

The Project

The **COMBINE** project is based on the successful **PROGRASS** project carried out between 2009 and 2012 and covers four main areas:

■ Demonstration

By means of the mobile demonstration plant, the energy recovery of the envisaged semi-natural grasslands according to the IFBB technology will be demonstrated at four sites in Northwest Europe. For this purpose, harvesting and processing methods will be optimised and standardised to allow the transferability of the **PROGRASS**® approach to future sites. The approach can also be adopted to utilise other "waste" biomass sources such as set-aside meadows, road- and railroad-side grass and even non-grass invasive species such as rush and bracken.

■ Feasibility

During the two-year pilot phase the technical feasibility will be scientifically assessed on the sites of the project partners and at the large scale sedentary plant. A main focus will be the integration of this technology in agricultural economic systems and in nutrient cycles.

■ Sustainability

The impact of the process on the environment is a centrepiece of the scientific research. Complementary economic studies will estimate the socio-economic effects of the approach in the partner regions and therefore contribute to its regional and interregional integration.

■ Capacity Building

The fourth area of the project covers valorisation, i.e. regional and transnational implementation activities and European dissemination activities with the aim to sustainably exploit the approach. Stakeholders in the regional environmental and agriculture sector, territorial authorities, national and European sector agencies, potential investors as well as citizens from the current and future regions are some of the essential **COMBINE** target groups.

Contact

Are you interested in our project? Do you want to keep up with the further „progress of **PROGRASS**“? Then register for our newsletter, bookmark our website, and feel free to contact us! The **COMBINE** team is always interested in getting into contact with potential investors, operators of bioenergy plants, institutions and farms managing grassland which cannot be fully used by conventional methods, regional and local administrations, expert institutions and research units.

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The Partners

COMBINE builds on a multi-stakeholder partnership consisting of bio-energy producers, scientific institutes, counselling agencies and public entities, from different levels and NWE member states:

U N I K A S S E L
V E R S I T Ä T



COMBINE

Converting organic matters from
European urban and natural areas
into storable bio-energy



COMBINE

The energetic utilisation of biomass has an important role for the achievement of the ambitious aims of EU to increase the share of renewable energies, as in contrast to other renewables (wind/PV) it is possible to produce storable bio-fuels. However, at present the energy production from biomass is often:

- economically inefficient (e.g. through an insufficient utilisation of waste heat)
- eco-inefficient, e.g. due to the dominance of maize and the increased risk of soil erosion and nutrient losses
- ethically problematic due to competition with food-production on fertile land and the resulting increase of prices for land and agricultural products

Against this background the project **COMBINE** aims at opening-up of abandoned urban, natural and agricultural areas for the energy production. This will be achieved through the regular, extensive use of these areas and the energy recovery of biomass by means of an innovative concept, which builds on the use of a technology called „Integrated Generation of Solid Fuel and Biogas from Biomass (IFBB)“.

In **COMBINE** four partner regions in the UK, Belgium, France and Germany will:

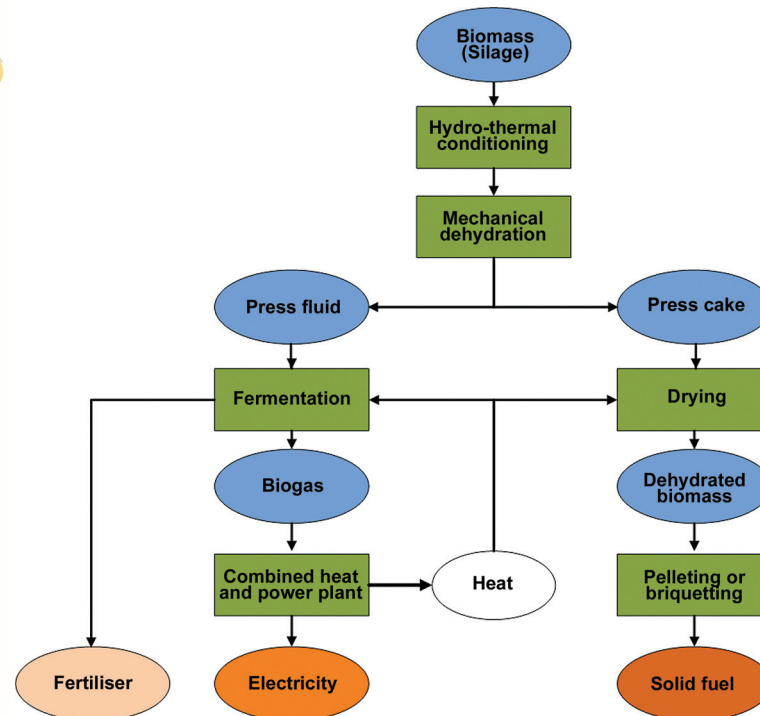
- produce bio-fuels from biomass from extensively used grassland areas and landscape management, which can neither be used in animal feeding nor in conventional energetic conversion technologies
- increase the efficiency of biomass supply chains, through the addition of a year-round heat sink in distributed biogas or AD plants
- create new energy supply chains from biomasses
- secure livelihood for small farmers and disadvantaged persons in remote, rural areas through the creation of new income sources and regional added values with renewable energy production



The Technological Process

IFBB - Integrated Generation of Solid Fuel and Biogas from Biomass

- Silage is first mashed with 40°-60°C warm water
- Separation of the mashed biomass into a solid, fibrous fraction (press cake) to be used as solid fuel, and a fluid, biologically convertible fraction (press fluid) for the production of biogas
- Production of solid fuel with improved combustion characteristics compared to untreated herbaceous biomass fuel (e.g. hay)
- Year-round drying of the press cake and water warming are secured by heat produced in the combined heat and power plant
- The fermentation of the press fluid brings high biogas yield
- The overall energy-efficiency of the PROGRASS approach is superior to conventional forms of grass biomass utilization



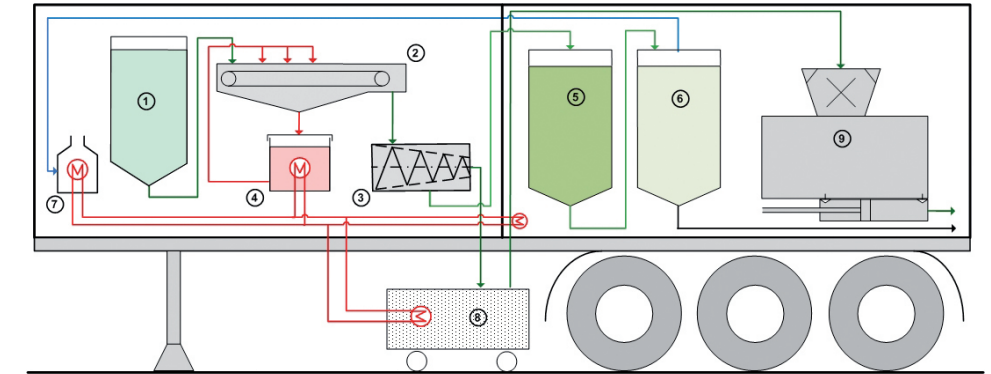
The Prototype

The mobile plant demonstrates the technology in every region of **COMBINE** at four locations in the United Kingdom, Belgium, France and Germany and examines the locally specific biomass. The first large scale sedentary plant in the city of Baden-Baden (DE) is part of the upscale strategy and produces large amounts of solid fuel. Accompanying scientific research is carried out in order to improve the process, to specify quality criteria for silage and fuel, to optimise the ecological and socio-economic impact as well as the feasibility of the concept in a mode of continuous operation.

Technical data of the mobile prototype:

Processing capacity: max. 400 kg of silage per day

Fuel production: max. 90 kg dry matter per day - this corresponds to a biogas yield of 7 kW



1 Biomass storage container
2 Hydro-thermal conditioning
3 Screw press for the mechanical dehydration

4 Mash water container
5 Press fluid storage container
6 Fermenter

7 Biogas burner
8 Press cake dryer
9. Briquette press

