WATER USE EFFICIENCY OF BIOENERGY CROPS ON DEGRADED SOILS IN SOUTHERN BRANDENBURG – A COMPARISON BETWEEN BLACK LOCUST AND GIANT KNOTWEED

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The cultivation of fast-growing trees and new bioenergy crop for biomass production is an alternative land-use for marginal and degraded lands. Southern Brandenburg, NE Germany is characterized by large areas of recultivated former open-cast mining with low nutrient content and limited ground water resources. As the availability of water influences also the biomass production significantly, a central role is played by the optimisation of these processes through the species selection. For the understanding of the governing processes of an efficient water use in agricultural systems it is important to develop a crop growth models for predictions of biomass production under various water regimes. Therefore, we compare the water use efficiency (WUE) of two bioenergy crops: a) Robinia pseudoacacia L. and b) Fallopia sachalinensis. As an early successional and nitrogen-fixing tree species, black locust grows rapidly even under unfavourable site conditions in the former mining sites, while the Giant Knotweed is characterized by a high annual biomass production and can be harvested 2-3 times during the growing season. For the determination of transpiration-yield relations at whole plant level we used a new modified wick lysimeter system, which allows us to study plant growth under controlled water regimes (well-watered, moderate, drought). The lysimeters are filled with a loamy sand. Water is supplied by an automatic drip irrigation system and water amounts is controlled by the actual evapotranspiration and water demand of the plants. Transpiration is calculated on the basis of water input, storage and drainage in daily intervals. The ecophysiological response of the plants to drought stress is investigated by using a portable gas exchange system with a minicuvette chamber, which allows the measurements of net photosynthesis and transpiration under various light, temperature and air humidity regimes. WUE of the plant level have been linked to their ecophysiological performance.