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The restoration of abandoned temperate forests with semi-free-range pigs: the experience of 'Food For Forest'

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Introduction: The reduction in the management of European temperate forests might adversely impact the numerous ecosystem services provided by these habitats (e.g. hydrogeological stability, biodiversity, recreational and aesthetic value, etc.). Silvicultural practices in such abandoned stands are often hindered by the abundance of shrubs in the understory, such as bramble (*Rubus* spp.), which reduces the access to the area for workers and require unprofitable clearing operations. The project 'Food For Forest' (funded by Piedmont RDP programme 2014-2020) proposes a multifunctional silvopastoral system coupling pig grazing and silvicultural treatments for the sustainable use and restoration of degraded temperate forests. With this system, pigs would facilitate silvicultural interventions through the reduction of undesirable plant species in the understory, while farmers would benefit from low-cost forages to feed animals. Moreover, this farming system ensures the provision of an environmental- and animal- friendly product for the market. Within this framework, we aimed to i) study plant species selection of semi-free-range pigs, ii) evaluate the damages to post-treatment tree resprouting by pigs and iii) assess the weight gain of animals.

Materials and methods: The study was carried out in two semi-abandoned hill stands located in Piedmont region (NW Italy) and dominated by *Quercus robur* and *Castanea sativa*. Here, a rotational grazing system with 20 Nero di Parma barrows was applied from April to December (240 days) in 2019 and 2020. Nose rings were provided for swines to avoid rooting. During the first year, swine feeding preferences were assessed through direct observations by monitoring animal behaviour at three-minutes intervals during 30-sec. observations. For each observation, the plant species consumed and those present in the surroundings of the pig were recorded. We focused on the selection of aboveground green tissues, while the occasional consumption of acorns and roots was not considered. Based on these data, a Selection Index (SI) was calculated for each plant species following Manly et al. (2002). In the second year, a silvicultural renovation cut removed 36% of the wood volume in the coppice layer. The sign of grazing on buds and leaves, and the growth of 1045 resprouts belonging to seven tree species were evaluated through the growing season. Finally, live weight gains of pigs were assessed throughout the grazing period, from 10 to 18 months age.

Results: The species *Corylus avellana*, *Hedera helix*, *Robinia pseudoacacia* and *Rubus* spp. were actively selected by pigs (SI >1). Among others, the species consumed proportionally to their availability (SI =1) were *C. sativa*, *Cornus sanguinea*, *Prunus avium* and *Ulmus minor*, while the avoided ones (SI <1) were *Fraxinus ornus*, *Ligustrum vulgare* and the oaks (*Q. cerris*, *Q. pubescens* and *Q. robur*). Sprouts of *C. avellana*, *C. sativa* and *U. minor* were damaged the most, followed by *F. excelsior* and *P. avium*. Swine grazed firstly buds, while later in the season both buds and leaves were consumed. *F. ornus* and *R. pseudoacacia*, instead, had a few sprouts damaged (4% and 20%, respectively) and stump heights increased through time. The lower preference for sprouts compared to mature leaves of *R. pseudoacacia* suggests that young tissues may contain chemical compounds reducing their palatability. On average, pigs grew from 59.7 to 157.1 kg LW, reaching the maximum LW gain in June (0.77 kg/d).

Conclusion: The results showed that pigs selectively consumed the plants available in the understory and the sprouts of tree species, providing novel knowledge on pigs diet preferences. Moreover, the large consumption of bramble suggested that pigs could be a suitable tool to control this undesired species in the understory. As regards the economic sustainability, the reduced demand for feed supplements, the high value of the meat on the market, and the improved quality of the woody stands are expected to positively balance the farmers profits. Therefore, the silvopastoral system proposed by 'Food For Forest' can be a sustainable management approach for the restoration of degraded temperate forests, allowing the enhancement of the related ecosystem services.