



Land Use for Bioplastics

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There is an ongoing public, political and industrial debate, with wide-reaching implications, on the competition between food, animal feeds and industrial markets for agricultural raw materials. This has created a lot of confusion and insecurity within the bioplastics industry. The German automotive industry in particular has decided not to use bioplastics based on potential foodstuffs such as sugar, starch or edible oil. This article offers some basic facts for this debate, which will be back on the agenda as soon as the world economy recovers and food prices rise again. The bioplastics industry should be well prepared for this debate.

Should we use food crops for bioplastics when people are starving?

This question is really misleading. People have been using agricultural raw materials for energy and materials as long as mankind has been on the earth. It is quite common to use agricultural feedstock for biomaterials and this has been done on a large scale for decades. The additional impact of bioplastics is extremely small.

The reason for hunger is not a shortage of land for food or animal feed production. We have more than enough space to produce sufficient food to feed everybody. And we are producing the food already. The main reasons for hunger are distribution, logistics and financial resources.

Or in other words, mankind is producing enough food and there are still huge areas free or unused. These areas can be used for energy and industrial raw material production without any harm, without any impact on food and animal feed production. Using these areas for energy and industrial materials will provide additional income to many farmers, who will be able to buy food for their families. After all, three out of four poor people in developing countries live in rural areas.

Deciding which crops are cultivated for fuel or industrial use on free agricultural areas should only be questions of efficiency, economy, ecology, sustainability etc. – but not a question of whether this crop could be also used as food or animal feed. This is the wrong question.

Very often food crops are the most efficient industrial crops too, because they have been optimised by selective breeding over the last 50 years. Using less efficient, non-food crops for fuel or industrial materials would mean the inefficient use of farmland.

There is no real reason not to use food crops to produce fuel or industrial materials, especially if they are the most efficient crops for these applications.

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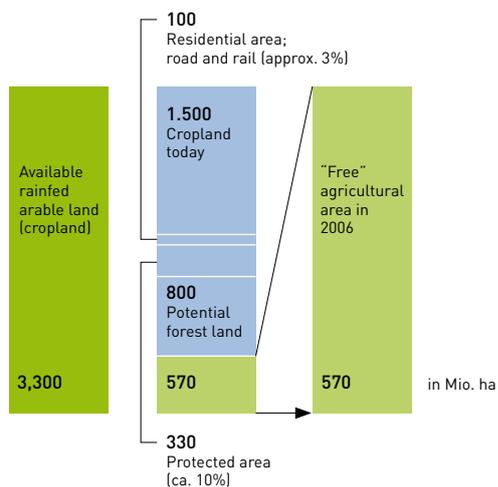
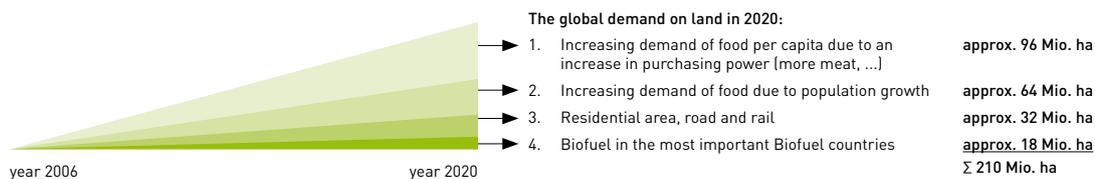


Fig 1: 'Free' potential agricultural area in 2006 and the global demand for agricultural land in 2020

Source FAO 2008, OECD 2007, OECD-FAO 2007, FAPRI 2007, nova 2007, FAO 2000



Availability and use of arable land

There are 3,300 million hectares of naturally irrigated potential arable land available on this planet. They are used for crop cultivation (1,500 million hectares), residential areas, road and rail (100 million hectares), protected areas (330 million hectares) and potential forest land (800 million hectares), so there are still 570 million hectares left. Those areas are in Russia, Kazakhstan, Africa and South America – often far away from any agricultural infrastructure. Until 2020 further huge areas will be put into production for crops, but still 360 million hectares are expected to remain 'free' for other agricultural uses (see Figure 1). To activate this potential, huge investments and reform in rural areas will be necessary.

Even in the European Union about 8 million hectares are free and could be used for bioenergy or biomaterials. Most of this land is located in the new member states in Eastern Europe.

Even more important than activating new agricultural areas is to increase productivity on areas already in use. Modern agricultural processing can increase the productivity up to ten times compared to traditional farming. Even in the European Union there is still much scope for productivity increases. In Romania, for example, yields for most crops are less than 50% of the corresponding yields in the EU-15, despite good quality soils.

As the OECD and FAO state: "Finally, over the longer term, agricultural supply is facing increased uncertainties and limitations on the amount of new land that can be taken into cultivation. Public and private investments in innovation and increasing agricultural productivity, particularly in developing countries, would greatly improve supply prospects by helping

to broaden the production base and lessen the chance of recurring commodity price spikes" [1]

In July 2009 the world leaders pledged to commit \$20 billion over three years for a 'food security initiative' to develop sustainable agriculture in poor countries. Addressing the G8, FAO Director-General Jacques Diouf said, "I am convinced that you will 'walk the talk' not only for natural ethical considerations but also for sound economic reasons and, last but not least, to ensure peace and security in the world" [2]. This commitment will trigger further investment in agriculture and will ease the supply situation.

Some facts about biofuels and bioplastics

From a mass flow perspective, the amount of raw materials used for the production of bioplastics is very small compared to the amount of raw materials used for biofuels.

Different estimates by the nova-Institute show that the impact of biofuels was about 250 times more significant than the impact of bioplastics on food markets, agricultural prices and land competition in 2008.

92% of the cultivated land in the world is used for food and animal feed production, 6% for industrial materials and 2% for biofuels. That means that even the impact of biofuels is very limited. Agricultural land used for bioplastics is less than 0.1%.

Some facts about food prices and recent food price increases

Compared to other raw materials the price increase for agricultural raw materials has been moderate over the last six years (see Figure 2). In inflation-adjusted terms, price levels in 2008 were even much lower than in the 1970s (see Figure 3).

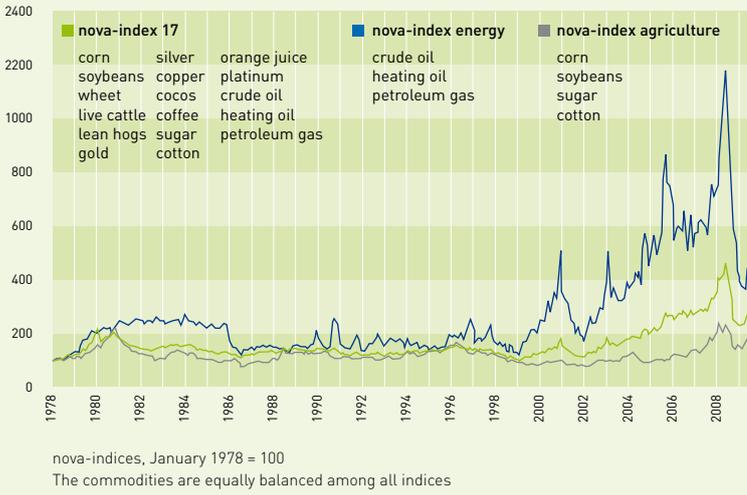


Fig. 2: nova price indices for agricultural and non-agricultural commodities and energy

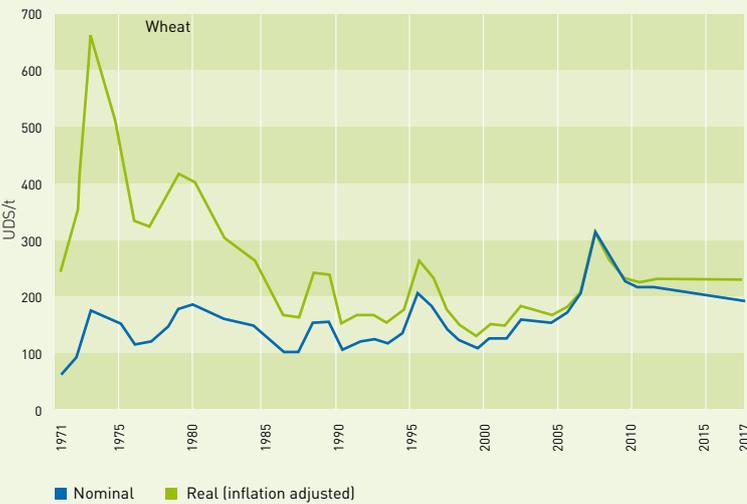


Fig 3: Inflation adjusted price movement of wheat
Note: Real prices deflated by USA GDP deflator; 2007 = 1
(Source OECD-FAO)

“The commodity price spikes witnessed in the last couple of years, and in particular most recently, are exceptional when viewed from the perspective of the last decade or so, but not so much so when seen in a longer historical context ... the recent price spike is neither the only, nor even the most important one to occur in the last 30-plus years. In inflation adjusted terms, today’s prices fall well short of the peaks achieved in the early 1970s, and neither current maize nor wheat prices are averaging much above levels achieved as recently as the mid-1990s” [1].

Until now biofuels have had only a small effect on world food prices. But, while smaller than the increase in food and animal feedstuffs, biofuel demand is the largest source of new demand for decades and a strong factor underpinning the upward shift in agriculture commodity prices.

The medium-term impact of biofuels on crop markets should not be overestimated at least until 2017, having had an influence on cereal and oilseed prices of 3% to a maximum of 10% [3].

Recently the impact of bioplastics has been about 250 times lower than the impact of biofuels, hence lower than 0.1%. Therefore, the impact of bioplastics on the world food market is negligible. Additionally, producing biofuels or bioplastics means in most cases also producing high value protein-rich by-products that can be used as animal feed.

The main driver for the price increase of agricultural products is the fast growing demand for meat and milk products (see Table 1). According to a special Biofuels Digest report, ‘Fat vs Fuel’, 70 % of US corn and soy production is devoted to animal feed, not food for humans, and not fuel. Feed for animals is to provide meat, dairy and other livestock by-products. According to the FAO and the USDA, US meat consumption has increased to 62 kg per person since the 1950s, with a resulting increase in grain usage of 170 kg per person (i.e. the grain which is fed to cattle and poultry). Cheese consumption has increased faster than milk’s decline, and Americans consume an extra 81 kg of milk, which uses up another 29 kg of grain.

	Today	2050
People on our planet	6.5 Billions	9.0 Billions (+38%)
Meat Production	229 Mio. t	465 Mio. t (+103%)
Milk Production	580 Mio. t	1.043 Mio. t (+90%)

Table 1: Increasing meat and milk demand worldwide (Source: Ernährungsdienst 2008)

High prices for agricultural raw materials are good for some and bad for others. Unpredictable movements in food prices can still provide problems in the future. With high prices the consequences in terms of hunger or malnutrition, especially in poor urban areas, will surface. But with low prices the consequences for poor farmers will be disastrous. Until recently, hundreds of millions of farmers could not lift themselves out of poverty because of low food prices. 75% of the world’s hungry people are still living in rural areas and are dependent on agriculture for their livelihoods. Over time, high agricultural prices should benefit them.

In poorer urban areas of the world the expenditure for food makes up, on average, about 50% of an individual’s disposable income. As such, price increases in these regions have dramatic effects. This percentage climbs to 65% if the food prices rise by 30%. In wealthy countries, these effects, on the other hand, will be limited to 1 to 2% of an individual’s income.

Apart from this, the hunger issue is, however, only partially attributable to the demand for biofuels

and is much more attributable to bad policy and the poor performance of the markets [4].

Summary

To sum up, the target should be to cultivate crops that use the land most efficiently for their intended purpose, independently of whether these are food or non-food crops. Even if an increasing share of arable land is used for energy and industrial material use there is still much scope for the expansion of agricultural areas and even more scope for productivity increases. However, biofuels have so far had a very small impact on food prices and the impact of bioplastics was, at 250 times less, clearly negligible. Even if they did have a significant impact, a higher agricultural price level, together with the international commitment to support sustainable agricultural development, is necessary for more investment in the agriculture sector to increase the production and secure the supply in the future. Although high food prices certainly have adverse effects for some, they will lead to the activation of agricultural land that is currently not in production and also to higher productivity on land already cultivated, which would increase the aggregate production of food, animal feed and renewable raw materials. Furthermore, high prices for agricultural products are necessary for poor farmers in developing countries to sustain their livelihoods.

nova-Institute:

Experts of the nova-Institute department 'resource management' are continuously analyzing the raw material markets and especially the markets for agricultural raw materials in industrial applications.

 www.nova-institut.de/nr

Sources:

- [1] OECD-FAO 2008: Agriculture Outlook 2008-2017
- [2] www.fao.org/news/story/en/item/24457/icode
- [3] OECD 2008: Biofuel Support Policies – an economic assessment
- [4] Banse, M., Nowicki, P., van Meijl, H. (LEI Wageningen UR) 2008: Why are current world food prices so high? Report 2008-040.

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In the second, extended edition of the Business Directory for Innovative Biomaterials (BIB 2010) companies in the field of biomaterials are invited to place their innovative products and services. Through the business directory, which is sent with a circulation figure of at least 5,000 copies and as a PDF free of charge to biomaterial decision makers in industries and science, potential customers and matching suppliers can easily get in touch.

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In our understanding, biomaterials comprise materials, which contain at least 20% renewable raw materials. Among these count bio-degradable and durable bioplastics, innovative derived timber products like Wood-Plastic-Composites (WPC) or thermally modified timber as well as natural fibre reinforced plastics. In the centre of attention are manufacturers and suppliers of biomaterials and products made of biomaterials as well as raw material suppliers, mechanical engineering companies, associations and research institutes operating in the wide field of biomaterials.

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