

ALLEY CROPPING DIVERSIFIES YOUR FARM AND IMPROVES THE ENVIRONMENT

Which species can be used in Finland?



THE WHAT AND WHY

Opportunities for agroforestry in Finland

Alley cropping, or planting woody perennials rows in arable or vegetable fields, is an innovative idea worthy of exploration by farmers seeking both an additional long term income, rather than income based solely on annual production, and to increase the environmental resilience of their system.

It is advisable that the trees and shrubs planted should have some of the following characteristics: i) produce a product or multiple products (e.g., timber, nuts) with an acceptable local market, ii) have deep roots to reduce competition with the crops, iii) do not produce allelochemicals or acid foliage that would prevent some crops growing under them.

Companion crops, planted in the alleys between the tree rows, may be: 1) cereal and forage crops; 2) fruits, berries, ornamental or aromatic/medicinal plants; or 3) biomass producing crops.

In the initial stages, the growing environment in the alley will be favorable to row crops requiring full sun. As trees grow, they will increase shade, water and nutrient competition and humidity levels, decreased temperatures and wind, so shade tolerant species will be more suitable then.

The management of trees includes weed control, pruning and thinning.



Alley cropping system on contour lines with apple trees, cherries, pears and plums together with comfrey and aronia in southern Finland
Iiris Mattila



Blossoming apple tree
Iiris Mattila

HOW IS THE CHALLENGE ADDRESSED

Which species are suitable?

Trees recommended for alley cropping are those providing fine hardwood timber or edible nuts, but also other added-value products, like syrups or medicines:

- Alder or birch for furniture, firewood and syrup
- European ash and black walnut for high value timber
- Norway maple, wych elm and European oak for timber and furniture
- Aspen for timber, biomass, firewood and purification of contaminated soils
- Poplars, willow, maple or birch as coppice biomass crops.
- Apple or pear for cider production
- Plum and cherry for high value fruit

Alley crops that can be grown are fruit bearing shrubs, regular and forage crops, ornamental and medicinal crops, or even coppice biomass crops:

- Regular crops include wheat, rye, oats, peas, pumpkins, etc.
- Forage crops such as meadow fescue, ryegrass or alfalfa for hay production or willow for livestock feed.
- Ornamental woody plants like Christmas trees, dogwood, curly willow, curly birch.
- Medicinal crops like St John's-wort, elderberry, willow.
- High value fruits or superfoods for example, blueberries, strawberry, raspberry, cranberry, currant, saskatoon, sea buckthorn, chokeberry, gooseberries, currants and American hazel.



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HIGHLIGHTS

- Alley cropping helps preventing erosion, especially when trees are planted as contour lines
- Alley cropping reduces run-off, improving the quality of surface water
- Tree roots and fallen leaves improve soil organic matter, reducing soil compaction and increasing soil carbon storage
- Alley cropping leads to increases in biodiversity and overall productivity.
- Trees provide additional farm income in the long run.

ADVANTAGES AND DISADVANTAGES

Testing what has not been tried before

Advantages

Integrating crops and trees leads to a diversification of the farm products, thus minimizing risks due to climatic events or to uncertain markets. At the same time it increases the resilience of the system and biodiversity.

Planting trees as contour lines on erosion-prone slopes can markedly reduce soil-erosion and leaching of excess nutrients which will improve soil conservation and the quality of the surface water in the surrounding area.

Fine tree roots and fallen leaves improve the soil organic matter content thereby improving soil nutrient levels and nutrient availability for the crops. A higher soil organic matter content also increases soil microbial activity, which leads to a faster nutrient turnover and reduces soil compaction. Trees and strips of natural vegetation provide a suitable habitat for pollinators and natural enemies improving crop production and reducing the need for use of pesticides.

Agroforestry practices can store more carbon compared to conventional agriculture, which helps to mitigate greenhouse gas emissions. The extra carbon is stored in the trees, in the tree roots and in the soil.

More diverse production (fruits, crops, nuts, timber) can generate some extra farm income throughout the year.

Bear in mind

An alley cropping system is more complex to manage than a mono-cropping system and its management can present some challenges.

Agroforestry generally requires more work and knowledge than a mono-cropping system. Most of these alley cropping systems



Strips of willow as windbreak
Iiris Mattila

have never been tried in Finland and therefore it is hard to find external advice. The success of these systems should be based on trial and error and common sense. Therefore, it is advisable to start any new alley cropping project on a small area to test it works before expanding to a larger area.

When planting shallow-rooted trees or shrubs (e.g. willow) make sure that the new plantings are at a safe distance (>15 meters) of drainage pipes or tile drains as the pipes can

easily be blocked by shallow tree roots under wet conditions. In northern Europe, light is a limiting factor for crop growth, however agroforestry is possible at northern latitudes with low tree density and sufficient distance between the tree rows. North-South orientation of tree lines is better at high latitudes to reduce light competition. As the trees grow, shade will increase. Thus the understorey crops might need to change over time to adapt to the new conditions.

FURTHER INFORMATION

The Center for Agroforestry at the University of Missouri, established in 1998, is one of the world's leading centers contributing to the science underlying agroforestry http://www.centerforagroforestry.org/pubs/training/chap3_2015.pdf

The USDA elaborates very practical and friendly factsheets on agroforestry <https://www.fs.usda.gov/nac/documents/agroforestrynotes/an12ac01.pdf>

Dupraz, C., Blitz-Frayret, C., Lecomte, I., Molto, Q., Reyes, F., Gosme, M. 2018. Influence of latitude on the light availability for intercrops in an agroforestry alley-cropping system. *Agroforest Syst* 1–15. <https://doi.org/10.1007/s10457-018-0214-x>

Koivula, K. 2012. Peltometsävilyjä mahdollisuutena tulevaisuuden Suomessa. Oulun seudun ammattikorkeakoulu. Available online: <http://www.theseus.fi/handle/10024/53324>

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