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Introducing trees in Dutch dairy and poultry farms

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Implications

The potential of free range areas and grassland on organic farms for performing natural behaviour and offering natural feed is not fully utilized yet. Moreover, there are also chances to be picked up for enhancing biodiversity, carbon fixation and mineral cycling. For example, Dutch organic and free range poultry farms together have 2300 ha range area available. In dairy farms this area is much larger. Challenges on goat and cow farms are a natural enrichment of the ration of the animals and making larger areas of the meadows attractive by providing natural shelter against bad weather. We try to "solve" these problems by introducing forestry in animal production and designing silvopastoral systems. Silvopastoral systems, which are the combination of trees and livestock, are applied traditionally already long times in "low input systems" in Africa (Torres, 1983) and in Mediterranean countries (Olea and San Miguel-Ayanz, 2006). Trees introduced on purpose in more intense livestock production systems in northwestern Europe is rather new (Horsted et al., 2012; Philips, 2002).

Background and objectives

The aims of the poultry farms in network "Trees for Chickens" are providing natural shelter, increase animal welfare, increase the area used by the animals, spread minerals, increase biodiversity and discourage water birds to use the free range area because they are risk species for avian influenza virus. The aims of the goat and cow farms in the network "Fodder Trees" are the nutritional value of several tree species (and willow clones) and how to mechanize the harvest. In both networks also the use of tree products for biomass in wood stoves, litter in stables and /or juice for human consumption are considered. With such applications we try to get the most of the combination of trees and animal husbandry, also in economic sense.

Key results and discussion

In "Trees for Chickens" very recently (early 2013) 3 farms planted fruit trees, 2 farms willow and 3 farms miscanthus, so results are not available yet.

In "Fodder Trees" one goat farm planted willows, another goat farm planted a combination of willows, alder, hazelnut and robinia, one dairy cow farm planted a combination of willows and ash and another cow farmer has a wooded bank which consists of 13 tree species. We have experience now with the performance of several willow clones and with "willow silage", which is being fed to dairy goats in winter.

The willow clones were Sven, Klara, Gudrun and Tora. The total dry matter production of wood and leaves and the percentage leaves for the year of planting (2011) and the year after is shown in Table 1. Of the four willow clones, Sven and Klara were most productive and Gudrun had the biggest leaves.

Table 1: Dry matter production and portion of leaves in willow clones

Clones	2011 (1 season growth)		2012 (1 season growth)		2012 (2 seasons growth)	
	DM-yield	% leaves	DM-yield	% leaves	DM-yield	% leaves
Sven	5.031	26%	4.590	33%	19.133	21%
Klara	4.745	22%	5.818	31%	23.576	16%
Gudrun	1.176	45%	4.142	34%	13.329	23%
Tora	3.337	24%	7.294	25%	15.390	24%

In terms of protein and mineral content all the different trees have potential but the in-vitro digestibility is in general lower than 65%. Possibly the results of the in-vitro digestibility are negatively affected by the content of tannins or other secondary metabolites in the leaves, while in vivo this would be less of a problem since goats can break down certain secondary metabolites. Moreover, dairy goats select the best digestible parts under "free choice conditions", which means a digestibility of the intake till about 75% (Oosting, personal information). For receiving additional information on digestibility, observations on young dairy goats in a nature area have started. Behavioural observations on one of the farms (Meir, 2012) showed that goats preferred willow above roughages, but there was no preference between willow and concentrate. Goats preferred leaves and young parts of twigs, then bark and older twigs.

How work was carried out?

The farmer groups informed themselves by visiting different agroforestry sites in The Netherlands, Flanders, UK and Germany. Together they decided who was going to plant what. Plantations were realized on 4 dairy farms (Apr 2011 - Febr 2013) and 9 poultry farms (Apr-May 2013). DM-production was determined by harvesting a surface of 3 x 1.125 m at a stubble height of 0.30 m. Leaves were separated from woody parts and weighed separately. From both leaves and woody parts the DM-percentage was determined. In-vitro digestibility was determined according to Tilley and Terry (1963). The observations on the behaviour of 21 dairy goats were done during a choice feeding test inside their stable. Freshly harvested willow branches were offered either with concentrates or roughage (grass and maize silage).

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