



'MIXED AND PURE FORESTS IN A CHANGING WORLD

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SURVIVAL AND EARLY GROWTH OF MIXED FOREST STANDS IN A MEDITERRANEAN REGION: EFFECTS OF SITE PREPARATION INTENSITY

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Mechanical site preparation to install forest plantations can be justified by numerous reasons as limiting weed competition, increasing effective soil depth, reducing soil strength to encourage root expansion, improving water holding capacity and nutrient availability. These effects are especially important in the Mediterranean Region, where water shortage is the main factor limiting the success of afforestation. In order to better understand the effects of site preparation on soil properties and plant behaviour, an experimental field was installed near Macedo de Cavaleiros, Northern Portugal, at 700 m elevation, mean annual temperature 12°C and mean annual rainfall 650 mm, with a typically Mediterranean seasonal distribution. This field, consisting of six treatments, randomly distributed in plots with 375 m², and comprised three blocks (replicates). *Pseudotsuga menziesii* (PM) and *Castanea sativa* (CS) were used as forest species, on 4 × 2 m density and alternate rows (2 for PM, 2 for CS), summing 12 plants per row in each plot. The treatments, representing different tillage intensities, were: (1) no tillage and hole plantation with hole digger (SMPC); (2) continuous subsoiling, using a covering shovel and plantation in the furrow (RCAV); (3) no subsoiling with furrow-hillock surface soil with two plough passes and plantation in the hillock side (SRVC); (4) located subsoiling, followed by two plough passes, leaving furrow-hillock surface soil and plantation in the hillock side (RLVC); (5) continuous subsoiling, followed by two plough passes, leaving furrow-hillock surface soil and plantation in the hillock side (RCVC); (6) continuous subsoiling followed by continuous ploughing and plantation in the furrow (RCLC). To assess growth and survival of species PM and CS, plants were observed and measurements of total height and stem diameter at ground level carried out in all plants immediately after planting and at 12, 24, 27, 30, 36, 39, 42 and 72 months. Survival was assessed before and after the summer period, by counting live plants, for six years. Changes in soil properties caused by site preparation techniques had evident effects on forest species survival rates and growth. Survival rates were less than 10% in treatments with light tillage intensity (SMPC, RCAV), over 65% in treatments with intermediate intensity (SRVC, RLVC), about 50% in treatments with a more intensive tillage (RCVC, RCLC), and the rates were, in all treatments, higher for CS than for PM. Plant growth (height and diameter) was significantly affected by treatments for both species, with the highest values in RCLC and the lowest in RCVC, and these differences were stepped up in time. The survival rate and growth showed a good relationship with soil thickness, which highlights the importance of improving rooting depth in the early stages of stands establishment in the Mediterranean Region.