



Fodder trees for micronutrient supply in grass-based dairy systems

Multiple advantages for biodiversity and animal welfare
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Why plant trees?

In order to meet the CAP (2014-2020) demands for a low carbon and climate resilient economy, it is necessary to create sustainable farming systems by reducing dependency on external feed inputs, and to sequester carbon on the farm.

Currently, Dutch dairy farms usually feed their cattle with a combination of spring/summer grazing and imported maize silage and/or concentrates. Incorporating fodder trees in dairy farms can be a good alternative option to maize silage and concentrates, and for supplementing cows with macro and micro elements. In this leaflet, focus is placed on selenium, as it has been found to be lacking in the diet of grass-fed ruminants in the Netherlands.



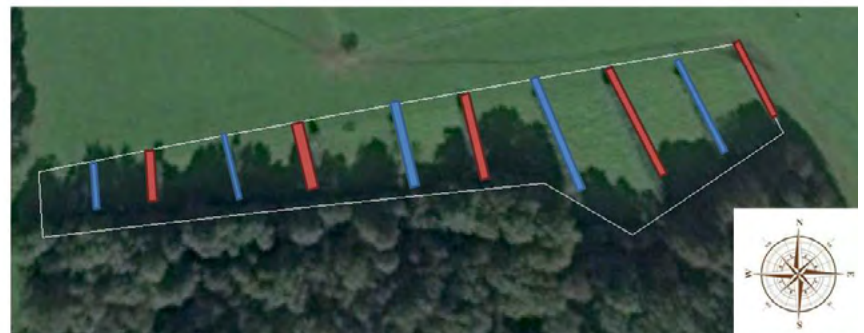
Selenium intake from grass, shown as a percentage of the total cattle nutrient requirements for dry and lactating cows. The 'deficit' represents the percentage that is normally covered via mineral supplements.



Cow and calf browsing from willow fodder trees Ref: Louis Bolk Institute

Where, how and which trees to plant

Historically, trees were planted as borders of hedgerows or wood-ed banks. However, trees can also be planted within the pasture. If tree rows are planted in a north-south direction, the shade effect is minimized. This design offers the highest amount of available tree leaves for browsing and is relatively easy to manage. Choosing tree species that are fast growing, high in leaf mineral content and compatible with the Dutch climate is essential. Willow trees (*Salix sp.*) and nitrogen fixing alder trees (*Alnus glutinosa*) are a good match for the Netherlands temperate climate, as they grow quickly and are richer in macro and micro-nutrients than grass. Also, varieties that branch out widely, providing many young twigs within browsing height, are good choices for



Trial field at 'de Kerkhoeve' farm. Red lines represent willow trees, and blue lines represent alder trees, planted in twin rows with 24 m between rows and 20 cm between trees



Twin rows of willow trees during a browsing experiment with dairy cows. The willows are planted on a north-south axis. In the back, an enclosure was constructed (behind the bamboo stick), where the cows were not able to browse. This picture shows the difference between browsed trees (in front of stick) and protected willow trees.

Advantages

Incorporation of trees provides animals with shade during spring and summer grazing. Animal welfare is a significant factor in shaping consumers' choice of livestock products, so this brings benefits, both for the animal and possibly to the income of the farmer.

Willow and alder trees are valuable additional sources of nutrition. On our test site, the dairy cows preferred to browse on willow trees. Although the intake rate was low, the fodder trees provided a natural source of macro- and micro-nutrients. Willow leaves are particularly high in selenium and zinc.

Planting trees assists in building a low carbon and climate resilient economy. Trees enhance carbon sequestration, nutrient cycling, soil drainage and soil stabilization. Four years after planting, we measured an increase in soil organic matter of 0.5% under willow and 0.3% under alder tree rows. Also earth-worm biomass increased by 52% under alder tree rows.

Diseases and pests

Infestation with diseases or leaf beetles can be an issue for both willow and alder. In large numbers, leaf beetles can defoliate the tree, and make it less attractive for browsing. Natural enemies like ladybirds, parasitic wasps and lacewings often keep pest populations low. Coppicing is a good method to restore vigor to the tree and help it recover from diseases or pest infestation.

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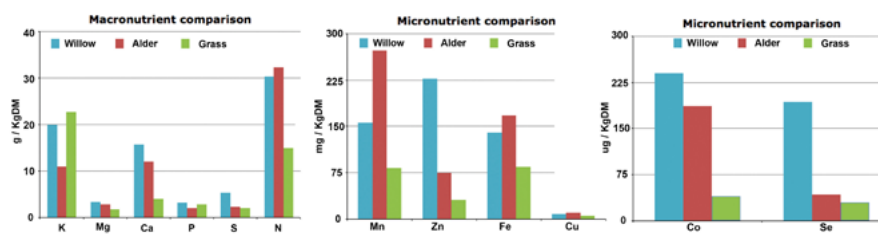
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Willow twigs up to a diameter of 1 cm were browsed by dairy cows. Ref: Boki Luske

Yields of willow

A five year old willow tree, planted in twin rows, produces 1.5 - 3 kg of fresh shoots annually, depending on the variety. Branched varieties produce less biomass, but are more accessible to the cows, which may enhance the intake of macro and micro elements through browsing. Willow and alder leaves have a mineral content that is higher than grass. Selenium content is especially high in willow.



Nutritional value of tree leaves and grass, for: a) macro elements (g/kg DM) and b) micro elements (mg/kg DM) (µg/kg DM).

Tree management

Management of the trees is limited to annual coppice performed immediately before the growing season. The newly grown vegetation is then browsed naturally by the cows. Edible parts of the trees are the leaves, twigs (diameter < 1 cm), and bark. Cows should not be allowed to browse from the trees until approximately two years after planting. This is because cows can inadvertently damage a young tree's growth.

Further information

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