



LIFE4FIR – Project LIFE18 NAT/IT/000164

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

Report: Dendro-auxometric parameters of the trees of the natural population of *Abies nebrodensis*

C.1 (C1.4)



Istituto per la Protezione Sostenibile delle Piante
Consiglio Nazionale delle Ricerche



Consiglio Nazionale delle Ricerche
Istituto per la BioEconomia
Dipartimento di Scienze Bio Agroalimentari

REPUBBLICA ITALIANA



REGIONE SICILIANA
ASSESSORATO REGIONALE
DELL'AGRICOLTURA, DELLO SVILUPPO RURALE
E DELLA PESCA MEDITERRANEA



UNIVERSITÀ
DEGLI STUDI
DI PALERMO

SAAF
DIPARTIMENTO
SCIENZE
AGRARIE
ALIMENTARI
FORESTALI



Parco delle Madonie



TABLE OF CONTENTS

1. Introduction	3
2. Tables	4
3. Conclusions	14


1. Introduction


The main objective of the action C1 is to support and protect the *Abies nebrodensis* population in its natural habitat, through a series of interventions and measures included in the following sub-actions.


1. Installation of a new larger and more functional protective fence around trees of the natural population to better protect the natural regeneration (C1.1); 2. setting up an electric fence (C1.2); 3. installation of 5 camera system with motion sensor, powered by photovoltaic panel, as grazing prevention of wild herbivore and of abandoned cattles and goats (C1.3); 4. permanent ground monitoring of the health state of *A. nebrodensis* population; mitigation of biotic and abiotic stresses (C1.4); 5. spatial and 'health' analysis of *A. nebrodensis* natural population using drone technology (C1.5). 6. erosion protection of *A. nebrodensis* individuals (C1.6).

The project planned to record the dendro-auxometric parameters of each tree to monitor their growth over time. This will allow to have a baseline to refer to in the future to assess the evolution and vegetative state of the trees in quantitative terms, also in relation to the protection measures that will be carried out during the project. This deliverable reports the results of the measurements recorded on the thirty *A. nebrodensis* adult trees constituting the natural population of this species. For each tree, the main dendro-auxometric parameters were recorded, such as: trunk height in meters, diameter of the stem at the base, diameter of the stem at breast height (bh: 1.3 m from the ground), diameter of the crown and its morphology. In case the trunk was forked, height and diameter of both trunks were measured. The geographical positioning of each tree was also carried out through the use of a GPS device. Information regarding the growth of trees and possible interference with other plants in the vicinity were also recorded. The collected data were reported in tables, one per each of the thirty trees on the population.

2. TABLES

Tree no.	1	
Trunk height (m)	6.5	
Trunk diameter (cm)	Bh: 41.3; base: 48.0	
Crown diameter (m)	6.4 x 7.6	
Coordinates	37° 50' 5.598" N 14° 1' 46.864" E	
Elevation (m asl)	1651	
Substantial good growth; monocormic, leader blighted, replaced by a new shoot; natural regeneration around		

Tree no.	2	
Trunk height (m)	14.4 (S); 10.7 (N)	
Trunk diameter (cm)	Bh: 42.9; base: 62	
Crown diameter (m)	9.20 x 9.10	
Coordinates	37° 50' 32.969" N 14° 1' 32.152" E	
Elevation (m asl)	1526	
Good growth and morphology, trunk forked at 30 cm from the ground		

Tree no.	4	
Trunk height (m)	0.85	
Trunk diameter (cm)	base: 10.5	
Crown diameter (m)	2.10 x 1.50	
Coordinates	37° 50' 19.178" N 14° 1' 21.031" E	
Elevation (m asl)	1639	
Small tree, without a leader, growing under the tree no. 6, subjected to heavy shading		

Tree no.	6
Trunk height (m)	7.8 (E); 7.5 (N)
Trunk diameter (cm)	Bh: 23.8 (27); base: 43
Crown diameter (m)	7.2 x 6.3
Coordinates	37° 50' 19.178" N 14° 1' 21.084" E
Elevation (m asl)	1639
Trunk forked, the east top is taller; between the two tops there is a third dried top	





Tree no.	7
Trunk height (m)	5.7 (E); 3.4 (W)
Trunk diameter (cm)	Bh: 21.3 (E); 12.7 (W) Base: 24.5 (E); 16 (W)
Crown diameter (m)	5.3 x 5.5
Coordinates	37° 50' 21.799" N 14° 1' 28.928" E
Elevation (m asl)	1603
Good growth and morphology; the top is lacking; the trunk is forked	




Tree no.	8
Trunk height (m)	11.0
Trunk diameter (cm)	Bh: 43.0; base: 44.0
Crown diameter (m)	7.7x 6.9
Coordinates	37° 50' 22.932" N 14° 1' 27.540" E
Elevation (m asl)	1577
Good growth and morphology, monocormic trunk	



Tree no.	9	
Trunk height (m)	1.8	
Trunk diameter (cm)	Bh: 15.9; base 21.0	
Crown diameter (m)	3.6 x 3.6	
Coordinates	37° 50' 22.513" N 14° 1' 15.769" E	
Elevation (m asl)	1617	
The trunk is cut at half height and the stump is dried		

Tree no.	10	
Trunk height (m)	7.5 (W); 4 (E)	
Trunk diameter (cm)	Bh: 40.7 (W), 11 (E); base: 48	
Crown diameter (m)	7.5 x 7.3	
Coordinates	37° 50' 28.756" N 14° 1' 5.352" E	
Elevation (m asl)	1525	
The upper portion is lacking; polycormic		

Tree no.	11	
Trunk height (m)	8.2 (7.9)	
Trunk diameter (cm)	Bh: 28.3 (N), 19.0 (S); base: 48	
Crown diameter (m)	5.1 x 4.6	
Coordinates	37° 50' 29.174" N 14° 1' 5.561" E	
Elevation (m asl)	1520	
Trunk forked at 40 cm from the ground; good morphology		

Tree no.	12
Trunk height (m)	8.5
Trunk diameter (cm)	Bh: 35.0; base: 55.0
Crown diameter (m)	6.8 x 8.4
Coordinates	37° 50' 20.695" N 14° 1' 24.016" E
Elevation (m asl)	1604

Monocormic stem, the leader is lacking, the crown is uneven in the upper third with blighted branches scattered throughout; trunk is a bit inclined



Tree no.	13
Trunk height (m)	11.1
Trunk diameter (cm)	Bh: 49.9; base: 60
Crown diameter (m)	9.5 x 9.2
Coordinates	37° 50' 23.913" N 14° 1' 28.601" E
Elevation (m asl)	1567

Monocormic stem, good growth; the top is lacking



Tree no.	14
Trunk height (m)	7.2
Trunk diameter (cm)	Bh: 29.6; base: 35.0
Crown diameter (m)	6.5 x 6.8
Coordinates	37° 50' 27.949" N 14° 1' 29.217" E
Elevation (m asl)	1556

Monocormic stem, good growth and morphology



Tree no.	15
Trunk height (m)	8.5
Trunk diameter (cm)	Bh: 23.5; base: 23
Crown diameter (m)	5.7 x 5.2
Coordinates	37° 50' 27.933" N 14° 1' 28.123" E
Elevation (m asl)	1539
Monocormic, good growth and morphology	



Tree no.	16
Trunk height (m)	5.3 (E), 4.5 (W)
Trunk diameter (cm)	Bh: 14.0 (E), 17.0 (W) base: 34.0
Crown diameter (m)	7.7 x 4.8
Coordinates	37° 50' 30.253" N 14° 1' 25.137" E
Elevation (m asl)	1488
Located as near as 1.2 m from the adjacent tree no. 17; the trunk is forked	



Tree no.	17
Trunk height (m)	10.7
Trunk diameter (cm)	BH: 50.2; base: 53.0
Crown diameter (m)	8.7 x 7.3
Coordinates	37° 50' 30.326" N 14° 1' 25.203" E
Elevation (m asl)	1488
The stem is monocormic, but not so straight; substantial good growth.	



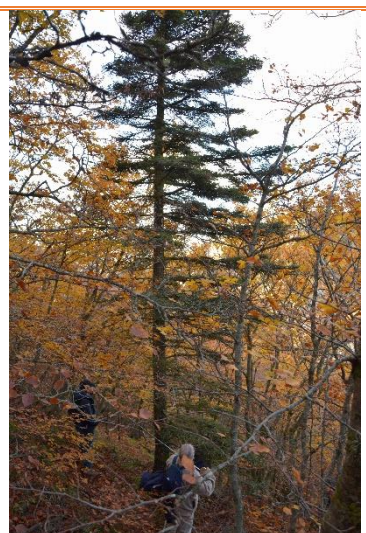
Tree no.	18
Trunk height (m)	7.6
Trunk diameter (cm)	Bh: 25.4; base: 30.0
Crown diameter (m)	5.15 x 4.50
Coordinates	37° 50' 29.108" N 14° 1' 18.820" E
Elevation (m asl)	1503
<p>Monocormic stem, the top is lacking. The crown is subjected to shading due to the adjacent beech</p>	



Tree no.	19
Trunk height (m)	5.5
Trunk diameter (cm)	Bh: 17.8; base: 18.0
Crown diameter (m)	4.6 x 4.9
Coordinates	37° 50' 29.797" N 14° 1' 18.088" E
Elevation (m asl)	1487
<p>Monocormic stem; the crown is reduced westward due to the shading of beeches</p>	



Tree no.	20
Trunk height (m)	9.2
Trunk diameter (cm)	Bh: 21.9; base: 27
Crown diameter (m)	2.90 x 3.21
Coordinates	37° 50' 30.708" N 14° 1' 19.509" E
Elevation (m asl)	1480
<p>Monocormic stem; the crown is reduced in the lower two-thirds due to the shading of beeches</p>	



Tree no.	21
Trunk height (m)	11.6
Trunk diameter (cm)	Bh: 40.7; base: 55.0
Crown diameter (m)	8.5 x 7.7
Coordinates	37° 50' 43.574" N 14° 1' 17.339" E
Elevation (m asl)	1433

Monocormic stem, good growth and morphology, it stands out among the beech trees



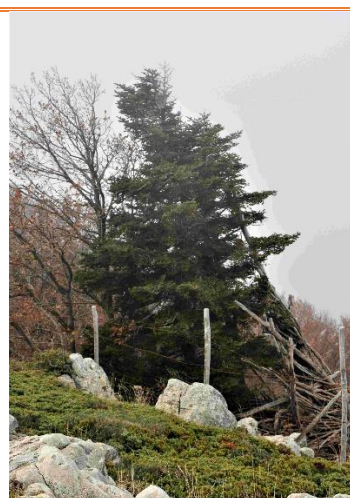
Tree no.	22
Trunk height (m)	12
Trunk diameter (cm)	Bh: 38.1; base: 49.0
Crown diameter (m)	5.90
Coordinates	37° 50' 38.279" N 14° 1' 13.392" E
Elevation (m asl)	1400


Monocormic stem, good growth; the lower portion of the crown is reduced due to the shading exerted by the surrounding broadleaves




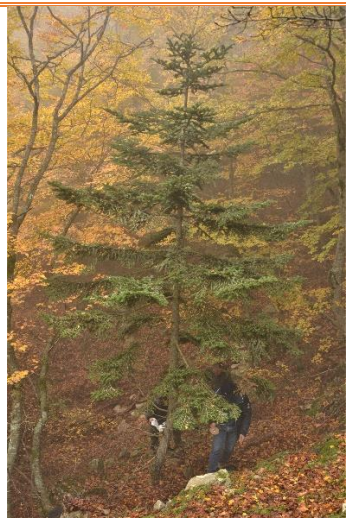
Tree no.	23
Trunk height (m)	7.5 (S), 6.5 (N)
Trunk diameter (cm)	Bh: 26 (S), 24.8 (N); base: 45
Crown diameter (m)	4.60 x 4.30
Coordinates	37° 49' 52.866" N 14° 2' 7.808" E
Elevation (m asl)	1673


Trunk is forked at 50 cm from the ground, one of the two tops is dried and replaced by a new shoot.





Tree no.	24	
Trunk height (m)	3.1	
Trunk diameter (cm)	Bh: 12.4; base: 17.0	
Crown diameter (m)	3.80 x 4.10	
Coordinates	37° 49' 56.957" N 14° 2' 15.737" E	
Elevation (m asl)	1705	
<p>Monocormic stem, the crown is flag-shaped; it grows close to the tree no. 25</p>		

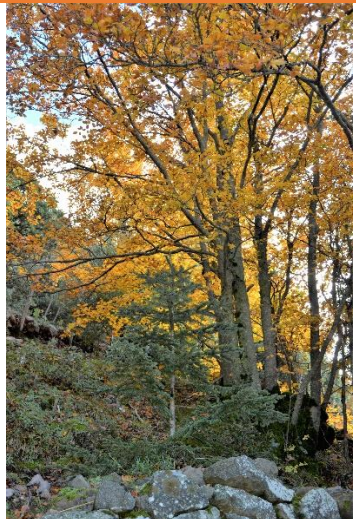
Tree no.	25	
Trunk height (m)	3.3	
Trunk diameter (cm)	Bh: 12.7; base: 13.0	
Crown diameter (m)	3.55 x 1.60	
Coordinates	37° 49' 56.956" N 14° 2' 15.655" E	
Elevation (m asl)	1705	
<p>Monocormic stem; the crown is flag-shaped, reduced in the north side more exposed to strong winds</p>		


Tree no.	26	
Trunk height (m)	6.0	
Trunk diameter (cm)	Bh: 11.4; base: 19.0	
Crown diameter (m)	3.80 x 3.60	
Coordinates	37° 50' 28.488" N 14° 1' 37.860" E	
Elevation (m asl)	1599	
<p>Monocormic stem, the tree grows within a beech grove and the crown is subjected a bit to shading</p>		

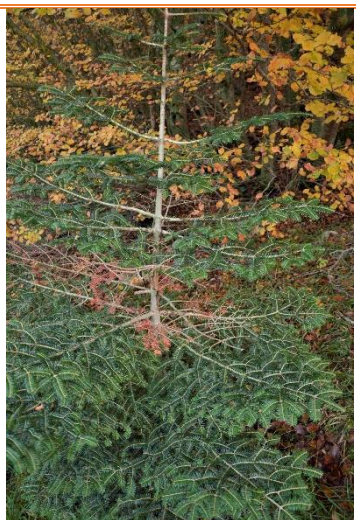
Tree no.	27	
Trunk height (m)	10.0 (S), 9.5 (N)	
Trunk diameter (cm)	Bh: 31.8 (S), 29.9 (N) base: 35 (S), 36 (N)	
Crown diameter (m)	7.40 x 6.70	
Coordinates	37° 50' 27.468" N 14° 1' 35.608" E	
Elevation (m asl)	1597	
Good growth and morphology, trunk forked at the base.		

Tree no.	28	
Trunk height (m)	0.48	
Trunk diameter (cm)	Base: 14.9	
Crown diameter (m)	1.35 x 1.0	
Coordinates	37° 50' 27.377" N 14° 1' 31.716" E	
Elevation (m asl)	1586	
Procumbent tree, lacking a leader; heavily damaged by herbivores		

Tree no.	29	
Trunk height (m)	10.5	
Trunk diameter (cm)	Bh: 23.8; base: 36.0	
Crown diameter (m)	4.20 x 4.95	
Coordinates	37° 50' 31.249" N 14° 1' 19.558" E	
Elevation (m asl)	1468	
Monocomic stem, crown reduced in the lower portion due to the shading exerted by beech tree around		

Tree no.	30	
Trunk height (m)	1.76	
Trunk diameter (cm)	Bh: 2.2; base: 6.0	
Crown diameter (m)	1.67 x 1.65	
Coordinates	37° 50' 38.351" N 14° 1' 13.645" E	
Elevation (m asl)	1400	
<p>Monocormic stem, good growth. Small tree originated by seed from the neighbouring tree no. 22</p>		

Tree no.	31	
Trunk height (m)	1.25	
Trunk diameter (cm)	Base: 4.77	
Crown diameter (m)	1.35 x 1.30	
Coordinates	37° 50' 41.985" N 14° 1' 14.521" E	
Elevation (m asl)	1398	
<p>Monocormic stem; small tree, suffering due to repeated damages by herbivores; crown yellowish</p>		

Tree no.	32	
Trunk height (m)	1.96	
Trunk diameter (cm)	Bh: 2.0; base: 5.7	
Crown diameter (m)	1.66 x 1.86	
Coordinates	37° 50' 32.715" N 14° 1' 18.259" E	
Elevation (m asl)	1449	
<p>Monocormic stem; good growth within a beech grove</p>		

3. Conclusions

The survey carried out allowed to update the data of the thirty *Abies nebrodensis* trees present in the native range.

Height of trees ranged from 14.4 m of tree no. 2, to 0.45 m of the tree no. 28. Trunk diameter at the base ranged between 62 cm of the plant no. 2 to 4.7 cm of the tree no. 31.

Most of the trees are in good vegetative conditions and have a balanced shape of the crown, among these there are the following: 1, 2, 7, 8, 11, 13, 14, 15, 17, 21, 22, 26, 27, 30, 32. In this group there are some beautiful trees, of different age and height, characterized by a higher growth rate than the others because they are located in the middle of beech groves, where they take advantage of the more deep and fertile soil. Among these are: 20, 21, 22, 26, 29, 32, though in some cases they suffer from excessive shading (20, 26, 29, 32). Other trees showed good vegetative conditions, albeit with reduced growth rates, despite being located in stony ground, where the soil is certainly poorer, more superficial or even absent, such as 2, 7, 8, 13, 17.

Then there is another group of trees characterized by less good vegetative conditions compared to the previous ones, due to the less favorable sites from an edaphic point of view or sites very exposed to the prevailing winds where they grow. Among these are: the no. 4, 6, 10, 12, 16, 18, 19, 23, 24, 25. These trees are characterized by a crown which is less regular in shape, sometimes lacking in some portions. However they appear in a condition of substantial equilibrium with the surrounding environment.

Among trees showing critical growth conditions are the no. 9, 28 and 31. Plant no. 9 is located on a rocky ridge, adjacent to a stony ground with almost no soil and very exposed to the prevailing winds, it is prostrate and without a top. Plant no. 31 shows a poor vegetative growth, with the crown considerably yellowed, with very stunted growths and important portions of the crown dried-up. Plant n.28 is in precarious conditions, both due to hard site conditions and to damage caused by herbivores. This tree shows almost half of the crown is desiccated and a height of the living part as low as 50 cm. Immediate implementation of individual protection is essential for its persistence.

Authors:

Roberto Danti, Gianni Della Rocca, Giovanni Emiliani, Vincenzo di Lonardo @ IPSP-CNR

Rosario Schicchi @ Unipa-Saaf

Filippo Amato (freelance forestry expert)

Peppuccio Bonomo @EPM