LIFE4FIR: Global review and progress of actions

Final Monitoring Meeting, Polizzi Generosa, 13 November 2024

'Decisive in situ and ex situ conservation strategies to secure the critically endangered Sicilian fir, *Abies nebrodensis*' Lojac.

Duration: 4 years (1.08.2019 – 31.07.2023) extended to 31.12.2024

Partners

1. CNR: Consiglio Nazionale Delle Ricerche (2 institutes: IPSP and IBE), Sesto Fiorentino, Italy;
2. EPM: Ente Parco delle Madonie, Italy;
3. UNIPA-SAAF: Dipartimento Scienze Agrarie Alimentari e Forestali - Università Di Palermo, Italy;
4. DRSRT: Assessorato Regionale dell'Agricoltura, dello Sviluppo Rurale e della Pesca Mediterranea Dipartimento Regionale dello Sviluppo Rurale e Territoriale, Italy;
5. US: University of Seville (Spain).

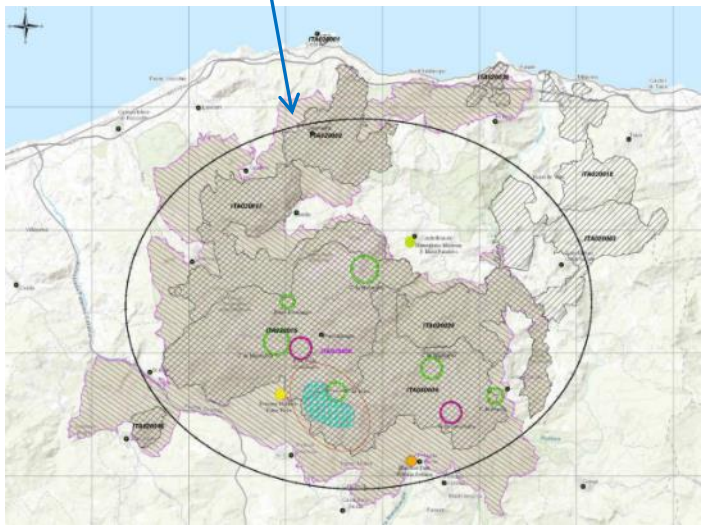
Abies nebrodensis is a critically endangered species (IUCN red list), endemic to the north-central part of Sicily.

- Only 30 relic adult trees;
- 165 seedlings of the natural regeneration.

Protection status under European legislation:

- Habitat: 'Apennine beech forests with Abies alba and beech forests with A. nebrodensis ' is included in the Natura 2000 network (Habitat of Community Interest - code 9220*)

- A. nebrodensis natural site: ZPS ITA 020050 e ZSC ITA 020004)



A. nebrodensis: current threats and vulnerability

- Strong genetic erosion;
- Fragmentation;
- Purported self-fertilization;
- Possible hybridization with alien firs;
- Poor natural regeneration;
- High mortality rate in the nursery.

and

- Localized soil erosion;
- Poor and rocky soils;
- Grazing:
  - By wild herbivores
  - By uncontrolled cattle and goats

Proposed solutions

1) Sustain the relic trees; 2) boost the genetic diversity of A. nebrodensis relic population; 3) produce healthy outbred seedlings; 4) create re-diffusion cores; 5) implement a seedbank and a cryobank for the ex-situ conservation.

Objectives

Improve A.n. state of conservation, reduction the extinction risk. Increase awareness, behavioural change, replication.

Through implementation of the following technical activities:

1. **Sustain and protection of the relic population, control of biotic, abiotic and anthropic disturbances (C1)**

By

new system of fences, video surveillance, bioengineering, monitoring of vegetation processes (drone), regular surveys to control pathogens and pests and abiotic stresses.

2. Increase the biodiversity of the progenies (A1, C2, C3)

By

- Evaluation of the genetic relatedness among the mature trees, controlled crosses;
- production and selection of pure outbred seedlings through paternity tests; implementation of a clonal orchard.

3. Improvement of the growing conditions of seedlings in the nursery (C4)

By

adopting effective techniques to select viable seed, to obtain mycorrhizal seedlings, to control biotic and abiotic disturbances.

Both these activities will lead to an increase of the vigour and fitness of saplings that will be used in reforestation

4. Replanting interventions (C6)

Using 4500 improved seedlings raised in the nursery, in 10 plots suited for reintroduction of A. nebrodensis, to create re-diffusion cores.

5. Ex situ conservation (A1, C5)

Ex situ conservation by the development of a highly-efficient propagation technique (somatic embryogenesis), as well as the implementation of a seedbank and a cryobank for the long-term conservation of seeds, pollen, isolated embryos and embryogenic callus lines.

6. Sustain the activities after the end of the project (C7 and F3) and replication

Most actions implemented in the course of the project will need to be continued after its end (After-life plan). Development of a replicable model.

List of the proposed actions

A. Preparatory actions

A1 Protocol setup to define genetic traits of Abies nebrodensis population and to improve its propagation and conservation at low and cryogenic temperatures of selected tissues and organs. Responsible: US.
Other partners: CNR–IBE, CNR–IPSP, UNIPA, DRSRT, EPM

A1.1 Evaluation of genetic diversity of adult plants and natural regeneration.
Started in November 2019: leaf samples were collected from the 30 adult trees and from 118 young plants of the natural regeneration for genetic analyses. SNPs genotyping to determine: population structure, inbreeding level, genetic diversity, genetic relatedness. Results: high rate of inbreeding and high rate of self-fertilization. **Deliverable completed Dec 2020** (Annex 5 and 6).

A1.2 Genetic characterization of seedlings from the local nursery 'Vivaio Piano Noce' to select intraspecific crosses.
Started in November 2019: samples collected from 2064 seedlings grown in the nursery from different mother plants. Results: high rate of self-fertilization and of suspected hybrids. **Deliverable completed in September 2021**

'..Agf can help in preventing the loss of genetic diversity, it may not alleviate the species vulnerability to environmental challenges, and break free from extinction spiral

A1.3 Set up of protocols to investigate biotic and abiotic stresses of seedlings in the nursery.

started in November 2019.

- More than 25000 plants in the nursery were surveyed (CNR-IPSP)
- 300 samples of twigs and leaves collected for laboratory analysis.
- fungal isolations were carried out: 25 fungal taxa identified based on morphology and sequence data. Only weak pathogens and endophytes were detected.
- investigations on the effect of water and soil traits on germination and growth of plants (UNIPA).
- tolerance to drought of seedlings was evaluated through water relations experiments (UNIPA). **Deliverable completed** (Annex 4).
- **Improving measures routinely implemented in the nursery.**



	plot 1		plot 14		plot 15		Tot.	
	No.	%	No.	%	No.	%	No.	%
mortality	459	5,04	7	0,34	142	1	608	2,4
reddened needles	145	1,6	10	0,5	117	0,81	272	1,07
chlorosis	190	3,82	17	0,84	764	5,35	971	3,82
defoliation	9	0,1			35	0,24	44	0,17
small needles					6	0,04	6	0,02
blighted shoots	12	0,13	4	0,19	8	0,08	24	0,1
stunted growth			47	2,32	64	0,45	111	0,43

Tabella 3. Frequence (as number and percentage) of the main symptoms observed on the aerial part of the saplings raised in the three nursery plots.

A1.4 Seed conservation at low temperature (-18°C), application of cryopreservation protocols.

Started in October 2019 (IBE-CNR, UNIPA)

- immature cones were collected during summer 2020; embryos were excised to induct embryogenic callus in vitro.
- vitality and germination rate of mature seeds, extracted embryos and pollen under low and cryogenic temperatures has been evaluated for conservation in the seedbank and cryobank.

(1-year relocation of deliverables: **Deliverables completed in Dec 2021**)

A1's PROJECT DELIVERABLE PRODUCTS

All done

Deliverable name	Deadline
Report on optimized protocols for the reproduction of A. nebrodensis trees by seed and grafting propagation (A1.4)	12/2020 relocated 12/2021 **done**
Report of a complete protocol for A. nebrodensis seed and excised zygotic embryo conservation at low (-18°C) and cryogenic (-196°C) temperatures, respectively (A1.4)	12/2020 relocated 12/2021 **done**
Samples will be deposited in the DNA-Bank of the University of Seville (Spain) (A1.1)	**done** 12/2020
Protocol for disease of A. nebrodensis identification in nursery (A1.3)	07/2020 **done** 12/2020
Report on the genetic variability of the A. nebrodensis population and related results (A1.1, A1.2)	**done** 12/2020
Report of a complete protocol of long-term conservation of A. nebrodensis pollens at ultra-low (i.e., cryogenic) temperature (A1.4)	12/2020 12/2021 **done**

C. Conservation actions

C1 Support and preserve Abies nebrodensis in its natural habitat.

Responsible: UNIPA; partners: CNR-IPSP, EPM, DRSRT

C1.1 Installation of a new larger and more **functional protective fence** around groups of plants of the natural population to better protect the natural regeneration. started in 2020, completed in June 2021: 1800 chestnut poles; 5 t iron wire; 3750 m wire mesh; 2167 m total perimeter; 14000 m^2 protected area(**deliverable relocated to 6/2021 and completed**, Annex 10)

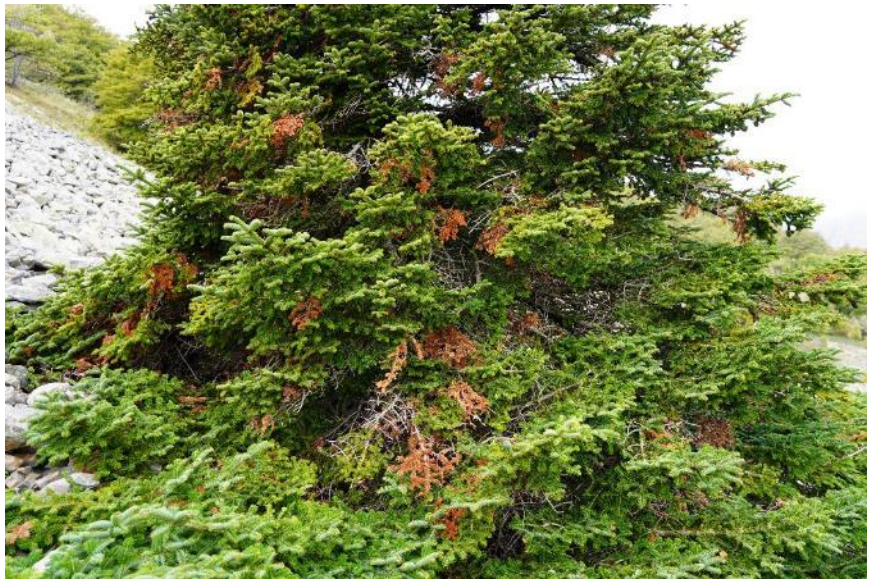
Tree Id. #	Fence perimeter (m)	Tree Id. #	Fence perimeter (m)	Tree Id. #	Fence perimeter (m)
1	100	**12**	72	**22 and 30**	230
2	82	**13**	90	**22 bis**	80
4 and 6	72	**14**	80	**23**	56
7	80	**15**	80	**24 and 25**	80
8	105	**16 and 17**	112	**26**	32
8 bis	50	**18**	120	**27**	98
9	60	**19**	40	**28**	28
10 and 11	150	**20 and 29**	100	**31**	24
10 and 11 bis	8	**21**	98	**32**	40

C1 Support and preserve Abies nebrodensis in its natural habitat.

C1.2 Setting up an **electric fence**. (changed compared to GA)
Funds relocated to: identification panels; video-surveillance; equipment; external assistance for controlled crosses 2022, graftings, selection of seedlings.

C1.3 Installation of 5 **camera system** with motion sensor, powered by photovoltaic panel, as grazing prevention of wild herbivores and of abandoned cattles and goats.
technical and financial problems encountered but **completed in September 2022** and included in the due **deliverable** ('fences and videosurveillance system').
System improved by EPM for remote acquisition of data.

C1.4 Permanent ground **monitoring of the health state** of Abies nebrodensis population; **mitigation of biotic and abiotic stresses** (with special attention to invasive species). (GA: 100 analyzes /year)



Tree health surveys conducted in November 2019, October 2020 and May 2023 by IPSP-CNR and UNIPA; visual inspection; samplings and fungal isolations (500 samples analyzed, 400 fungal DNA regions sequenced) dendro-auxometric parameters of trees recorded; census of the natural regeneration completed. **Deliverables completed** (Annexes 1, 2 and 3). Study of the mycobiome of the crown in trees growing in different environments with NGS techniques.

Results

- Actually, all isolated fungi are classified as weak pathogens,
- endophytes or saprophytes.
- Involvement of aggressive pathogens as the cause of needle-disorders was excluded.
- Needle reddening and cast and twig blight are related to the environmental stresses.
- A. nebrodensis trees have shown fairly good health. The species adapted and tolerates its altered habitat.

Journal of Plant Pathology
https://doi.org/10.1007/s42161-024-01639-7

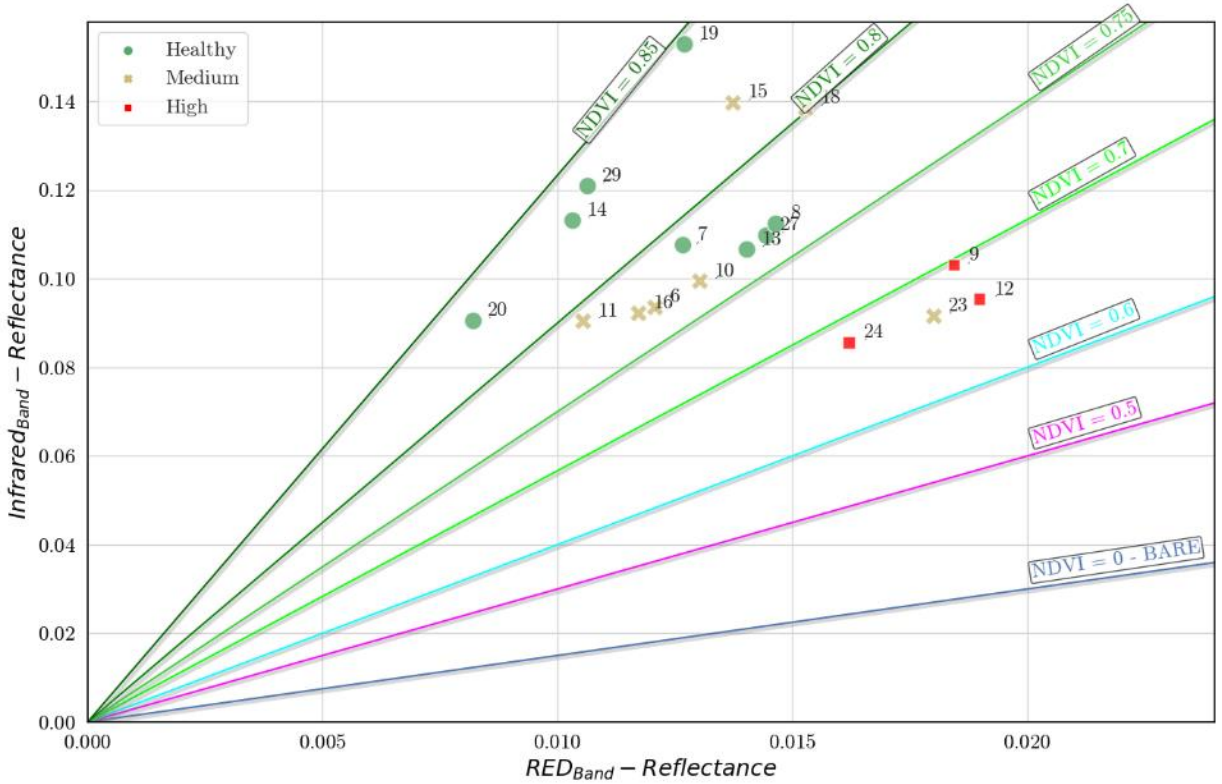
ORIGINAL ARTICLE

Insights on the fungal communities associated with needle reddening of the endangered *Abies nebrodensis*

Arcangela Frascella[1,2] · Sara Barberini[1] · Gianni Della Rocca[1] · Giovanni Emiliani[1] · Vincenzo Di Lonardo[1] · Stefano Secci[1] · Roberto Danti[1]

C1.5 Spatial and 'health' analysis of A. nebrodensis natural population using **drone technology**.

1st drone survey and multispectral analysis carried out in October 2020 (EPM); (1st **deliverable completed**, Annex 1). New drone flight done in August 2023**. 2nd deliverable completed.** Maps and health state of A. nebrodensis population monitored by IPSP-CNR.



C1.6 Erosion protection of A. nebrodensis individuals: environmental engineering activity. expected for 6/2021; some months delay, **completed in November 2022.** DRSRT

C1's PROJECT DELIVERABLE PRODUCTS

Deliverable name	Deadline
Report of both fences installation including the surveillance system (C1.1, C1.2, C1.3)	6/2020 **done** 6/2021
Report of actions related to control and prevention of native and invasive pests and pathogens	**done** 06/2023
Map of final A. nebrodensis population and habitat video/hyperspectral inventory and 'health' state	09/2023 **done** 09/2024
Map of initial A. nebrodensis population and habitat; video/hyperspectral inventory and'health' state (C1.4, C1.5)	03/2020 **done** 12/2020
Report: Dendro-auxometric parameters of the trees of the natural population of A. nebrodensis (C1.4)	04/2020 **done** 12/2020
Report: updated census and mapping of the natural regeneration of A. nebrodensis (C1.4)	6/2020 **done** 10/2021
Report: Description of major potential diseases, pests and their antagonists (C1.4, C1.5)	**done** 08/2021

C2 Conservation of genetic purity of Abies nebrodensis and improvement of its genetic diversity. (GA: cross-pollinations in two flowering seasons)

Responsible: US; partners: UNIPA, CNR-IPSP

C2.1 Ext **Enhancement of the genetic diversity** of the natural population: promoting the outbreeding through **manual cross-pollination**.
manual pollinations in May 2020 on 24 trees: 56000 seeds sown in December and April; more than 5000 seedlings obtained, but high mortality. Flowering null in 2021; **new crosses in May 2022**: 23 cross-combinations, 121 bags, 389 cones following the US genetic instructions: 90000 seeds sown in Dec-Jan; mortality rate still high**. Flowering 2023 null.**
May 2024 (flowering poor) new crosses: 16 cross-combinations; 82 bags, 240 cones**.** UNIPA

C2.2 Ext **Selection of outbred seedlings** derived from intraspecific crosses to be used in reforestation. Sampling and sequencing done on 2064 pre-existing seedlings: high rate of self-fertilization (97%) and suspected hybridization, **deliverable completed in July 2021**, see A1.2). 3500 seedlings from controlled crosses were genetically verified with high success rate.

C2.3 Ext Identification and **removal** of the natural regeneration of **alien firs** (*Abies cephalonica* and *A. alba*) in reforested areas of the Madonie. Identification carried out in June-July 2021 by Unipa and IPSP-CNR. Removal started November 2023 and continued in 2024 (deliverable 9/2021, **completed**).
Extended to Dec 2024. DRSRT UNIPA

C2's PROJECT DELIVERABLE PRODUCTS

Deliverable name	Deadline
Recommend actions for conservation programs	09/2023 **done**
Report: Implemented procedure to quickly determine the genetic origin of seedlings. Dissemination our results to Natural Park Managers at the end of the Project	09/2022 **done**
Report: Distribution of natural regeneration of exotic Abies (including a map)	9/2020 **done** 9/2021
List of the seedlings growing in nursery indicating their genetic origin will be delivered	**done** 9/2021
Molecular data derived from this project will be exploited by the participants and will be deposited in the free-access public genetic databases (e.g. GenBank)	10/2021 **done**
List of all the hybrid seedlings to be eliminated	10/2022 **done**

C3 Establishment of a new clonal orchard for germplasm collection and to boost the genetic variability of the progeny.

Graftings planned for April 2020-21 were not carried out due to Covid, shifted to

- April 2022: 454 graftings done;
- April 2023: new 850 graftings carried out.
- April 2024: further 295 graftings carried out
- Area fenced in September 2023.
- October 2024: 450 grafts have been planted out in the clonal orchard; all mother plants represented (GA: 360 grafts)

Extended to October 2024

Responsible: CNR-IPSP; partners: UNIPA, EPM, DRSRT

C4 Ext **Nursery production of improved seedlings of Abies nebrodensis**

Responsible: CNR-IPSP; partners: UNIPA, DRSRT, CNR-IBE

C4.1 Application of an **improved seed propagation protocol**, implementation of a system for the selection of viable seed through the use of a 'ballistic´ machinery. Started in 2021, replaced by an X-ray procedure (GA: ballistic machinery);

C4.2 Mycorrhization of A. nebrodensis seedlings. Started in 2021, ectomycorrhyzal fungal strains selected (Pisolithus tinctorius). Mycorrhization done from Nov 2021, assays for effectiveness done in Sept. 2022. UNIPA

C4.3 Nursery **propagation** of (i) **4500 A. nebrodensis** seedlings for the reforestation program, and (ii) **360 grafted plants** for the establishment of the clonal orchard. > 4500 outbred seedlings raised in the nursery by October 2024; 450 grafts obtained.

C4.4 Application of proper procedures for the **control of biotic and abiotic disorders in the nursery**, according to what emerged in the action A1. In course: standard soil mixture, use of sowing trays, frequency and procedure of transplants, mycorrhization.

C3's PROJECT DELIVERABLE PRODUCTS

Deliverable name	Deadline
Report and map of the newly constituted clonal orchard	04/2023 **Ext 10/2024**

C4's PROJECT DELIVERABLE PRODUCTS

Deliverable name	Deadline
Report on the effective production of mycorrhizal A. nebrodensis seedlings and on the improved health status of the seedlings of the local nursery of 'Vivaio Piano Noce´.	Done 06/2023

C5 Ext Constitution of a seedbank and a cryobank for the long-term conservation of seeds, pollen, isolated embryos and embryogenic callus lines of Abies nebrodensis. **Responsible: CNR-IBE;** partners: UNIPA, EPM.

Protocols defined, installation of safety devices carried out; Seedbank and cryobank officially launched on the 21 July 2023 and fully operational. **Written engagement by the Municipality obtained; contract for the 18 months supply of liquid nitrogen signed. Extended to Dec 2024**

C5's PROJECT DELIVERABLE PRODUCTS

Deliverable name	Deadline
Report on the seed- and cryobanks constitution	**done** 07/2021
Database of the pollen/excised embryos/somatic embryogenesis samples in the cryobanks reported in the website	01/2023 12/2023 **done**
E-manual on the website for downloading, containing practical information on the constitution and management of seed and cryobank for the long-term conservation of fir genetic resources	04/2022 **Done** 6/2024
Report of a complete protocol of somatic embryogenesis and cryopreservation of proembryonic masses of A. nebrodensis	12/2021 **done** 12/2023
Database of the seed samples in the bank reported in the website	03/2023 12/2023 **done**

C6 Reforestation with A. nebrodensis (4000 improved seedlings) in 10 plots (new diffusion cores) in the Madonie Park in suitable areas for the reintroduction applying innovative planting techniques.

Responsible: UNIPA; partners: EPM, DRSRT

Plots suited for the reintroduction of A. nebrodensis were selected ranging between 800 and 1600 m elevation asl.

Two plots completed in April 2023 (plants + fences) in Mandarini e Favarotti. Fences completed in all plots by July 2024. Extended to November 2024 for completing the remaining plots. DRSRT

C6's PROJECT DELIVERABLE PRODUCTS

Deliverable name	Deadline
List of reforested plots explaining the characteristics of each areas, planting techniques adopted including maps of the reforestation in GIS	09/2020 **Done 10/2022**

C7 Replication. Implementation action dedicated to the results' transfer and replication during the project. **Responsible: CNR-IPSP;** Partners: (All) UNIPA, US, EPM, DRSRT

- Replication Kick off meeting (Seville) 11/2022
- Replication event (Polizzi) 05/2023
- Best Practice Handbook (three languages)

Share knowledge and experience with managers, stakeholders, technicians and working with protected sites and habitats

- Replication plan

Presentazione di
licrosoft PowerPoi

C7's PROJECT DELIVERABLE PRODUCTS

Deliverable name	Deadline
Best Practice Handbook	9/2020 **Done** 09/2022
Replication Plan	09/2022 **Done** Ext 09/2024

D. Monitoring of the impact of the project actions (obligatory)

Responsible: CNR

D1 Monitoring of socio-economic assessment and ecosystem services and conditions of LIFE4FIR Project

D1.1 **Socio-economic impact**

Questionnaire prepared submitted 200 visitors and 300 local people. Data were processed to draw up the due report.

D1.2 **Ecosystem services and conditions impact**

Questionnaire submitted to 25 stakeholders to assess perception of ecosystem services. Data processed and the due report has been prepared.

D1.3 **Recommendations to ensure replicability and transferability**

Transfer of methods and knowledge: exchange with stakeholders (replication events).

Deliverable name	Deadline
Report on the socio-economic impact of LIFE4FIR project	07/2023 **Done** Ext 10/2024
Report on the LIFE4FIR impact on ecosystem services and conditions	07/2023 **Done** Ext 11/2024

D1. Socio-economic impact: main results

- Persons interviewed were mostly Sicilian, between **40-49**, with **degree, employed** and **equally male and female**;
- Persons prefer to visit the Madonie Regional Park in an **organized group** by using the public transport;
- Persons for visiting the Madonie Regional Park usually spend daily more than € 90.00 mainly for food and drink;
- Persons who visited the Madonie Regional Park are **usually part of an Association** and knew it through the **web information**;
- Persons pay attention and retain very important environmental topics;
- Persons **do not know EU environmental topics as Natura 2000 and SIC/ZPS/ZSC topics;**
- Persons **do not know EU tools** for helping environmental topics;
- Persons retain LIFE4FIR very important;
- From a social point of view thanks to the LIFE4FIR project persons have **increased the knowledge** on EU environmental topics, Natura 2000 and SIC/ZPS/ZSC topics and LIFE programme;
- From a social point of view thanks to the LIFE4FIR project persons will **increase the participation at Environmental Associations interested** to visit Natura 2000 areas

- From a social point of view thanks to the LIFE4FIR project persons have more **appreciated the local environmental topics** and will pay more attention to the respect of environmental procedures;
- From an economic point of view thanks to the LIFE4FIR project, persons **will increase the visits** and the number of days in the Madonie Regional Park;
- From an economic point of view thanks to the LIFE4FIR project persons will spend more money for staying in the Madonie Regional Park: in particular calculating an average of **€ 100 per day**, an average of **2 days** for staying and an average of **400 persons** per year, we can approximately calculate an economic project impact of around **80,000 € per year**, excluding specificic school and educational visits);
- From an economic and social point of view, thanks to the LIFE4FIR project persons will increase the stay, live and **opening of new commercial activities** in the area of the Madonie Regional Park;
- From an economic and social point of view, it will **very important** to disseminate any initiative of the Madonie Regional Park through any type of social media.

D1. Ecosystem impact: main results

- The Madonie Park is **attractive** for tourists because is located in an area characterized by a **rich historical and cultural heritage**, all combined with a **natural**, unique and **satisfying environment**.
- Need for **greater involvement** of **local administrators** and **citizens** who live in the Madonie Park in actions aimed **to respect and feel part** of a territory that **preserves one of the protected areas** with the greatest biodiversity in the Mediterranean.
- The major **weaknesses** can be found in the **non-sharing of common objectives** by all stakeholders (local administrations, various associations, cultural groups, workers in the sector): it would be appropriate to create a "**Single Tourist Committee of the Park**" which acts as a **single promoting body** for all promotional initiatives and activities.
- Creation of a **unique brand** with the creation of various initiatives that can become **real tourist products** and therefore **opportunities** for the entire territory.
- Possibility of **paying for access** to the Park or to some parts of it: if we consider an example of € 5 for daily ticket and the number and day of visits analyzed in the conclusion of people questionnaire, it is possible to consider an economic impact of € 4.000 per year.
- Need to **intensify the promotion** of initiatives in the Park area **via social media** with the aim of **arising the curiosity of visitors** by making them feel an **integral part of an area that combines colours, flavours, art and culture.**

- Need to **improve access roads** and **paths in the Park**, particularly for **families** with small children.
- Insertion of **small rest areas** along the route equipped with **images and curiosities** (small sensory paths with the scents of local plants) to allow children to get to Abies without feeling the weight of the distance.
- **Enhancement** of the **natural habitat** for the **maintenance** of the **biological and genetic diversity** of the territory.
- **Entrustment** of some areas of the Park also to **private entities** who, united in **cooperatives or associations**, could deal exclusively with some paths.
- Specialization on **training of park staff** aimed at targeted **promotion of the territory** and **sensitize visitors to respect nature**.
- **Improvement of public transport connections**.
- **Encouraging participation in projects at Regional, National and European level**.
- Identification of public and private financing lines (fundraising) and begin **to plan concrete actions** with the PCM (Project Cycle Management) strategy such as: **education campaigns** in schools, **tasting courses**, **events promotion** and **targeted tourist circuits**, to enhance their quality and development.

D2 LIFE4FIR **Impact in A. nebrodensis conservation**

Responsible: CNR; partner CIRITA-UNIPA

Results and outcomes have been processed to evaluate their impact on A. nebrodensis conservation and draw up the due report.

Deliverable name	Deadline
Impact in A. nebrodensis conservation report	07/2023 Ext 10/2024 In preparation

D3 LIFE4FIR (KPI) Performance indicators

Responsible: CNR

Data at Mid-term inserted in the LIFE dedicated webpage

KPI's are being updated. 12/2024

D2 LIFE4FIR **Impact in A. nebrodensis conservation**

Useful indicators

- Percentage of the area in strictly protected status (fenced);
- Temporal change in the number of plantlets of the natural regeneration;
- Number of outbred seedlings obtained though the controlled crosses campaigns;
- Area interested by repopulation measures;
- Survival, growth and health state of the genetically selected plantlets in the repopulation sites;
- Number and health state of plantlets raised in the local nursery;
- Growth and health condition of trees of the natural population;
- Control of the fallow deer and wild boar populations;
- Survival, growth and state of health of plants in the clonal orchard;
- Regular operation of the cryobank and the seed bank and amount of samples conserved;
- Absence of non-native firs in the surroundings of A. nebrodensis population.
- Increase awareness of local people and schools on the issues of A. nebrodensis conservation and on biodiversity, number of visitors.

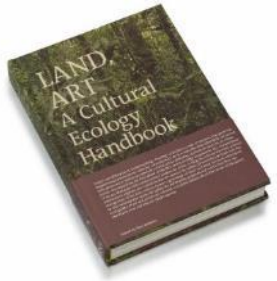
Life4fir: concrete effects visible in the years to come.

Base of best practices to be continued and developed in the next years.

E. Public awareness and dissemination of results

E1 (tools) Project communication and dissemination: web-site, posters and leaflets, articles, Layman´s report, manuals and handbooks, gadgets, video.

E2 (events) Tourists visits, workshops, fairs, congresses, open days, networking, Institutions and policy makers involvement.



E1 Project communication and dissemination: web-site, posters and leaflets, articles, Layman´s report, manuals and handbooks, video.
Responsible CNR; Partners: all

E1.1 Dissemination and communication
Website, Facebook profile, YouTube channel, Twitter.
A project logo has been designed. The LIF4FIR website www.life4fir.com has been created (**near 500,000 visits up today**). Information uploaded on progress of activities, results and events related to the project, dissemination material, publications etc.
Facebook and Twitter profiles and YouTube channel created and updated.

E1.2 Dissemination material
Collection of advertising and information material to be distributed during the events proposed in LIFE4FIR (posters, brochures, gadgets….)
The noticeboards and brochures (10000 copies in 3 languages) have been printed and spread. Roll-up and gadgets: pens, pencils, polo, usb pendrive, block notes, jackets, hats, water bottles.) Prepared by CNR, EPM, Unipa and US.

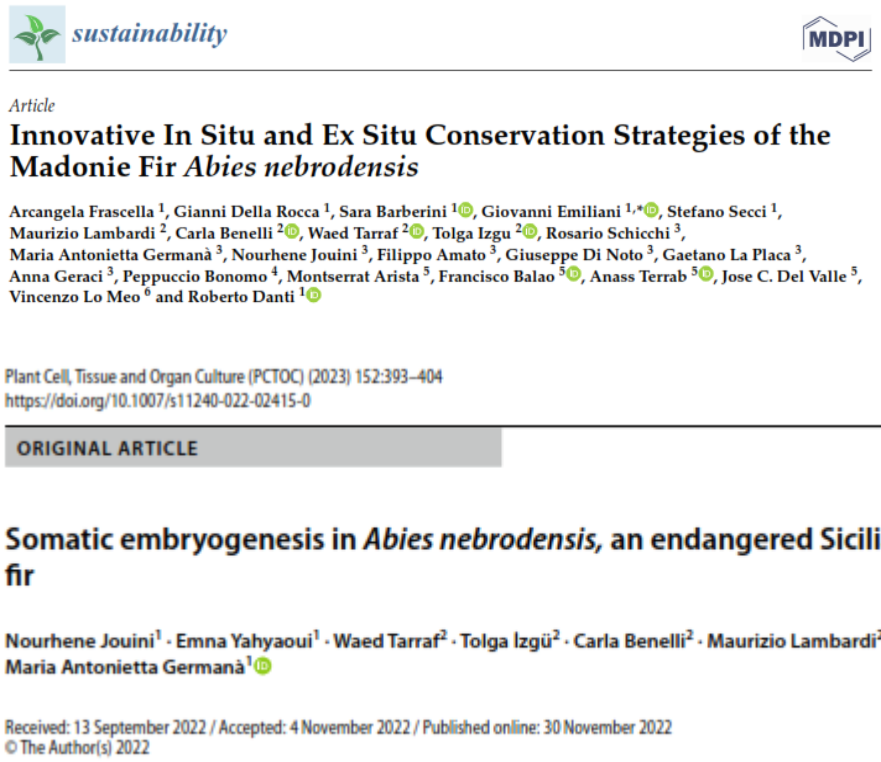
E1.3 Articles

15 technical and general articles on newspapers and specialized journals.

1 article on LIFE4FIR was published on La Repubblica the 21th November 2019;

1 article published on the journal 'Gardenia',

7 articles in scientific journals published; 2 being prepared; 1 Graduation Thesis (Univ. Florence) + 16 abstract of congresses



sustainability

MDPI

Article

Innovative In Situ and Ex Situ Conservation Strategies of the Madonie Fir *Abies nebrodensis*

Arcangela Frascella [1], Gianni Della Rocca [1], Sara Barberini [1], Giovanni Emiliani [1,*], Stefano Secci [1], Maurizio Lambardi [2], Carla Benelli [2], Waed Tarraf [2], Tolga Izgu [2], Rosario Schicchi [3], Maria Antonietta Germanà [3], Nourhene Jouini [3], Filippo Amato [3], Giuseppe Di Noto [3], Gaetano La Placa [3], Anna Geraci [3], Peppuccio Bonomo [4], Montserrat Arista [5], Francisco Balao [5], Anass Terrab [5], Jose C. Del Valle [5], Vincenzo Lo Meo [6] and Roberto Danti [1]

Plant Cell, Tissue and Organ Culture (PCTOC) (2023) 152:393–404
https://doi.org/10.1007/s11240-022-02415-0

ORIGINAL ARTICLE

Check for updates

Somatic embryogenesis in *Abies nebrodensis*, an endangered Sicilian fir

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ORIGINAL ARTICLE

Check for updates

Insights on the fungal communities associated with needle reddening of the endangered *Abies nebrodensis*

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Genomic-guided conservation actions to restore the most endangered conifer in the Mediterranean Basin

José Carlos del Valle, Montserrat Arista, Carmen Benítez-Benítez, Pedro Luis Ortiz, Francisco J. Jiménez-López, Anass Terrab, Francisco Balao

doi: https://doi.org/10.1101/2023.11.24.568549

plants

MDPI

Article

Long-Term Conservation for the Safeguard of *Abies nebrodensis*: An Endemic and Endangered Species of Sicily

Carla Benelli [1], Waed Tarraf [1,*], Tolga İzgü [1], Monica Anichini [1], Cecilia Faraloni [1], Maria Cristina Salvatici [2], Nourhene Jouini [3], Maria Antonietta Germanà [3], Roberto Danti [4] and Maurizio Lambardi [1]

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https://doi.org/10.1080/11263504.2022.2089765

Taylor & Francis
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Seed vitality and fungal contamination in *Abies nebrodensis*

G. Mirabile, F. Cirlincione, G. Venturella and L. Torta

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Strategies for the conservation by biotechnological approaches of *Abies nebrodensis*, a relict conifer of Sicily

W. Tarraf[1,a], T. Izgu[1] and N. Jouini[2]

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E1.4 Layman's report: published, November 2024

E1.5 Video documentary (7/2023 ext. 10/2024): completed, October 2024.

E1.6 Manual
Technical and operational phases, protocols and procedures (200 hardcopies and pdf in the website). Published, November 2024

E1's PROJECT DELIVERABLE PRODUCTS

Deliverable name	Deadline
LIFE4FIR dissemination material at mid-term period	Done 07/2021
LIFE4FIR dissemination material at project end	07/2023 Ext 12/2024
LIFE4FIR manual	07/2023 Done Ext 07/2024

E.2 Tourists visits, workshops, fairs, networking, Institutions and policy makers involvement, awareness-rising. **Responsible: CNR;** partners: all

E2.1 Information for general public distribution of project material

- 20 press articles on traditional local and regional radio and television broadcasters;
  - Madonie press: 'Salvaguardia e riforestazione dell'abete delle Madonie: parte il progetto Life'4 ottobre 2019
  - Press release was issued by the EPM (Ente Parco delle Madonie) the 4th October (soon after the KO meeting) to promote the LIFE4FIR project.
  - a TV report on LIFE4FIR was broadcasted by the RAI3 regional and RAI2 national news the 24th and 25 December 2019.
  - Interview of the coordinator at Radio Italia 5 (rubrica Story Time) in May 2022
  - Palermo TODAY (19.05.2023): Parco delle Madonie, Il progetto LIFE4FIR, avviato nel 2019, ha riguardato le "Strategie decisive di conservazione in situ ed ex situ per la salvaguardia e la conservazione dell'Abies nebrodensis" (LIFE 18 NAT/IT/164 LIFE4FIR).
  - Castelbuono Live: PARCO DELLE MADONIE Il Progetto LIFE4FIR procede con successo. Riguarda la conservazione dell'Abies nebrodensis (27 luglio 2023)
  - ISPRA: Abies nebrodensis: 30 alberi per salvare una specie https://www.isprambiente.gov.it/it/news/abies-nebrodensis-30-alberi-per-salvare-una-specie
  - EUFORGEN: LIFE4FIR project: enhancing the genetic diversity and conservation status of the Sicilian fir

- Regione Sicilia, Osservatorio Regionale Biodiversità Siciliana: Il Monitoraggio Fitosanitario e la Conservazione in situ di Abies nebrodensis
- Ente Parco delle Madonie: Progetto LIFE4FIR – Il Parco delle Madonie Geoparco Unesco all’Open Day del Dipartimento di Scienze Agrarie Alimentari e Forestali dell’Università di Palermo
- Parks.it: 30°ANNI DEL PROGETTO LIFE4FIR FESTEGGIAMENTI OPEN DAY IMPORTANTE APPUNTAMENTO A POLIZZI GENEROSA "Strategie Innovative per la Conservazione in situ di Abies Nebrodensis»
- OHGA! (magazine online): “L’albero di Natale” più raro al mondo è in Italia: come sta l’Abete delle Madonie? 7.12.2023
- Interview broadcasted on 7 February 2024 by the national Rai Radio 1 within the show 'Auditorium' with with Prof. Rosario Schicchi (Unipa) who illustrated the activities and objectives of Life4ir among the other things.
- DISBA-CNR: LIFE4FIR:Decisive in situ and ex situ conservation strategies to secure the critically endangered Sicilian fir, Abies nebrodensis.

E2.1 Information for general public distribution of project material

- Inauguration events, open days, educational visit in the Madonie area during the touristic seasons; 20 one-day trips by bus involving around 1000 people from several place of Sicily to the areas interested by LIFE4FIR project.

Educational visits

visits for local primary, high schools and Universities resumed since October 2021 after Covid-19 and almost completed in the course of 2022. Some visits were continued in 2023 and 2024 EPM. Much more than 1000 students and people visited the A. nebrodensis natural site.

Open days:

- 16 May 2022 for schools, associations and local people: meeting + visit to the A. nebrodensis natural population and the MAN.
- 10 November 2022 for students and researchers, Seville, Facultad de Biología LIFE4FIR "Innovative strategies for in situ and ex situ conservation of Abies".

E2.2 Workshops.

The LIFE4FIR project will be disseminated by means the organization of **3 workshops** (p. 111), and other **training courses**.

- Training: 'Conoscenza e salvaguardia dell'Abies nebrodensis e del suo habitat', Petralia Soprana, 19 Sept 2020, with involvement of local bodies and institutions, professionals.
- Workshop on 'Protection of biodiversity' organized the 17 November 2021 in Castelbuono, where local bodies, authorities, managers and local people were involved.
- Training: for the nursery employees and technicians on updated procedures of propagation by seed and grafting of A. nebrodensis: for technicians
- Workshop on 'ex situ conservation strategies' the 17 May 2022 in Palermo.
- Training course held the 2 June 2022 on A. nebrodensis disorders for local people, environmental guards and technicians of public institutions involved in the protection of A. nebrodensis.
- Training course at the Faculty of Biology (US) of Seville held on 10 Nov 2022 within the Open day on 'Innovative strategies for in situ and ex situ conservation of *Abies*'
- Workshop on ''Il monitoraggio fitosanitario e la conservazione in situ di Abies nebrodensis''; Palermo, 28 Novembre 2023
- Online seminar by Barberini and Danti (IPSP-CNR) on 'Measures to conteract genetic ersosion and endogamy in endangered species: the Abies nebrodensis case study' has been scheduled for the next May 29th 2024 within the 'I seminari del CREA Centro di Ricerca Orticoltura e Florovivaismo' for the formation of PhD students, research fellows and post-doc. Next

E2.3 Fairs and conferences

10 international conferences and fairs on topics related to LIFE4FIR.

23 conferences and fairs attended

2020

- Poster by **Terrab** et al. Presented at SESBE VII Congress of the Spanish Society for Evolutionary Biology, Seville 5-7 feb. 2020.
- LIFE4FIR activities and main results were presented at the IV National Conference of IPSP-CNR.

2021

- 2 oral reports presented at the XIII National Congress on Biodiversity in September 2021 (**Danti** et al., **Tarraf** et al.).
- **Lambardi** as invited speaker at the at the 20th International Conference "Life Sciences for Sustainable Development", Cluj-Napoca, 23-25 September 2021.
- 116th SBI (Soc. Bot. Ital.) Congress, Firenze 8-10 Sept 2021.
  - A poster and video by **Schicchi** et al., 'Identification and removal of exotic fir trees for in situ preservation of Abies nebrodensis';
  - Oral presentation by **Geraci** et al 'Preliminary investigations of ecophysiological traits in Abies nebrodensis'.
- Oral presentation by **Tarraf** et al. on 'Ex situ conservation of A. nebrodensis' at the 10th International Molecular Biology and Biotechnology Congress (MolBiotech 2021); Adana-Turkey, 4-8 October 2021.

E2.3 Fairs and conferences

2022

- Oral presentation by **Schicchi** et al: "Translocation of species for conservation: the case of Abies nebrodensis in Sicily" 1st International Plant Traslocation Conference IPTC 2022, Roma 20-24 june 2022
- 31st International Horticultural Congress (IHC 2022), 14 - 22 August 2022, Angers- France
  - oral presentation by **Waed** et al. 'Strategies for the conservatıon by biotechnological approaches of Abies nebrodensis, a relict conifer of Sicily'
  - E-poster by **Jouini** et al. 'In vitro germination of mature embryos from Abies nebrodensis, an endangered species in Sicily'
- Poster by **Arista** et al. (*Conservation genetics of the endangered Nebrodi fir: estimating the effective population size, inbreeding and hybridization*) in the SESBE (Spanish Society of Evolutionary Biology) VIII Conference,Vigo (Spain), 2 - 4 February 2022.
- Poster by **Schicchi** et al: 'Manual pollinations among individuals of Abies nebrodensis', presented at 117th Congress of Società Botanica Italiana, Bologna 7-10 sept. 2022.
- **Merlino** A. and **Bonomo** P. invited speakers on 'Protecting from erosion A. nebrodensis within the Life4fir' at the 4th International Congress on Bioengineering, Sant'Agata di Militello, 23-24 September 2022.
- Oral communication by **Izgu** et al: 'Conservation of the critically endangered conifer Abies nebrodensis (Sicilian Fir) in Sicily'; IV National Congress on Micropropagation held in Bari, Italy, the 12-14 October 2022.

E2.3 Fairs and conferences

2023

- Oral communication by **Barberini** et al: 'Study of the fungal microorganism of Abies nebrodensis twigs and needles in the natural habitat' XIV National Congress on Biodiversity, Lecce, Italy, 13-15 Sept. 2023
- Oral communication by **Benelli** et al: 'Biobanking for genetic resources conservation: Abies nebrodensis a case study'. XIV National Congress on Biodiversity, Lecce, Italy, 13-15 Sept. 2023
- A poster by **Sgadari** et al., titled 'Propagation techniques of Abies nebrodensis by the side-veneer graft', was presented at the 118th Congress of SBI, Pisa, 13-16 Settembre 2023.
- The **EPM** participated the UNESCO Geoparks Conference, held in Marrakesh from 6-11 September 2023, illustrating the activities of the Life4fir project.
- **EPM** participation at DIDACTA, fair for schools, Catania, 12-14 October 2023.
- Oral communication on Abies nebrodensis and Life4fir by **Bonomo** (EPM) at the international congress 'Alla scuola dell'abete bianco', Rosello (CH), 20 Oct. 2023.
- Poster by **Jouini** et al 'An innovative protocol to propagate and preserve the threatened Sicilian fir through somatic embryogenesis technique', COPYTREE conference, Cost Action CA21157 - European Network for Innovative Woody Plant Cloning, Santiago de Compostela, Spagna, il 17-18 April 2023

2024

- **EPM** participation at DIDACTA, fair for schools, Florence, 20-22th March 2024, where activities and objectives of the Life4fir project were illustrated among the other things
- Oral presentation by **Jose Carlos del Valle** of US (University of Seville) titled 'Genomic-guided conservation actions to restore the most endangered conifer in the Mediterranean Basin’. XX International Botanical Congress, Madrid 21-27 July.
- Participation of **Unipa** to 'Sharper, La notte dei Ricercatori', held in Palermo on 27 September with a presentation titled 'Abies nebrodensis, a fir to save'.

E2.4 Networking

With other projects to promote the exchange of information.

- Coordination of the **LIFE GOProFor project (LIFE17 GIE/IT/000561)** has been contacted to insert Life4fir in the best pratice list of selected European Life project addressed to biodiversity conservation.
- **Life Mycorestore (LIFE18 CCA/IT/001110)**: Innovative use of mycological resources for resilient & productive Mediterranean forests threatened by climate change.
- Beneficiaries of IRET-CNR engaged in the **Life AIRFRESH project (LIFE19 ENV/FR/00086)** were met to exchange experiences on tree protection.
- Exchange of information on A. nebrodensis genetics occurred with the project **FORGENIUS**, an **H2020** project, aimed at 'Improving access to forest genetic resources Information and Services for End-users'.
- The Life4fir project was reported in the newsletter of June 2023 of the European Forest Genetic Resources Programme (**EUFORGEN**), an international cooperation programme that promotes the conservation and sustainable use of forest genetic resources in Europe.
- The 18th September, a meeting at EPM premises with the Romanian Propark Foundation representatives of the **LIFE Carpathia project (LIFE18 NAT/RO/001082)** allowed exchanging of good practices, results and procedures.
- Contacts with **LIFE 'SeedForce - Saving plant diversity' (LIFE20 NAT/IT/001468)** to improve the state of conservation of 29 plant species through germplasm conservation (coordinator: Muse, Trento).
- Visit to the Abies nebrodensis natural site with the Spanish, Polish and Turkish teachers within the **Erasmus project**, held by EPM on 1st March 2024.

E2's PROJECT DELIVERABLE PRODUCTS

Deliverable name	Deadline
LIFE4FIR dissemination events at project end	7/2023 Ext 12/2024
LIFE4FIR dissemination events at mid-term period	Done 7/2021

F.1 Project management by CNR **Responsible CNR;** Partners: All

- CNR has been regularly in contact with all the beneficiaries. The Project Coordination Meetings are arranged every 6 months in order to review and take decisions about the overall project status and to tackle technical and administrative issues.
- The coordinator will also be in charge of maintaining contact with the European Commission through the LIFE External Assistance Team designated (CINEA).
- CNR will coordinate the preparation of reports, technical as well as financial, for the European Commission: Initial, intermediate, progress and final.
- The Project manager is assisted by a TC (Technical Committee) constituted by the representatives of all the partners which will be able to discuss and to take all the decisions regarding the technical and administrative aspects of the project.

Management structures

Technical committee

CNR IPSP: Roberto Danti
CNR IBE: Maurizio Lambardi
DRSRT: Pippo Di Noto
EPM: Peppuccio Bonomo
UNIPA: Rosario Schicchi
US: Montserrat Arista

Administrative committee

CNR: Roberto Danti
DRSRT: Valeria Restuccia
EPM: Isabella Potestio
UNIPA: Elena Maugeri
US: Concha Rodriguez

F. Project management

F.1 Project management by CNR

- The Kick Off meeting was held in Palermo the 2-3 October 2019. Representatives of all beneficiaries attended the two-days meeting. The first day was a sort of panel discussion dedicated to technical and administrative matters. The second day dedicated to the visit of the natural population and the nursery object of the project actions.
- Participation to the LIFE Welcome Meeting of LIFE18 Nat & Gie projects held the 5-6 November 2019 in Bruxelles: LIFE Programme rules, interaction with EASME and the role of the external monitoring team, financial and technical issues, project reporting, dissemination and communication matters, were discussed.
- In date 2.04.2020, authorization by MATTM and ISPRA to carry out the scientific research program on Abies nebrodensis. The Director of the Madonie Park also granted (Det. n. 37 of 27.04.2020) the due authorization to carry out the Life4fir project activities and let all beneficiaries to access the areas of the Park

F.1 Project management by CNR **Responsible CNR;** Partners: All

- The Mid-term report was arranged and submitted at the beginning of August 2021, with the technical support of all beneficiaries.
- The Mid-term report was arranged and submitted at the beginning of August 2021, with the technical support of all beneficiaries.
- Preparation and print of the Best Practice Handbook by October 2022
- Preparation and submission of the amendment request (18 month project extension) in April-May 2023.
- Preparation and submission of the Progress Report scheduled for 31 October 2023
- Drafting and uploading of reports and deliverables on the Butler platform
- Quarterly reports regularly completed in due time.
- Organization of workshops, Open days, training courses during the years of the Project in collaboration with the other beneficiaries.
- Contact with CINEA through monitor and project advisor to reply to the issues raised in the monitoring visits.
- **35 deliverables** have been completed by April 2024 (10 as annexes of the mtr), **5 pending, including the final report.**

F.2 Life4Fir Audit

F.3 LIFE4FIR After-LIFE plan: in preparation

Attività After Life	Ente coinvolto	Fondi: interni / progetti
Nuclei di riforestazione: cure colturali post-impianto, irrigazioni, diserbi, monitoraggio, sostituzione fallanze, verifica stato recinzioni	Dipartimento SAAF-UNIPA (Monitoraggio) DRSRT	risorse interne ed eventuali nuovi progetti
Arboreto clonale: assistenza post-impianto: irrigazione, monitoraggio, sostituzione fallanze	Dipartimento SAAF-UNIPA (Monitoraggio) DRSRT	risorse interne ed eventuali nuovi progetti
Produzione di piantine in vivaio: esecuzione nuovi incroci, raccolta dei coni da libera impollinazione, semina, germinazione ecc. Le piante presenti in vivaio vengono seguite con trapianti, irrigazioni, diserbi ecc.	Dipartimento SAAF-UNIPA (esecuzione nuovi incroci) DRSRT	risorse interne ed eventuali nuovi progetti
Banca del seme e criobanca: 1. monitoraggio consumo azoto; 2. Rifornimento azoto; 3. aggiunta nuovi campioni	1. personale EPM 2. Comune Polizzi Generosa 3. CNR-IBE	risorse interne
Popolamento naturale: monitoraggio delle piante, della rinnovazione, stato delle recinzioni	Dipartimento SAAF-UNIPA; IPSP-CNR	risorse interne ed eventuali nuovi progetti
Impianto di videosorveglianza: download delle immagini acquisite, eventuali riparazioni.	personale EPM	risorse interne
Nuove visite guidate	EPM	risorse interne ed eventuali nuovi progetti
Incontri per far conoscere e trasferire i risultati del progetto?	Dipartimento SAAF-UNIPA EPM, IPSP-CNR	risorse interne ed eventuali nuovi progetti

Deliverables and reports still to do

- Replication Plan	C 7	30/09/2022 ext 9/2024
- Layman's report	E1	Ultimi 6 mesi
- Report and map of the newly constituted clonal orchard	C 3	30/04/2023 ext 10/2024*
- Impact in A. nebrodensis conservation report	D 2	31/07/2023 ext 10/2024*
- LIFE4FIR Final Report	F 1	31/07/2023 ext 03/2025*
- LIFE4FIR After-LIFE plan	F 3	31/07/2023 ext 12/2024*
- LIFE4FIR audit report	F 2	31/07/2023 ext 12/2024
- LIFE4FIR dissemination events at project end	E 2	31/07/2023 ext 12/2024*
- LIFE4FIR dissemination material at project end	E 1	31/07/2023 ext 12/2024*
- LIFE4FIR manual	E 1	31/07/2023 ext 07/2024
- Report on the LIFE4FIR impact on ecosystem services and conditions	D 1	31/07/2023 ext 11/2024
- Report on the socio-economic impact of LIFE4FIR project	D 1	31/07/2023 ext 10/2024
- Map of final A. nebrodensis population and habitat video/hyperspectral inventory and 'health' state	C 1	30/09/2023

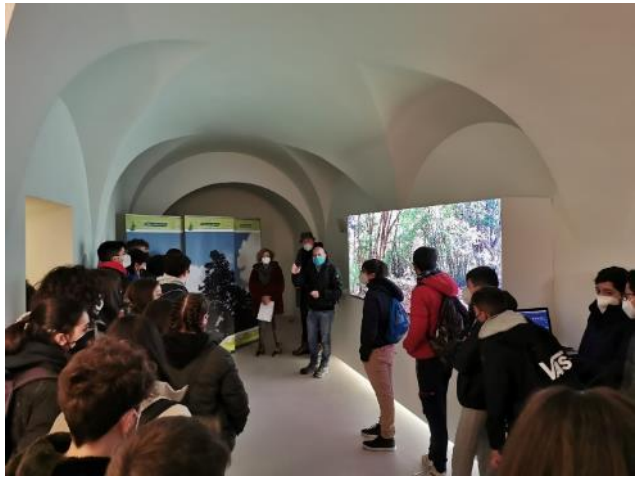


VISITS 2021

28.10 2021 scientific high school


4.11.2021 primary schools





School visits in 2022

Polizzi Generosa, 4.05.2022

KO meeting in Palermo 2-3 October

Welcome LIFE18 Meeting, 5-6 November, Bruxelles

Progress meeting 26 May 2021, Petralia Sottana

Monitoring meeting, Polizzi 15 November 2021

Workshop, Castelbuono, 17 November 2021

Technical course on grafting propagation, Piano Noce, 18 November 2021

May 2022: preparation of the questionnaire for visitors

Open day 16 May 2022

Workshop 17 May 2022, Palermo

Ronda – Seville 7-10 Nov. 2022

Progress meeting, Polizzi, 17 maggio 2023

Replication event, Polizzi, 18 maggio 2023

21.07.2023: launch of seedbank and cryobank with the Mayor and council member of Polizzi

EPM stand at 10th congress of Geoparks, Marrakesh, Sept. 2023

Informative panels installed by EPM for each A. nebrodensis tree

EPM stand at Didacta, Catania 12-14 Oct 2023

2nd drone flight, 2 August 2023

Workshop, Palermo, 28 Nov. 2023

Project meeting, Petralia Sottana, 29 Nov. 2023

Didacta, Firenze, 20-22 March 2024

Erasmus project, visit with Polish, Spanish and Turkish teachers 1st March 2024

Palermo Secondary school visit, 9 Feb 2024

Students of Agricultural Engineerng Univ. Palermo, visit 12 April 2024

MANAGEMENT

- ❑ CNR had continuous contact with all project partners for monitoring project activities
- ❑ Before the month end CNR received from each beneficiary technical inputs for the monitor month summary
- ❑ At the end of each month CNR prepared and sent a summary of the project activities carried out to monitoring team
- ❑ Definition of management structures
- ❑ Definition of payment procedures of each beneficiary
- ❑ UNIPA and CNR organised the kick-off and CNR the monitoring meeting in scheduled time
- ❑ CNR defined and sent the Partnership Agreement (following the EC scheme) and collected all the beneficiaries signatures
- ❑ CNR will revise the project progress indicators in each of the projects coordination meeting in order to check any irregularities

MANAGEMENT

Definition of project accounting system and cost center

All beneficiaries have defined the following internal specific code (codice commessa) which identify the project and all costs and income related to the project:

- CNR: B74I19001150007
- DRSRT: LIFE4FIR
- EPM: 10410-40510
- UNIPA: PRj-0248
- US: 1806047106-2019/724

For all the beneficiaries VAT is a cost.

MANAGEMENT

Procedure about reporting to monitor

The summary report about the update of activities per project ACTION has to be sent to the monitor each four month of each project year:

- Quarterly Report 1: Oct-Dec 2019
- Quarterly Report 2: Jan-March 2020
- Quarterly Report 3: Apr-Jun 2020
- Quarterly Report 4: Jul-Sep 2020
- Quarterly report 5: Oct-Dec 2020
- Quarterly report 6: Jan-Mar 2021
- Quarterly report 7: Apr-Jun 2021
- Quarterly report 8: Jul-Sep 2021
- Quarterly report 9: Oct-Dec 2021
- Quarterly report 11: Jan-Mar 2022
- Quarterly report 12: Apr-Jun 2022
- Quarterly report 13: Jul-Sep 2022
- Quarterly report 14: Oct-Dec 2022
- Quarterly report 15: Jan-Mar 2023
- Quarterly report 16: Apr-Jun 2023
- Quarterly report 17: Jul-Sep 2023
- Quarterly report 18: Oct-Dec 2023
- Quarterly report 19: Jan-Mar 2024
- Quarterly report 20: Apr-Jun 2024
- Quarterly report 21: Jul-Sep 2024

MANAGEMENT

Project past and next meetings

- Kick off meeting in Palermo in UNIPA premises in Italy on 2-3 October 2019
- 6 month monitoring meeting in Sesto Fiorentino (FI) in CNR premises in Italy on 16 January 2020
- 12 month monitoring meeting in Unipa premises in Palermo on October 2020
- 18 month meeting in EPM premises in Petralia Sottana (PA) on May 2021
- 24 month meeting in Polizzi Generosa in municipality premises on November 2021
- 30 month meeting in Palermo in US premises on May 2022
- 36 month meeting in Seville in US premises in Spain on November 2022
- 42 month meeting in Polizzi in Municipality premises in Italy on May 2023
- 48 month meeting in Petralia in November 2023
- 54 month meeting in Sicily (Petralia Sottana) in May 2024
- Final meeting in Polizzi Generosa 11-15 November 2024
- Final Life4fir event in Florence, 3 December; Accademia dei Georgofili