

# COMBINING SHORT ROTATION WILLOW COPPICE WITH FREE RANGE CHICKENS - EXPERIENCES FROM EXPERIMENTS ON FARM LEVEL IN THE NETHERLANDS

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## Abstract

Free-range areas are important for the welfare of laying hens. Chickens are forest animals that try to avoid large open areas. Providing shelter in the form of trees can improve the quality of the free-range area for the chicken. Also trees can provide extra income for the farmer. This paper discusses the results of an agroforestry pilot project in the Netherlands in which short rotation willow coppice plantations were established in four free range areas on chicken farms. Between 2013 and 2016 the farm-level experiences were studied, including planting and management of the willows, effects of chickens on the willows, biomass production, laws and regulations and effects on animal behavior. The project has shown that the combination of free range chickens and biomass production provides multi-benefits for both the environment and the chickens. Introducing short rotation willow coppice proved a cost-effective way to set up agroforestry on chicken farms.

**Keywords:** short rotation coppice; willow; free range chicken; agroforestry

## Introduction

Free-range areas are important for the welfare of laying hens, because they reduce the degree of feather pecking. Chickens are forest animals that try to avoid large open areas. Therefore, providing shelter in the form of trees and shrubs can improve the quality of the free-range area and increase the proportion of laying hens using the area (Bestman and Wagenaar 2003). Planting trees in a free-range area can also provide extra income, because they can produce fruits, nuts, timber and biomass.

In the Netherlands there is an increased demand for woody biomass for the production of sustainable energy in e.g. wood fueled heating systems on farms, public swimming pools or district heating. However, biomass resources in the Netherlands are limited. The establishment of short rotation coppice plantations with fast growing tree species like willow could help to increase the domestic biomass availability. In the Netherlands there is a huge competition for land-use. In 2012 we explored the opportunities for planting short rotation willow coppice in free range chicken areas as a possible win-win combination. This resulted in the agroforestry pilot and demonstration project 'Kiplekker onder de wilgen' ('Happy healthy chickens under the willows').

## Materials and methods

In April 2013 a total of 2.75 ha of willow coppice was planted in the free range areas of four egg production farms (Figure 1). Between 2013 and 2016 the farm-level experiences were studied,

including planting and management of the willows, effects of chickens on the willows, biomass production, laws and regulations and effects on animal behavior.



Figure 1: Locations of the free range chicken farms where short rotation willow coppice was planted in 2013. 1: Schore (0.5 ha); 2: Overberg (1 ha); De Glind (1 ha); Welsum (0.25 ha).

## Results

Per hectare 15,000 willow cuttings of 20-25 cm length were planted with planting machines (Figure 2). After planting it proved to be necessary to fence the willows for 2.5 to 3 months to avoid the hens digging out the cuttings or pecking the young willow leaves. After 3 months the willow shoots were approximately 50 cm high and the hens were let into the willow plantation. Monitoring showed that from this moment on the hens did not inflict any significant damage anymore to the plantation. Also planting large parcels instead of strips proved to reduce the damage by the hens.

The average establishment costs of the plantation including the weed control during the first year were € 4045.37 per ha. Measurements on one farm showed that the biomass production after 3 growing seasons is on average 33 tons DM per ha. The establishment costs and production figures are comparable to the figures of regular short rotation willow coppice plantations. The planned mechanized harvesting of the willows on two farms after 3 years proved to be a problem due to the low carrying capacity of the soils. On one of the farms the willows were manually harvested by an osier trader who uses the shoots to produce decorative woven garden fences (Boosten and Penninkhof 2016).

The willow plantations have proven to be effective in attracting the hens to the range area. Hens are seen on a distance up to 250 m from the stable. More than 75% of the hens are seen outside. The cover provided by the willows also contributes to a better distribution of hens across the free range area (Figure 3). This may reduce the manure load in the vicinity of the stable and the risk of parasitic contamination (Boosten and Penninkhof 2016; Bestman 2017). Research by Bestman et al. (2017) also shows that a higher degree of woody cover seems to be related to less avian influenza risk birds in the free range area.

All farmers in the project are satisfied with the willow plantations because they contribute to the welfare of the hens and improve the appearance of their farm. However, most of the farmers indicate that the amount of work to establish the plantation was higher than initially expected and the revenues during the first 3 growing seasons were lower. Nevertheless they would recommend the planting of willow short rotation coppice to other free range chicken farms.

Moreover, they state that after the first year of establishment the management of the willow plantations doesn't require much work (Boosten and Penninkhof 2016; Bestman 2017).



Figure 2: Site preparation for planting of the free range area on the farm in Overberg in 2013 (left picture) and short rotation willow coppice on the same location in 2017 (right picture).

### Discussion

The pilot project 'Kiplekker onder de wilgen' has shown that the combination of free range chickens and biomass production provides multi-benefits for both the environment and the chickens. The latter result is confirmed by recent experiments in Flanders which demonstrated that free-range broiler chickens have a strong preference for short rotation coppice as a cover compared to open grassland or artificial shelter (Stadig 2017).

Moreover, this combination has proved to be a cost-effective way to set up agroforestry on chicken farms. However, it is advised to establish a minimum of 2 ha of short rotation coppice on a farm in order to have an economically viable biomass production.

In October 2016 the Forest and Timber Action Plan was launched to advocate an extension of the forest area in the Netherlands with 100,000 ha to make a substantial contribution to the Dutch climate goals. The ambition is to realize 25,000 ha of this forest expansion in the form of agroforestry. Approximately 2,700 ha of free-range area is present in the Netherlands on farms that have free-range or organic hens for the production of eggs. This means that agroforestry with e.g. biomass production on free-range chicken farms can provide a substantial contribution to the goals of the Dutch Forest and Timber Action Plan.



Figure 3: Free range chicken using the short rotation willow coppice on one of the farms.

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