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Paludibiomass for energy generation: exemplarily results

Biomass harvested from paludiculture can be used for many applications such as construction works, raw materials, and bioenergy. Recently, the utilization of wetland plants for biogas generation has received much attention as a potentially cheap and efficient renewable energy source. However, the specific methane yield of wetland plants depends on harvest time and plant species and is generally lower than that obtained from the conventional feedstock, such as maize silage. Therefore, wetland biomass is unlikely to replace the maize silage completely; however, with methane productivity comparable to swine manure, it can be exciting co-substrate in wet fermentation technology. The energy efficiency of biofuel production, including biogas production, cannot be considered only in terms of the amount of energy produced. Investors and operators of biogas plants should consider the entire process beginning from the preparation of the feedstock, the operation of the installation, and the management of post-production residues. Cultivation of maize is associated with the risk of increased erosion, N₂O emissions, and eutrophication. High-yielding maize requires a substantial supply of nutrients, especially nitrogen, and significant external inputs of energy, coming primarily from fossil fuels. In contrast, biomass harvested from paludiculture requires neither the energy input for cultivation nor the fertilizer application. The choice of biogas production technology is also crucial. A comparison of dry and wet anaerobic digestion technologies used in biogas production from wetland biomass pointed to the advantage and more significant (by several percent) energy efficiency of dry fermentation technology due to less energy demand. Biogas production serves not only as an energy source but also as a source of high-quality soil amendment. The post-fermentation sludge (digestate), a by-product of anaerobic digestion from the biogas plant, is characterized by high ammonium-N and organic matter content. The use of digestate obtained by anaerobic digestion processing of biomass harvested from wetlands as a substitute for mineral fertilizers allows to decrease mineral fertilization and to sequester part of the carbon in agricultural soils. All these benefits may be achieved by adequately organized biogas production process, assuming a short distance between the biogas plant and biomass harvesting and an equally short distance of the biogas plant from the fields fertilized with digestate. All these assumptions may cause that the biogas plant operating on the biomass obtained from wetlands may turn out to be a profitable investment.