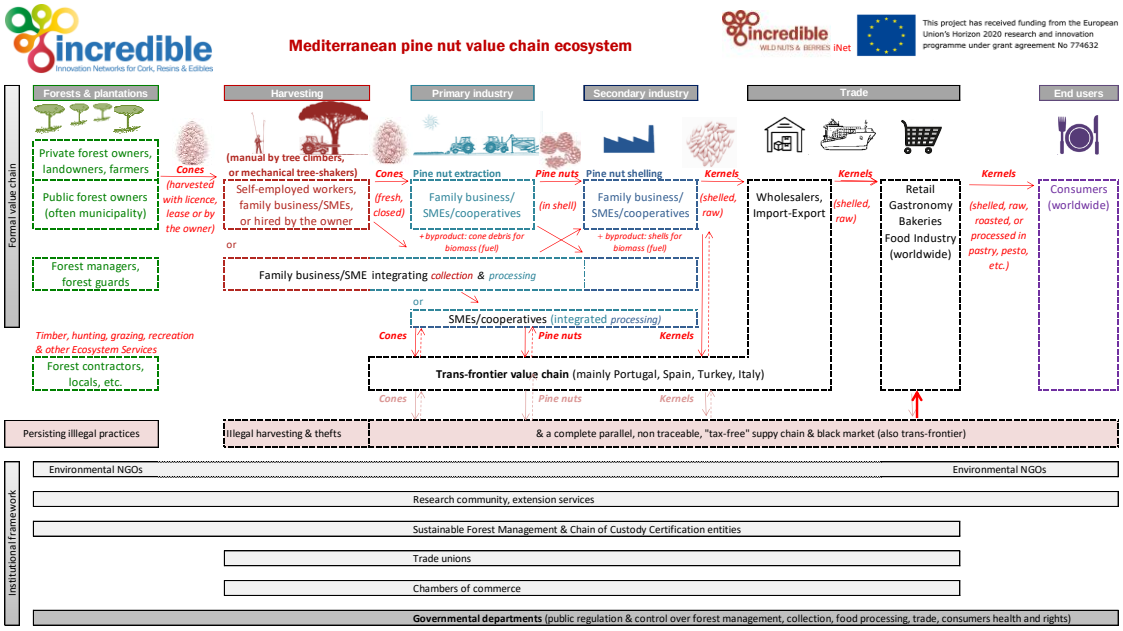


Figure 1. Mediterranean pine nut value chain map resulted from the scoping seminar.

## 2.1.3. Priority themes to focus INCREDIBLE actions

The following priority themes emerged from the session "Scoping the iNet". Each theme is listed here with title, its nature (technological, social, etc.) and a brief description. These themes will influence the design of interregional workshops and cross-cutting seminars within the next years of the INCREDIBLE network.

### RESOURCE MANAGEMENT

#### Plantation management

In the case of pine nuts, domestication in quite recent phenomenon in pine nut production. As a consequence, a clear, although not precisely define, knowledge need of the sectorial agents is clearly related to the novelty of Mediterranean stone pine (*Pinus pinea*) as tree crop. Few decades ago, cones were only collected opportunistically from multifunctional pine forests, and research on this

species had been focused on botany, ecology and silviculture. Only recently, the booming demand for pine kernel and the crisis of alternative tree species such as *Pinus pinaster* have reoriented landowners' preference. While *Pinus pinea* plantations have rapidly expanded, optimised management and tending schemes are still lacking (including aspects such as: selection of genetic material, planting density, tilling, pruning, fertilization, irrigation, integrated pest management, mechanical harvest optimisation). Clone x site interactions need to be evaluated in new regions, since different clones might be the more productive in different agroclimate regions. Relevant knowledge can be gained by collecting the experience and outcomes of past plantations and notable by evaluating their performance. In the timeframe until 2020, existing knowledge should be collected, integrated and translated into management guidelines and good practices guidelines. Cooperating also with recently set up Operational Groups, INCREDIBLE can face this generic challenge making use of most of its tools. Domestication of chestnut production is well consolidated and resource management challenges are manly related to pests and diseases, addressed below.

### Pest and diseases

The main nature of this challenge is the knowledge gap how to solve severe yield losses especially due to new exotic pests (chestnut gall wasp, conifer seed bug). However, there are also organizational gaps on how to apply at operational scale available solutions such as biological control by parasitoids, and in some regions a lack of politic support to these actions. Given that the threads are similar for both value chains, for 2020 a coordinated common approach/strategy should be looked for, not only for research, knowledge and innovation exchange within and among existing networks (European Inter-professional Chestnut Commission EUROCHESTNUT, FAO/CIHEAM Research Network on Nuts, etc.) and in cooperation with Operational Groups, but also for searching more efficient influence on and support from national, European and regional authorities. INCREDIBLE network is called to play a role as platform and meeting point to channel these initiatives by all tools the network does offer.

## PROCESSING QUALITY

High quality standards are considered a challenge for the whole value chain, implying all actors. In 2020, there should be operative protocols developed and implemented by all industries. The steps to achieve this goal are the collection of knowledge from research and practice for the setup of good practices guidelines. Cooperation with related Operational Groups is one of the most obvious issues. INCREDIBLE network as network can contribute with science-to-practice activities and open innovation challenges.

## MARKETING, PRODUCT INNOVATION AND CONSUMER AWARENESS

This is a market issue that aims at placing "chestnut as a common item in the consumers' basket". Currently, consumption of chestnuts is limited to a relatively narrow portfolio of products and could build upon existing trends favouring wild and natural foods. Some ideas for 2020 are product lines for chestnut beer or chestnut flour. Two main challenges have been identified in this respect. The first one has to do with standardised supply, with correct rating and labeling of product quality and sizing, geographic origins, varieties, etc. The second challenge is related to the need to improve marketing of forests nuts, and in particular, consumer awareness about health, environment and cultural benefits of chestnut consumption. Here we have a clear example how INCREDIBLE network might favour new market ideas as open innovation challenge.

Pine nuts also face critical challenge in relation to strengthening supply chains. This are related to persisting black markets, lack of quality standards, traceability procedures and guarantee labels, processing standards and product quality.

The situation in relation to market development is somehow different, as pine nuts already had a significant market in elaborated food products and traditional recipes (e.g. *pesto*), but where it is being substituted by other, cheaper nuts. A related issue is the lack of awareness of consumers (and public authorities) about the differences between genuine Mediterranean pine nuts from *Pinus pinea* and pine seeds from different Asian pine species (*P. koraiensis, P. sibirica*, etc.) labelled currently indistinctly in retail in spite of their huge differences (shape, nutritional properties, flavour, but also cultural heritage and sustainable harvesting). One action for rising consumers awareness about might be a "Check that it is Med" visual card (physical or digital for smartphones) that consumers could use at the supermarket for differing the botanical species by themselves, even coupled with a Citizens Science project that would allow feedback to verify how much pine nut is local.

### ORGANIC FOOD LABELS

Being a market issue by nature, the labelling of certification schemes for organic food production and/or as sustainably managed forest product, such as FairWild standards, are seen as a chance for rising consumers' awareness about the superior quality of both European chestnuts and Mediterranean pine nut kernels. Discussion took into account that possible development of chemical control for extremely serious pests might enter in conflict with Organic Food Labelling. However, for 2020, the proposal oriented towards promotion campaigns in Europe for a better marketing of certification brands and labels. The INCREDIBLE network might offer cross cutting seminars on this topic.

# 3. Discussion and findings among iNets

## 3.1. Overview

In the period from May to July 2018, scoping seminars of five iNets were held in Spain, Portugal, Tunisia and Italy, with the total number of 184 attendees, coming from different backgrounds, positions in the value chain and also diverse interests and expertise. They included land owners and managers (both public and private), government officials, collectors, processing industries and retailers of different sizes, industry and retail associations, intermediaries and service companies (e.g. nurseries, consulting, etc.), researchers and technicians from various disciplines and, finally representatives of boundary sectors, as hotel and restaurants. In general terms, the biggest interest on the scoping seminars was found among the industry/trader representatives (29% of the attendees; Figure 2) and private and public forest owners and managers (20%) and the research community (12%).

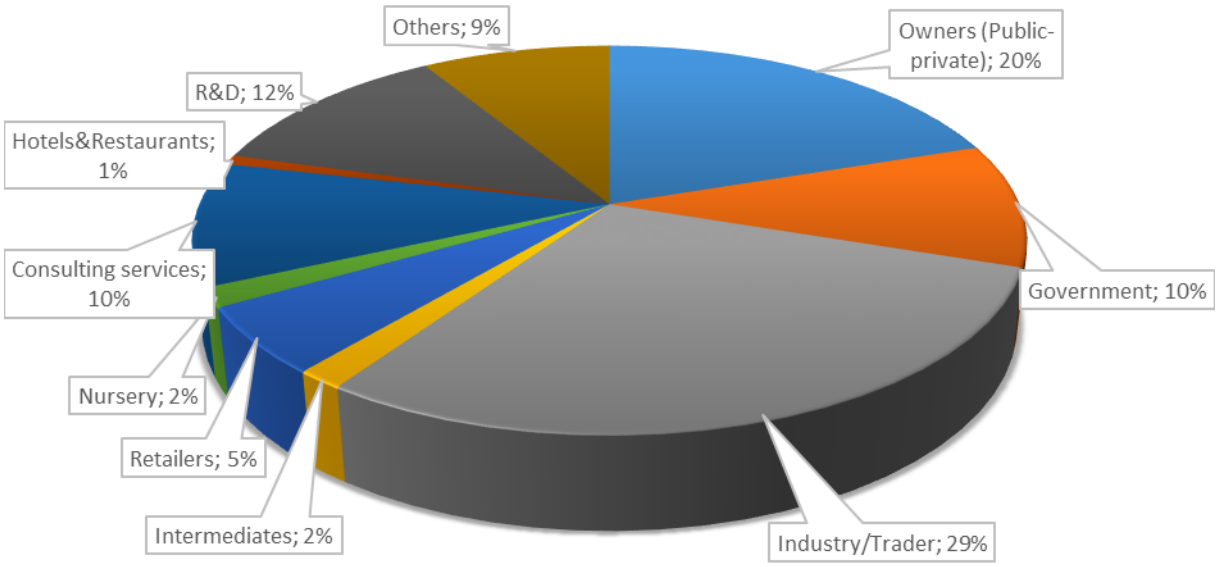


Figure 2. Percentage of attendees from all scoping seminars grouped by their value chain position.

Successful completion of the scoping seminars proved that the chosen methodology meets the expectations of network outputs. High rates of stakeholders and individual responses to join the scoping seminars is just one of the indicators. More important, the results of scoping seminars revealed precise problems, needs, expectations and possible solutions for problems in each of the five iNets. That clearly indicates that the network topic is relevant for the European NWFP sector as it is for the overall development of rural communities across Europe.

## 3.2. Innovation challenges in non-wood forest products in the Mediterranean region: common themes across iNets

Since the different NWFP are collected, produced, processed and marketed in different social-ecological systems (as a consequence of divers biophysical, socio-economic, technological and cultural aspects), different priority themes arose at each iNet scoping seminar. The analysis of the outcomes, however, shows common knowledge gaps and challenges for innovation. The identified cross-cutting themes are described below.

### LONG-TERM AVAILABILITY AND SUPPLY OF NWFP IN A CONTEXT OF GLOBAL CHANGE

*Understanding and mitigating the impacts of climate change*

Climate change is recognised as a major threat to all forest ecosystems and is predicted to have especially intense impacts in the Mediterranean region. Higher temperatures and reduced precipitation will directly affect the composition, structure and productivity of forest ecosystems and thus, of non-wood forest products. How this will affect the production of NWFP and what are the options to mitigate this impacts is an area that needs research and knowledge transfer. While agronomic practices can be adapted for domesticated products (e.g. irrigation in truffle or chestnut), mitigation options for wild NWFP are less evident. The same can be said for emergent pests and diseases. Climate change can also affect the length of the production/collection period and increase the inter-annual variability in production, hampering the development of the value chains. In some cases, the impacts of climate change can be exacerbated by human activities. For example, irrigation of agricultural crops can reduce underground water availability for nearby forests, thus jeopardizing also the production of NWFP.

*Sustainable production and harvesting*

In the case of many wild NWFP, sustainable harvesting levels are not well understood. The condition and availability of the resource is not regularly monitored nor evidence-based harvesting levels are estimated or enforced. This situation can become critical as market develops and demands increases. Also because intense harvesting can concentrate in the most accessible areas. What would be the impact of increasing mushroom picking in long-term production? What is the impact of using rakes to increase harvesting by professional pickers instead of the traditional picker knife? What will be the long-term availability of rosemary for wild collection in a context of high picking pressures and climate change? How much resin can be produced in southern Europe under plausible climatic and social scenarios? How can NWPF primary processing industries can forecast their investments with such uncertainties? In some cases, the lack of knowledge on future resource availability difficult rational business and policy decisions.

In the case of more domesticated products, there are still significant knowledge gaps in relation to, for example, genotype x site interaction for relevant characteristics as it can be cork quality in cork oaks stands or kernel productivity by stone pine groves. Management of pests and diseases are also a critical issue that requires increased knowledge generation and transfer. In all domesticated crops, optimization of irrigation to improve yields, quality and economic return with maximum efficiency is also a very relevant area (e.g. truffle, cork and stone pine).

### UNSECURED AND IRREGULAR SUPPLY

There are also critical socio-economic challenges related a stable and secure supply of NWFP. Supply of forest products depend on individual non-professional collectors (mushrooms, wild truffles, some aromatic plants) and sometimes on professional crews working for periods, with inadequate labour conditions and limited knowledge on the sustainable collecting practices (mushrooms and AMP mainly). In some cases, there is lack of workers due to hard working conditions and relatively low income as it can be the case for resin and cork in high-income regions. This situation makes difficult the creation of stable value chains and in some cases limits the market expansion in well stablished industrial activities (cork, resin, some essential oils).

For all widely collected products, there is inadequate knowledge on the size of the market and its economic relevance. Black and grey markets are very important and there is a generalised lack of traceability. This, consequently, favours black and grey markets and also robbery, as in pine nuts, and the concurrence with uncontrolled substituting products from other regions (e.g. pine nuts from East Asia, mushrooms from Russia, etc.). The lack of traceability can have especially negative effects for those products used as food, in cosmetics and related to human health. New business organisations, improved or adapted regulation and registration of collectors, or mobile ITC are some of the promising innovations, either social or technological, that can help tackling some of these issues and that could be adapted and adopted more widely. However, firstly, challenges should be better understood.

### REDUCED PROFITABILITY

The situation described above is partially related to the tight profitability of NWFP production and collection. Most of the wildly collected or only partially domesticated NWFP analysed in the different scoping seminars have limited capacity to generate sufficient income for producers (private forest owners, forest municipalities, etc.) or for collectors (resin tappers, AMP collectors, etc.). This is a structural weakness that in some cases almost totally prevents the development of NWFP business activities or that jeopardises its future. This is especially true in countries or regions with a high average income and explains the almost inexistent resin or cork production in France, or the incapacity to mobilise cork from the forest to meet the existing demands as it happens in Catalonia (Spain). Some social, managerial and technological innovations can help in improving NWFP production and harvesting profitability. These are related to mechanisation (e.g. pine nuts or chestnut collection, cork debarking, resin tapping), to harvesting methodologies more adapted to the socio-economic context (e.g. borehole resin tapping in timber-oriented stands), to silvicultural or agronomic practices that increase productivity (e.g. improved genetics, forest management practices that improve mushrooms yield, truffle plantations irrigation), to logistics, etc. Evidently, the development of high added-value products based in NWFP is a necessary condition to maintain and improve the profitability for producers and collectors, although it does not guaranties equity and fairness within the value chain. At the same time, the recognition of the positive externalities produced by the NWFP production, as through PES schemes, is seen as a strategic component on the economic viability of, at least, cork and resin value chains.

In some cases, producers or collectors have weak bargaining power in relation to the primary processing industries and they are not able to get a fair compensation, or they feel so. In other cases, processor cannot mobilise the resource because they cannot meet the expectations of producers that may have unrealistic views on the market value of their products, as it can happen in cork.

Improved awareness on market functioning, transparent and widely recognised procedures to measure quality or public price observatories can reduced tension within the value chain, along with contractual arrangements and new forms of collaboration among producers/collectors.

#### ACCESS TO THE RESOURCE

Across the Mediterranean region there is a large diversity of forest tenure regimes and different regulations on who and how can access wild resources. Free access to forest and the right to collect NWFP for all citizens irrespective of tenure is rooted in many countries. However, the risk of overexploitation or the need to manage conflicts between recreational collectors and professional collectors are fuelling the adoption of new regulations.

#### LACK OF AWARENESS OF CONSUMERS, POLICY MAKERS AND SOCIETY AT LARGE

The lack of awareness of the economic, social and environmental benefits that NWFP production provide is common among all five NWPF; for those that reach the consumer highly transformed (resins and AMP) as well as for those that are easily recognisable by end-users when eaten (mushrooms and truffles, nuts and berries) or used (cork). The lack of awareness is of different nature depending on the NWFP: knowing the origin of the product or the ecosystem services its production provides, being able to distinguish between a given product and its substitute, or simply identifying that a NWPF (or its derivatives) enter in the composition of a manufactured good.

In this case, the challenge is related to marketing. Already existing tools to tackle this challenge are marketing campaigns, product traceability labels and regulated geographical indications or designations of origin.

### 3.3. Cross-cutting areas for action

On the one hand, climate change, globalisation, urbanisation, tertiarisation are megatrends affecting the development and sustainability of non-wood forest products and explain to a large extent the challenges identified. Competition in the global markets with other producing countries and with alternative products put high pressures on profitability of raw materials. Rural abandonment makes difficult to find labour. Due to the niche character of many NWFP, informal rural value chains persist, implying black and grey markets for products and labour. On the other hand, the emerging trends represent new, even immense, opportunities. Nature-based and experiential tourism, green care, societal preference for natural cosmetics and natural food are experiencing and increasing demand. The need to replace oil-based or non-renewable products with bio-based solutions in creating a new market pull for manufacturing and construction (cork or resin and other plant-based chemicals). Facing challenges and making the best of emerging opportunities requires concerted action of diverse actors in multiple directions. The outcomes of the Scoping seminars allow us to highlight three domains that require specific attention as they can provide the necessary conditions for sustainability and innovation to happen.

#### BETTER FOCUSED RESEARCH AND IMPROVED KNOWLEDGE FLOWS

Research, development and extension capacities are very different between Mediterranean countries and there is much to be learnt from cross-regional cooperation. Some countries had a long tradition of using NWFP. The lack of research is often related to insufficient number of specialised researchers for some NWFP, non-existent financial and/or development programs to implement specific projects and the lack of interest from political and governmental structures. Research

capacities are fragmented across countries and among institutions within one country. In the case of cork and wild nuts, there are different field trials, not always connected to each other, despite being highly complementary. Sometimes in-house research produced by companies (e.g. resin stimulants, new resin tapping technologies, etc.) is neither published nor disseminated. Usually, across the region, support for NWFP research and rural innovation is weak.

### IMPROVED GOVERNANCE

Having better, stronger, more comprehensive governance frameworks for NWFP should allow for better decision-making by all actors, should facilitate stronger and more equitable value chain arrangements and contribute long-term social and environmental sustainability. Institutional arrangements and public regulation varies from country to country and between NWFP, becoming much weaker or inexistent as we move form fully domesticated products to completely wild products. In general, governance is considered fragmented, confusing, inadequate, limited or totally inexistent by INCREDIBLE network stakeholders.

In the case of wild NWFP, some Mediterranean countries or regions do have a regulation that covers aspects related to collecting rights, access to the resource or permits and taxes. However, this is totally absent in other. In some cases, existing regulation is not helping to facilitate cooperation and transparency inside the value chains or can even represents an obstacle for collection, production and trade. As an example, forest or environmental regulation, or the way is interpreted by the competent authorities, can limit the establishment of new truffle plantations in forestlands in central Spain. Across the iNets, the need to overcome this problem is recognised as one of the most important. In the case of edibles, regulating quality, forest to fork traceability and allowing for effective protection of origin is a specific challenge.

Governance approaches, arrangements and procedures by private (e.g. companies) and other non-governmental actors (e.g. forest certification entities) are much less known. Formally adopted good practices codes or due diligence systems among collectors and processors are generally missing or have not been yet identified and properly described. Some NWFP are covered by sustainable forest management certification schemes (e.g. cork in PEFC and FSC), although they might not be generating the added value that could be expected or desired.

Addressing these and other related issues (market and environment, plant health regulation, incentives and PES schemes, irrigation rights, etc.) will greatly benefit from more structured public-private cooperation.

### MORE EFFECTIVE COMMUNICATION FOR GREATER SOCIAL AWARENESS

When sustainably managed, the production, collection, and transformation of NWFP can generate multiple positive externalities: rural development, forest fire prevention, climate change adaptation and mitigation, etc. However this benefits are rarely recognised in the markets, where Mediterranean NWFP compete with petroleum-based counterparts (e.g. petroleum derivatives, plastic stoppers, etc.) and with imported products that can differ in quality and environmental performance (Asian pine nuts, Russian mushrooms, etc.). Stakeholders across the iNets are convinced that it is extremely important to increase the awareness about the current situation and existing potential for NWFP and the environmental, social and economic benefits that they can provide. Product, environmental and geographical certification schemes are seen as promising tools.

On the one hand, the actors in the value chain could better communicate outside their sector. On the other hand, the need for better communication along the value chains (between producers, processors, market and government) is clearly identified by the stakeholders. Between different stakeholders, there are different communication problems. Depending on the region or the country, the problems are identified as:

- reduced information flows between producers/collectors, traders and transformers;
- lack or not existent knowledge and technology transfer between actors of the value chain;
- lack of cooperation towards potential common goals such traceability schemes, quality assurance, joint marketing and certification;
- lack of awareness by policy makers on the barriers and opportunities for NWFP that translate into fragmented, inadequate or non-existing regulation.

Consequently, better dissemination of information between procedures for quality control and certification methods from certification entities, both for harvesting and processing is needed. For those sectors where we have good practices, dissemination between actors in the value chain should be increased. For the sectors where quality control and certification methods are not established, it is necessary to make a complete analysis and to set up good foundations so certification entities can produce a uniformed method for quality control and certification of every product in each iNet.

# 4. Roadmap for INCREDIBLE and beyond

The reports from each Scoping seminar are a good starting point for future regional or international events organised by the INCREDIBLE network. Adopting new knowledge and ideas to existing ones, spreading the existing discussions and trying to solve problems through networking guarantees successful future work of each iNet.

## Wild nuts and berries iNet roadmap

Key consequences for further action in the Wild nuts & berries iNet events are the marks put on the main challenges that are jeopardising the sustainable and profitable production of forest-collected gourmet nuts, namely chestnuts and Mediterranean pine nuts. There is a need to recover a sustained and higher production by the deployment of improved and adapted genetic material, the spread of optimised management techniques, and the development of integrated pests' management systems.

The participants of this iNet defined a very interesting topic: "Traditional forest owners or chestnut growers, often with seldom full-time dedication, should be clearly differed from a new type of farmers or landowners who do apply a more agronomic approach on new plantations, active management, and intensive treatment practices". This issue will involve a hard effort to identify chestnut growers as such, especially incorporating this into national policies that will offer different kind of support and incentives.

Although the Scoping seminar on wild nuts and berries successfully identified the possibilities and challenges of the pine nut and chestnut sectors, other nuts and berries that have or could have an important role in the rural economy were poorly discussed. The conclusions of the Scoping seminar should be reviewed and see how much do they differentiate from formerly wild-collected berries (blackberries, bilberries, raspberries and strawberry trees), especially because they are identified as new intensive crops, which could be very interesting as an innovation in rural economies in most of the partner countries.

Accordingly, this iNet will place additional efforts on:

- documenting and sharing existing knowledge on plantation management (pine nuts, chestnuts) including the potential impacts of climate change and the management of current and emerging pests and diseases,
- identifying (in multi-stakeholder set-ups) domestication opportunities for other nuts and berries (e.g. strawberry trees),
- compiling existing research infrastructure (e.g. clonal and provenance trials) in other to foster research cooperation and identify future collaborative projects,
- promoting intra-sectoral dialogue and multi-actor governance, in relation to traceability, identification of origin and product labelling, and
- contributing to a new culture of innovation and entrepreneurships in the transformation and marketing of wild nuts and berries.

## Annex: Access to scoping seminar reports and other materials

- Cork iNet: https://incredibleforest.net/inet/cork
- Resins iNet: https://incredibleforest.net/inet/resins
- Aromatic and medicinal plants iNet: https://incredibleforest.net/inet/aromatic-medicinal-plants
- Mushrooms and truffles iNet: https://incredibleforest.net/inet/mushrooms-and-truffles
- Wild nuts and berries iNet: https://incredibleforest.net/inet/wild-nuts-and-berries