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### ► To cite this version:

François Warlop, Melodie Aujogue, Alice Bombeau, Mathias Boucheraki, Lou Milon, et al.. A user-friendly decision tool for facilitation of fruit trees choice. 6. European Agroforestry Conference. Agroforestry for the Green Deal transition, May 2022, Nuoro, Italy. hal-04331574

**HAL Id: hal-04331574**

**<https://hal.inrae.fr/hal-04331574>**

Submitted on 8 Dec 2023

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## A user-friendly decision tool for facilitation of fruit trees choice

EURAF 2022  
Agroforestry for the Green Deal transition.  
Research and innovation towards the sustainable development of agriculture and forestry

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**Theme:** Crop and grassland productions

**Keywords:** decision tool, fruit trees, design

### Abstract

In France, farmers are getting more and more interested in integrating trees in their agroecosystems, thanks to the French plan called « Plantons des haies » giving substantial subsidies for plantations. Breeders also consider the multiple interests of trees for broilers or even ruminants. Fruit trees are among the preferred tree species, as they deliver multiple services like all trees, but they can also produce fruits for animals, for farmers themselves, or for diversification of the farm incomes.

However, choosing fruit trees is a tougher job than choosing timber species, as fruit trees (including their rootstocks) are more sensitive to a great diversity of pests and diseases, making it much more complicated to have regular yield when an inappropriate choice is made. Additionally, few advisors are able to help the farmer willing to plant fruit trees, in regions where such crops are not well spread. For these reasons, members of the French 'RMT Agroforesteries' (a network devoted to information-sharing about all agroforestry systems) decided to work on the development of a decision tool to help farmers in species, rootstocks and cultivars choice.

The tool was developed in 2021 by a group of students and fruit experts of the RMT network. The tool has specific objectives, as it is dedicated to (i) systems where fruit is a secondary production, not the main one, and (ii) agroforestry systems where determinants will not only be technical, but also socio-economical.

The main knowledge gathered helped to identify and order the main criteria that will have the most decisive impact on choice relevance. Soil quality, climatic conditions (drought/frost risk level) or technical complexity to grow the species have been sorted as most determining criteria. Other socio-economical traits had to be considered and added for such specific systems: labour requirement, harvest period, post-harvest constraints... as farmers have to manage other crops or livestock in priority. All criteria have been gathered and weighed under an algorithm, using R software. As a final output, experts gave a cultivar list for all 6 rosaceous species considered (apple, pear, peach, apricot, cherry, plum), according to the region where the grower is from: these cultivars are already known to be rather tolerant to pests and diseases, therefore more adapted to a low-input system, as growers in general won't be willing/have time to spray fruit trees.

The decision tool is now accessible on a R-shiny App, very easy for farmers to understand and use. It gives a ranking of a couple fruit species/rootstock according to the farmer's answers.

Next development stages will be the achievement of an optimal answer from the tool, with the use of secondary criteria when necessary.