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Evaluation of a willow system for wastewater treatment and energy crop production in Norwegian climate

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Wastewater treatment systems based on evapotranspiration such as willow systems have been studied for many years in Scandinavian and some European countries. The application of wastewater to energy crops is seen as an attractive alternative in the purification process of wastewaters because the irrigation permits not only to increase the biomass production, but also generate local environmental benefits such as increased soil fertility and reduced nutrient leaching, besides it permits to recycle some of the resources contained in the wastewater particularly the non-renewable resources like phosphorus. The aim of this study is to give an overview of the condition of the willow treatment system located at the energy farm of Eidsalm in Brandbu – Norway, which was built to serve a total of 12.7 PE, but since the beginning has been serving just 5 PE with an average flow of 25 m^3 per month. In order to analyze the willow system performance, several investigations were carried out during seven months (January - August) concerning treatment efficiency, operation and maintenance. A willow system has essentially no outflow and the water is accumulated during the winter and evaporated during the growing season. The water in the system has a long retention time and equilibrates with the soil and plant uptake. Thus, the results from the analyzed water samples indicate high removal efficiencies of nitrogen and phosphorus, 79% and 98% respectively and removal efficiency for COD of 92%, leading to the conclusion that the system does not represent a sanitary risk, even if outflow should occur. Soil samples showed that the substrate meets the requirements of the Sludge Directive 86/278/EEC and can be spread in agricultural fields as a fertilizer. The willows are harvested, chipped and used for heating purposes. The amount of energy harvested per year is estimated to 7000 KWh. Recommendations to improve the willow system performance in a Norwegian climate is given.

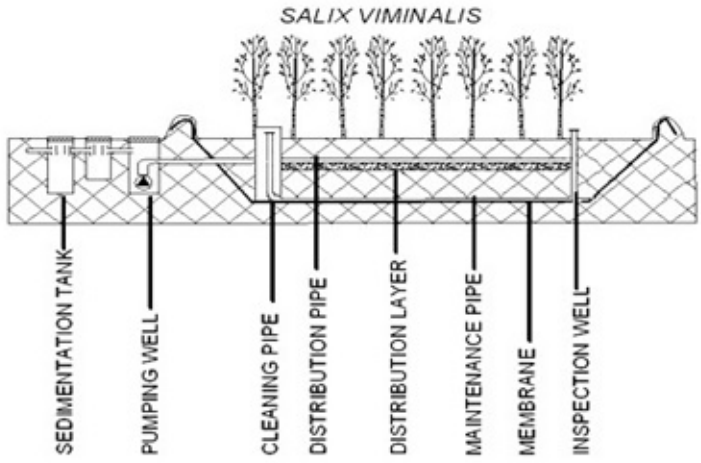

Figure 1: Diagram of a closed Willow system (modified from Gregersen, *et al.*, 2003).

Biography

Verónica Vela Vela is a Colombian student with a Bachelor's degree in Applied Ecology and has just finished a Master's degree in Environmental Engineering with a specialization in wastewater treatment. Her Master's thesis based on natural systems in cold climate elucidates new, environmentally friendly, pathways for rural households where nutrients can be recycled and bioenergy produced. Her MSc thesis was entitled: Evaluation of a Willow System for wastewater treatment in Norwegian climate was conducted at Eidsalm, the energy farm, in Brandbu – Norway.

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