

## **Characterisation of the organic pools in biomass and the related biochemical methane potential (BMP)**

For decades, most of the oil/gas/coal-dependent countries have been promoting new ways of producing energy. More recently, this has been intensified, because it is foreseen that fossil energy sources will be exhausted and the energy prices are fluctuating. Therefore, the Danish government has focused on developing and implementing new methods for sustainable energy production, i.e. wind-farms, biogas and bioenergy. In particular biogas are in focus of the Danish governmental energy policy and in 2009 it was decided to set as a goal that up to 50% of the manure produced in Denmark should be used to produce green energy by 2020. In Denmark the aim is to be independent of fossil fuels before 2050 and more biogas production is expected to contribute to reach this goal. Fossil fuel consumption increase greenhouse gas (GHG) concentration in the atmosphere, therefore, fossil fuel consumption in EU must be reduced to reach the EU target of 90% reduction in greenhouse gas (GHG) emissions by 2050. Biogas production and recycling of digested biomass can contribute to reduction in fossil fuel consumption and GHG emission from agriculture. Biogas production is one of the most eco-friendly and cost-effective technologies for reducing global warming, producing energy and fertilizer. This can contribute to a solution to the manure problem Denmark is facing, and at the same time improve the energy independence of the country. Both biogas production and GHG emissions are related to the content and composition of organic matter in the biomass. A highly efficient biogas production process consuming large quantities of easily digestible volatile solids will generally give the largest reduction in GHG emissions. A very important knowledge gap in developing efficient and environmentally friendly production chains is the biomass characterisation and linking this to biogas production potential. The characterisation of organic wastes is a necessary step before using in anaerobic digestion. The quantities of different compounds (carbohydrates, proteins, lipids and fibers) and anaerobic biodegradability are important information required to be characterised. The biochemical methane potential (BMP) test is one of the most relevant tests for assessing the biodegradability of waste biomass. However, unfortunately the BMP test is very time-consuming, i.e. it requires at least one month for BMP determination. Using alternative methods for determining the anaerobic biodegradability of biomass must be cost-effective and time-saving. Models using physicochemical characteristics as input data can predict BMP.

The PhD study is expected to contribute to the specific goal which is “Developing analytical methods that enable systematic quantification of biogas production and carbon and nutrient fractions in important biomass categories from livestock farms, crop production etc. This research shall contribute to achievement of the overall goal of the project which is: providing the theoretical and methodological scientific knowledge needed to develop and implement the value chain framework and computational models that can generate valid information. In order to fulfill the overall objective, this study will be carried out with the specific objective of developing a method to characterise the most important organic carbon fractions and the change in fraction size during anaerobic digestion.