



Biomass energy

Biomass energy is generated from living and recently dead biological material that can be used as fuel. It is the oldest and most commonly used renewable energy source.

Solar radiation falling on the Earth produces light. This is converted by plants and trees into organic materials by photosynthesis, enabling biomass to grow. Sunlight's infrared rays provide conditions for growth so that plants and crops can be harvested in autumn. All kinds of unused organic materials and waste can be burned for energy. Burning biomass does not contribute significantly to the greenhouse effect, as only the carbon recently consumed by the plants during photosynthesis is released into the atmosphere. Moreover, even without burning biomass, nearly the same amount of carbon dioxide would be released into the air as a result of natural decay. Biomass burning does, nonetheless, produce carbon monoxide and soot. The efficiency of such power facilities is poor, due to the fuel's low calorific value, thus the high volume of biomass needed to generate energy makes this a relatively expensive energy alternative.

The main sources of biomass are:

- wood, including firewood, logs or wood prepared for burning in a stove or fireplace; and forest industry waste and by-products such as bark, sawdust and shavings, woodchips, trimmings and other logging residues;



- energy crops, such as miscanthus and other perennial grasses, switch grass, hemp, corn, poplar, willow, sugarcane and oil palm; and
- straw and farming waste, including straw from corn, oil plants and leguminous plants; harvest waste, coconut husks and corn cobs; waste and by-products from the processing industry; and the residues of sugarcane processing.

Biomass can be processed into briquettes, pellets or biofuel:

- Wood briquettes are produced from timber waste, such as sawdust, shavings or woodchips, which are compressed under high pressure. Thanks to the low moisture content, the fuel value of briquettes is higher than that of wood. Also, due to high density relative to volume, the combustion process is slow and gradual. Raw biomass material for briquette production can be any kind of plant or plant waste. Briquettes made from wood are the most important economically and have the greatest trade value.
- Pellets are a highly efficient renewable fuel produced from biomass. They are manufactured using timber waste from sawmills and timber processing companies, as well as from forest waste. The most common wastes are sawdust and wood shavings. It is also technically possible to produce pellets from bark, woodchips, energy crops and straw. The end products are small granules 6 to 25 millimetres in diameter and a few centimetres in length. In the EU, the production of granules from timber waste has risen several fold in recent years. Pellets have been used to heat public buildings and households for many years. The industry is most advanced in Sweden and Austria, which have large forested areas. Pellets have a high energy value and low moisture content (8–12 percent), but contain ash (0.5 percent) and substances that are harmful to the environment. However, the fact that pellets are easy to transport, store and distribute makes them a less harmful source of fuel than many other alternatives.
- Biofuel industries are expanding in Europe, Asia and the Americas (e.g. E10 fuel production). Increased American and European demand has led to the clearing of land for oil palm plantations. In Brazil, alcohol produced from sugarcane is widely used as a motor fuel. During World War I, due to the lack of gasoline, the Russian army's cars and planes were fuelled with a so-called Kazan mixture, a blend of gasoline and ethyl alcohol. Methyl alcohol produced from wood waste is also used as fuel in racing cars and motorcycles. Technically, biomass can be converted into liquid fuel in two ways: by growing sugar crops (sugarcane or sugar beet) or starch (corn/maize), then using yeast fermentation to produce ethanol (ethyl alcohol); or by growing plants that naturally produce oils, such as algae or jatropha. When these oils are heated, their viscosity is reduced and they can be burned directly in diesel engines. The oils can also be chemically processed to produce biodiesel.

Another option involves the digestion of biomass or organic waste in a digestion tank or methane tank and the subsequent use of methane (biogas) to generate electricity for household needs. This method can be used in places where large amounts of agricultural, wood or municipal waste are available, and where there is no permafrost. If it is possible to produce methyl or ethyl alcohol through the fermentation of agricultural or wood waste, it can be used as a motor fuel, either by itself or in combination with other fuels.

Biomass combustion can be used to generate both thermal and electric energy. The burning process generates up to 90 percent of energy obtained worldwide from biomass.

At present, forest firewood, waste timber from the timber industry and straw from farming offer only limited fuel possibilities. Energy crop plantations are being established in order to meet the increased need for biomass for energy purposes.

Energy crops are characterised by a high annual growth rate, high fuel value, high resistance to diseases and pests, and relatively low soil requirements. It is also crucial to mechanise the agro-technical actions involved in setting up a plantation and harvesting crops. Energy crops can be harvested every two to three years on average for a period of 15 to 20 years before rotating with other crops. Research into the production of firewood in special plantations is being carried out in many countries. The Energy Forestry programme, for example, is currently being implemented in Sweden. Forest plantations are being expanded at the rate of 16,000 hectares per year, while the planned total area of energy crops is 800,000 hectares.

Increasing the use of biomass obtained from energy crops requires the creation of a system of production, distribution and utilisation. Efforts should thus be made to establish plantations, organise a fuel storage and distribution system, and ensure effective biomass utilisation. Biomass from energy crop plantations can be utilised for the production of electric or thermal energy, as well as for liquid or gas fuel. All the components of a biomass-based system should be developed simultaneously if production is to be successful. The cultivation of energy plants can help to create new jobs and form the basis of local, independent energy markets.

However, the fact that too often the expansion of energy crops is at the expense of the land used for food production should not be underestimated.