



Douglas-fir silvicultural management with strips cuttings to enhance natural forest regeneration

Introduction

Between 1960 and 1980, Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) was the most abundantly cultivated species for abandoned lands reforestation in Tuscany. Given its high growth rate, high productivity and carbon stock capacity, as well as other biological characteristics (adaptability by resisting aridity and wind, phytosanitary resistance) it can therefore be considered for all intents and purposes a viable option for the achievement of sustainable development goals as mitigation and adaptation to climate change in mountain areas. Moreover, Douglas-fir forests constitute an element of landscape diversity in the Tuscan Apennine, enhancing its recreational, naturalistic, runoff-regulating and productive value of the territory, thus contributing to the sustainability and economy.

The project Do.Na.To. aims to promote Douglas-fir forests natural regeneration in Tuscany (Italy), through application and adaptation of a silvicultural management systems already tested in other European countries.

During the project, a group of technicians travelled to France to get to know the techniques adopted by their colleagues, and subsequently set up 26 demonstrations areas where different silvicultural systems were applied. Currently, Douglas-fir stands in Tuscany are managed with clear cutting and artificial regeneration postponed to the first useful dormant season, with bare-root plantings or phytocells. This is a simple method, but it is not free of problems, both technical and economic.

Douglas-fir renews with extraordinary facility, both in full light and in half-shade conditions. The ecological benefits of natural regeneration are numerous and underlie the formation of more resilient forests, rich in biodiversity and genetically better adapted to the environment, being the result of local selection processes from the earliest life stages and occupying each species the micro-stational conditions in which it is most suitable. With natural regeneration, the root system turns out to be more efficient, without damage to the taproot and better interconnected to the mycorrhizal network and root system of the released plants. The silvicultural systems tested during the project have been shelterwood cutting followed by seed cutting, strips cutting and selection cutting.

The best regeneration results were obtained by clear cuts on strips, on the order of several tens of thousands of plants, with strips of the same width of the height of the bordering plants, not wide as the double-height as suggested by previous literature (la Marca et al., 2017; la Marca and Pozzi, 2016). The proximity of the

strips promotes the formation of a favourable light-shady microclimate, less impacted by atm agents such as drought or wind.

The fundamental aspect is the planning of cuttings in order to wait until the seeds are mature, not before, so from late summer onward. In addition, it's preferable to make them in conjunction or the year before the last year. The entry of natural regeneration occurs massively in the presence of seed and light in the first and in the second dissemination season following cutting, it's not really appreciated by wild ungulates, but it's endangered by weed flora, in particular bramble. In spite of significantly greater technical/executive difficulties if compared to traditional clear cutting, the treatment with strips cutting enhances natural renovation establishment, presents lower environmental and landscape disturbance, and confers greater resilience to the forest.

Lessons learned

The research produced very interesting results, Douglas-fir forest natural regeneration can be considered a viable option for addressing the negative effects of ongoing climate change and an opportunity to pursue an ecological transition for sustainable development. Strips cutting system with strips of the same width of the height of the bordering plants, enhances natural Douglas-fir regeneration and reduce the environmental, economic, landscape and social conflicts (related to the execution of clear cutting for regeneration).

Still, in Italy there are several constraints that limit the method and timing of silvicultural actions, so that, for example, if strips cutting is done, replanting is still mandatory, and often timings of acquiring permits and carrying out the cuttings are slow.

For further information contact

David Pozzi, Project manager, Italy, e-mail: davidpozzi@agro-dendrostudio.it

Sabrina Raddi, Professor, University of Florence, Italy, e-mail: sabrina.raddi@unifi.it Francesca Giannetti,

Assistant Professor, University of Florence, Italy, e-mail: francesca.giannetti@unifi.it

The information presented in this factsheet was developed by the FOREST4EU partner, drawing on the innovations and knowledge generated by the indicated operational group with their explicit authorization.

Further information

<https://www.progettodonato.it/>



 <p>Funded by the European Union</p> <p>Funded by the European Union (Grant n. 101086216). Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or REA. Neither the European Union nor the granting authority can be held responsible for them.</p>	 <p>UNIVERSITÀ DEGLI STUDI FIRENZE DAGRI DIPARTIMENTO DI SCIENZE E TECNOLOGIE AGRARIE, ALIMENTARI, AMBIENTALI E FORESTALI</p>	 <p>Do.Na.To. Douglasiete Naturali Toscane</p>	 <p>Website</p> <p>  FOREST4EU Project  FOREST4EU Project  info@forest4eu.eu </p> 
--	--	---	--