

## Biogas from Cover Crops and Field Residues: Effects on Soil, Water, Climate and Ecological Footprint

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**Abstract :** Cover or catch crops have beneficial effects for soil, water, erosion, etc. If harvested, they also provide feedstock for biogas without competition for arable land in regions, where only one main crop can be produced per year. On average gross energy yields of approx. 1300 m<sup>3</sup>; methane (CH<sub>4</sub>) ha<sup>-1</sup> can be expected from 4.5 tonnes (t) of cover crop dry matter (DM) in Austria. Considering the total energy invested from cultivation to compression for biofuel use a net energy yield of about 1000 m<sup>3</sup>; CH<sub>4</sub> ha<sup>-1</sup> is remaining. With the straw of grain maize or Corn Cob Mix (CCM) similar energy yields can be achieved. In comparison to catch crops remaining on the field as green manure or to complete fallow between main crops the effects on soil, water and climate can be improved if cover crops are harvested without soil compaction and digestate is returned to the field in an amount equivalent to cover crop removal. In this way, the risk of nitrate leaching can be reduced approx. by 25% in comparison to full fallow. The risk of nitrous oxide emissions may be reduced up to 50% by contrast with cover crops serving as green manure. The effects on humus content and erosion are similar or better than those of cover crops used as green manure when the same amount of biomass was produced. With higher biomass production the positive effects increase even if cover crops are harvested and the only digestate is brought back to the fields. The ecological footprint of arable farming can be reduced by approx. 50% considering the substitution of natural gas with CH<sub>4</sub> produced from cover crops.

**Keywords :** biogas, cover crops, catch crops, land use competition, sustainable agriculture

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