Shelterbelt of fast growing tree species for mitigation of wind erosion and carbon sequestration in an open landscape of northeast Germany

Scientific work objectives and associated work packages (2010 to 2014)
- Monitoring yields of SRC and annual cultures
- Economic accounting of windbreaks effect
- Monitoring of climatological characteristics
- Carbon inventories after 4 years
- Monitoring of biodiversity (arcsine)

This project is financed by the Volkswagen AG. It is part of the larger framework ‘Biomassee für Sonnich’ wherein the federal states of Lower Saxony, Hesse and Brandenburg and the Volkswagen AG join forces to achieve new knowledge for the development and introduction of synthetic biofuels. This poster presents selected results. Carbon inventories after 4 years and monitoring of biodiversity (arcsine) are still in progress.

Trial area and approach
At the study site in Casowice (county Luxemburg, NE Brandenburg) a short rotation coppice plantation (SRC) was established by the CHOREN Industries GmbH in spring 2010, dividing a 90-hectare field in north-south direction, the main wind direction being west.

The shelterbelt of SRC has a width of 40 m and a length of 800 m. Different tree species and clones as well as different planting densities were considered (see figure 1 - 2). The aim was to manage the middle part of the shelterbelt with wider spaced poplars in a medium rotation (5–8 years) while its edges, composed of densely planted poplars and willows, should be harvested in a short rotation (3–4 years), in order to provide a continuous (but not identical) windbreak effect on the leeward adjacent arable land.

Discussions with participating farmers made clear that the acceptance of strip-cultivation of energy wood by the use of tree clones having higher planting density, as the poplar clones were planted in the peripheral areas of the shelterbelt (see figure 3), is never the entire strip to be harvested. Deviation from the original schedule, however, was harvested the entire northern part of the shelterbelt in February 2014.

Willow clones with higher planting density, as the poplar clones were planted in the peripheral areas of the shelterbelt (see figure 2). The central part of the strip consists of three clones of poplar designated for a management in a longer rotation cycle (5–8 years). They were planted in single row layout.

In contrast to this, the dense edge areas of the shelterbelt were planted with a double row pattern, and shall be managed in a short rotation cycle (3–4 years). This layout should ensure a durable wind protection for the leeward adjacent area, because it’s never the entire strip to be harvested. Deviation from this original schedule, however, was harvested the entire northern part of the shelterbelt by the Energy Corps GmbH in February 2014.

Willow clones in it’s center with a longer rotation cycle still grow.

The determination of the wood increments in the shelterbelt is done by using clone-specific biomass functions that were created in the project BIODEM at the University-Eberswalde (see figure 5). When creating the functions is in principle to proceed as follows:
1. Individual shoots with different diameters are taken from each clone.
2. Determination of shoot weight and diameter at 100 cm height. Calculation of the base area of each tree.
3. Preparation of the biomass function (base area to shoot weight).

Biomass functions are clone specific and only valid for the particular plant spacing and the respective rotation. While determining the increments of the trees in the shelterbelt the base areas from all shoots on plots per clone on 4 transects were measured and were used in the existing functions, considering the number of trees per unit area.

To capture climatological parameters (air temperature, wind speed, wind direction, precipitation, air temperature) four monitoring stations were established in 2011 leewards to the shelterbelt (5, 20, 50 and 100 m distance from the belt). With a point inclusion of climatological parameters on 15/09/2013 differences in wind speed and wind direction were observed (see figure 6). The wind speeds at the stations 5 and 20 m to the strip were significantly lower than at the stations positioned further away. It is assumed that this is due to the influence of the wind strip.

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Volkswagen AG
Konzernforschung, Antriebstechnik, Kraftstoffe

June 2014