



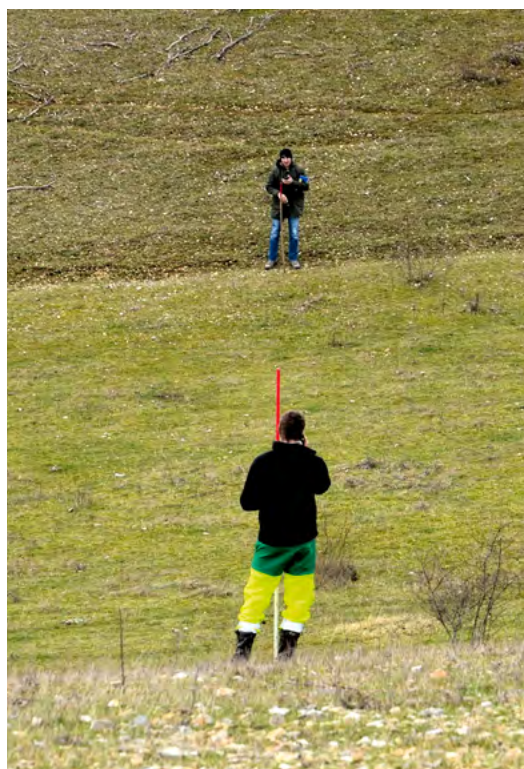
Planning an agroforestry project

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A lot of silvoarable systems exist, with a broad range of varying tree densities and tree spacings. Almost all combinations are viable if the appropriate tree species and the crops are selected to match the environmental conditions.

Before planting, farmers have to decide on the tree density, orientation, spacing between the tree lines and between the trees located in the same line.

Critically the trees should not hamper mechanisation of crop operations between the lines or at the edges of the plot.



A tractor GPS can be used for line staking. Otherwise, this can be done directly from the ground.



The distance between the tree lines is a multiple of the largest engine working width, this to avoid the overlaps.

Project design

Tree density

Silvoarable systems imply interactions and sharing of resources between the trees and the associated crops, both above and below ground.

In a well-managed silvoarable system, the competition between plants is exploited to improve the overall use of resources. For instance, deeper tree roots are able to utilize excess nitrogen fertiliser, thereby increasing efficiency and minimizing waste. They can also decrease crop evapotranspiration by providing shelter, or improve the water holding capacity of the soil.

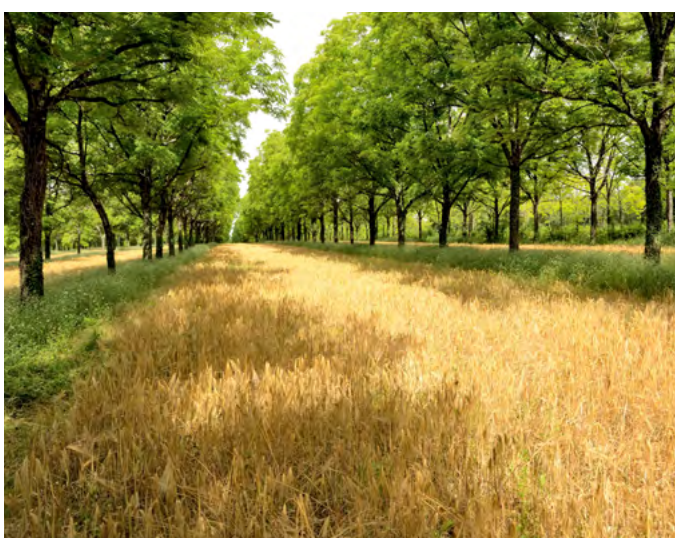
Over the years, however, the competition between crops and trees will often increase in favour of the trees. Crop yields usually start being negatively affected by the presence of mature trees after 20 or 30 years.

Therefore, farmers have to manage the tree density carefully, bearing in mind that the higher the density the stronger the competition.

Research suggests that:

- well-managed silvoarable systems are profitable at densities of between 50-100 trees/ha;
- crop yields will start decreasing halfway through the tree rotation. However, in a well-designed system the overall profitability can be maintained if trees are managed in the proper way. For example, it is possible to have 20-50 timber trees per hectare providing appropriate tree monitoring is carried out in the first ten years of establishment.

It is recommended to have a tree density of at least 100-150 trees/ha at planting so as to be able to select appropriate trees for thinning.



Poor silvopastoral design: 38 year-old black walnuts on 14 m wide apart lines. An example where alleys have been designed much too narrowly to allow comfortable crop operations (especially harvesting). In addition, crop yield has been shown to stand 60 % below the open landscape average, due to lack of sunlight reaching the lower storey

Planting distance

Trees are planted in lines to not interfere with the machinery during crop operations. The distance between the lines has to be chosen in accordance with the width required for operations.

Line spacing should:

- allow the use of the biggest machine/tool (a tractor mounted boom sprayer for example);
- be a multiple of the working width of the narrowest machines to avoid overlapping;
- be at least equal to two times the average of the mature height of the trees; e.g. a distance between 25 m and 40 m for 15 m high deciduous species.

The initial distance between the trees varies between 4 m and 10 m, and can be adjusted (by thinning) later on. The non-cultivated grass strip located at the base of trees is usually 2-4 m wide.

Planting distance

In temperate systems tree lines should ideally run North – South, so the crops will be less affected by the shade and any shading will be equal on both sides of the runs. Of course this will be influenced by other factors such as the orientation of the field and the slope. On steeper ground trees should be planted along contour lines to reduce erosion. The tree rows should not interfere with drainage ditches. In windy areas it is better to arrange tree rows in parallel with the main wind direction. An area with no trees should be maintained at the end of each line (head-lines) to allow machines turning around them. In addition, trees should not be planted under an electric or telephone wires crossing the plot.



Planting a mix of species on contour lines has a great impact at the landscape level

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Special thanks go to Fabien Balaguer (French Agroforestry Association) and to Dr Tim Pagella (World Agroforestry Centre) for their work as technical editors and translators.

23 October 2017

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