



**LIFE4FIR:** Decisive in situ and ex situ conservation strategies to secure the critically endangered Sicilian fir, *Abies nebrodensis*

LIFE18/NAT/IT/000164 **LIFE4FIR**



# **IPSP-CNR** **Role and Responsibilities**

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## Actions in which the *IPSP* is involved:

### Preparatory actions – ACTIONS "A"

- **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 (US)

### Implementation actions – ACTIONS "C"

- **C1** – Support and preserve *A. nebrodensis* in its natural habitat (CIRITA-UNIPA)
- **C2** – Conservation of genetic purity of *A. nebrodensis* and improvement of its genetic diversity (US)
- **C3** – Establishment of a new clonal orchard for germplasm collection and to boost the genetic variability of the progeny (CNR-IPSP)
- **C4** – Nursery production of improved seedlings of *A. nebrodensis* (CNR-IPSP)
- **C5** – Constitution of a seed bank and a cryobank for the long-term conservation of seeds, pollen, isolated embryos and embryogenic callus lines of *A. nebrodensis* (CNR-IBE)
- **C6** – Reforestation with *A. nebrodensis* (4000 seedlings) in 10 plots in the Madonie Park in suitable areas for the reintroduction applying innovative planting techniques (CIRITA-UNIPA)
- **C7** – Replication. Implementation action dedicated to the results' transfer and replication during the project (CNR)

### Monitoring actions – ACTIONS "D" (D1, D2, D3) (CNR)

### Communication and Dissemination – ACTIONS "E" (E1, E2) (CNR)

### Project management – ACTION "F" (CNR)

## Sub-actions in which the *IPSP* is involved:

### ACTIONS "A"



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



### ACTIONS "C"



**C1.4** – Permanent ground monitoring of the health status of *A. nebrodensis* relic population, mitigation of biotic and abiotic stresses



**C2.1** – Enhancement of the genetic diversity of the natural population: promoting the outbreeding through manual cross-pollination



**C2.2** – Selection of outbred seedlings derived from intraspecific crosses to be used in reforestation



**C3** – Establishment of a new clonal orchard for germplasm collection and to boost the genetic variability of the progeny (**Resp.**)



**C4.4** – Application of proper procedures for the control of biotic and abiotic disorders in the nursery (**Resp.**)



**C7** - Implementation action dedicated to the results' transfer and replication during the project

## ACTION "A1"



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



A high mortality of seedlings of *A. nebrodensis* has been observed in the 'Vivaio Piano Noce' nursery.

In order to reduce such mortality:

- regular surveys
- samples will be collected and analyzed using molecular diagnostic assays (100 samples/year)
- assessments of environmental factors in the nursery (soil pH, moisture/temperature of substrates, soil texture, organic matter content, mineral fertilizers).
- surveys for signs of nutrient deficiencies

**DELIVERABLES** (in charge to IPSP):

07/2020 - Protocol for disease of *A. nebrodensis* identification in nursery

**Action A1 - WHO is involved? = collaborations among partners**

**US** ↔ CNR (IPSP+IBE) ↔ CIRITA-UNIPA ↔ DRSRT ↔ EPM





## ACTION "C1"



**C1.4** – Permanent ground monitoring of the health status of *A. nebrodensis* relic population, mitigation of biotic and abiotic stresses



Surveys by experts in plant pathology and entomology of CNR + UNIPA:

- Evaluation of biotic or abiotic disturbances in *A. nebrodensis* (symptoms due to pathogens or insects): observations of crown shape and transparency, presence of declining parts, length of the sprouts, occurrence of lesions; distribution, incidence and impact of symptoms will be recorded
- Collection of dendro-auxometric parameters
- Laboratory analysis of collected samples (100 morphological and molecular analyzes every year)
- Control measures based on Integrated Pest Management will be implemented

### **DELIVERABLES** (in charge to IPSP):

04/2020 - Report: dendro-auxometric parameters of the trees of the natural population

08/2021 - Report: description of major potential diseases, pests and their antagonists

06/2023 - Report of control and prevention of native and invasive pests and pathogens

**Action C1 - WHO is involved? = collaborations among partners**

**CIRITA-UNIPA** ↔ CNR (IPSP) ↔ DRSRT ↔ EPM





## ACTION "C2"



**C2.1** – *Enhancement of the genetic diversity of the natural population: promoting the outbreeding through **manual cross-pollination***



**C2.2** – ***Selection of outbred seedlings** derived from intraspecific crosses to be used in reforestation*



Both the most genetically distant reproductive and the higher outcrossing trees will be identified and a plan of controlled crosses to obtain a good amount of vigorous outcross seeds will be realized.

- Isolation of female cones before pollen dispersal, using special bags to prevent the penetration of pollen grains from outside; Pollen collection and storage from mature trees; Hand pollination between different sexually mature individuals to maximize the number of different combinations between non-relatives



- Phenotypical selection of resulting most vigorous seedlings

### DELIVERABLES : -

**Action C1 - WHO in involved?** **US** ↔ CIRITA-UNIPA ↔ CNR (IPSP)



## ACTION "C3"



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

Establishment of a clonal orchard: clonal plants (ramets) obtained by grafting propagation of the 30 mother plants; 12 replicates of each of the 30 mother plants (ortet), 5 x 5 m spacing (400 trees/ha) to favor the crossing in all possible combinations among the represented genotypes

Surface size: 1.50 ha, protected with a 2 m high fence (partially buried) against damage due to wild animals

### **DELIVERABLES** (in charge to IPSP):

04/2023 - Report and map of the newly constituted clonal orchard

### **Action C3 - WHO is involved?**

**CNR (IPSP)** ↔ CIRITA-UNIPA

DRSRT ↔ EPM





## ACTION "C4"



### **C4.4** – Application of proper procedures for the control of biotic and abiotic disorders in the nursery

Based on A1 (Integrated Pest Management approach):

- (a) Prevention: Continual monitoring, early diagnosis, to prevent the entry and/or spread of pathogens in the nursery (exclusion).
- (b) Cultural control: reduce chances of pathogen spread = reduce inoculum sources; control of timing and amount of irrigation to reduce losses due to soil pathogenic fungi and promoting air circulation among plants. Use of chemicals pesticides will be applied as a ultimate management approach, when absolutely necessary. Biological strategies will be applied as much as possible.

#### **DELIVERABLES** (in charge to IPSP):

06/2023 - 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'

#### **Action C4 - WHO is involved?**

**CNR (IPSP+IBE)** ↔ CIRITA-UNIPA ↔ DRSRT







## ACTIONS "C"

**C7** - Implementation action dedicated to the results' transfer and replication during the project

Creation of a "replicable model" by means of:

- **Best Practice Handbook** to share technical knowledge with replication partners
- **Replication plan** will detail the technical, economic and social factors in order to replicate the initiative of safeguard carried out with *A. nebrodensis*

The replication partners will be identified and involved through an international network of direct users/stakeholders interested to the experiences and outcomes of the project (e.g. authorities and technicians of Parks, scientists, researchers, foresters, institutions responsible for Parks protection). Some aspect of the project could be replicated to *Abies pinsapo* (in Spain), *Abies borisii-regis* (between Bulgaria and Greece), *Pinus heldreichii* subsp. *heldreichii* (Calabria, Italy), relict populations of *Tetraclinis articulata* (in Spain and Malta).

Dissemination of practices will be based on 2 Replication promotion Events (one kick-off meeting in Palermo in October 2021 and a second event in Seville in the second half of 2022)

### **DELIVERABLES:**

03/2022 - Best Practice Handbook  
09/2022 - Replication Plan

### **Action C4 - WHO is involved?**

**All Partners !**





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**THANK YOU FOR  
YOUR ATTENTION**

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