Project “Reborn from Ashes”

Partnership

FREUDENBERG Group, ZERO e FCT-UNL

Final Report

Recovery of the vegetation cover in the Leiria National Forest

Planting season 2018/2019

May, 2019

Summary

1. Framing

Within the framework of the partnership between the Freudenberg Group, the ZERO-Ground Sustainable System Association and the Faculty of Science and Technology, University of Lisbon (FCT-UNL), it was decided to perform recovery actions of autochthonous vegetation cover in about 21 hectares (ha) raveged by fires in National Forests under management of ICNF-Institute for Nature, Conservation and Forestry, I.P. (ICNF). The initiative, which will take place in the seasons of 2018/2019 and 2019/2020, also involves the active collaboration of ICNF as regards the information on potential areas of action, assisting in voluntary actions and storing plants and materials, among other types of cooperation.

In the first season (2018/2019) 5,712 natives trees/shrubs in around 9.612 hectares (ha) of the Leiria National Forest (MNL) were planted, the remaining 11.388 ha will be intervened until March 2020. Planting began in 09/02/2019 and finished in 26/02/2019.

The monitoring and evaluation of the results of the interventions will be ensured by the FCT-UNL and comprises, inter alia, the determination of the rate of mortality of installed plants and the tentative of identification of the causes of death.

2. Areas of intervention

The intervention was carried out in three plots of the MNL (table 1, figures 1, 2 and 3 and annex I), for a total of 9.612 ha (45.8% of total defined for the two seasons), selected in coordination with all entities involved (ZERO, the Freudenberg Group, FCT-UNL and ICNF) and after several previous visits carried out in the field. Each plot was intervened taking into account their characteristics and the goals to achieve.

The demarcation of the plots is in the *shapefile* that follows (intervention plots _MNLeiria_2018 -2019).

Table 1 – Identification of intervention plots (season 2018/2019).

Plot	Local	Parish	Municipality	Field (m)	Area (ha)
P1	Leiria National Forest	Marinha Grande	Marinha Grande	129 e 130	1,219
P2				129 e 130	3,848
P3		Vieira de Leiria		121	4,545
TOTAL					**9,612**

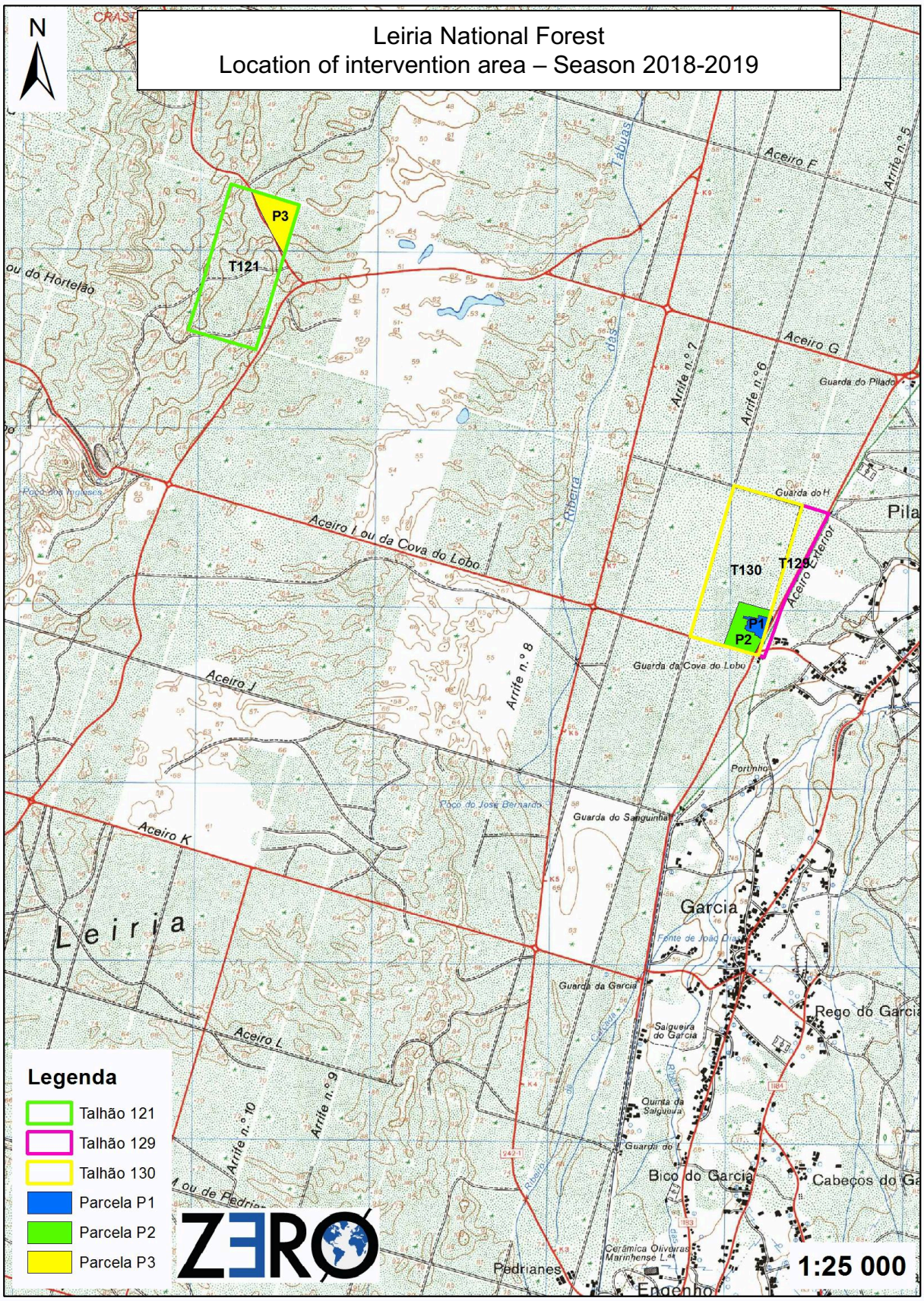

Figure 1 -Location of the three plots of intervention

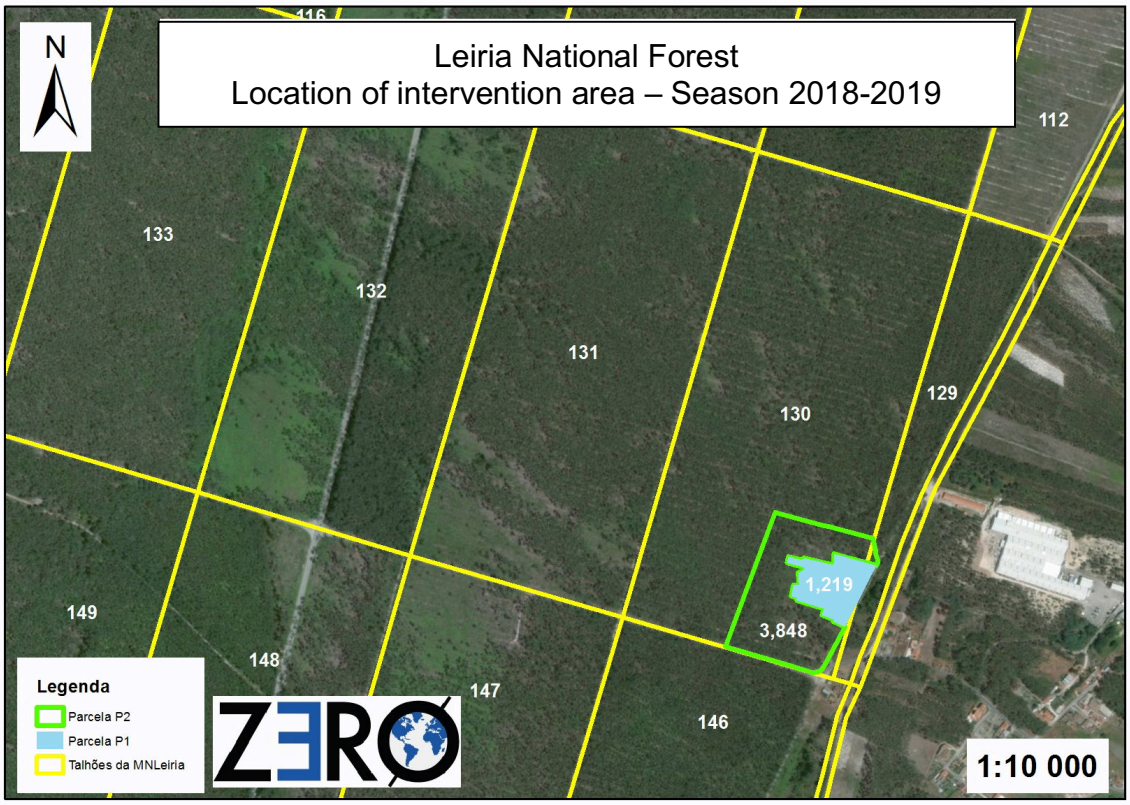

Figure 2 – Location of intervention plots P1 e P2 in fields 129 e 130.

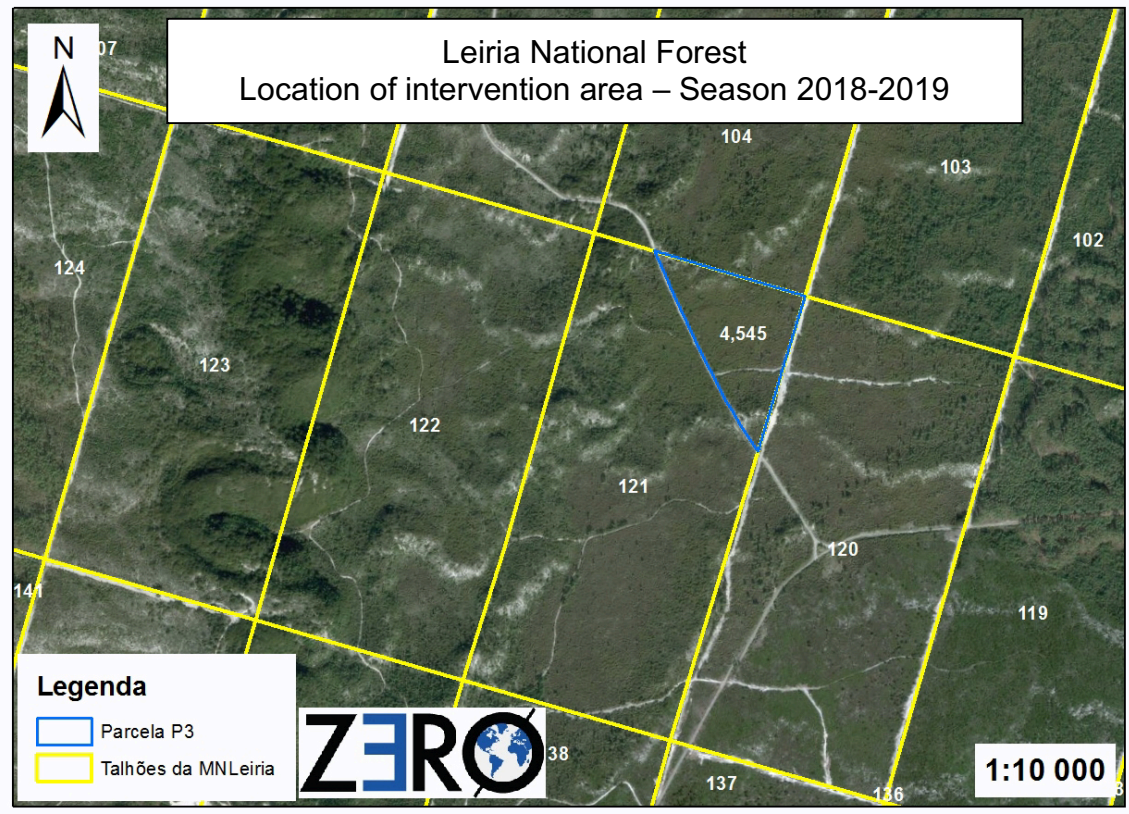

Figure 3 - Location of intervention plot P3 in field 121.

- **Plot 1**

Brief characterization: favorable to the accumulation of surface water with autochthonous vegetation typical of humid environments (e.g. grey willow *Salix atrocinerea*, rushes *Juncus spp. and bryophytes*), some specimens of australia (*Acacia melanoxylon*) and burned trunks of maritime pine (*Pinus pinaster*). In addition to the occurrence of natural regeneration of maritime pine, about 60 m from the east limit of plot (outer firebreak), there are some buildings.

Intervention goals: Elimination of invasive alien species and tree/shrub cover recovery, using native species more demanding in terms of soil moisture, keeping the small ponds and native vegetation previously existing.

- **Plot 2**

Brief characterization: Plot devoid of arboreal individuals with shrubby cover and also with logs and branches of maritime pine resulting from recent forest exploitation. In the area there is a burned individual of cork oak (*Quercus suber*), but with lignotuber sprouts, and dead invidual of portuguese oak (*Quercus faginea* ssp*. broteroi*). Part of the shrubby cover consists on, amongst other species, narrow-leaved mock privet (*Phillyrea angustifolia*), butcher's broom (*Ruscus aculeatus*), the sage-leaved cistus (*Cistus salviifolius*), the smooth-sepaled rock rose (*Cistus psilosepalus*) and heather (*Erica spp*.). In addition to the occurrence of natural regeneration of maritime pine and australia on the parcel, there are several buildings about 25 m from the extreme southeast of P2 (firebreak I) and 60 m from the eastern limit (outer firebreak). Intervention goals: elimination of invasive alien species and tree cover recovery using native species, keeping the natural regeneration of maritime pine and native shrub species.

- **Plot 3**

Brief characterization: Plot devoid of tree cover, with some individuals of strawberry tree (*Arbutus unedo*) that sprouted from lignotubers after the fire, low shrubby vegetation (some individuals of sage-leaved cistus and mastic tree) and natural regeneration of australia restricted to small cores. The plot is enclosed by a forest road (southwest) and two firebreaks (north and east sides).

Intervention goals: Elimination of invasive alien species and tree/shrub cover recovery using native species, protecting and integrating the previously existing individuals of strawberry tree and mastic tree.

3. Held Intervention

Table 2 summarizes the work carried out in each plot: the control of invasive exotic plants (*Acacia* spp.), the use of natural regeneration, land mobilization, planting (with and without addition of organic fertilizer) and the placement of individual photodegradable protectors, among other complementary information. Taking in account the characteristics of the different parts of the plots (section 2), techniques were chosen having in mind that they should, a priori, allow best results with lower environmental impacts (e.g. soil mobilization in planting lines only;

absence of use of herbicides for the control of invasive exotics), resulting in the recovery of the native tree/shrub-covered by planting, the use of natural regeneration and the elimination of alien species with invasive nature.

Table 2 – Work performed in each plot and further information

Intervenção		P1	P2	P3
Manual extraction of invasive alien species.		X	X	X
Use of natural regeneration.	Grey willow and shrubs/native herbaceous .	X		
	Maritime pine and native shrubs (e.g. Butcher's broom).	X	X	
	Strawberry tree and lentiscus.			X
Manual opening of graves (30x30x30 cm) in clearings not subject to flood		X		
Ripping the ground with 1 tooth to 60-80cm deep in the entire area, with the exception of the area with the greatest slope situated in the far north-west of P3.			X	X
Plantation .	With addition of -0.5 0.4 litres of organic concealer* on planting pit, except for some hardwoods installed in P2 (easily identified by not having individual photodegradable savers).		X	X
	Without adding organic concealer.	X		
Placement of individual photodegradable protectors without tutor in the vast majority of plants, except in the stone pine (*Pinus pinea*) and in a small part of P2 (the same plants without added organic fertilizer in planting pit).			X	X
Planting compass	Irregular compass, being about 4m the average distance between installed plants. However, until 100 m of distance from buildings, i.e. up to 40 m from the eastern boundary of P1, the distance between plants installed is 5-6 m (except for some shrubs).	X		
	Regular compass, according to the schema shown in Figure 4. The plants were arranged in a quincunx according to the bars of 8x6x6 m (up to about 100 m far from buildings) and 8 x 4, 27x4 .27 m (in the remaining area). The distance between planting rows is 4 m, with the exception of the second line after the firebreak I, located 5 m from the first line.		X	
	Regular compass, according to the schema shown in Figure 5. The plants were arranged in a quincunx according to the compass of 8 x 4, 27x4 .27 m. The distance between planting rows is 4 m, being 5 m the distance of the first plant of each line to its extreme in the plot.			X

*Horse manure was used (SIRO AGRO 2-agricultural organic concealer)

Table 2 –Work performed in each plot and further information .

Intervention		P1	P2	P3
Distribution of species on the plots	Random distribution, according to the characteristics of the terrain and the requirements of the species in terms of humidity .	X		X
	Distribution by patches of species in southern zones (stains of portuguese oak and cork oak) and north (stone pine stain). In between and in the areas adjoining the P1, plants were distributed randomly, taking into account their requirements in terms of soil moisture.		X	
Planting dates	Start 09/02/2019, finish 22/02/2019.		X	
	Start 15/02/2019, finish 20/02/2019.	X		
	Start 21/02/2019, finish 26/02/2019.			X
Planting method	Opening of covet with hoe/tined in the ripped line, except for 205 pine-meek (north zone) for which was adopted plantation in holes with use of planter. Volunteers (1,431), members of ZERO (215) and a specialized company (205 stone pines), did the work.		X	
	Manual opening of graves (30x30x30 cm) with hoe/tined, performed by members of ZERO (667).	X		
	Plantation in holes with use of planter (for compression of soil), carried out by a specialized company (3,194).			X

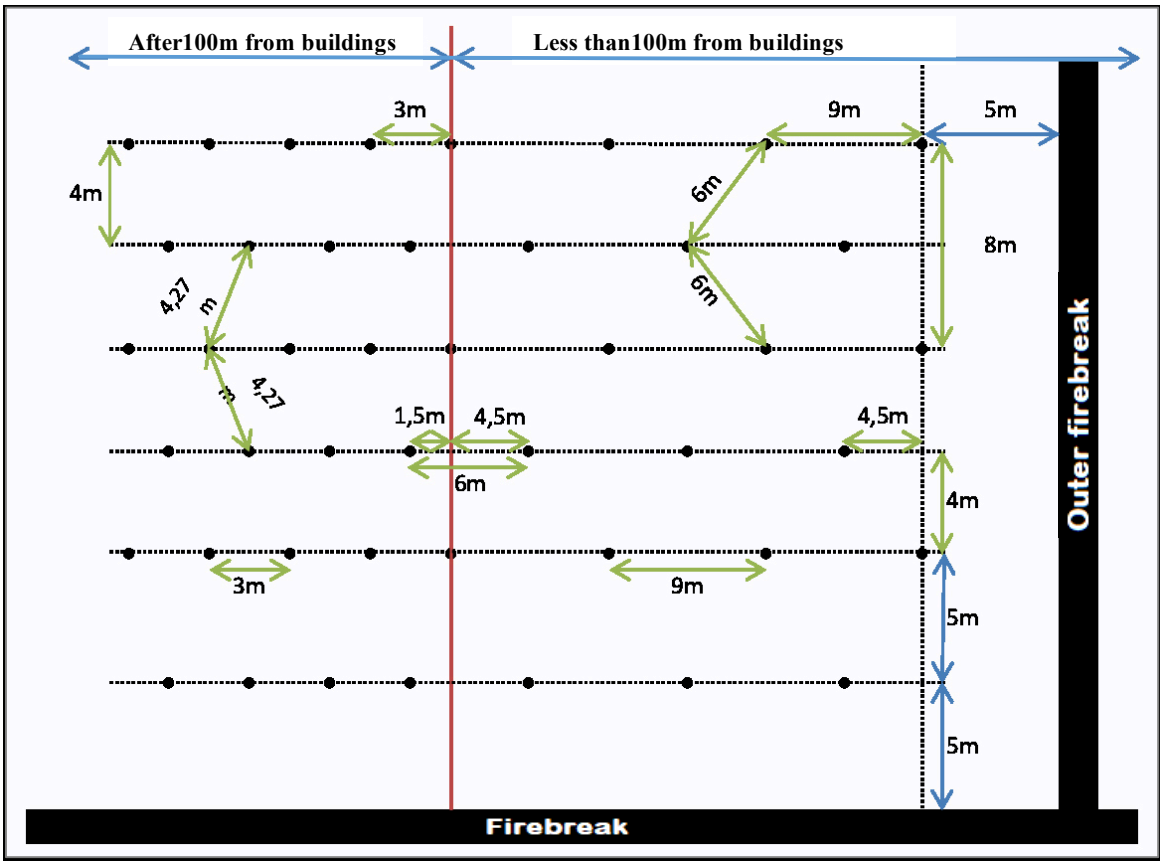

Figure 4 – planting scheme adopted in the parcel P2.

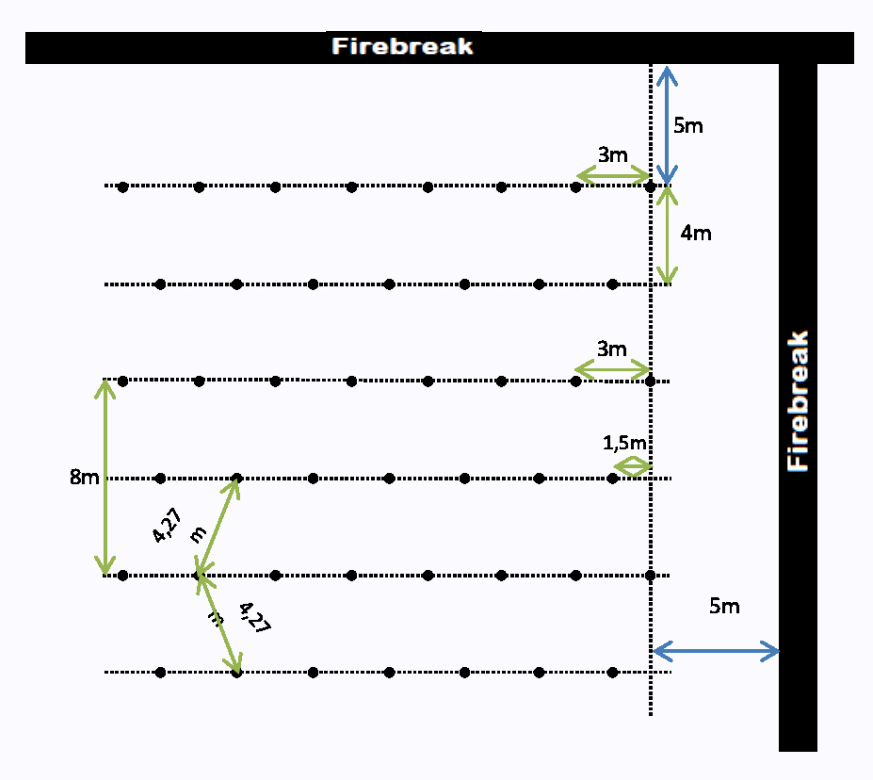

Figure 5 –Planting scheme adopted in the parcel P3.

Four aspects should also be highlighted: i) the mechanical mobilization of soil (ripping) in P2 and P3 plots was completed one to two days before the start of planting; II) the distribution of each species on the plots was based on their ecological requirements and the best planting locations for each of them have been selected in order to enhance their adaptation and survival; III) only plants in container were used, duly certified; IV) on 09/02/2019 took place a voluntary action that involved the Freudenberg Group and staff, teachers, ICNF, FCT-UNL and ZERO representatives, during which 1431 trees were planted on the parcel P2 (Annex II).

4. Plants per species and parcel

According to the characteristics of the plots (e.g. soil, climate, orography and local flora), the objectives of the interventions and the availability of nursery plants, 16 native species were selected to recover the vegetation potential of each land, 5,712 trees and shrubs were planted (table 3). Although selected parcels are on the limit of the natural distribution area of some species (e.g. common oak) we opted for their inclusion in the list and, in particular, aiming to evaluate their adaptation to the characteristics of the forest season.

As noted in Figure 6, the species with the largest number of plants installed was the stone pine (38.4%), followed by the portuguese oak (18.5%), cork oak (17.5%), strawberry tree (13.7%), common oak (5.6%), narrow-leaved ash (1.8%), sycamore maple (1.4%), tamarisk (1.1%), *Juniperus turbinata* (0.5%) and *Myrica faya* (0.5%). The remaining six species (hawthorn, laurel, common myrtle, mastic tree, Italian Buckthorn and laurustinus) have under 30 plants and, together, account for about 0.9% of the total.

Tabela 3 – Number of individuals per species planted in each plot.

Specie	Common name	P1	P2	P3	TOTAL
Acer pseudoplatanus	Sycamore maple	80			**80**
Arbutus unedo	Strawberry tree	48	7	728	**783**
Crataegus monogyna	Hawthorn	5			**5**
Fraxinus angustifolia	Narrow-leaved ash	100			**100**
Juniperus turbinata	-	6		24	**30**
Laurus nobilis	Laurel	5			**5**
Myrtus communis	Common Myrtle	5			**5**
Myrica faya	-	10		20	**30**
Pistacia lentiscus	Mastic tree	7		10	**17**
Pinus pinea	Stone pine		748	1 448	**2.196**
Quercus faginea ssp. *broteoi*	Portuguese Oak	150	405	504	**1.059**
Quercus suber	Cork oak	50	500	450	**1.000**
Quercus robur	Common oak	129	191		**320**
Rhamnus alaternus	Italian Buckthorn	5			**5**
Tamarix africana	Tamarisk	60			**60**
Viburnum tinus	Laurustinus	7		10	**17**
TOTAL		**667**	**1.851**	**3.194**	**5.712**

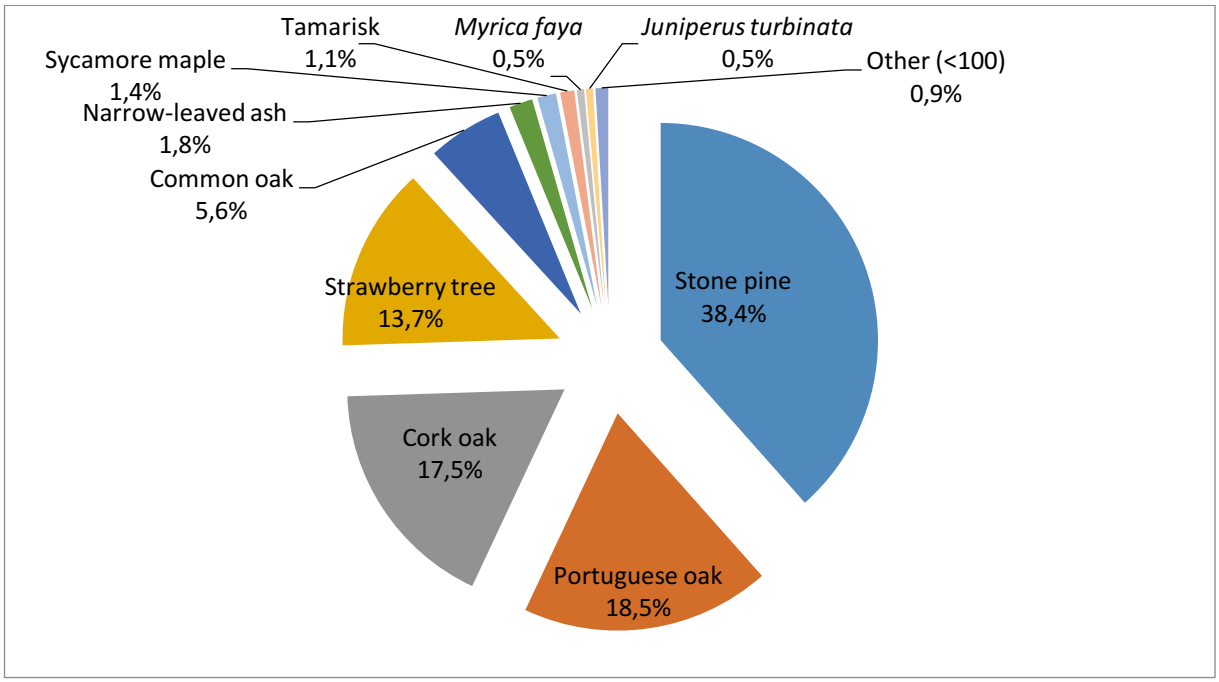

Figure 6 -Percentage of installed plants in the three parcels.

5. Final considerations

In short, compared to the planning, it was possible to achieve all the objectives set for the first planting season. The maintenance of planted areas includes the technical follow-up, the replacement of dead plants, preferably in November/December of 2019, prevention of fires

and other interventions that are necessary for the plant´s development (e.g. training pruning), with a view to the conservation objectives that guided its creation.

Castelo Branco, 28 may 2019

Paulo Monteiro
(Forest Engineer)