



Mediterranean Network FORUM/22

Barcelona
29 Nov. – 1 Dec.
2022



**Mediterranean
Network**

FORUM/22

Theme 2:

Conservation and management of biodiversity and forest genetic resources

Bruno FADY

INRAE, Ecology of Mediterranean Forests
Avignon, France

November 29, 2022, Barcelona, Spain



bruno.fady@inrae.fr

There is a growing awareness worldwide of
the importance of genetic diversity for:

resilience and adaptation
of forest trees, forests and other habitats

in a context of risk management



**Mediterranean
Network**

FORUM/22

Barcelona
29 Nov. – 1 Dec.
2022





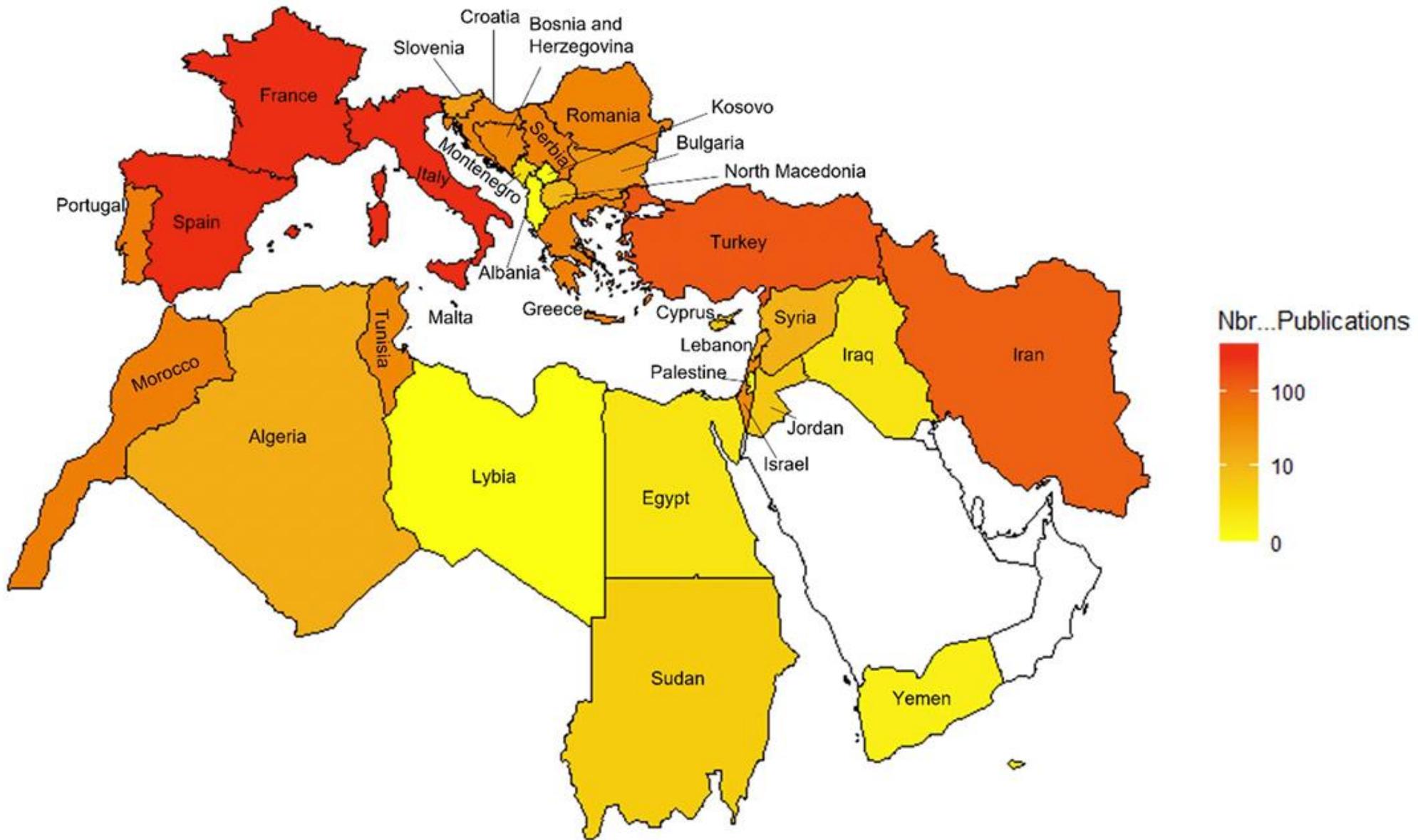
Forest Genetics Research in the Mediterranean Basin: Bibliometric Analysis, Knowledge Gaps, and Perspectives

Bruno Fady¹ · Edoardo Esposito² · Khaled Abulaila³ · Jelena M. Aleksic⁴ · Ricardo Alia⁵ · Paraskevi Alizoti⁶ · Ecaterina-Nicoleta Apostol⁷ · Phil Aravanopoulos⁶ · Dalibor Ballian^{8,9} · Magda Bou Dagher Kharrat¹⁰ · Isabel Carrasquinho^{11,12} · Marwan Cheikh Albassatneh^{13,14} · Alexandru-Lucian Curtu¹⁵ · Rakefet David-Schwartz¹⁶ · Giovanbattista de Dato¹⁷ · Bouchra Douaihy¹⁸ · Nicolas-George Homer Eliades¹⁹ · Louis Fresta²⁰ · Semir Bechir Suheil Gaouar²¹ · Malika Hachi Illoul²² · Vladan Ivetic²³ · Mladen Ivankovic²⁴ · Gaye Kandemir²⁵ · Abdelhamid Khaldi²⁶ · Mohamed Larbi Khouja²⁷ · Hojka Kraigher⁹ · François Lefèvre¹ · Ilène Mahfoud²⁸ · Maurizio Marchi²⁹ · Felipe Pérez Martín³⁰ · Nicolas Picard³¹ · Maurizio Sabatti³² · Hassan Sbay³³ · Caroline Scotti-Saintagne¹ · Darrin T Stevens³⁴ · Giovanni Giuseppe Vendramin³² · Barbara Vinceti³⁵ · Marjana Westergren⁹

Accepted: 5 July 2022

© The Author(s) 2022, corrected publication 2022





**Mediterranean
Network**

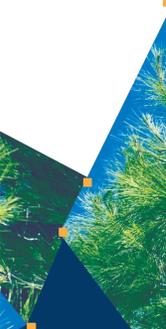
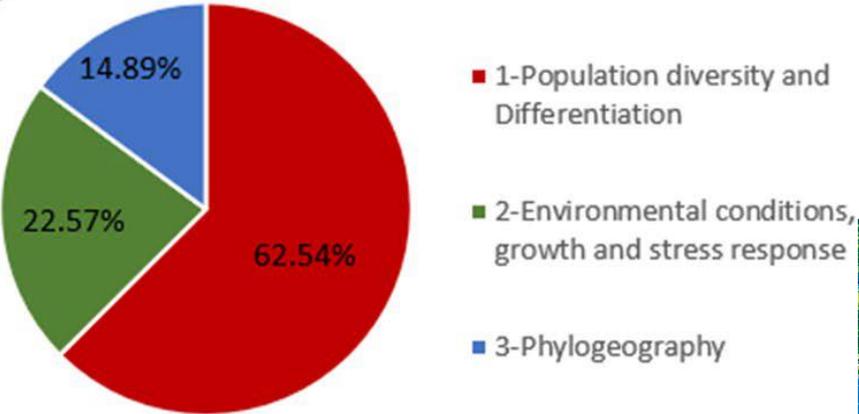
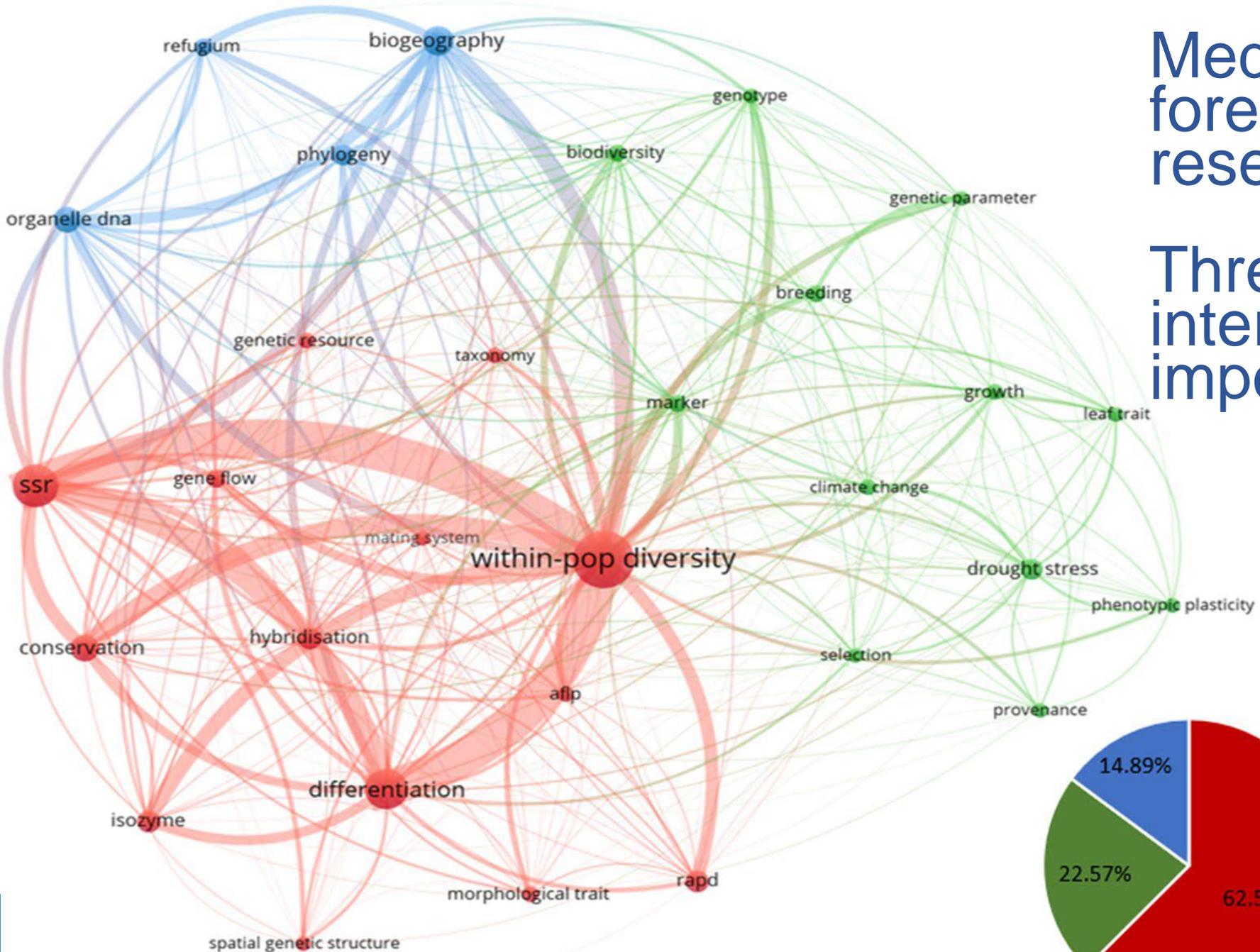
FORUM/22

Barcelona
29 Nov. – 1 Dec.
2022



Mediterranean forest genetics research:

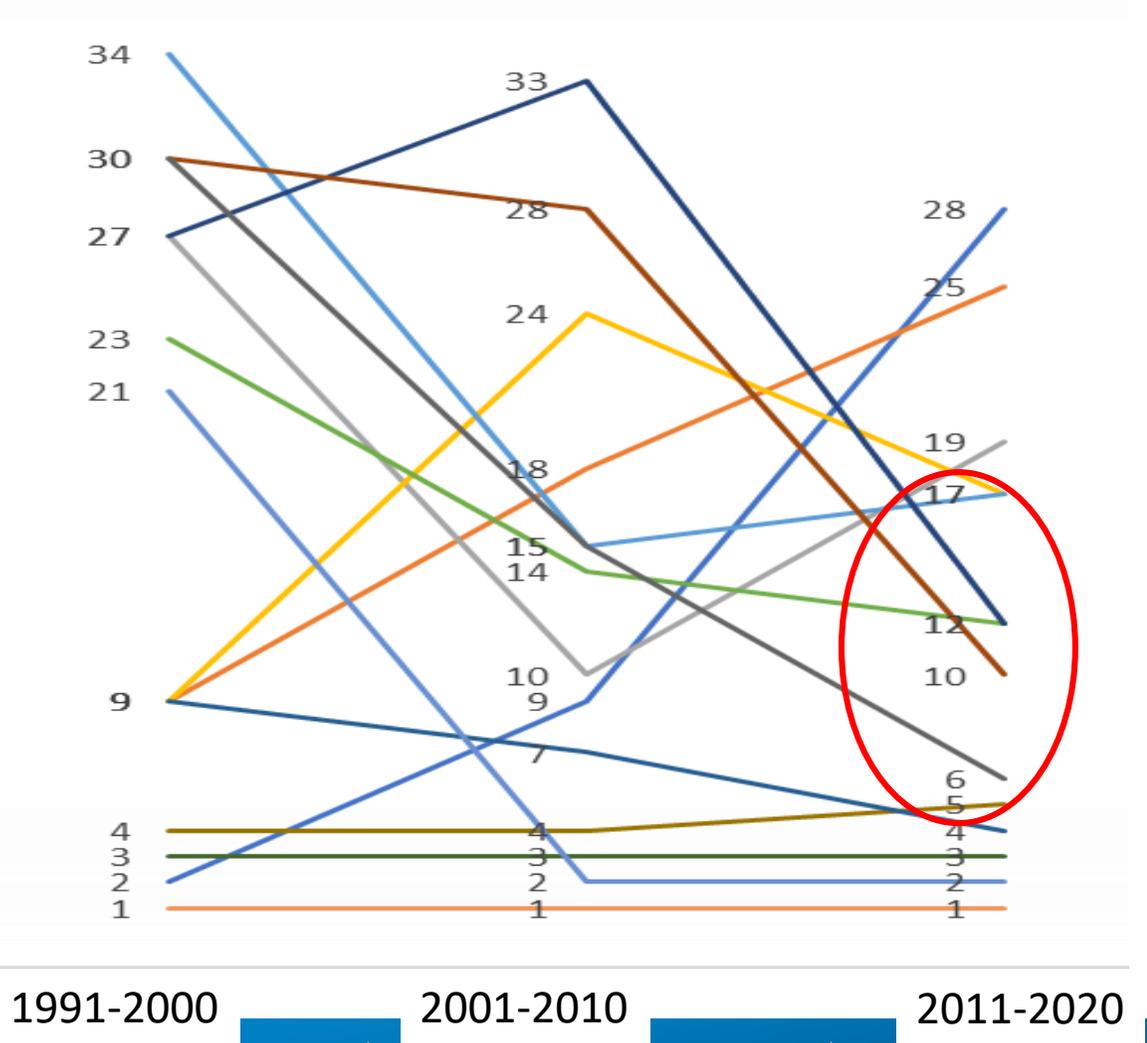
Three major fields of interest of unequal importance



Shifting research interests: Rank change of main keywords over three decades

Least frequent

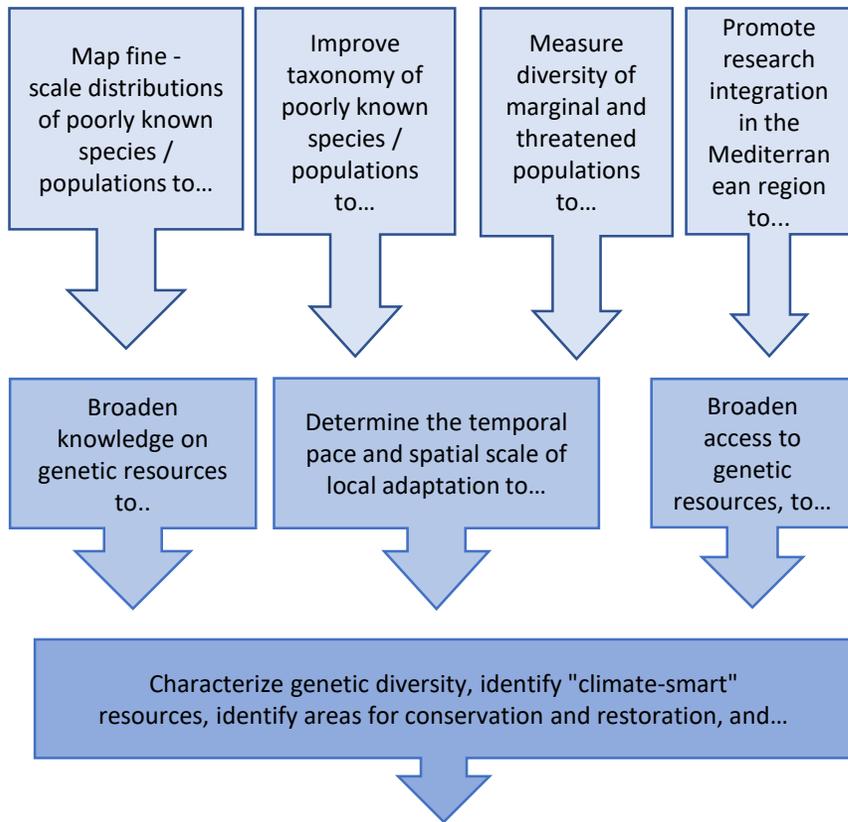
Most frequent



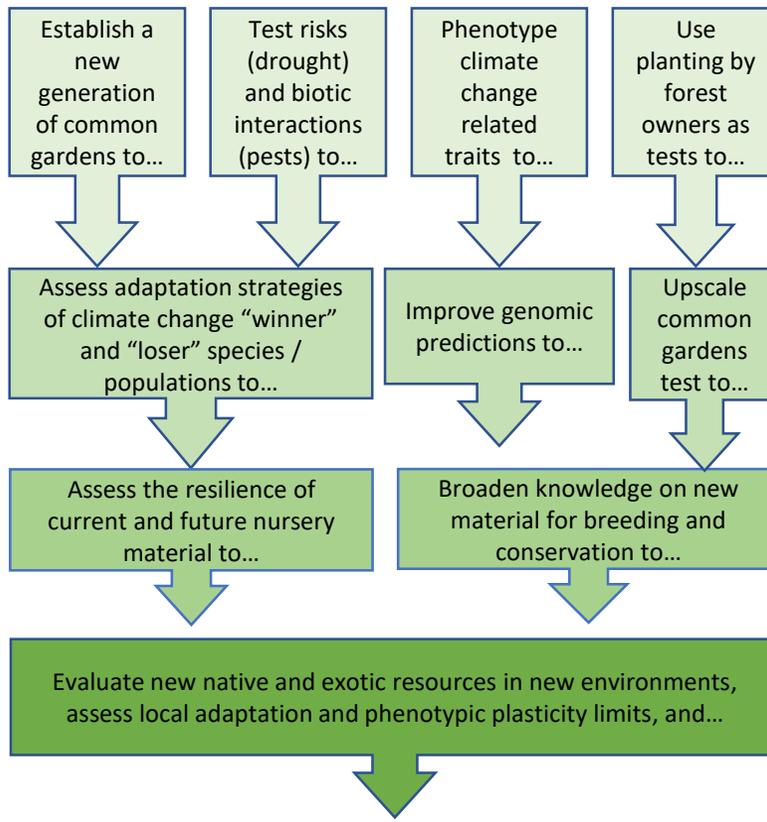
- Isozyme
- Morphological trait
- Refugium
- Growth
- Biodiversity
- Breeding
- Adaptation
- Climate change
- Drought stress
- Biogeography
- Conservation
- Differentiation
- SSR
- Within population diversity



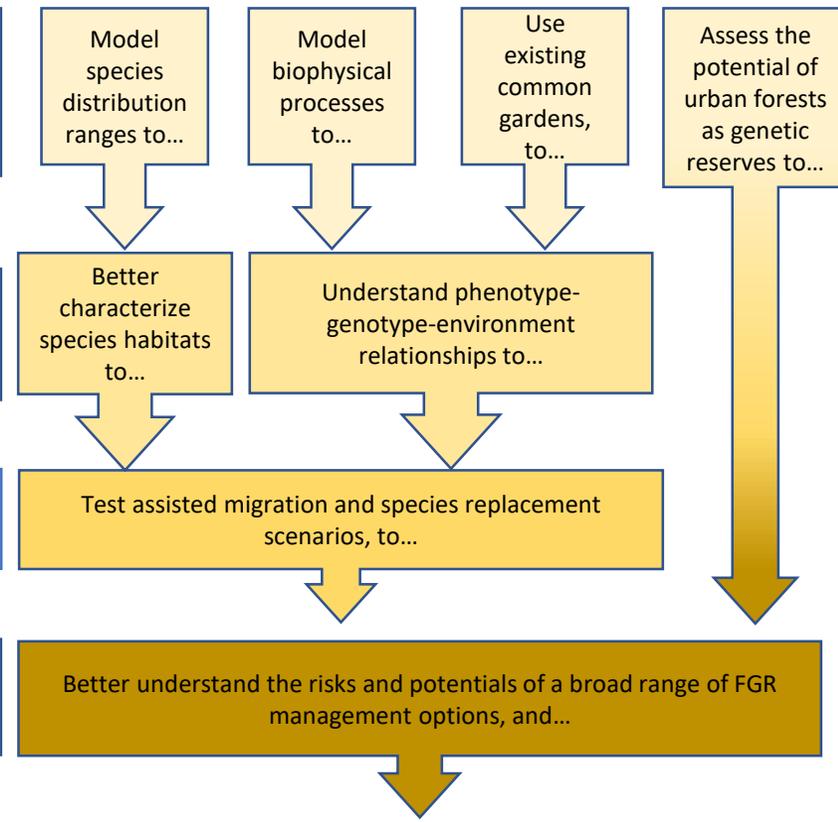
Explore



Experiment



Model



Use standardized **metadata** to improve data quality, make **data open access**, share results, experience and knowledge to...

Provide solutions to manage climate-induced risks and human pressure on Mediterranean forests



Mediterranean Network

FORUM/22

Barcelona
29 Nov. – 1 Dec.
2022



Mediterranean
Network

FORUM/22

RESULTS

Mediterranean Forest Research Agenda **2030**



WEBINAR #3

Conservation and management
of biodiversity and forest
genetic resources

Bruno Fady,
INRAE

French National Institute for
Agriculture, Food, and Environment

17 Nov. **2022**



Key research questions identified:



1

What is the potential of Mediterranean tree species to establish at northern latitudes?

2

How efficient is the natural dispersal ability of Mediterranean trees tracking their optimal conditions – with a focus on the total dispersal kernel for Mediterranean tree species and their associated community.

3

How can the alteration of key interactions between species lead to fragmenting the entire interaction web and hinder whole-community migration?

4

How should landscape-level management strategies (e.g., biodiversity corridors) be designed and implemented for lasting positive impacts on biodiversity at habitat, species and genetic levels?



5

What forest resource management approaches can be used to maintain and improve forest biodiversity and its resilience?

6

How can knowledge on forest biodiversity best be catalogued and shared for effective knowledge management?

7

What legal and policy limitations exist or need developing for effectively implementing and managing protected area networks across the Mediterranean region?

8

How do post-fire community dynamics influence adaptive potential and resilience within different forest types, and under different wildfire frequencies and intensities?



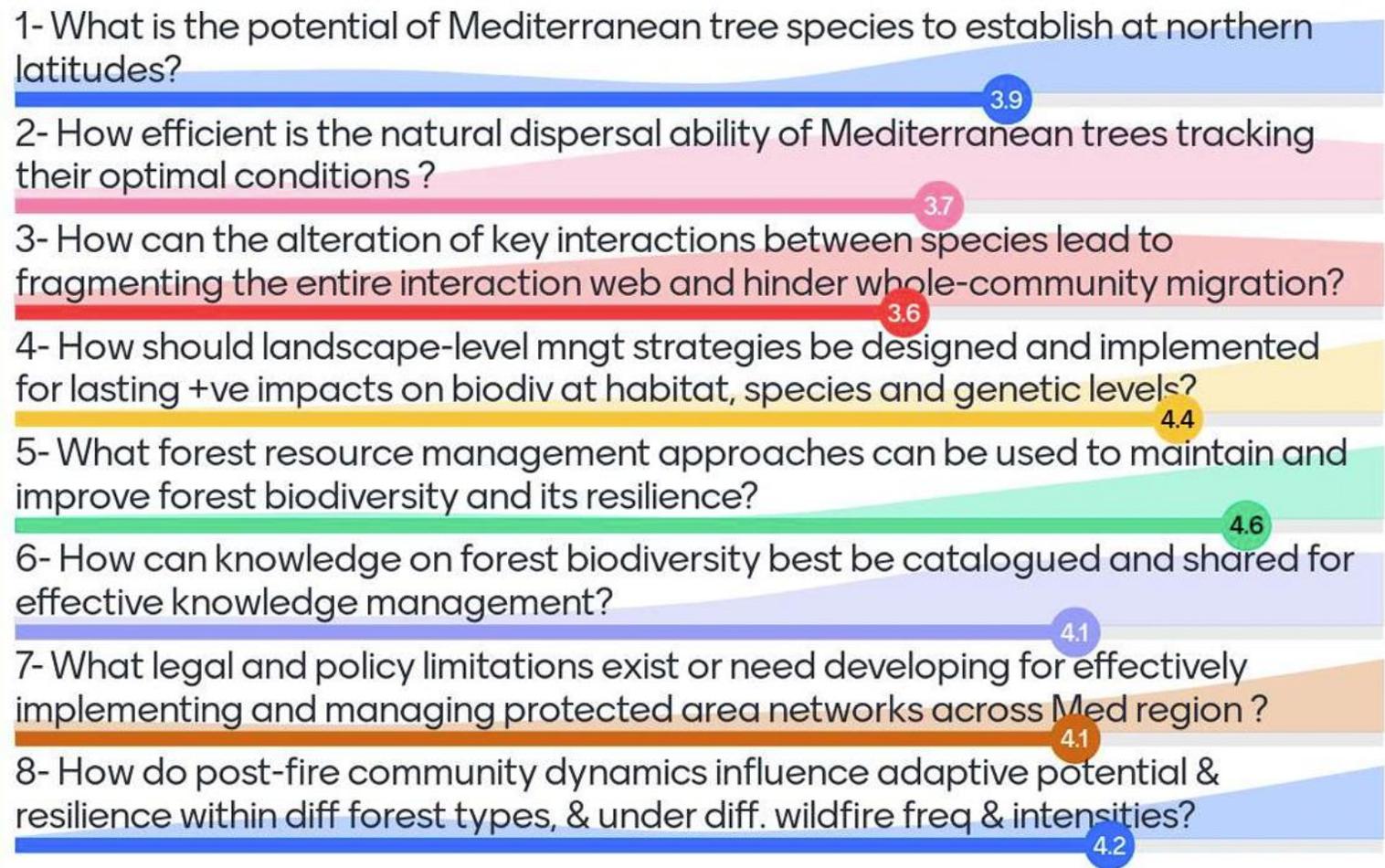
Q#1 - Where are you from ?

Approximately 50 on-line participants



Q#2 : Are the research questions relevant to your country?

IRRELEVANT



VERY RELEVANT





Suggested research approaches:



1

Build niche-modelling techniques based on trees' adaptive and functional traits and their distribution mode to forecast changes to species distributions under future climate scenarios and predict abrupt shifts of dominant tree species at different spatial scales during the next decades.

2

Apply population genomics to assess and monitor species interactions in reference forests and in restored forests (Breed et al., 2019). Meta-omics will elucidate any biological interactions before, during and after restoration activities. This helps more responsive and relevant planning for resilient restoration activities in the face of rapidly changing environments.

3

Transfer of best practices, ecosystem indicators, and effectiveness of conservation efforts, particularly for conservation projects aimed at safeguarding genetic diversity and adaptive potential.

4

Implement long-term ecosystem monitoring and experiments in protected areas as living laboratories for forest sustainable development.

5

Intensify observational, experimental and modelling research on tree species and within species mixtures, aiming at increased system productivity, stability and multifunctionality through trait-based mechanisms of complementarity and facilitation.

6

Gather a solid dataset (based on real data) affecting Mediterranean forests to be used in machine learning and similar statistical tools to predict future scenarios.

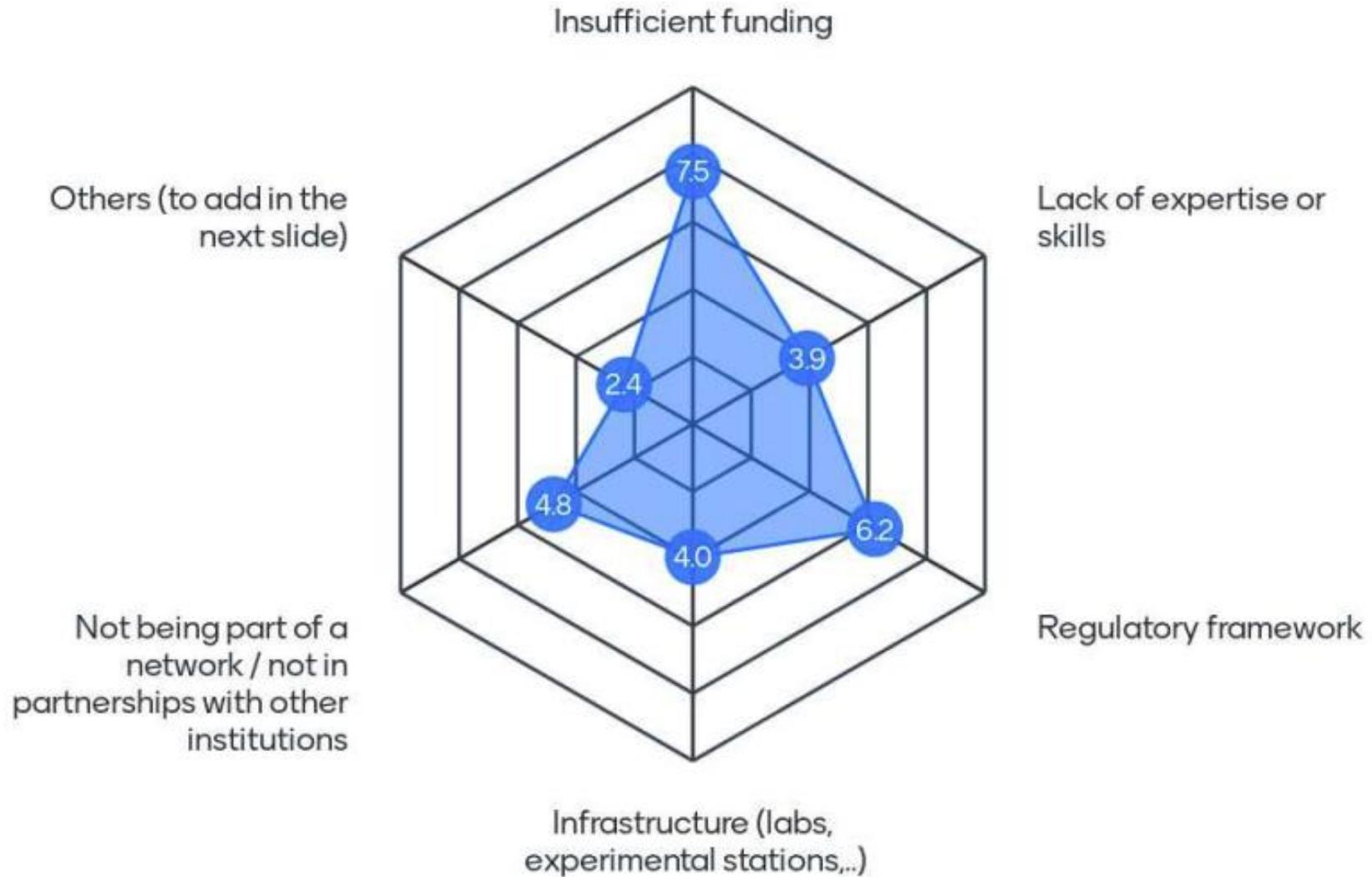
7

Develop and manage open-access databases and platforms for data and knowledge exchange in the field of forest genetics and biodiversity across the entire Mediterranean region.

8

Knowledge sharing and capacity building through training, coaching and skills transfer among Mediterranean institutions.

The main challenges to implement the research proposed are :



What are the additional challenges to implement this work ?

Questions

Asked on: Q 4: What are the additional challenges

Bridge the knowledge and transfer gap between

Asked on: Q 4: What are the

Problem in the transition

Asked on: Q 4: What are the additional challenges

Efficiently eradicate corruption in decision making sector.

Asked on: Q 4: What are the additional challenges

Integrate the knowledge and transfer gap between

Asked on: Q 4: What are the additional challenges

policy implementation and the willingness to change

Asked on: Q 4: What are the additional challenges to implement this work?

Increase the connection with the private landowners

Asked on: Q 4: What are the additional challenges to implement this work?

Integrated and inclusive Management Plans that include a FGR and bring into interest the multi stakeholder approach

Questions

Asked on: Q 4: What are the additional challenges to implement this work?

Translate genetic research in current language in order to raise awareness to this issue, even among politic decisors

Asked on: Q 4: What are the additional challenges to implement this work?

Public funding for conservation of biodiversity (including genetic diversity)

Asked on: Q 4: What are the additional challenges to implement this work?

How to bring efficiently managers to the discussion with scientists

Asked on: Q 4: What are the additional challenges to implement this work?

Efficiently eradicate corruption in decision making sector.

Asked on: Q 4: What are the additional challenges to implement this work?

Legal frameworks implemented

Bridge the gap between scientists and practitioners and policy makers

Integrated and inclusive management plans that include FGR and bring into interest the multi-stakeholders approach



Opportunities

- Existing and emerging genomics tools such as population genomics and meta-omics can improve seed sourcing as well as the assessment and monitoring of restoration outcomes.
- The political context of ecological transition is favourable to biodiversity conservation and sustainable management (e.g., European Green Deal).



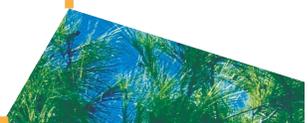
Challenges

- Genetic diversity in Mediterranean forest policy instruments and conservation efforts is not well integrated.
- The Mediterranean region is not an integrated political arena and human impact is high there.



Recommendations

- Functional trait, distribution and dispersal data often exist for Mediterranean trees only for their specific European locations. Extend data and analyses to include the whole Mediterranean region.
- Identify clear ecosystem indicators to measure conservation effectiveness, and adoption of these indicators across fields to allow for better standardised measures of effectiveness, and quantitative meta-analyses to identify best management practices.
- Identify and analyse the political and socio-economic settings that favour biodiversity conservation, including genetic diversity.





**Mediterranean
Network**

FORUM/22

Barcelona
29 Nov. – 1 Dec.
2022

Thanks!!

INRAE, URFM
Ecology of Mediterranean Forests
Avignon, France

https://www6.paca.inrae.fr/ecologie_des_forets_mediterraneennes



bruno.fady@inrae.fr