

## Lignocellulosic Biomass for Sustainable Energy: Some Neglected Issues and Misconceptions

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Lignocellulosic biomass (LB) is widely used in the field of renewable energy production because of its low price and easy availability. Many kinds of fuels from LB have been developed and are being used in our daily lives. The LB energy has become an indispensable part in the energy mix on account of its steady and sustainable supply. However, there are some neglected issues and misconceptions regarding its development and utilization, although it has numerous advantages over other energy sources. Firstly, its development and utilization can change the living environment of organisms and decrease biodiversity to some extent, relative to using other sources of energy. Secondly, it is not a completely carbon-neutralized fuel as has been claimed in some literature. Finally, its excessive exploitation can seriously damage the environment and biosystems. This editorial will give a brief discussion on some neglected issues and misconceptions during its development and utilization for its suitable exploitation.

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### Energy from Lignocellulosic Biomass: An Indispensable Part in Energy Mix for Its Sustainable Supply

Lignocellulosic biomass (LB) is the most abundant renewable resource on earth. It has been used as energy since ancient times for heat and light. Only in the 20<sup>th</sup> century was biomass replaced by fossil fuels as the main energy source. With the massive use of fossil fuels, a lot of shortcomings are gradually coming out. The limited resource of fossil fuels and their negative effects on climate change, ecology, and environment render them as an unsustainable energy source. Great efforts have been made in searching for their suitable alternatives to meet the ever-increasing energy demand and maintain the sustainable development of our society. Because it has the advantage of low price and easy availability, LB has aroused our great interest again as a cheap source of raw materials for renewable energy production. At present, many kinds of fuels derived from LB have been developed and used in our daily life. The LB energy has become an indispensable part in energy mix due to its steady and sustainable supply. It also plays an important role in ensuring regional energy security. Because it has these numerous advantages, it is described as a green and clean energy and its negative effects on ecology and environment during its development and utilization have been largely overlooked. It is also claimed as a carbon-neutralized fuel in some literature, even in textbooks. Moreover, LB is treated as an unlimited resource for

energy use, which may lead to its excessive exploitation in some regions and serious damage to the environment and biosystems. Therefore, it is necessary to deal with these neglected issues and misconceptions for its suitable exploitation.

### **Some Neglected Issues and Misconceptions in the Development and Utilization of Lignocellulosic Biomass as a Sustainable Energy**

Use of LB as an energy source is of great importance in meeting the ever-increasing energy demand and improving the environment and ecology around us. Many studies and incentive measures have been taken to support the development and utilization of LB as a sustainable energy. However, there are some neglected issues and misconceptions in the process of exploitation of LB for energy use.

Firstly, the negative effects on the environment are often overlooked when considering the exploitation of LB for energy use. LB used for energy mainly includes agricultural wastes, forestry wastes, and energy crops. Negative effects of large-scale planting energy crops on the environment have aroused attention in recent years. Mono-crop planting can lead to fragile biosystems with single species. Agricultural and forestry wastes are widely regarded as an effective source for energy products, and their ecological value has not received due consideration. These wastes provide food and habitat for some insects and microorganisms in nature. The exploitation of these wastes for energy use naturally affects the growth of these insects and microorganisms and decreases their population quantity, which indirectly affects the plant growth and animal existence and leads to an unhealthy ecological system. Therefore, the ecological value of agricultural and forestry wastes ought not to be neglected when taking them for energy use.

Secondly, LB is often misunderstood as being a carbon-neutralized fuel. It is often stated that CO<sub>2</sub> emission and uptake is equal from atmosphere and it does not increase atmospheric CO<sub>2</sub> concentration when LB is used for energy. This overlooks two facts. One is that the planting, harvesting, transportation, and processing of LB for energy use also consume energy and emit CO<sub>2</sub> to the atmosphere. The other is that LB used for energy and its natural degradation are two different processes. The former generally emits more CO<sub>2</sub> to the atmosphere than its natural degradation. When LB is naturally degraded, this process is slow and some carbon is sequestered in the soil, as in the case of humic acids. Thus, there is a net CO<sub>2</sub> emission when LB is used for energy.

Finally, LB is often mistakenly considered as an unlimited resource for energy use. Although it has abundant reserves and renewable ability, the amount of LB that can be sustainably harvested in an economical way is limited because of its disperse distribution. Besides its energy use, the harvested LB also has many other uses, such as producing high-value chemicals and materials. Therefore, LB is a very precious natural resource. Its energy use should be controlled in a suitable scale because its excessive exploitation may seriously damage the environment and biosystems. In order to meet the ever-increasing energy demand, the LB energy has become an indispensable part of the energy mix. More attention should be paid to the effect of LB energy development on the environment. A comprehensive understanding of the exploitation of LB for energy use and its suitable development are needed in order to maintain the sustainable development of our society.

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