

**A Road Map for innovating NWFPs value chains
for the
Cork iNet**



**Conclusions issued from the Scoping seminar – 11 & 12 July 2018
of the
Innovation Networks of Cork, Resins and Edibles in the Mediterranean basin
project**

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1. Introduction to the innovation networks (iNets)

1.1. INCREDIBLE project overview

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 can be seen as a common underlying factor that jeopardises the capacity to sustainably manage forest resources already menaced by climate change. Non-Wood Forest Products (NWFP) can be part of the solution, if they can contribute to a smart and inclusive bio-based economy that can create value from and investment streams for sustainable forest management. Developing existing potentials requires the collaboration and knowledge exchange between NWFP practitioners and scientists, and among regions. The INCREDIBLE project 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 project to promote knowledge exchange on NWFP across the Mediterranean basin. 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. iNets are innovation networks where individuals meet 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: 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 will aim to gather the best practical and science knowledge related to NWFP production, transformation and trade channels. Special attention will be drawn to cross-cutting sectorial issues.

Within the iNets, the goal is to achieve and implement innovations through the project. The project 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. The innovations in this context have to be interpreted like an innovation process in which actors from different organisations participate on its creation. 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 innovation process.

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 project'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. Cork iNet narrative

In the cork production, the greatest peculiarity is that cork is harvested in periods of 9–14 years without cutting the tree (cork oak, *Quercus suber*) and therefore without the need to modify the

forest structure. In Portugal and southern Spain, cork is typically produced in open, multifunctional agroforestry systems stands (*montados* and *dehesas*), which also produce other products and ecosystem services with very high cultural heritage values. In other regions, Catalonia, Mediterranean France, the isles of Corsica and Sardinia and the Southern Mediterranean, cork is produced mainly in closed forest stands. In both systems, cork production is a main source of income. The manufacturing of stoppers is the most important use in economic terms, ensuring a vital role in maintaining the economic value of cork and the low intensity use of cork oak forests. However, there is an increasingly large portfolio of construction and other manufacturing materials produced with cork that are gaining relevance in the bottom line of cork processing companies. New markets related to sustainable construction and the transport and aerospace industries could uptake more cork products if those were available at competitive prices. However, these new applications cannot make today a profitable business model in the absence of quality stoppers that still represent some 70% of the total industrial turn-over.

As a typical Mediterranean forest ecosystem, cork oak forests are significantly affected by climate change. Many cork forests are scarcely managed but a significant area is now under less favourable conditions regarding its productive potential, reflecting overexploitation and inappropriate management practices due to lack of knowledge. Such factors in certain cases also contribute to put at risk the sustainability of the entire value chain. In addition, the long period for investment recovery, the relatively high cost of labour and low profitability for forest managers, the fragmentation of owners and the lack of innovation culture among forest owners and managers does not favour the desirable correction of these imbalances in the value chain.

2. Scoping seminars

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 had an opportunity to validate previous work, to propose bottom-up, complementary activities and to contribute to the iNet future development.

The main objectives of each scoping seminar were:

- to validate the narrative, and to establish a road map for the development of the iNet. The object was to focus on the themes that will be addressed throughout the project,
- to manage expectations on what can be achieved,
- to give participants opportunities for networking.

At the scoping seminar, stakeholders gathered from all links of the value chain had an opportunity to share their opinion and bring up problems and difficulties of their sector. This was a unique chance for everyone to learn about challenges and to get a wider picture of the condition in the sector. Most of the stakeholders were from the country where the scoping seminar was organised but international stakeholders were participating too. It was interesting to local stakeholders to learn and compare the difficulties, qualities and solutions in other countries.

The number of stakeholders attending scoping seminars (Table 1) was higher than expected (targeted number was 30) 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.

	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

Table 1. Number of participants at each scoping seminar.

Per iNet, this chapter summarises:

- the main outputs from each Scoping seminar;
- the improvements that this event brought to the value chain map (improved description or addition of new stakeholders and fluxes), and

- the priority themes on which the INCREDIBLE project should focus, those that would have a bigger positive impact on the value chain.

2.1. Scoping seminar report of the Cork iNet

2.1.1. Summary output

The Cork iNet scoping seminar took place on 11 and 12 July in Sardinia, Italy. A significant number of participants attended the seminar and represented the most significant links of the cork value chain, namely forest owners, cork industry, research and development, wine industry, national and regional governments and chamber of commerce. Most of the participants were from Italy, with some participants from Portugal, one from Spain and one from Tunisia. Regarding the representativeness of the cork value chain, and thinking about future events, iNet should improve the engagement of more participants from Portugal, Spain, Tunisia and other cork producing countries like France and Morocco, and for a more balanced representation of the links in the cork value chain.

Although most of the participants were Italian, that was not an obstacle to obtain a very interesting and participated discussion sharing knowledge and doubts between the different players and the different countries represented. The interactive discussions, exercises, group works and session dynamics were essential for a well participated cork value chain reflection that allowed for the identification of priority themes to focus in INCREDIBLE actions (see section 2.1.3). They are key areas that require increased knowledge sharing, and better understanding of existing of regulations and policy innovation ideas in different countries, such as those aimed at:

- minimizing the grey economy,
- establishing of payment for ecosystem services (PES) models,
- maintaining/developing regulations to assure the sustainability of the cork oak ecosystem (including regulation of pastoral pressure and addressing oak decline,
- transparent assessment of cork quality before harvest,
- multifunctional ecosystem policies, recycling cork and advancing towards a circular economy.

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

Four working groups were established to discuss the cork value chain map (Figure 1) with representatives from the different stakeholders. The main issues that arose from the discussion to be included in the value chain map were:

- Existence of a sampling methodology applied by the forest owners associations in Portugal to evaluate cork quality and market price prior to the sale. This is seen as a tool to empower forest owners and improve their bargaining position with industry over price of cork;
- Different cork quality classes are used in different countries, which makes it difficult to share information on market and prices, but also on research results (e.g. seven quality classes are used in Portugal versus three in Sardinia or Catalonia);
- Relevance of the silvo-pastoral “actors” in Sardinia: establish connections between the farmers and the shepherds, and new relevant actors where identified and added to the cork ecosystem as is the case of tourism operators and small cork artisans;

- The existence of different forms of commercialization, for example the auctions in Tunisia and public forest in Sardinia, which are different from direct selling in private forests in Portugal and Catalonia.
- The presence of “grey trading” between farmers, intermediaries and industries was identified along with the need to better understand the connections between the “cork strippers contractors” and the cork intermediaries in different regions.

CORK iNet VALUE CHAIN MAP

1 – reproduction cork | 2 - virgin and second cork, pieces of cork, defective planks

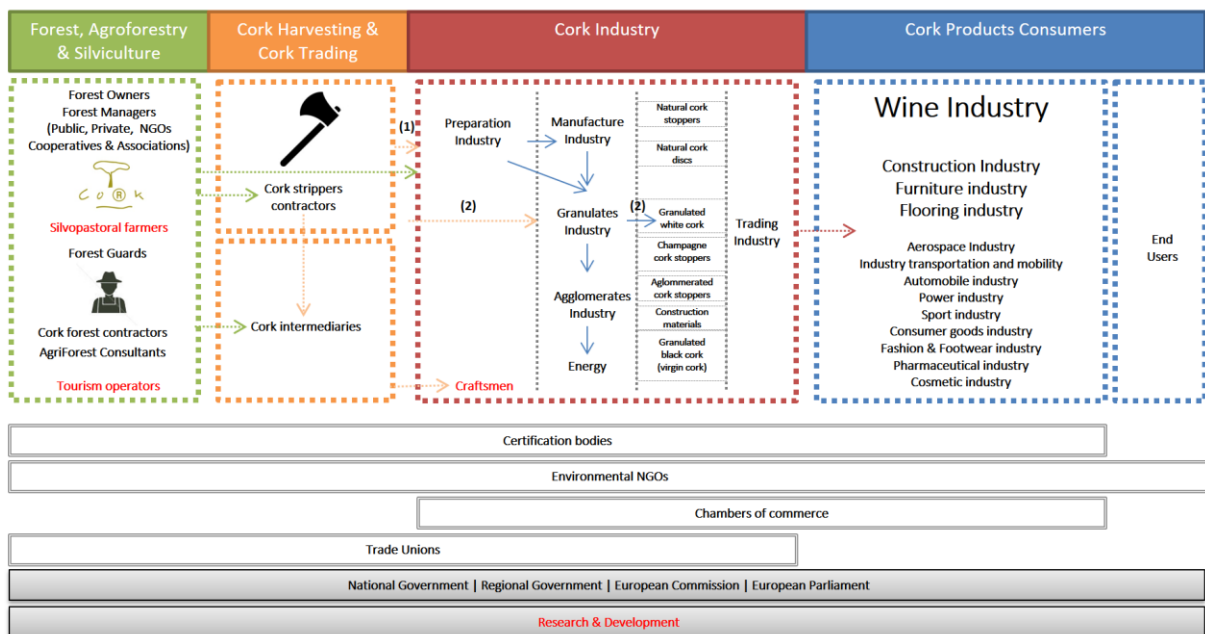


Figure 1. Reviewed cork value chain map. Note in red the contributions entered in the scoping seminar.

2.1.3. Priority themes to focus INCREDIBLE actions

During the iNet sessions, a list of future challenges emerged and priority themes to focus future iNet actions were established.

EVALUATION OF ECOSYSTEM SERVICES

This is seen as a technical and managerial innovation challenge.

Desired state: a set of management models suitable for different conditions available; balancing different ecosystem services (ES) and achieving synergies among them; delivery of ES is rewarded and profitable.

What needs to happen: research-based identification of management models; assessment of feasibility of proposed management models (stakeholder engagement); assessment of ES within each management model (quantifying synergies and trade-off).

Actions/role for INCREDIBLE:

- provide a rating system associated to different ES performances;
- documented and critical assessment of existing cork or related PES schemes.

PROFITABILITY OF CORK PRODUCTION

This is seen as a complex challenge with technological, managerial, social and policy components:

- technological challenge: mechanical cork harvesting, optimisation of cork extraction and transport logistics, reduction of time to first harvest and/or first revenue through silvicultural innovations (irrigation, mixed plantation...);
- organizational challenge: negotiation power increase for producers, new commercialisation approaches;
- policy challenge: related to ES payment regulation, including EAFRD;
- business model challenge: new contractual arrangements, new financial support to new plantations, operationalisation of ES and paying for ES schemes...

Desired state: stabilising new cork plantations is financially attractive, decreased costs of cork extraction by 30% maybe through mechanically debarking, new marketing strategies, increased profits for producers, payments for ES become a normal, dynamic and innovative sector, workers training, transparent market trading,

What needs to happen: improving funding to implement R&D agenda, sharing and expanding cork quality sampling and assessing methodologies, identifying solutions for humidity sampling methodology to better schedule cork harvesting, creating financial schemes to support plantation (attractive and adequate), expanding the cork market platform, performing operational research on cork extraction and logistics.

Actions/role for INCREDIBLE:

- attempt the adoption of a common standard for assessing cork quality across the Mediterranean;
- assessment documentation and share relevant cases and literature;
- workshop organization about the relevant cases;
- dissemination events (including field discussions);
- addressing rural development funding as a tool to support cork value chains in INCREDIBLE activities;
- a review NWFP training necessities and approaches;
- training school meetings;
- e-tools development: webinar and practical tutorials videos.

CLIMATE CHANGE

This is seen as a management and innovation challenge: facing the effects of climate change such as decrease in precipitation, increase in temperature and of extreme events, and with the fact that cork oak is a slow response system/species.

Desired state: resilient ecosystem services from cork oak systems.

What needs to happen: more adaptive management at a spatial and temporal scale (no unique management solution).

Actions/role for INCREDIBLE:

- awareness of public decision-makers for the need for long term research;
- analysis and integration of existing information and good practices for dissemination for forest owners;
- promote research and knowledge transfer cooperation among cork oak stakeholders;
- tools for better scheduled harvest operations in a context of increased drought.

3. Discussion and findings

3.1. Overview

In the period from 8th of May 2018 to 12th of July 2018 five iNet scoping seminars were held in Spain (two), 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%).

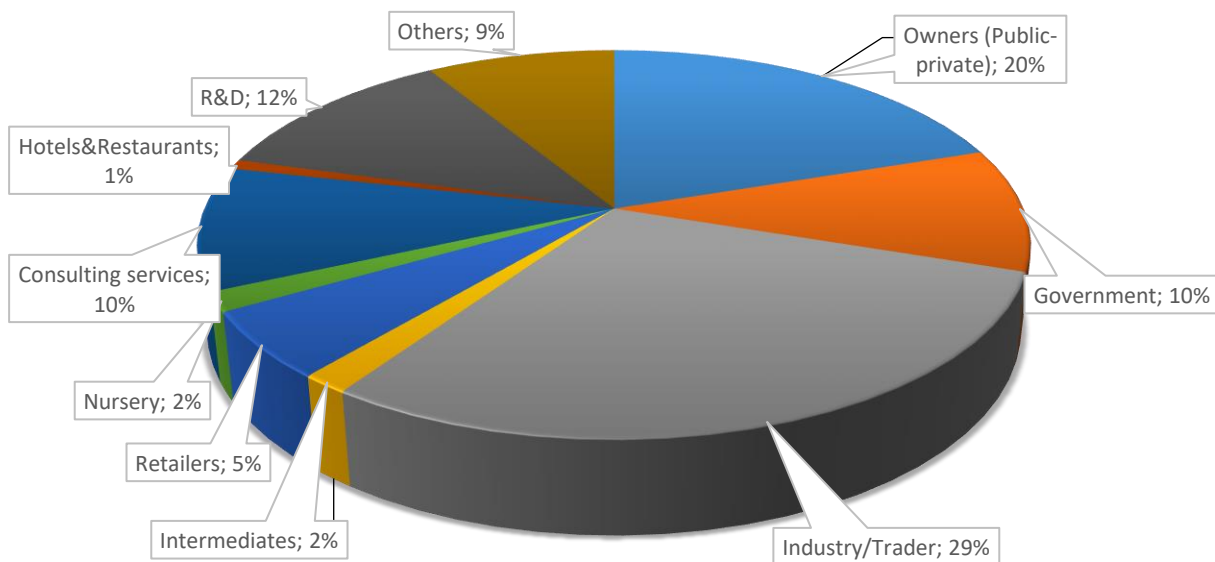


Figure 2. Percentage of attendees from all scoping seminars grouped by their value chain position.

This scoping seminars were aimed at better understanding the most relevant needs and opportunities for innovation and strengthening the respective value chains. The methodology was based on a combination of plenary, break-up groups and informal discussions during 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. 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. The objective was rather to develop a collective assessment of the functioning of the value chains and the identification of challenges or opportunities, as perceived by the different actors. As expected, this approach facilitated an extensive discovery of themes and topics, the identification of new or better characterised actors and fluxes in the value chain. 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.

Successful completion of the scoping seminars proved that the chosen methodology fully meets the expectations of project 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 project topic is highly 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 diverse 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 NWFP 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 established 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 guarantee 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 reduce 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 (e.g. pine nuts, cork, resin, essential oils). Rural abandonment makes difficult to find labour. All this favours black and grey markets for products and labour to reduce costs. 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 from fully domesticated products to completely wild products. In general, governance is considered fragmented, confusing, inadequate, limited or totally inexistent by INCREDIBLE project 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 represent 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 these 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 very concise; they perfectly represent the situation on the field and are a good starting point for each future regional or international events organised by the INCREDIBLE project. Adopting new knowledge and ideas to existing ones, spreading the existing discussions and trying to solve the small problems through networking guarantees successful future work of each iNet. The following discussion will try to gather the conclusions and propose next steps for each iNet based on the Scoping seminar reports.

4.1. Cork iNet roadmap

The Cork iNet Scoping seminar highlighted several main issues that will need more attention in the future:

- Improved profitability of cork production:
 - possibility of mechanic debarking introduction;
 - production increase by irrigation and pest management;
 - improved genetics;
 - recognition of the generated externalities.
- Optimise supply arrangements:
 - overcome difficulty of finding skilful workers;
 - increase transparency in the market.
- Development of new products in order to achieve new markets.

IMPROVED PROFITABILITY OF CORK PRODUCTION

While discussing the mechanisation of cork debarking in order to solve the problem in lack of experienced workers, we should consider the examples of mechanic debarking that exist in Portugal and Spain. As a potential innovation output, this network should include the potential for promotion of innovations by mechanics, ergonomics and similar engineers working on this issue. Since the tests for new methods of debarking last for more than 10 years, Cork iNet should address in its next steps the problems of implementing the mechanical cork harvesting into action and through discussion with relevant stakeholders to find the way to overcome those barriers. For sure, the goal of these efforts will not be the decrease of cultural and natural heritage emerged from cork stand management, but to support the growing demands of this economic sector. Mechanisation of this sector probably will not be eligible without solving the other two challenges mentioned during the Scoping seminar.

Regarding the second point, a case study was mentioned: irrigation started in Spain four years ago and they still lack of published results. Pest management is a part of climate change effects, which can also cause extreme draughts and fires. More effort should be involved into gathering knowledge on irrigation and on pest control. If this knowledge is not available on published works, it could be obtained, maybe, from the experience of stakeholders.

Similarly, the provenance trials that were set up in different countries are entering now the age of first debarking and this should allow to have first data about the influence of genetics on production by different site qualities. INCREDIBLE project should document this knowledge. Finally, the maintenance of non-intensive, cork production ecosystems (*montados* and *dehesas*) will be facilitated by the economic retribution of their positive externalities through, for example,

PES schemes. INCREDIBLE project can document existing drivers and barriers and can help bridge the offer and demand sides, through a market place.

OPTIMISE SUPPLY ARRANGEMENTS

Concerning this second issue, the difficulty to find skilful workers is linked to reduce profitably, on the one hand, and insufficient training in vocational schools, on the other. INCREDIBLE project can work with existing institutions and the European Network of forest vocational training to help overcome this issue. In relation to supply chain transparency, producers can benefit from common procedures to estimate cork quality pre-harvest and through a Mediterranean price observatory. INCREDIBLE project can provide a neutral place for evaluating the feasibility of both approaches.

DEVELOPMENT OF NEW PRODUCTS IN ORDER TO ACHIEVE NEW MARKETS

For the third issue, it will be very hard to find and promote new products or new methods of cork usage, since the value chain identified 13 industry branches that use the cork products on regular basis, from wine industry all the way to aerospace industry. Even if new usage possibility exists, a question of “How will this product satisfy the needs of this new industry that any other products until now do not do?” will remain. A possible answer to this issue lays in finding new business models, standardisation of cork harvesting (stand years and debarking height) or in developing new policies on multifunctionality. This being said, research and development, promotion (through marketing, communication and dissemination) and economics should have higher and more important position in the future value chain.

5. Annexes

5.1. 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>