

# OPPORTUNITIES FOR AGROFORESTRY IN FINLAND

den Herder M<sup>1</sup>, Vanhanen H<sup>2</sup>, Karvinen P<sup>3</sup>, Matila A<sup>4</sup>, Mattila I<sup>5</sup>, Nuutinen S<sup>6</sup>, Ryhänen S<sup>7</sup>, Siikavirta K<sup>8</sup>, Westersträhle M<sup>9</sup>, Verdonck P<sup>9</sup>, Muñoz Alonso A<sup>10</sup>

\* Correspondence author: [michael.denherder@efi.int](mailto:michael.denherder@efi.int)

(1) European Forest Institute, Joensuu, Finland (2) Natural Resources Institute Finland, Joensuu, Finland (3) Sammallahden tila, Viinijärvi, Finland (4) Tapio Oy, Helsinki, Finland (5) Kilpiän tila, Pusula, Finland (6) Putkisalonen kartano, Rantasalmi, Finland (7) Rural Women's Advisory Organisation, South Savo Region, Mikkeli, Finland (8) Etelä-Savon elinkeino-, liikenne- ja ympäristökeskus, Mikkeli, Finland (9) INAGRO, Rumbek-Beitem, Belgium (10) Fundación Empresa-Universidad Gallega (FEUGA), Santiago de Compostela, Spain

## Agroforestry in Finland

Although agroforestry is not very often associated to northern European climatic zones, agroforestry has a long tradition in Finland (Uusitalo & Peltola 2015). The most well-known examples of agroforestry practices in northern Fennoscandia are reindeer husbandry and the collection of non-wood forest products such as berries, mushrooms and wild herbs. Even though the climate in Finland is harsh, there would also be opportunities for vegetable production, although this is much less common. The purity of agricultural products in Finland is considered a main advantage. Due to the harsh climate, pests rarely reduce the quality of vegetables, which decreases the use of pesticides and opens opportunities for organic production (Anttila 2012, European Food Safety Authority 2013). In northern Finland, vegetable production has been decreasing and currently there is very little production of vegetables grown in outdoor conditions. Supply is far from covering the demand, especially since locally grown-food ideology has grown in recent years (Räty & Kajala 2015). Therefore, studying and developing short and local food supply chains would provide opportunities for agroforestry in Finland in the future.

Grazing of forests and wood pastures is another agroforestry practice found in Finland (Uusitalo & Laurila 2015)(**Figure 1**). Forest and wood pasture grazing was still common in Finland in the 1930s, but disappeared almost completely in the 1950s with the intensification of agriculture and forestry. Forest and wood pastures are shaped when animals are grazing in the forest. Selective grazing of cattle modifies forest vegetation to a more meadow-like vegetation and speeds up nutrient turnover. An appropriate grazing pressure is important as grazing at intermediate pressure has in general a positive impact on biodiversity. In Finland, there were still about 2 million hectares of forest and wood pastures in the 1950s. Since then, the area of wood pastures (In Finnish: hakamaita) has decreased to about 1900-3300 ha and the area of forest pastures (In Finnish: metsälaitumia) to about 5000-9000 ha (Schulman et al. 2008). The quality of the remaining woody traditional biotopes has deteriorated considerably due to eutrophication and forestry operations. However, the maintenance of traditional biotopes, their landscape values and delivered ecosystem services provide opportunities for entrepreneurship and development of modern silvopastoral systems. Government support is until now the main source of income for farms managing key biotopes and traditional rural landscapes by grazing (Uusitalo and Laurila 2015). Nevertheless, there would be a range of opportunities to develop additional sources of side- or main income such as e.g. ecotourism, therapy and well-being services (Greencare), wild berry and mushroom cultivation, honey production, bioenergy production and direct sales of pasture meat (Uusitalo & Laurila 2015).



Figure 1: Traditional Finnish wood pasture with Scots pine (*Pinus silvestris*) and grazing horses.

### **The AFINET project – Agroforestry Innovation Networks**

In the AFINET project (AFINET 2017), nine Regional Agroforestry Innovation Networks (RAIN) were created in nine countries (Spain, Portugal, Italy, Belgium, United Kingdom, Finland, Hungary, France and Poland) during the summer of 2017. The RAINs mainly consist of practitioners of agroforestry, complemented by experts from various fields and other stakeholders (e.g. technical advisors, associations, extension services, entrepreneurs, NGO's, administration, policy advisors), depending on the focus of the network events. The main objectives of the RAINs are: 1) to improve knowledge exchange between scientists, practitioners and other agroforestry stakeholders on agricultural and forestry practice, supporting innovation-driven research and ensuring a wide transfer of knowledge towards the end-users, 2) to co-create new knowledge, and 3) to put insufficiently exploited research results into practice.

### **Objectives and activities of the Finnish Regional Agroforestry Innovation Network**

The main aim of the Finnish RAIN would be to increase the uptake of agroforestry in Finland by taking some of the identified agroforestry innovations forward. During the RAIN workshops, we will collect ideas for innovative agroforestry practices, their benefits and opportunities and identify bottlenecks, challenges and barriers for uptake of the innovations. In addition, the RAIN will also identify possible knowledge gaps and search for solutions to overcome the possible challenges. When a promising new innovation or existing bottleneck or barrier for uptake has been identified, existing scientific and practical literature will be examined to provide the state-of-the art knowledge to the RAIN members and to see if possible solutions to existing problems can be found. In addition, external experts can be invited to the following RAIN meetings to give a lecture on a certain topic of interest what has been identified by the RAIN members.

Another aim of the Finnish RAIN is to increase awareness on agroforestry in Finland. In Finland, agroforestry (In Finnish "agrometsätalous") is not a commonly known concept and most people have never heard of it. On the other hand, reindeer husbandry, forest grazing, beekeeping, hedgerows, shelterbelts, buffer strips and forest farming such as collecting berries and mushrooms are agroforestry practices which are very well known in Finland. Raising general awareness on the concept "agroforestry" would already be a huge step forward in promoting this sustainable land use practice.

### **Some examples of identified innovations**

The first Finnish Regional Agroforestry Innovation Network meeting took place in September 2017. During the meeting, the participants collected 18 ideas for agroforestry innovations. Some examples of some of the most promising ideas are described below:

### **Management of seedling/sapling stands by grazing**

Pre-commercial thinning is beneficial for future stand development as it speeds up wood production. Pre-commercial thinning is often performed by a forest contractor but in many cases management is delayed or neglected completely which affects the future productivity of the stand. However, understory and shrub vegetation in young seedling/sapling stands can also be managed by grazing animals. This would work best in spruce and pine sapling stands as most grazers do not prefer spruce/pine. Grazing of seedling and sapling stand could possibly save costs for pre-commercial thinning and improve nutrient cycling which is beneficial for future stand development.

Challenges for the implementation of this practice include the cost of fencing and herding, finding the appropriate grazing pressure and possible damages to the planted seedlings or saplings. Before implementation of this practice we would need more knowledge on the optimal grazing pressure in relation to different tree species and a cost benefit analysis. One proposed solution to overcome the challenges would be to establish some experimental or demonstration sites in a well-planned experimental design which could serve as an example to other farmers.

### **Growing hops in an agroforestry system**

Hops (*Humulus lupulus*) can be grown on stalks in field boundaries or on forest boundaries supported by trees. Hop production in an agroforestry setting can fulfil the needs of local micro-breweries. Micro-breweries are interested in delivering a local and organic product. However, locally grown hops are not available on the market in Finland and almost all hops are imported from Germany or other central European countries or the USA. Local or “agroforestry beer” might be an attractive product for many “beer connoisseurs”.

The main challenges for implementing this innovation would be to find the markets and make agreements with a small-scale brewery. Another challenge would be to upscale hop production so that micro-breweries would have a guaranteed stable supply of raw material. In a new research project, the Natural Resources Institute Finland has collected close to one thousand old Finnish hop varieties from different provenances in order to select those varieties combining a satisfactory yield and a good taste for beer making (Natural Resources Institute Finland 2017a; 2017b, 2018). In order to take this innovation forward and grow hops in an agroforestry system, we would need more knowledge and research on growing techniques and the effect of tree shade on hop yield and quality.

### **Landscape grazing and fully utilizing the grazing area as part of a viable business operation**

Grazers can be used in landscape management by shaping attractive landscapes. This would create opportunities for rural and farm tourism, for example scenic farm-landscape cafeteria's, hiking trails and touristic routes through the farm landscape. The idea is to create an economic sustainable business model combining wood production from forests and livestock grazing in combination with other entrepreneurial activities (e.g. tourism, Greencare, non-wood forest products, bioenergy, direct sales of farm products).

The main challenges include agreements between the land owner and the owner of the animals, initial investments and the continuity and long-term vision of supporting policies. In order to take this practice forward, networking and information sharing between farmers, land and animal owners should be facilitated. In addition, it would be useful to develop a benchmarking system where the performance of different farms and their activities can be compared.

### **Future plans**

In the Finnish Regional Agroforestry Innovation Network, the plan is to take some of the most promising innovations forward. This can be achieved by active networking, where the Finnish innovation network would facilitate interactions between the farmers and other supply chain actors, for example extension services, processors and retailers. In addition, there exist the possibility of trailing some of the most promising innovations. In Finland, currently there exists no Operational Group related to agroforestry. One idea would be to apply for, and if the application is successful set up a new Operational Group where the most feasible and promising innovations can be tested. Finally, currently there exists no Finnish Agroforestry Association. The Finnish RAIN will consider setting up a Finnish Agroforestry Association, if it turns out during the RAIN workshops that there exists some regulatory or policy barriers for agroforestry implementation in Finland. A Finnish Agroforestry Association should be in a better position to influence decision making and the development of a regulatory framework allowing more successful implementation of agroforestry as a sustainable land use.

References:

- AFINET (2017) Agroforestry Innovation Networks. <http://www.agroforestry.eu/afinet>. Accessed 14 December 2017
- Anttila P (2012) Lapin ilmanlaatu 2000–luvun alussa. In: Peltola R and Sarala P (eds) Pohjoinen puhtaus. Acta Lapponica Fenniae 24, Lapin tutkimusseura. <http://www.lapintutkimusseura.fi/files/Acta%20Lapponica%20Fenniae%2024.pdf>. Accessed 9 April 2018
- European Food Safety Authority (2013) The 2010 European Union Report on Pesticide Residues in Food. EFSA Journal 2013;11(3):3130. 808 pp. doi:10.2903/j.efsa.2013.3130. Available online: [www.efsa.europa.eu/efsajournal](http://www.efsa.europa.eu/efsajournal)
- Natural Resources Institute Finland (2017a) Finnish hops to the world - LukeLEADS. Natural Resources Institute Finland. <https://www.luke.fi/projektit/finn-hops/>. Accessed 10 April 2018
- Natural Resources Institute Finland (2017b) Puutarhan vanhat aromihumalat panimoiden käyttöön. Natural Resources Institute Finland. <https://www.luke.fi/projektit/aromihumala/>. Accessed 10 April 2018
- Natural Resources Institute Finland (2018) Suomalaista pohjoista humalaa markkinoille. Natural Resources Institute Finland. <https://www.luke.fi/projektit/polar-hops/>. Accessed 10 April 2018
- Räty A and Kajalo M (2015) Pohjoisia vihanneksia lautasille. In: Uusitalo M and Peltola R (eds) Pohjoisen uusiutuvista luonnonvaroista kasvua ja kannattavuutta - Agrometsä- ja puutarhatalouden mahdollisuudet Pohjois-Suomessa. Luonnonvara- ja biotalouden tutkimus 24/2015, pp. 90-97.
- Schulman A, Alanen A, Hæggström C-A, Huhta A-P, Jantunen J, Kekäläinen H, Lehtomaa L, Pykälä J, Vainio M (2008) Perinnebiotoopit. In: Raunio A, Schulman A, Kontula T (eds) Suomen luontotyyppien uhanalaisuus – Part 2: Luontotyyppien kuvaukset. Suomen ympäristökeskus, Helsinki. Suomen ympäristö 8/2008, pp. 397–465.
- Uusitalo M and Peltola R (2015) Pohjoisen uusiutuvista luonnonvaroista kasvua ja kannattavuutta - Agrometsä- ja puutarhatalouden mahdollisuudet Pohjois-Suomessa. Luonnonvara- ja biotalouden tutkimus 24/2015.
- Uusitalo M and Laurila M (2015). Metsälaidunnus ja paimenten uusi tuleminen? In: Uusitalo M and Peltola R (eds) Pohjoisen uusiutuvista luonnonvaroista kasvua ja kannattavuutta - Agrometsä- ja puutarhatalouden mahdollisuudet Pohjois-Suomessa. Luonnonvara- ja biotalouden tutkimus 24/2015, pp. 42-55.