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Outline of the presentation

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   - **Mediterranean specificities**
   - **Forest-based bioeconomy discourses and drivers**
3. **Objectives**
4. **Methodology**
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6. **Results**
7. **Discussion and recommendations**
8. **Acknowledgments**

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1. Premises

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Manuscript - Version 14 – updated 08.03.2021

Innovations for the Mediterranean forest-based bioeconomy: breakthroughs, knowledge gaps and recommendations

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Abstract
Innovation is often considered as an all-purpose answer to overcome emerging challenges and tackle wicked problems, including the development of an effective forest-based bio-economy in the climate change perspective. The topic is regaining attention in Europe as well as worldwide. So far, publications around forest-based bioeconomy and innovation have clustered in the Western/Northern European context. However, the peculiar characteristics of forests and forest sectors within the Mediterranean region call for dedicated analysis and creation of specific development paths towards innovation in this field. It remains unclear how research on forest innovation is targeted and progresses in the Mediterranean forest-related domain, with respect to research and innovation needs in Europe and the Mediterranean. The present literature review tries to identify the main current breakthroughs and knowledge gaps on innovations that underpin a transition towards a forest-based bioeconomy in Mediterranean countries, and formulate

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2. The rationale: current global trends

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2. The rationale: emerging trends

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2. Specificities/challenges of the Mediterranean forests

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- **Particularly vulnerable:** T° increase, water scarcity, climate-related disasters, wild-fire risks, desertification, migration patterns, land abandonment
- **Biodiversity spot, various and important ecosystem services**
- **Highly densely populated** with urbanization trends = *divergent interests expressed by different stakeholders and social demands*

- Mountainous topography, remoteness, low accessibility
- Soil erosion and desertification trends
- Limited biomass growth (in certain sub-regions)
- **Micro- or small-size forestry companies**
- **Landownership fragmentation**
- **Land abandonment**

Forestry (*timber*) = **complex, costly, limited investments in innovation,** limited profitability, poorly competitive

Forest industries strongly depend on imports

Forests do not significantly contribute to the national economy: low political relevance

Wild, NTFPs underestimated, not always taken into account

Non-market ecosystem services not taken into account

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2. FBBioeconomy discourses

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Dominant forest-based bioeconomy discourses

(e.g. Schmidt et al. 2012, Ollikainen 2014, Kleinschmit et al. 2014, Roos and Stendahll 2015, World Bio-Economy Summit 2015, Pülzl et al. 2017, Hausknost et al. 2017, Hetemäki 2017, Lovrić et al. 2019, Hedeler et al. 2019, Mair and Stern 2017, Dietz et al. 2018, Jarre et al. 2019, Lovrić et al. 2020, Asada et al. 2020, Wolfslehner et al. 2020, Toppinen et al. 2020)

It "encompasses the **production of renewable biological resources** and their conversion into food, feed, bio-based products and bioenergy" (EC, 2012).

- **Technology-oriented and industry-driven** (biorefineries, biotechnologies, wooden based constructions, bioenergy, high-tech/high-performance materials, …)
- **Digitalisation** (IT connection, remote control, blockchain, …)
- **(Others:** systems (e.g. wood cascading, value-chains), non-technological knowledge)

Main drivers:
- European Technology Platforms (e.g. Toppinen et al.2020, Lovrić et al. 2020)
- European Research Area (e.g. Birch et al. 2010)
- Forest-based Sector Technology Platform and Strategic R&I Agenda (e.g. Weiss et al. 2017, Secco et al. 2018)

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2. FBBioeconomy discourses

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Emerging forest-based bioeconomy discourses and possible future directions

(e.g. McCormick and Kautto 2013, Kleinschmit et al. 2014, Winkel et al. 2017, Martinez de Arano et al. 2018, Secco et al. 2018, Wolfslehner et al. 2020)

- broader range of ecosystem services
- citizen-science, science-stakeholders collaboration
- knowledge co-construction

https://ec.europa.eu/growth/industry/innovation/policy/social_en

Main drivers/main effects:
- The New EU policies
- Social Capital (e.g. Putnam 1993, Horlings 2012, Marquardt et al. 2012, Pisani et al. 2018, 2020)
- Social Innovation (e.g. Mulgan 2007, Murray 2010, Moulaert et al. 2013, 2017, Haxeltine et al. 2017, Bosworth et al. 2018, Melnykovych et al. 2018, Rogeljia et al. 2018, Ninjik et al. 2019, Ludvig et al. 2019, Gorriz-Mifsud et al. 2019, Sarkki et al. 2019)
- Transformative Social Innovation (e.g. Haxeltine at al. 2017, Avelino et al. 2017, 2019, Wittmayer et al. 2019)

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2. Drivers: allocation of R&I funds

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The **Strategic Research and Innovation Agenda 2020 (SRA)**, released in 2006 and revised in 2013, resulted in the launch of **more than 230 research projects** relevant for the European forest-based sector and an amount of over **€ 1 billion of EU funding (Forest-based sector Technology Platform, 2017).**

However…
19 Research and Innovation Areas identified as key to unlocking the potential of the forest-based sector and ensuring its future competitiveness (Secco et al. 2018):

- **12 mainly technologically-oriented** (e.g. Enhanced biomass production, Secured wood supply, forest operations and logistics, Cascade use, reuse and recycling systems, Resource efficiency in manufacturing, Biorefinery concepts, New biobased products, Intelligent packaging solutions, etc.)
- **3 mainly socially-oriented** (e.g. Citizen's perception of the sector, Policies and good governance, New business models and service concepts)
- **4 mixed** (e.g., Multi-purpose management of forests, Forest ecology and ecosystem services)

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3. Objectives

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1) **To identify breakthroughs and knowledge gaps in research on innovation towards a forest-based bioeconomy** transition in **Mediterranean countries**

1) **To formulate recommendations** and future avenues for practitioners, policymakers and researchers

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4. Methodology: focus on Mediterranean countries

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21 Mediterranean signatory countries of the Barcelona Convention:

- Albania
- Algeria
- Bosnia and Herzegovina
- Croatia
- Cyprus
- Egypt
- France
- Greece
- Israel
- Italy
- Lebanon
- Libya
- Malta
- Monaco
- Montenegro
- Morocco
- Slovenia
- Spain
- Syrian Arab Republic
- Tunisia
- Turkey

+ 6 other countries and territories that are part of the Mediterranean bioclimatic basin:

- Bulgaria
- Jordan
- Palestine
- Portugal
- Serbia
- the former Yugoslav Republic of Macedonia

Source: State of Mediterranean Forests (FAO and Plan Bleu, 2018: 2)

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4. Methodology: literature review   1/2

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- Scientific papers searching in **Scopus**
- **1980-2020**
- String: *"Forest* AND innovat* AND bioeconomy (OR bio-economy OR bio-based) AND Mediterranean OR MENA"*
  (+ run for each single country).
- In **Title, Abstract and Key Words** of papers, in **English**

- Screening based on Abstracts reading => full contents reading
- **Qualitative content analysis: traditional "narrative review"**
- **Network analysis (software: Gephi)**

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4. Methodology: literature review 2/2

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- 214 papers initially retrieved
- Inclusion/exclusion criteria:
  - Excluded: those not relevant after the Abstracts' screening
  - Excluded: papers mentioning innovation only as a general recommendation; papers with full text not available (e.g. conference papers)
  - Included: only papers explicitly exploring innovations in forest-related fields
  - Duplicates: deleted

- **86 papers (30 = 35% in 2020!) included in the review**

- Results organized according to the main innovation categories previously identified
- **Confronting R&I agendas and scientific papers** (tables)

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4. Methodology: analysis of R&I agendas

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*Suggested **correspondences between the MFRA 2010-2020 and the DGAgri 2018-2020** agendas for research and innovation* (source: own elaboration)

	MFRA 2010-2020		DGAGRI R&I agenda 2018-2020
	SRA Strategic Objectives	Forestry-based value chains	Priorities (P) and Cross-cutting issues (CCI)
	1. Development of innovative products for changing markets and customer needs	1-6: Commercialising soft forest values	P1. Resource management
	3. Enhancing the availability and use of forest biomass for products and energy	3-1: Trees for the future	P2. Healthier plants and animals
	4. Meeting the multifunctional demands on forest resources and their sustainable management	4-1: Forests for multiple needs	P3. Integrated ecological approaches from farm to landscape level
			P4. New openings for rural growth
			P2. Healthier plants and animals
			CCI1. Systems approach
		4-2: Advancing knowledge on forest ecosystems	P3. Integrated ecological approaches from farm to landscape level
		4-3: Adapting forestry to climate change	P3. Integrated ecological approaches from farm to landscape level
			P2. Healthier plants and animals
	5. The sector in a societal perspective	5-2: Instruments for good forest-sector governance	CC1. Systems approach
			CC2. Social engagement
		5-3: Citizens' perceptions	CC2. Social engagement
			P5. Socio-economic research

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5. On innovation

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Technological innovation

Technological innovations comprise **new products and processes** and significant **technological changes** of products and processes.

*The implementation of a **new or significantly improved product (good or service), or process, a new marketing method**, or a new organizational method **in business practices, workplace organization or external relations***
(OECD, 2005: 46)

Photo by Romain Tordo on Unsplash

- It derives from the industry- and business-oriented definitions for innovation, typically applied at an enterprise level (e.g. Schumpeter 1934, 1942, Nelson and Winter 1977, Hagedoorn 1996, Śledzik 2013; e.g. Kubeczko et al. 2006 for the forest sector), interpreted as an outcome of entrepreneurial activities/behaviour (Bruyat and Julien 2001).

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5. On innovation

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Social Innovation

Several definitions in literature: another "fuzzy" word - risk of misleading.

*The **reconfiguring of social practices**, in response to societal challenges, which seeks to enhance **outcomes on societal well-being** and necessarily includes the **engagement of civil society actors***
(Polman et al. 2017 – SIMRA project Deliverable 2.1;

simra
Social Innovation in Marginalised Rural Areas

www.simra-h2020.eu

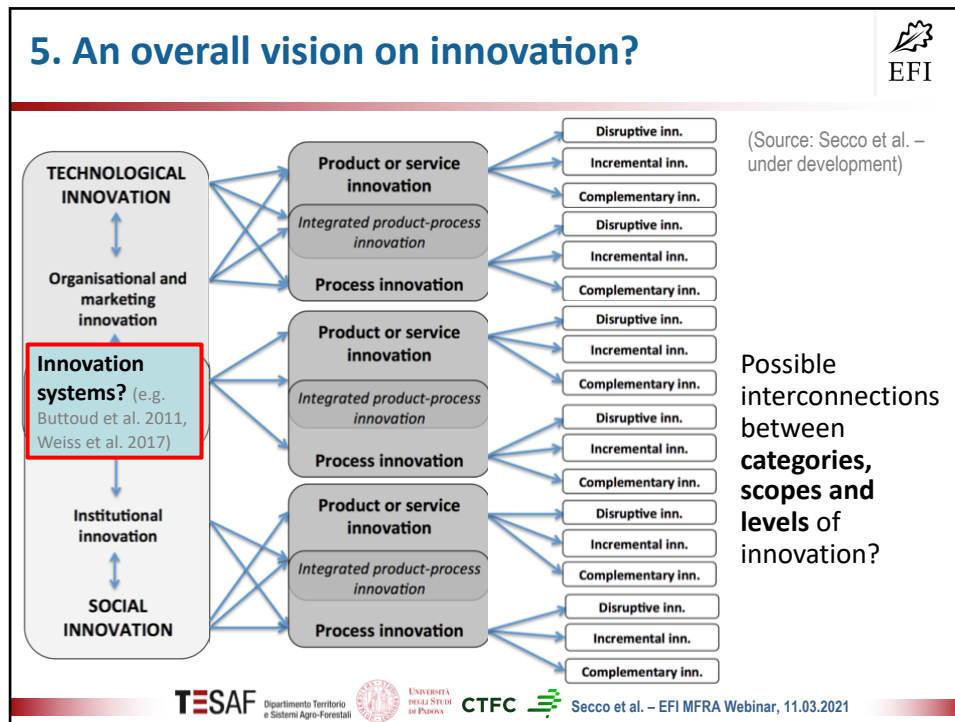TESAF Dipartimento Territorio e Sistemi Agro-Forestali   UNIVERSITÀ DEGLI STUDI DI PADOVA   CTFC   Secco et al. – EFI MFRA Webinar, 11.03.2021

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5. An overall vision on innovation?

(Source: Secco et al. – under development)

Possible interconnections between **categories, scopes and levels** of innovation?

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6. Results (*to be refined*): geographical distribution

*Percentage of papers by **country (location of the study/case study)***

Others countries having 2 papers/each are: Greece, Turkey, Croatia

Others countries having 1 paper/each are: Serbia, Macedonia, Morocco, Bulgaria

No papers have been found for the acronym MENA, Monaco, Malta, Montenegro, Syria, Lebanon, Jordan, Palestine, Libya, Tunisia and Algeria

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6. Results (example - *to be refined*), by innovation categories

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Category	Predominant topics	Other topics	Examples of papers
Technological/ technical innovation	• **Cultivation/harvesting techniques and/or machineries** • **New research approaches, methods and tools** = new models, new conceptual frameworks (e.g. forest fires prediction, erosion risk mapping, landscape-biodiversity scenario modelling, etc.)	• Agroforestry and forest management systems • Mulching and groundcover protection techniques in plantations • Digital technology in recreation management • Artificial intelligence in prediction relations between tree diameter/height	Pari et al. 2013, Schweier et al. 2019, Bados et al. 2016, Štěrbová et al. 2019; Morhart et al. 2014; Coello et al. 2018; Vitone et al. 2016; Kalabokidis et al. 2012; Zdruli et al. 2016; Azul et al. 2014; Esteban and Carrasco, 2011; Ferreira et al. 2016; etc.)
Institutional innovation	• **Networks/interactions between private and public actors** • Networks and cooperatives of private forest owners	• Role of EU LEADER funded projects • Effects of international regimes • Effects of policy reforms • Intermediary organizations	Favero et al. 2016 ; Aubert et al. 2009; Mendes et al. 2011; Feliciano et al. 2011; Fromond et al. 2009; Buttoud et al. 2011; Eid and Haller, 2018; etc.
Social innovation	• **Social capital** • New forms of cooperation, relationships • Policy framework conditions	• New values • Rediscovery traditions	Blanc et al. 2012; Focacci et al. 2018; Paletto et al. 2012; Sarkki et al. 2019; Živojinović et al. 2019; Lorber and Žiberna, 2017; Daly-Hassen et al., 2010; Górriz-Mifsud et al. 2019; Rogeljia et al. 2018; Ninijk et al. 2019

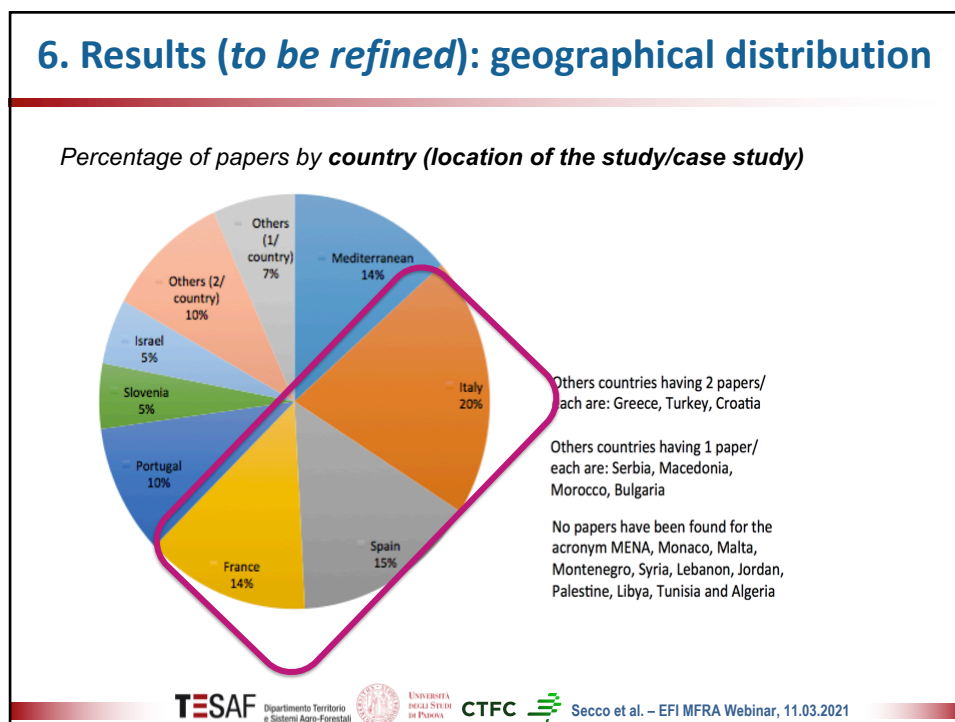TESAF Dipartimento Territorio e Sistemi Agro-Forestali · UNIVERSITÀ DEGLI STUDI DI PADOVA · CTFC · **Secco et al. – EFI MFRA Webinar, 11.03.2021**
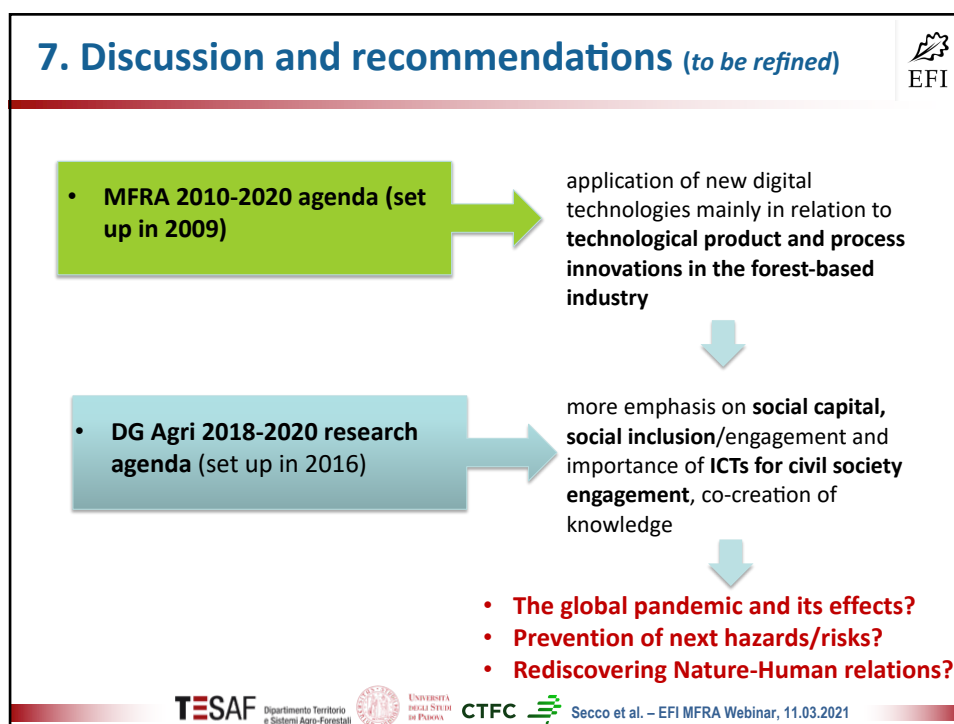
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7. Discussion and recommendations (*to be refined*)

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• **MFRA 2010-2020 agenda (set up in 2009)** → application of new digital technologies mainly in relation to **technological product and process innovations in the forest-based industry**

• **DG Agri 2018-2020 research agenda** (set up in 2016) → more emphasis on **social capital, social inclusion**/engagement and importance of **ICTs for civil society engagement**, co-creation of knowledge

• **The global pandemic and its effects?**
• **Prevention of next hazards/risks?**
• **Rediscovering Nature-Human relations?**

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7. Recommendations (*to be refined*)

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Crises as an opportunity to innovate
- **Co-creation of solutions, co-design**
- Societal transition
- EU as

5 missions:
- **Cancer**
- **Climate adaptation**
- **Smart cities**
- **Quality of water**
- **Health of soil**

- Trus
- **Impact-foc** **on innovation!**
- Concrete projects and instruments
- Young people to be fully engaged
- **Private-public partnerships**
- Research-innovation-education

Mariya Gabriel

European Commissioner for innovation, research, culture, education and youth

European Commission

Words/concepts extracted and synthesized from her at the Plenary session on "European Green Deal and Just Transition", 22.09.2020: https://www.youtube.com/watch?v=YNrfE_iuXJU and in pre-recorded interview to the Financial Times (https://research-innovation-days-conference.online/hubs/plenary#/2020-09-22)

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7. Discussion and recommendations (*to be refined*)

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- **Unbalanced distribution**: a few dominant countries **(Italy, France, Spain)** by far, followed by Portugal, Slovenia, Turkey, Greece, Croatia (Morocco, Serbia, Macedonia, Israel).

- Most of the papers derived from **public-funded research**, in particular EU programs (H2020, Era-net)

- **Systematic, regular and long-term research** on clearly defined topics **is not often performed**

It confirms what observed by Bajocco et al. 2013, Di Matteo et al. 2015, Nardi et al. 2016

Leadership by the top-three countries is expected to persist in the near future (Lovrić et al. 2020), as the **level of competition for international and EU funding calls will increase** and the most structured countries and research groups will probably continue to prevail

- **Private funds?**
- **Feasibility? Interest?**
- **Long-term, stable funds?**
- **Innovative funding mechanisms?**

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7. Discussion and recommendations *(to be refined)*

EFI

- **High fragmentation**

An example of the **network of concepts** explored in relation to **forest innovation and social capital**
*(source: own elaboration)*

It confirms that **organizational innovations are needed to reinforce collaboration among research structures** and groups/countries, to optimize resources at a regional level (Bajocco et al. 2013; Di Matteo et al. 2015)

Papers: 13
Small green nodes: Authors
Blue nodes: keywords
identified by the Authors
Edges: connections between papers based on the keywords
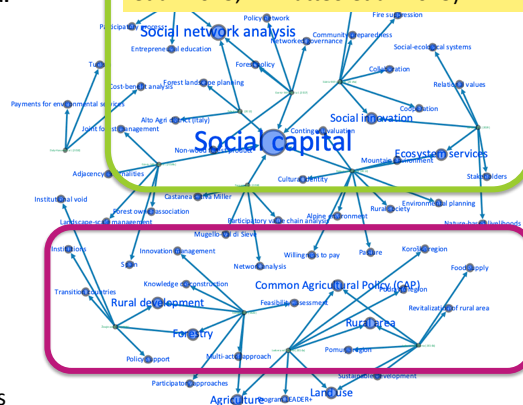
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7. Discussion and recommendations *(to be refined)*

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Topics and contents that remain overlooked with respect to potential and expressed needs (*list to be completed/refined*):

- **Digitalisation and ICT, e-marketing tools and value-chains**
- **Prevention and management of hazards/risks other than forest fires** (soil erosion, water scarcity, e.g. windstorms)
- **Adaptation** to climate change, **biodiversity** and **nature-based solutions**
- **Product innovations** for typical Med. NTFPs other than cork (e.g. resins)
- **Role of NTFPs and social factors in rural development** (income, diversification)
- **Institutional innovations** (e.g. hybrid-actors, novel risks insurances, financial and contractual mechanisms)
- **Role and co-design of effective innovation systems** (sectorial, regional)
- Innovations of **micro- and small-scale forest-related enterprises**
- **Impacts of forest-related policy and governance reforms**
- **Role of forests in new social demands/uses** (e.g. human health)
- **Citizens' engagement** in forest-related sciences
- **Use of research outputs** by policymakers and practitioners
- Others (e.g. training needs of public and private actors)

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7. Other general recommendations (*to be refined*)

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- *"Scientific priorities may need to balance between issue-driven and curiosity-driven science"* (van der Hove, 2007 – cit. in Maryudi et al. 2018)

- More **specific details about innovativeness of the paper** and how to use its results use (e.g. possible applications, additional gaps, …) should be **included also in technical papers**?

- **Technology transfer** to practitioners/policy makers should be reinforced (reducing emphasis on the "scientific performance" in international peer-reviewed indexed Journals and reinforcing **Open Access/Open Data**), taking advance of **new communication channels/tools**?

- **Creation of databases on innovations adapted to the forest sector** (such as the "Community Innovation Survey" datasets - Gandin and Cozza, 2019)?

- **Monitoring and/or periodic evaluation the use of the research outputs by practitioners/policy makers** (not only scientific impacts)?

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8. Limits (*to be refined*)

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- Mediterranean languages not included:
    - ✓ *Is this a relevant issue?*

- Selection of papers based on the use of the term "*innovation*" in Title, Abstract, Key Words:
    - ✓ *All of those maybe innovative, but very technical-specific (just for experts), have not been intercepted!*

- Significant overlaps between the identified innovation categories/scope/levels of intensity:
    - ✓ *Is it really useful? Needs to be re-adjusted?*

- Unrealistic recommendations? *To whom?*

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8. Limits (*to be refined*): we need your help!

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**Criticisms on weaknesses
and suggestions for
improving the
paper/analysis are super-
welcome!**

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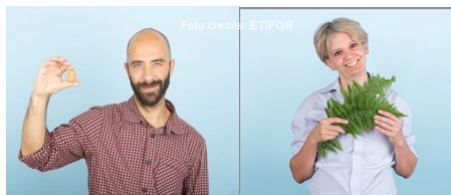
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9. Acknowledgments

- **European Forest Institute https://efi.int/**
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