

IMPROVE THE EFFICIENCY OF AFFORESTATION BY THE USE OF AGROFORESTRY PRACTICES

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Introduction

In 2015 the Nyírerdő Forestry Corporation has achieved very good results with alley cropping systems used for supporting afforestation in the area of the company's division at Hajdúhadház (Eastern-Hungary). The field trial was an own-initiative of the company, without specific scientific purposes. The original objective was to produce feed for livestock used for hauling and for other forestry related field work. They planted trees intermixed with corn, and during the certification of the plantation an unexpected degree of positive effects on seedlings were observed. Based on the first perspectival results, the company plans to develop the trial in the direction of a participatory research project.

Material and method

The 1 year old agroforestry system had been established in an area of 0,66 ha for reforestation purposes (Figure 1). Planting was completed with the following parameters:

- tree line spacing: 2.5 m
- distance between trees in rows: 30 cm
- species: *Quercus robur*, *Pyrus pyraeaster*, *Tilia tomentosa*, *Betula pendula*
- orientation of alleys: NS (prevailing wind direction: NE)
- crop planting technology: MTZ-82 tractor and two-line drill.

Figure 1: Agro-forestry systems to support reforestation at Hajdúhadház forestry area of Nyírerdő Forestry Corporation.



Planting of trees was arranged in accordance with the parameters provided for reforestation (8,000 seedlings/ha in density). Within the space of 250 cm between the tree rows they sowed corn (Dekalb 4592) in 70 cm wide double-lines, resulting in a 90-70-90 cm spacing of tree and corn lines. The land is non-irrigated and surrounded by a fence. For cultivation of tree rows, plough and some chemical weed control was applied. The corn harvest was done manually. The same management practices were applied for the saplings both in the agroforestry and the neighbouring control areas. During the growing season plants experienced severe droughts twice: once in the end of May and again in July. As the soil is humous sandy which heats up rapidly, strong radiation from the top and the bottom at the same time effects the young plants.

Use of the space between tree lines for the production of feed enhanced the reforestation plot in several ways. The observations from this experience were:

- Trees had lower mortality in the intercrop area compared to the trees in the control plots without intercrop. In the last very dry year, there was no mortification damage caused by drought in the agro-forestry area, while trees of the same age in control areas suffered losses of 50% on account of the drought.
- The deliberately chosen low-growing (max. 160 cm height) corn varieties let pass the right amount of light for seedlings, and at the same time improved micro-climatic parameters as was indicated by the plant conditions.
- The association of trees and crops had a positive effect on intercrop yields as well: the specific yield amount per unit area of corn was close to the average (56 ~ q/ha) of the area, being better than expected considering the non-irrigated sandy soil. At the same time in the nearby control monoculture corn, field plants were dry and graining was very poor. Surface coverage with cultivated plants had a positive effect on growth and health for the seedlings. In the agroforestry plot one year old seedlings have no dried sprouts and leaves, and were taller by 30% compared to the control area where significant part of the plantation suffered damages on account of the drought.

Discussion

Preliminary results points to the fact that the use of the intercrop can significantly increase the efficiency of artificial forest regeneration, reduce drought damage and improve seedling survival. Additionally, covering of free spaces between tree lines with intercrop provides further benefits such as forage production and ecosystem services that result in resource efficiency and economic benefits.

However, these are only preliminary results and must be used with caution. Experiment will be repeated in 2016. Examination will be extended on microclimate conditions, as well as more detailed phenological observations are planned to be made.

Additionally, further development of agroforestry areas is foreseen. The forestry company plans to intercrop corn in the first three years in more reforestation plots, by using the same method as described in this paper. The stand will be supplemented by more species eg. blackthorns (*Prunus spinosa*), hornbeams (*Carpinus betulus*) and wild cherries (*Prunus avium*) in order to comply with the national regulations by increasing tree diversity.

The participatory experiment will be implemented in cooperation of the Nyírerdő Forestry Corporation and the University of West Hungary.