

(Italy). The main objective of silvicultural treatments realized in the frame of both projects is to increase the provision of some ecosystem services (climate change mitigation, biodiversity conservation, soil protection, bioenergy and timber production) ensuring sustainable forest management. Study areas are located in Central Italy: two in the Apennines (Pratomagno and Val d'Orcia) and the third in the hill of the Florence town (Monte Morello). Forest stands are black pine plantations established throughout the Apennines after the Second World War with the purpose of re-establishing forest cover. Black pine stands already achieved the land restoration purpose and today silvicultural treatments have the aim to enhance forest multifunctionality, trying to balance various ecosystem services. Both projects are based on testing an innovative thinning (selective thinning) which seems to be one of the most promising and interesting approach for dense artificial plantations. The thinning is a localized action performed on the most promising trees per hectare, characterized by easy applicability and replicability and known to improve the mechanical stability of trees, the growth rates and the timber production in artificial black pine plantations in the Italian Apennines chain. Furthermore, this thinning is effective in increasing soil biodiversity and improving the ecological equilibrium and climate change mitigation potential of stands. Preliminary results show that the selective thinning increases the net primary production, contains GHG emissions from deadwood decomposition, and increases bioenergy production.

Protection and conservation of the manna ash landscape in Sicily

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Known as manna ashes, some local varieties of *Fraxinus ornus* L. and *F. angustifolia* Vahl (*Oleaceae*) are cultivated for extracting the manna, a product rich in mannose which is useful under both pharmaceutical and nutraceutical aspects. As wild plants in Sicily these ashes participate in diversifying evergreen and deciduous oak woods as well as other forest communities at the watercourse borders, together with several species of *Salix*, *Populus* and *Ulmus*, particularly in the hills. Cultivation of manna dates back to ancient times in Sicily and elsewhere and ash groves were increasingly spread up to the half of last century. Then, the culture had a progressive decline due to the abandonment of land and its gradual replacement by other crops. Most of the surface formerly occupied by ashes is now uncultivated and therefore also exposed to recurrent fires. As a consequence even the rich varietal heritage, documented by detailed monographs, went partially lost, although recently have not missed a revival of the local scientific community.

In the face of the many thousands hectares occupied by these crops in the past, now residual plantations are confined in just a few hundred hectares in the territories of Castelbuono and Pollina (province of Palermo), in the northern side of the Madonie mountains. In this area the plant landscape had been strongly characterized by the ash groves, that besides acted an efficacious hydrogeological protection. At present, despite the progressive loss, the cultivation of manna ashes could still play an important role in the local economy. Therefore, in order to preserve all social, cultural and even biological values as well the landscape, it was proposed to establish a natural reserve of the manna ashes some decades ago; but that suggestion was later abandoned after the Madonie natural Park was established. Nevertheless the Park has not, over the years, affected concretely the further abandonment of ash groves and the protection and conservation of the related landscape.

Recently, the Sicilian Regional government has adopted some measures aimed at supporting farmers for replanting ash groves: these are active conservation initiatives for the production of manna. Here we find it useful to propose even passive measures such as reforestation like those implemented elsewhere in the province of Palermo with good results for the environment and landscape. Other initiatives, that could not be postponed, concern vocational training as well as research and conservation of ash varieties germplasm to be grown in specific arboretums such as those already implanted in the fields of the agricultural schools at Castelbuono (Palermo) and Mussomeli (Caltanissetta) and in the experimental plantations at Sparacia (Caltanissetta), SAF Department of the Palermo University.

Sustainable use of Mediterranean forest resources: the collection and recycling of cork stoppers

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Among the organic materials produced by the forest plants, in addition to the wood for the various uses, the cork is mainly used to derive the stoppers for the bottling of wines and sparkling wines. The cork oak (*Quercus suber* L.) is the main source of production of this material. A close connection exists between the wine growing and distribution area of this forest species. Around the world - except the Islamic and underdeveloped countries - wine and therefore also cork is consumed. The intensive use of cork is causing the decline of the cork forest and its supply for the industry. In addition, the recurring fires and the decrease of forest areas by expansion of urban centers is involving the loss of product quality. A comparable example occurring in the cork oak Maamora forest (Morocco). In the past, the efforts promoting the recycling of cork stoppers to send to the industries for the production of new cork stoppers and especially of insulating panels, have been few. Collections for these purposes have been imple-