# Walnut and Vegetable Production in Agroforestry Systems

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## Walnuts in Agroforestry

The growing interest in locally produced food and products offers unique opportunities for the cultivation and processing of walnuts in Belgium and the Netherlands. Despite strong demand, most walnuts are still imported today. This creates a market opportunity in which agroforestry can play a significant role.

The nutritional value of walnuts and their derived products makes them particularly popular among consumers. By integrating walnuts into agroforestry systems, both in silvoarable systems (a combination of trees and arable crops) and silvopastoral systems (a combination of trees and livestock), farmers can respond to this demand in an ecologically and economically sustainable way.

**FIGURE 1. WALNUT TREE**

Walnut trees are well-suited for agroforestry. They have deep root systems and, depending on the variety, tend to remain relatively low, which simplifies harvesting. Moreover, they leaf out late in the season, which significantly reduces competition with understory crops for sunlight and water. Their fallen leaves decompose quickly and provide a natural source of nutrients and organic matter, contributing to soil health.

The flowering period of walnut trees depends on the variety. Choosing late-budding cultivars that flower in late May or later can further minimize shading of the crops beneath. It also reduces the risk of frost damage during productive years, contributing to more stable yields. Although walnut trees are tolerant of heat, they are sensitive to drought. They grow best in rich, well-drained soils that are not overly wet.

## Walnuts and Vegetables: A Thoughtful Combination in Agroforestry

Het combineren van groenten en bomen in één teeltsysteem Although combining vegetables and trees within one cropping system is technically very feasible, it is by no means straightforward. A well-functioning agroforestry system requires careful planning of tree species, cultivar selection, and crop combinations to minimize the impact of trees on vegetable growth.

Walnut trees offer several advantages in this context. They leaf out and bloom relatively late, which reduces competition for light and water during the crucial early growth stages of many vegetables. Their open crown structure and relatively modest height also help reduce shading. In addition, walnut trees have large leaves that, once fallen, cause less contamination of vegetable crops compared to small leaves or pine needles. This reduces the need for cleaning and lowers post-harvest handling costs.

Selecting the right vegetable species is crucial and must consider planting time, light and moisture requirements during key growth phases, and the harvest period. Crops that are harvested before walnut leaf fall, or that tolerate partial shade, are ideal. Leafy and root vegetables such as Swiss chard, chicory, radish, rhubarb, and leek generally perform well. Some brassicas (like Brussels sprouts and kale) and legumes such as peas and broad beans can also adapt well to these conditions. In contrast, fruiting crops tend to be more sensitive to shade, which can negatively affect both growth and visual quality.

FIGUUR 2: WANUT TREES AND LEEK AT INAGRO TEST FIELD

While agroforestry systems combining walnuts and vegetables are technically viable, large-scale implementation in Flanders remains limited. Many large-scale vegetable growers are hesitant due to potential yield impacts and the strict quality standards set by processors and wholesalers. However, for small-scale producers focused on local sales, short supply chains, pick-your-own initiatives, or organic markets, the situation is different. For them, agroforestry offers not only ecological and agronomic benefits but also commercial opportunities. It supports sustainable and resilient farming practices, which are increasingly valued by consumers.

# Potential of Understory Crops

In agroforestry systems with walnut trees, attention is often focused on the trees themselves and their placement in tree rows. However, the space beneath and between these trees, called the understory, also offers many possibilities. This layer can contribute not only to additional production but also provide valuable ecosystem services, such as increasing biodiversity and supporting natural pest and disease control.

Using the understory with suitable crops makes the system more multifunctional and economically attractive. Especially in the early years, when walnut trees are not yet productive, shade-tolerant crops can help generate income and reduce investment costs. Rhubarb (*Rheum rhabarbarum*) is a good example of a hardy crop that grows relatively well in partial shade and can be harvested early.

Pumpkins (*Cucurbita* species) are also interesting because they require little input and can grow well in the sheltered areas of the tree rows, although it is important to control their spread. Other examples include herbs, artichokes (*Cynara scolymus*), shade-tolerant berries such as blackberries (*Rubus fruticosus*) and wild strawberries (*Fragaria vesca*), and even edible mushrooms.

By choosing the right understory plants, an agroforestry system with walnut trees can become more resilient and biodiverse while also becoming economically profitable sooner.

# References


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