

# Is there enough land for growing energy crops?

One question that often pops up in the debate about bioenergy, and not least biofuels, is the availability of land for energy crops. The EU Commission wants to phase out support for biofuels based on energy crops in their proposal for a revised Renewable Energy Directive for the period 2021-2030.

The background is the idea that there is not enough arable land to produce both food and energy. Svebio's view is that there is no shortage of land that can be used for growing energy crops. Here are some facts about the situation in Sweden, EU, Eastern Europe and the rest of the world.

## Sweden

The Swedish agricultural land covers just over 3 million hectares, of which nearly 2.6 million hectares arable land and approximately 450.000 hectares of pasture land. Out of the 2.6 million hectares, grains are grown on 1 million hectares, forage at just over 1 million hectares and otherwise the land is used primarily for rape seed, potatoes, sugar beets, protein crops and fallow. The cultivated area decreases year by year as the yield increases and the Swedish self-sufficiency in food is reduced. At most, about 50 percent more arable land was cultivated in Sweden than is the case today.

Of the cultivated area, 170.000 hectares is fallow, i.e. uncultivated arable land. In addition, all farmers in the agricultural districts in southern and central Sweden are obliged to allocate up to 5 percent of the land as "ecological focus areas" (greening) such as uncultivated field margins. It is unclear how this area is reported in the statistics.

The largest reserve for increased cultivation of energy crops is however the area cultivated with low yields, mainly arable grassland, only to be kept open so that the landowner may receive support from the EU. That area is estimated to several hundred thousand hectares of the arable grassland area of 1.1 million hectares.

In addition to the reported acreage is the already abandoned arable land. Since 1970, that equals about 400.000 hectares, of which a lot is overgrown by forest plantations. Arable land has also been lost to urban development, roads, etc. A large part of the abandoned land has a low return but may be suitable for planting of trees, which will eventually provide bioenergy.



Abandoned farm land planted with spruce in central Sweden, west of Stockholm. Photo: Kjell Andersson

Finally, new land becomes available for energy crops when the average yield increases on existing acreage, and by the decreased demand for feed crops within the country due to the on-going decrease of livestock farming.

One can summarize the potential for growing of energy crops in Sweden in the following way:

- 170.000 hectares of fallow (plus greening areas of uncertain amount)
- 250.000 hectares of surplus land with grassland
- 150.000 hectares of abandoned fields and pasture land – mainly suitable for woody plants (poplar, willow)

In addition to this we have the areas that will be released in the coming decades, through increased yields, and reduced domestic food needs. The Swedish Board of Agriculture estimates that 900.000 hectares may be used for energy crops in 2050. A recent report from the Swedish Energy Agency states that this amount of land will be available for energy crops already by 2030-2035.

### **Conclusion:**

In Sweden there is potential to increase the cultivation of energy crops on 500.000 hectares or more, with unchanged focus on agricultural production in general, compared with the cultivated area today that is just over 2.5 million hectares. A medium-size ethanol plant requires about 100.000 hectares of arable land. Growing of perennial energy crops may also provide other environmental values, such as improved water quality, increased protection of wildlife on farmland, some carbon storage in the soil, increased domestic production of sustainable protein feed etc.

(Sources: The Swedish Board of Agriculture, the Swedish Energy Agency, Lund University)

## **EU**

EU's agricultural area is 177 million hectares according to the European Commission, of which 100 million hectares are cultivated arable land. 58 million hectares are permanent pastures and 12 million hectares are fruit plantations, olive groves and vineyards. In addition, around 7 million hectares are fallow.

As in Sweden, there is also abandoned arable land outside these areas, and it is uncertain how the so-called "ecological focus areas" are counted for in the statistics. They represent 5 percent of the cultivated area. Both the cultivated area and the total agricultural land is decreasing steadily. From 2013 to 2026, a decline of EU agricultural area of 5 million hectares is expected.

A problem in the statistics is that there is no data on arable land that is not cultivated today, mostly abandoned arable land that is not built on or afforested. The satellite study of abandoned farmland cited under the heading "Eastern Europe" (below) indicates that these areas of abandoned farmland are localized in EU countries: 1.5 million hectares in Poland, 1 million hectares in Romania, 0.9 million hectares in Lithuania, 0.6 million hectares in Latvia, as well as lower shares of abandoned farmland in Estonia, the Czech Republic, Hungary, Bulgaria and Slovenia.

In total, the researchers have mapped around 6-7 million hectares of abandoned arable land in these eastern EU areas. If one takes into account that there are similar problems in other parts of the EU, one can certainly count on 10 million hectares of abandoned arable farmland, which is equivalent to the area that is needed to produce crop feed-stock for about 100 mid-sized ethanol plants.

In addition, the European Commission's Agriculture General Directorate concluded in its forecasts that there will be a considerable grain surplus that will need to be exported, even though the forecast says that there is a constantly increasing production of grain-based ethanol. If the demand for ethanol production would be removed, as in the proposal from the EU Commission, one would need to export close to 40-50 million tonnes, compared to the total output of grains in the EU that is about 320 million tonnes.

Europe's population is increasing by about 0.4 percent per year, but many countries, both in the central, eastern and southern parts of the EU, are today facing a population decline, a trend that will be reinforced due to demographics, low birth rate and emigration.

The increased yield in agriculture can be estimated to at least 1 percent per year. A prudent assumption is that 0.5 million hectares and 0.3 million hectares of pasture land will be available every year in the EU for other crops. By 2030 this will be just over 10 million hectares.

### Conclusion:

There are at least 25 million hectares of cultivated area available for energy crops in the EU by 2030.

- 7 million hectares of fallow (+greening area)
- 10 million hectares of abandoned arable land
- 10 million hectares of land available by productivity improvement by 2030

In addition to this is the possibility that by changing our diet, this would reduce the area used for feed crops and free even more land for cultivation of energy crops; 60 percent of the grain harvest in the EU is used as feed, and 58 million hectares of the EU's arable land is used for grain cultivation. But such change, on the other hand, may be countered by more organic farming, which reduces the acreage yield by 20-40 percent. Therefore, we have not counted the effect of a more "environmentally friendly" diet.

(Sources: FAO, EU-Commission)

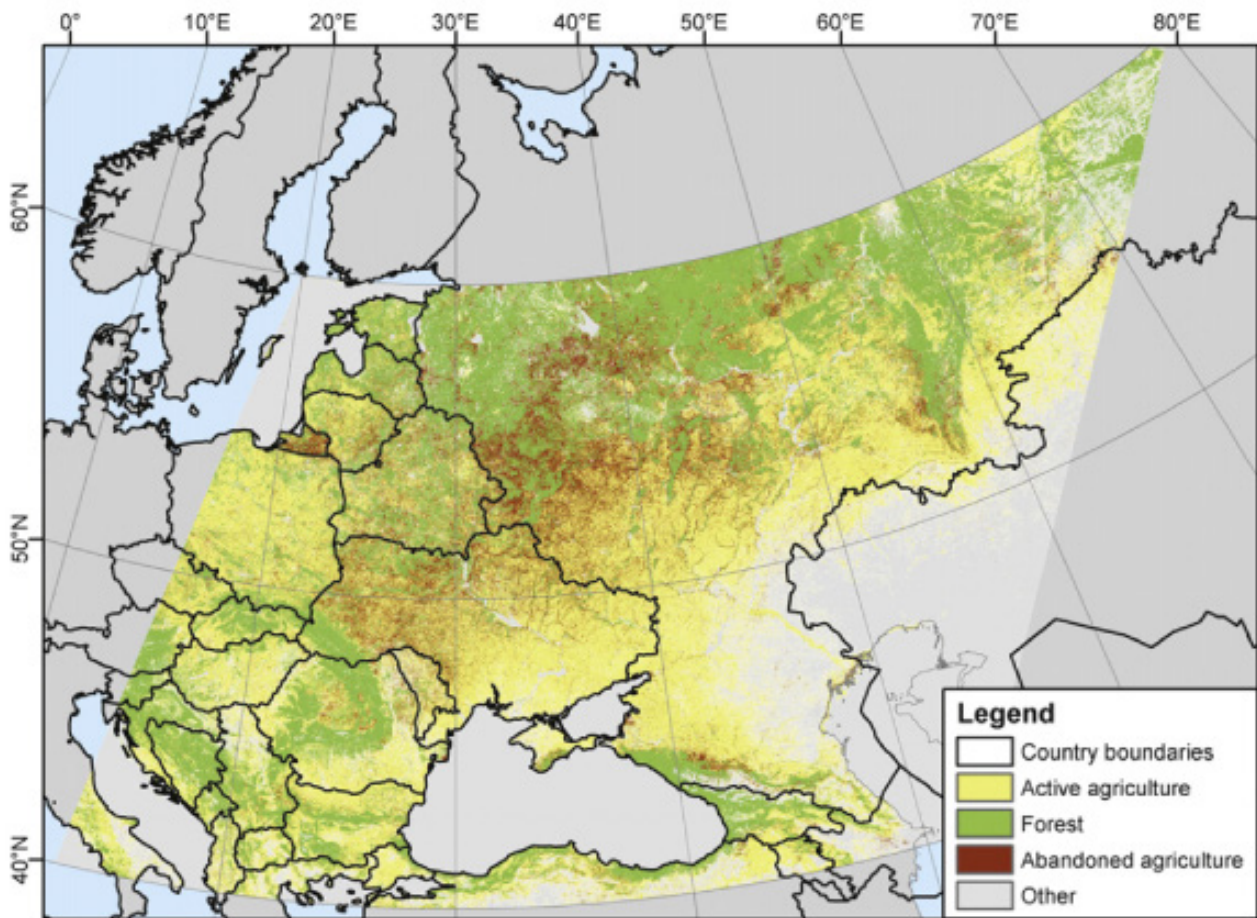
## Eastern Europe

After the dissolution of the Soviet bloc, farming in Central and Eastern Europe underwent a drastic downsizing. Production has fallen and large areas of arable land have been abandoned. Some has been afforested, but more often grass and shrubs have taken over and the land is unproductive without any type of occurring production. Reduced cultivation has led to lower employment and incomes and a comprehensive relocation and today we find very unfavourable demographics in rural areas, accompanied by major social problems.



Photo: Kjell Andersson

The extent of the abandoned areas has been studied by a group of researchers who used satellite images along with controlling on-site examinations. The research covers a rectangle with corners in the Baltic Sea, Western Siberia beyond the Ural Mountains, the Caucasus and southern Italy. The studied area included most of the arable regions of Russia, Ukraine, Belarus, the Baltic States, Poland, Czech Republic, Slovakia and the Balkans down to northern Greece (see the extent of the studied areas on the map).



The result of the study is that there is 52.5 million hectares of abandoned agricultural land in the examined area. This surface corresponds to about half of the EU's total arable land, so it is a significant area that could be used for production of energy crops.

- The largest area of abandoned farmland was found in Russia, 32.2 million hectares, in Ukraine, 9.2 million hectares, Belarus, 3.4 million hectares, and Poland, 1.5 million hectares.
- The highest proportions of abandoned agricultural land available was found in Belarus (34%), Latvia (27.6%), Lithuania (23.7%), Russia (22.5%), Ukraine (20.5%), in Moldova (18.9%) and Estonia (16.8%). Abandoned farmland at a lower level were recorded in Poland, the Czech Republic, Hungary, Bulgaria, Croatia, Georgia among other countries.
- In some provinces in Russia, the share of abandoned farmland is around, or over, 80 percent of the total agricultural area – Smolensk, Tversk, Yaroslav and Kalush.
- A significant part of the abandoned land is located in areas with good growing conditions.

### Conclusion:

In Central and Eastern Europe there are tens of millions of hectares of abandoned farmland that could be used for growing energy crops. Cultivation would contribute to development, employment and income support in rural areas and in the regions concerned.

(Source: Alcantara et al.: Mapping the extents of abandoned farmland in Central and Eastern Europe using MODIS time series satellite data, Environmental Research Letters, August 2013.)

## The world

Out of the global land surface of 13.500 million hectares, currently about 1.6 billion hectares are used for food production, as arable land and permanent pastures. In 2018, the UN's Food and Agriculture Organisation (FAO) estimated that it would be possible to increase the area with 250-800 million hectares without intruding on areas that need to be protected for nature conservation, biodiversity, water, etc. This only concerns areas with sufficient rainfall, i.e. that do not require irrigation. The main parts of these land areas are found in Latin America and sub-Saharan Africa.

Are these areas needed for increased food production? The answer is no.

The global area under cultivation has not increased over the past fifty years, even though the population has doubled. Global food production has kept pace with population growth and the nutrient availability per person has increased at the same time. The number of hungry people has declined sharply and the number of overweight people has increased. Today there are more people suffering from overweight than malnutrition in the world. This has been achieved with an unchanged global crop area. Hunger is now primarily a question of unequal distribution, wars and bad policies. There is enough food to feed all the inhabitants of the globe.

Population growth will stall in the coming decades, while productivity in agriculture will continue to increase. Still, there is a large backlog of yield growth in many developing countries. The yield of grain production is around 1 to 1.5 tons per hectare in Africa, compared with 7 tonnes per hectare in Europe and North America and 4 tons per hectare in Brazil.

FAO has stated that there is no conflict between food production and production of energy crops ("food versus fuel"). The increased cultivation of energy crops can indeed promote food production by facilitating the introduction of modern farming methods, to bring investment capital and provide revenue to farmers. The experience is that the food supply has increased in connection to energy crop projects.

In addition to this, production of biofuels from crops, in addition, provides high-quality protein feed by-products, which are used in the food chain and reduces the need for pure protein crops, such as soy.

### Conclusion:

On a global level, it is possible to use several hundred million hectares of land for growing energy crops. The cultivation can be conducted primarily in already cultivated areas, but it is also possible to increase the cultivated areas, mainly in Africa and Latin America. The cultivation of energy crops provides much needed export revenue for many countries that have good growing conditions, as well as increased self-sufficiency in energy. Many developing countries are suffering economic hardship for expensive imports of fossil fuels and if they were to produce their own biofuels, their trade balances would improve drastically.

By: Kjell Andersson, Svebio, March 2017