

MAIZE PRODUCTION FOR ENERGY PURPOSES - THE EMISSION LOAD

Jaroslav BERNAS¹, Jan MOUDRÝ jr.¹, Zuzana JELÍNKOVÁ¹,
Marek KOPECKÝ¹, Petr KONVALINA¹, Jan MOUDRÝ¹

e-mail: bernasj@seznam.cz

Abstract

The trend of increase in energy consumption has been recorded in a civilized society. Fossil fuels are the main sources. However, their world's reserves are limited. Therefore, developed countries pursue the possibilities of substituting for them. The solution may be renewable energy resources. Besides water and solar energy, biomass has the greatest potential. Its combustion, but also the transformation into biogas - a mixture of methane, carbon dioxide and other minor gases - are the most common possibilities for its use. Biogas produced by fermentation of plant biomass (phytomass) in biogas stations (BGS) ranks among the promising renewable energy sources. The input material of these stations is not only the biodegradable waste, but especially the phytomass grown on agricultural land. Maize (*Zea mays* L.) has been used most often so far for this purpose due to its high yields and a favorable chemical composition. However, maize production itself and especially technical processes associated with it participate in the anthropogenic emission production that contribute to the greenhouse effect. This article presents the results of monitoring of emission load resulting from the cultivation of maize (*Zea mays* L.) for energy purposes. As a tool for emission load measuring, the simplified LCA method, respectively its *Climate change* impact category, was used. For the calculations, the SIMAPro software and the ReCiPe Midpoint (H) Europe method were used. The input data were determined from the field experiments conducted on the lands of the University of South Bohemia in České Budějovice and supplemented with data from the Ecoinvent database. The life cycle modelling includes the farming phase (field emissions, seeds and seedlings, fertilizers, plant protection products, agrotechnical operations) and the functional unit of the whole process was 1 kg of dry matter of maize. The results show that the total emission load in the maize cultivation (with a total yield of 19.25 t ha⁻¹ DM) is 0.1499 kg CO₂e · kg⁻¹ DM and 0.04496 kg CO₂e · kg⁻¹ GM (at a dry matter content of 32%). The highest amount of the total CO₂e burden comes from the nitrogen fertilizer application (0.06362 kg CO₂e · kg₂ DM) which is used for the fertilization of maize. 405.5 l of methane · kg⁻¹ DM were obtained in survey tests of methane yield on average. 0.3696 · 10⁻³ kg of CO₂e represents the emission load of one liter of methane.

Key words: maize, greenhouse gases emissions, Life Cycle Assessment, crop production