

# AGROFORESTRY IN SWITZERLAND – A NON-CAP EUROPEAN COUNTRY

Herzog F<sup>1</sup>, Szerencsits E<sup>1</sup>, Kay S<sup>1</sup>, Roces-Diaz JV<sup>1,2</sup>, Jäger M<sup>3</sup>

(1) Agroecology and environment, Agroscope, CH-8046 Zürich, Switzerland (2) Department of Geography, Swansea University, Swansea SA2 8PP UK (3) Agridea, CH-8315 Lindau, Switzerland

\*Corresponding author: felix.herzog@agroscope.admin.ch

## Abstract

Agroforestry in Switzerland makes up approximately twelve per cent of the country's farmland, with forest pastures, hedgerows and traditional fruit orchards being the most widespread systems. Those traditional agroforestry systems receive policy support due to the ecosystem services they provide, notably for biodiversity and landscape scenery. Under the same subsidy guidelines, also novel agroforestry systems, e.g. combining fruit trees and arable crops, qualify for support. This has allowed a small community of agroforestry pioneer farmers to emerge. The rules for evaluating the ecological quality of agroforestry systems are summarized. Private initiatives are becoming increasingly important, also in relation to carbon sequestration.

**Keywords:** biodiversity; carbon sequestration; ecological quality; landscape scenery

## Introduction

Switzerland is located in the center of Europe, but is not a member of the European Union. It develops its own agricultural policy, which has to fit into the broad framework related to its membership of OECD, WTO and to bi-lateral trade agreements – as does the Common Agricultural Policy (CAP) of the European Union. In this contribution we want to report on: (i) the status of agroforestry in Switzerland, (ii) the policies and market initiatives that support it and (iii) agroforestry innovation in particular for the purpose of carbon sequestration.

## Materials and methods

The current extent of Swiss agroforestry systems was derived from a spatial analysis of the recent land-use statistics (BFS 2015). Forest pastures were selected from all pastures employing open forest involving single tree density derived from the topographic landscape model TLM3d (Swisstopo 2017). The information on policies, market initiatives and innovation stem from literature and internet research and from stakeholder interviews as indicated below.

## Results and discussion

Traditional agroforestry systems are still quite common in Switzerland (Riedel et al. 2012). In all, they make up twelve per cent of the 1.5 Million hectares of farmland (Table 1). Forest pastures are the most widespread agroforestry element. They occur in the Jura mountains, where they are a prominent landscape feature ("Wytweiden", "pâturage boisé", see Buttler et al. 2009) and in the northern pre-alps (Figure 1). Hedgerows as the second most relevant agroforestry type are quite evenly distributed across the farmland. Yet, there are only very few real "hedgerow landscapes" sensu "bocages" as in north-western France or "Knick" in northern Germany. Traditional fruit orchards are a still prominent agroforestry system in the lowlands. Chestnut selva, which formerly were a major source of food and income in south-alpine valleys, are the

least widespread traditional agroforestry system today. Few isolated selva are also maintained in central Switzerland close to the inner-alpine lakes.

In addition, 15 per cent of the Swiss mountain forests are regularly grazed in early summer or in autumn, mostly with cattle (Mayer et al. 2003). This use is controversial and in some regions, the cantonal forest authorities attempt to adapt the forest laws to ban husbandry animals from forests.

Table 1: Extent of traditional agroforestry systems in Switzerland.

Agroforestry system	Description	Location	Area (sqkm)	References
Forest pastures	Pastures (mostly cattle, horses) with isolated trees	Pre-alps and Jura mountains	650	BFS (2015), swisstopo (2017)
Traditional fruit orchards ("Streuobst")	Fruit and nut trees on grassland, mown and/or pastured	Lowlands and hilly regions, often close to villages	222	BFS (2015), cat. 38
Hedgerows	Hedges and small forest islands on farmland	General, on farmland	307	BFS (2009), cat. 58
Chestnut selva	<i>Castanea sativa</i> on grassland, mown and/or pastured	Southern and central Switzerland	17	BAFU/WSL (2015)

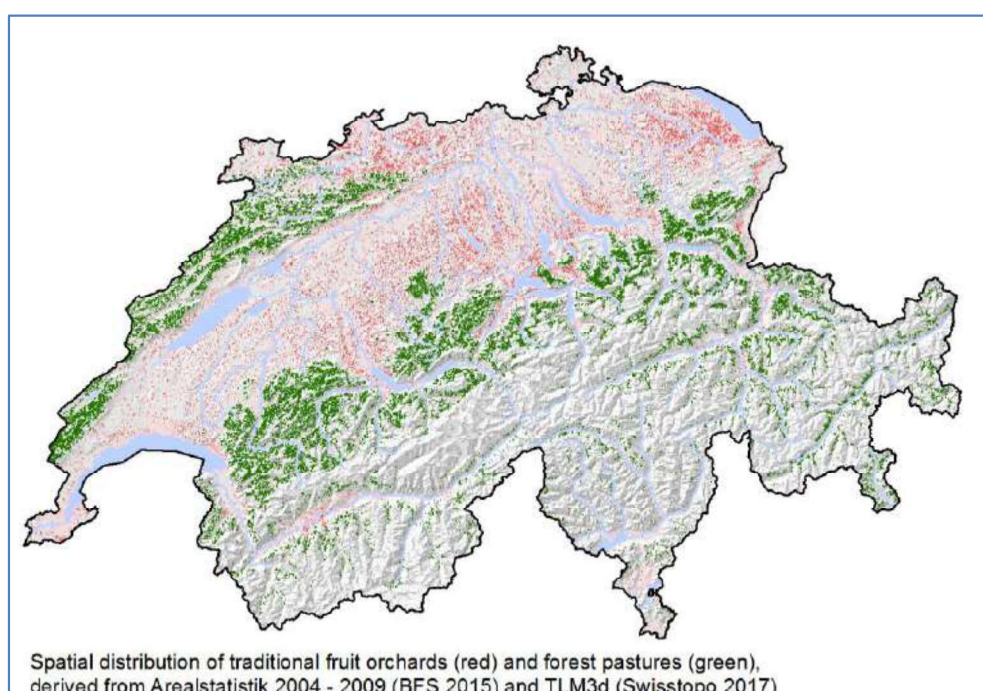


Figure 1: Major traditional agroforestry systems in Switzerland: Forest pastures and traditional fruit orchards (hedgerows and chestnut selva not shown).

The main policies for supporting agroforestry in Switzerland are related to cross-compliance, agri-environmental schemes and landscape quality payments. In fact, since the late 1990ies, farmers have to manage seven per cent or more of their land as ecological focus areas (EFA) in order to qualify for direct payments (cross-compliance mechanism). They can choose amongst 15 EFA types comprising the four agroforestry systems listed in Table 1. For those systems, farmers can obtain additional payments if criteria for ecological quality are met and/or if they participate in regional projects for ecological networks and/or landscape quality. Regional policies of some cantons support those policies with additional programs to maintain characteristic agroforestry landscapes. Additional incentives come from label organizations and market initiatives (Table 2).

Ecological quality criteria have been introduced in 2001 with the main goal to promote farmland target species that have been specified for the different bio-geographical regions of Switzerland (BAFU and BLW 2008). The quality criteria were defined based on scientific ecological evidence in a dialogue with relevant stakeholders (representatives of nature protection NGOs, of farmers, of administrators, of control organisations). They are regularly revised and can be adapted to regional conditions. Landscape quality payments have been introduced only more recently (2014). They aim to overcome the administrative barriers posed by the strict legal separation between farm and forest land, which is particularly relevant for forest pastures. They allow for a more comprehensive promotion for the visual and cultural quality of the landscape.

About ten years ago, Swiss pioneer farmers began to experiment with novel agroforestry systems by combining trees with arable crops. Most of them actually plant fruit trees (Sereke et al. 2015) mostly because they are familiar with such trees (in contrast to forest trees) and because fruit and nut trees are promoted as EFA regardless of whether they are planted in a traditional silvo-pastoral or in a novel silvo-arable system. Farmers can apply for the same subsidies, including ecological quality and landscape payments. The crop rotation usually remains unchanged, which works well as long as the trees are still young. When trees get bigger, however, the combination between fruit trees and crops will become challenging and will need to account for the timing of crop and fruit harvest. In particular, the timing of pesticide applications on the individual components of the system (fruit tree, crop) is challenging, due to the legal restrictions that prescribe e.g. minimum time lags between the last application of a pesticide and the harvest. This will constrain the choice of crops in fruit tree agroforestry systems (Jäger 2016).

Table 2: Policies and market initiatives relating to agroforestry systems in Switzerland. Sources: BLW (2017) and internet sites as indicated.

Agroforestry system	National policies	Regional policies (examples)	Criteria for ecological quality	Private initiatives and market instruments (examples)
Traditional fruit orchards ("Streuobst")	Cross compliance and agri-environmental payments if <120 trees/ha (<100 for cherry, nut and chestnut); landscape quality payments	Additional incentives in cantons that want to maintain and promote the regionally characteristic agroforestry landscapes	≥0.2 ha with ≥10 trees, 30-100 trees/ha, combination with another EFA within 50 m distance	Label production: <a href="http://www.hochstamm-suisse.ch/">http://www.hochstamm-suisse.ch/</a> , <a href="http://www.posamenter.ch/">http://www.posamenter.ch/</a> , <a href="http://www.zugerchriesi.ch/">http://www.zugerchriesi.ch/</a>
Forest pastures			≥6 plant indicator species present on 20% of the area, ≥10% shrub/tree cover with ≥2.5% thorny or species rich shrubs	Regional nature parks promoting local, labeled products
Chestnut selva			As for fruit orchards	Foundations <a href="http://www.sl-fp.ch/">http://www.sl-fp.ch/</a> , tourism related promotion <a href="http://www.bregaglia.ch/de/kastanienfestival">http://www.bregaglia.ch/de/kastanienfestival</a>
Hedgerows	Cross compliance and agri-environmental payments for hedges with 3 m grassland buffers on both sides	n.a.	≥2 m width (woody component) and 3 m grassland buffer at both sides. No invasive species, ≥ 5 shrub or tree species per 10 m length, ≥20% of thorny shrubs or one native tree every 30 m (stem perimeter ≥170 cm at 130 cm above ground)	n.a.

The Swiss Federal Office for Agriculture (BLW) and two private foundations support the national agroforestry community ([www.agroforst.ch](http://www.agroforst.ch) / [www.agroforesterie.ch](http://www.agroforesterie.ch)) by funding extension and monitoring activities. In addition to the above mentioned ecosystem services related to biodiversity and landscape, they want to learn more about the potential of agroforestry to sequester carbon for climate change mitigation. Regular measurements (Kuster et al. 2012) revealed that in 2017, an apple orchard planted with 100 trees per hectare in 2009 had sequestered 1.2 t of carbon per hectare in the tree biomass and another 0.9 t of carbon per hectare in accumulated soil organic matter (Seitz et al. 2017). Alig et al. (2015) compared the potential of 23 different mitigation measures that farmers can implement to reduce their emission of greenhouse-gas by means of life-cycle analysis. Whereas the potential reduction of those measures ranged between zero and thirty per cent, the planting of an apple agroforestry system (50 trees per hectare on 20 per cent of the arable land) would reduce greenhouse-gas emission by up to 110 per cent, accounting only for the carbon sequestered by the trees.

## Conclusion

Traditional agroforestry systems are still relatively widespread in Switzerland and are supported by direct payments due to the ecosystem services they provide. The same payments are also available for novel agroforestry systems, as long as fruit and nut trees are planted. Agroforestry with other tree species potentially provide similar ecosystem services and extending the payments to forest trees might facilitate the uptake of novel agroforestry systems in Switzerland.

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