

Potentials and limiting factors of biomass energy – Estonian Experience of Short Rotation Forests.

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The willows production potential studies in Short Rotation Forest have revealed a lot of interesting information during last decades. The pioneer country of willow plantation for energy purposes, Sweden reported in 80ths that in South-Sweden climate it was possible to achieve annual willow production of 20 t of dry shoot biomass per ha per year (e.g. Christersson, 1986). Later on these figures decreased by one fourth even for plants without any visual damages (e.g. Verwijst et al. 1995). Furthermore, in plantations with sufficient water and nutrient supply next to wastewater outlet points the annual production of willows was reported to be around 10 t ha⁻¹ (e.g. Aronsson et al 2002). Such large variability is mainly caused by the age and environmental conditions of plantation under investigation. Even if the study methods and research areas are the same throughout the years the yield numbers vary from year to year and depend on the planted clone. The highest annual productivity of 24 t ha⁻¹ in Estonia was estimated one year for one clone of *Salix dasyclados* (for details Heinsoo et al 2002). However, the average annual production of the same clone/plot over the whole rotation cycle was 15 t ha⁻¹. Overall average productivity of the same plantation during the same rotation cycle was 11 t ha⁻¹ and 5 t ha⁻¹ for fertilised and non/fertilised plots, respectively. Therefore we conclude that willow shoot production in Short Rotation Forests depends on different biological factors with the most important by our expertise listed (not in the order of importance):

- plantation size
- plantation age
- planting material suitability for local climate conditions
- water availability
- nutrient supply
- pathogens existence
- soil type.

Beside biological barriers for biomass production in the SRF there exist also a lot of other non-technical barriers having an influence on the feasibility on the biomass production for energy purposes. Quite many of them are typical not only for Estonia but according to our practice with different international applied research projects in the other countries starting with SRF management as well (for example www.biopros.info). Some of these can be overcome with the longer expertise on regional level by producers themselves and some need special support activities from authorities:

- uneven availability of planting material
- absence official cutting producers
- high planting cost
- fertilisation limitations do not give any specifications to energy crops
- unequal land usage subsidies available
- lack of training system for farmers
- know-how dispersion
- uncertainty of the production market.

There are also some technical barriers that limit today acceleration the biomass production from Estonian SRF that should be solved by the local scientists and specialists with the support on governmental level:

- lack of local planting material
- absence of suitable machinery for both harvesting or planting

Despite all this problems and shortages in SRF management of Estonia, we have got a great public interest so far, both by the farmers and the entrepreneurs of distant heating systems. Furthermore, in January 2007 Estonian Parliament approved the biomass and bioenergy usage development plan for 2007-2013 where the role of SRF for biomass production is pointed out. Therefore we assume that the area of SRF in Estonia will continue rapid growing during next years and in the long-run it has a future in the Estonian energy market.