UNION ZUR FÖRDERUNG VON OEL- UND PROTEINPFLANZEN E.V.

Rapeseed – Opportunity or risk for the future!?

From the start until the middle of May, the yellow blossoms of rapeseed stamp the agricultural landscape unmistakably across many regions of Germany. The crop was actually sown before winter, at the end of August, and the harvest will begin in July. The vegetation cycle comes to a close in 11 months.

Rapeseed in flower obviously touches the emotions of many. There is no other way to explain why the blossoming "oil fields" in spring draw tourists and holidaymakers to many regions of northern Germany, where the rapeseed serves as a kind of giant billboard for tourism, so to speak. Tens of thousands of bee colonies also look forward each year to this season, when they begin to carry immense quantities of nectar and pollen back to the hives. The hives then buzz with activity in the truest sense of the word, the colony matures quickly and the beekeeper looks forward to a dripping harvest of honey.

When it comes to the many ways it can be used, no other crop culture surpasses rapeseed. Among the raw materials of biomass, it is the true "all-rounder".

- It is the source of raw materials for cooking oil, margarine, mayonnaise, etc.;
- With a fatty acid composition that is unique from a nutritional standpoint, rapeseed oil is the best-selling cooking oil in Germany today;
- What's more, rapeseed oil packs an energy density roughly equal to that of diesel fuel. Processed further into biodiesel, it is mixed with fossil diesel at rates of up to seven per cent; while that may sound insignificant, it is today and will continue to be in the near future far and away the most important renewable fuel alternative;
- Its fatty acid composition makes it a valuable raw material for the lubricant and chemical industries;
- About 60 percent of the harvest volume following the pressing for oil becomes, in the form of rapeseed meal, a high-quality protein feedstuff that reduces soybean imports from overseas;
- Rapeseed is the most important non-genetically modified protein source in Europe. This feature is proving profitable for milk and meat producers, given the market demand for products labelled "GM-free".

Rapeseed in Germany 2014: facts at a glance

Area: approximately 1.4 million hectares
(total arable area: 11.5 million ha)

↓

Harvest volume: 6.2 million metric tonnes
average yield: 4.5 tonnes per ha
sowing rate < 3 kg / ha

↓

Rapeseed meal: 3.7 million tonnes
Rapeseed oil: 2.5 million tonnes
Food/cooking oil/chemical industry: 0.6 million tonnes

Biodiesel proportion (RME): 1.9 million tonnes

↓

Greenhouse gas savings: about 2.9 million tonnes of CO_2

1 million hectares of rapeseed

↓

Biodiesel for about 3 million cars
2.6 million tonnes of protein feed
(substitutes for about one million hectares of soybean)

Assumption:
About one million hectares of rapeseed are cultivated for biodiesel production. 4.5 tonnes of rapeseed per hectare correspond to approx. 2,000 litres of biodiesel yield/ha. At a consumption of six litres/100 km (passenger car), this equals 33,000 km of mileage, or enough to fuel three cars per hectare per year.

Rapeseed has its critics

One would think that with these versatile characteristics rapeseed is a "high-flyer" among crops. Success, however, has its shadowy side, as the cultivation of rapeseed for biofuel production has come under heavy criticism. Here too, rapeseed must prove itself in terms of its environmental efficiency and benefits. When in the 1990s about five million hectares of arable land in the European Union had to be taken out of production, rapeseed became the "problem solver" that would, under force of circumstances, open up new markets beyond the market for foodstuffs. The allegation in particular that the ever-growing cultivation of rapeseed for biodiesel promotes "monocultures" does not stand up to detailed scrutiny. The acreage planted with rapeseed, which has increased from approximately one million hectares in 1993 to about 1.4 million hectares today, is not significant. A monoculture is also not possible because rapeseed is itself incompatible with that kind of agriculture. Crop rotations with rapeseed should observe a three-year break in cultivation of the crop. Only then can rapeseed yield its full genetic potential. While in 1993 about three tonnes per hectare were harvested, in the record-breaking year of 2014, the yield had risen to an average of around 4.5 tonnes. The total harvest volumes were 2.9 and 6.3 million tonnes, respectively.

In East Germany in particular, rapeseed as a "leaf crop", with its deep tap root, has replaced the leaf crops that broke up the cereal crop cycle before 1989, such as sugar beet and potatoes.

Harvest/storage and prices – the state has pulled back

The set-aside obligation has in the meantime been done away with, for good reason. Farmers grow rapeseed without knowing how it will ultimately be used. Only further down the trade and processing chain is it decided whether the rapeseed oil will be processed into biofuel. German and European rapeseed producers have had to withstand inter-

national competition for some years now. This is because the European Union (EU) has liberalised the European agricultural markets through reforms of the Common Agricultural Policy (CAP), which has opened up the European market to developing countries. The reverse side of this market policy or orientation is that the agricultural prices on the international markets and exchanges can swing wildly, without the EU Commission stepping in as it once did – for example buying up grains and then selling them off to exert a price-dampening effect on the world market. The state has withdrawn from its role as an active wholesale buyer, warehouse keeper and marketer. These roles today are assumed solely by the farmers, the agricultural trade, and the oilseed mills. In the 1980s and 1990s, the EU was accused of using its export policy to keep prices low on world markets, which was hurting developing countries. Today, the market mechanisms of supply and demand govern the price and therefore also the purpose for which rapeseed or other biomass raw materials are processed.

Fuel tank or dinner plate? Who is responsible? Can both be filled?

In 2008, agricultural commodity prices rose sharply. The biofuels policy of the European Union was held partly responsible for this development. Fewer foodstuffs were available for the food supply, particularly for the poorest countries, and what was available was more expensive. Food security is a highly sensitive issue for the public. The question posed by the media was: "Fuel tank or dinner plate?": Is it ethically defensible to grow rapeseed or, in principle, any renewable raw materials in this country for producing biodiesel, if this squeezes the supply of foodstuffs, raises agricultural prices and, in the worst case, causes hunger elsewhere?

Some critics make it too easy to put the blame on the biofuels policy. The policy is confronted with a dilemma. It must in the worst case fear being denounced publicly when it has to seek a balance between the contribution biofuels make to the security of energy supply, and to climate and resource protection, as well as the argument that foodstuffs are filling up the petrol tank instead of the dinner plate.
The following facts must be taken into account or acknowledged here:

- **Only about five to eight percent** of the world's produced and traded agricultural commodities go into biofuel production;
- **About one billion tonnes** of food or foodstuffs, however, never even reach the plate. Causes: bad/inefficient harvest methods, high regional storage losses due to mould and pest infestations, and large losses during transport. In Germany alone, **around 11 million tonnes** of food end up on the rubbish heap every year.
- Regional prices in developing countries are not necessarily determined by the world market. The cause of this is that the local food supply often determines quantity and price. In many developing countries, foods are grown (manioc, cassava, etc.) that are not traded on the international markets.
- Moreover, questions of land ownership and access to or the availability of water are unresolved.
- In many poorly developed countries there are governments in power that neglect the country's needs, particularly in rural areas. The result is that the rural population in many poor regions is threatened by poverty and hunger.
- The question of security of supply is an important political issue and should be reflected in the responsible commitment of developed countries to development aid. Worldwide, migrations away from poverty are on the rise. However, politics is powerless if famines are the result of military conflicts.

Nevertheless, biofuels could be just the stimulus for opening up new perspectives in rural areas, and also as a contribution to the local energy supply. With new kinds of crops or new varieties developed by breeders that are adapted to local site conditions, arable land that is so far unused in these countries could be brought into cultivation. In comparison with the huge investment sums driving the search for new sources of fossil fuel raw materials, the research funding for agriculture is very modest, even though it should be clear to all that the fossil era is coming to an end and new fossil fuel sources can only buy more time, at the expense of climate protection.

Attention must be paid, it has to be said, to the discussion on biofuels and their impact on international raw material supply and price development, in view of the necessary acceptance by politicians and the population. Nonetheless, the politicians must grapple with the question of which approaches need to be pursued as a priority. The world agricultural market does have, after all, significant structural surpluses despite biofuel production.

Instead of putting biodiesel or biofuels produced from rapeseed under a general blanket of suspicion, development policies must be implemented concretely and promptly and adequately backed financially, mainly by the developed countries who share the responsibility. Success could be seen immediately in a better market supply and thus a fall in the number of hungry people.

Biofuels are an important element of sustainable mobility

Under the German Presidency, the EU decided in 2007 that the binding target for all Member States by the year 2020 was a proportion of renewable energies in the transport sector of at least 10 percent. The European politicians thus did not agree on a quantity goal, but left it to each Member State to calculate the amount of fossil fuel energy (diesel,

petrol) that would be used in the transport sector in 2020. At least 10 percent of that would then have to come from renewable sources.

This objective is part of the so-called energy revolution in Germany and in the EU today. The policy thus commits European states to develop biofuels as an important pillar for achieving climate protection targets and for the fuel supply in the EU. Billions of euros have been invested in the necessary biofuel production plants and in oil mills, and jobs have been created.

About 210 million tonnes of diesel fuel are consumed in the EU. How can the pre-set target of 10 percent of that be met? The Member States had to provide the EU Commission with so-called action plans that pointed out the national strategy and the biofuel volumes required to meet the target. The table shows the amount of biodiesel needed for the respective rate of diesel consumption, as set out in the reports of the respective Member States.

In Germany and in the EU, around 5 and around 21 million tonnes of production capacity respectively have been created to produce biodiesel. This capacity is enough to reach the energy target (10 percent) in 2020.

This target has in turn had the consequence that the petroleum industry has promised to mix a certain minimum proportion of biofuels into fossil fuels. The maximum proportion that can be added is not only a political but also a technical question that is agreed on by standards bodies at the European level, in which the motor vehicle, oil, and biofuel industries are all represented. The outcome of these deliberations can now be read at the fuel pumps of petrol stations: B7, E5 and E10. In accordance with the European diesel fuel standard – EN 590 – diesel fuel may contain a maximum of seven percent biodiesel by volume and has been approved by vehicle manufacturers for old and new diesel vehicles.

Agricultural production and sustainability: biofuels take the lead

Where do the raw material for biodiesel originate? Only from countries in the EU? Following the liberalisation of its agricultural policy for oilseeds (rape, soy, sunflower) and vegetable oils (including palm oil), the EU is no longer a closed market. This also applies to biodiesel as fuel. This must also be taken into account by investors that have established production facilities in the EU. The raw materials and the biofuels themselves are produced and traded in a competitive international market. Thanks to their high energy density, biodiesel and vegetable oils are less costly to transport per calorific unit measured against other renewable energy sources. Especially in vegetable oils, there is a high incentive to supply the European market through imports of raw materials or biofuels. The manda-

National Action Plans – Biodiesel Employment in the EU Transport Sector (millions of tons)

Year	2005	2010	2015	2020
Germany	1.873	2.42	3.255	5.184
Spain	0.17	1.716	2.53	3.616
France	0.382	2.526	2.77	3.325
Great Britain	0.06	1.004	2.136	2.872
Italy	0.209	1.012	1.603	2.193
The Netherlands	0	0.162	0.407	0.643
Czech Republic	0.003	0.225	0.405	0.577
Portugal	0	0.327	0.472	0.525
Finland	0	0.174	0.349	0.501
Austria	0.04	0.322	0.360	0.478
Total	2.737	10.723	13.452	19.914
EU 27 total	2.753	11.225	14.613	21.83

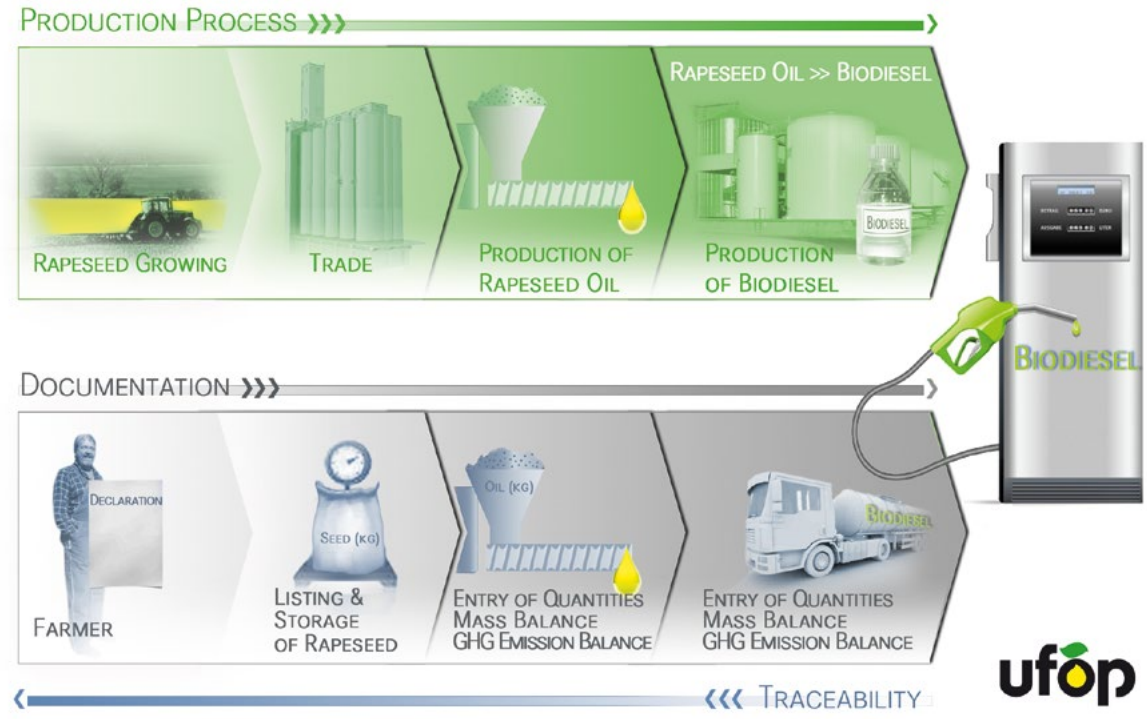
Source: Dutch Energy Research Center. ECN

tory prescribed objective signals to operators assured minimum sales, as it were. As expected, the policy questioned whether this incentive in Asia (palm oil) as well as in South and North America (soybean oil) would encourage the cultivation of commodities to expand at the expense of areas that are needed to protect natural ecosystems, such as the rain forest, and the climate.

The European Parliament and the Council of Ministers therefore agreed to adopt the directive presented by the European Commission "On Promoting the Use of Energy from Renewable Sources (2009/28/EC) – in short, the Renewable Energies Directive" in June 2009, and also the new "Rules of the game" embedded in the directive – which all stakeholders must comply with; and what's special here is that it includes even stakeholders in countries outside the EU. A trend-setting legal structure of this kind, virtually passed overnight, impacting the agricultural commodity production of soybeans, sugar cane and palm oil plantations in South and North America and Asia, is, with the exception of the EU Eco-regulation, historically unprecedented. The special thing about these legally binding "Rules of the game" is that they must be implemented directly as a precondition for accessing the EU market.

These rules include requirements for a sustainably-oriented agricultural commodity production. At the centre is the question: what areas do the commodities come from? For evidence of this, the European Commission has currently approved 19 certification systems that include specific indicators on the verification of compliance with the sustainability requirements in the countries the commodities come from. This includes in particular proof that the biomass raw materials, such as soy, palm oil or even rape, may not be taken from land cleared after 1 January 2008 – for example, forests cut down for plantations of soy or palm oil. Through this, policymakers wanted to ensure that only fields already under cultivation before that date are used to grow raw materials and to produce biofuels. The Commission had already succeeded in using modern satellite

Certification and Documentation of Biodiesel



Source: UFOP

technology to identify and draw up effective inventories of areas already under cultivation. This form of "monitoring" has been state of the art for European agriculture for many years.

It also must be demonstrated that the greenhouse gas emissions associated with biofuel use throughout the entire process chain, from the growing of the raw materials to the end use, are currently at least 35 per cent of the emissions from fossil fuels and from 2017 will be at least 50 percent. These requirements are certified, so that the origin and greenhouse gas reduction of biofuels such as those that are used in Germany and that are under the admixture obligation are covered by the competent federal agency for agriculture and food (BLE). Market participants must be registered for this purpose in the BLE "Nabisy" database. The technical processing is similar to a bank account, but with the difference that bio fuel amounts are credited only if they demonstrably meet certain sustainability criteria. If this is the case, partial quantities can, for example, be booked from this account. The recipient, usually a company in the petroleum industry, then gets a so-called 'sustainability proof' of this amount. With this proof, the company can then be credited for the appropriate amount of bio fuel that goes towards fulfilling its obligation.

To ensure the legally required transparency, the BLE draws up an "evaluation and experience report" each year. This report includes the evaluation of the origins of the bio fuel quantities registered in its database. The individual links (see illustration on the right) of the certification chain start with the cultivation of the raw material, and then encompass the processing in the oil mill and finally the production of biodiesel.

With the renewable energy directive, the EU has established international criteria and certification systems that are also applicable outside the EU. These systems or the local certification bodies responsible for implementing them on site must be developed further, as a learning process. What is to be stressed in particular here is that these certification systems provide for social standards requirements by recognising the criteria of the "International Labour Organization (ILO)". Precisely this is worth developing further in the spirit of fostering fair international competition, so that the added value triggered by the European biofuels policy is also reflected in better working conditions. The biofuel industry has a special responsibility here, since results are easy to measure at this point and furnish a trend-setting basis for political and public acceptance.

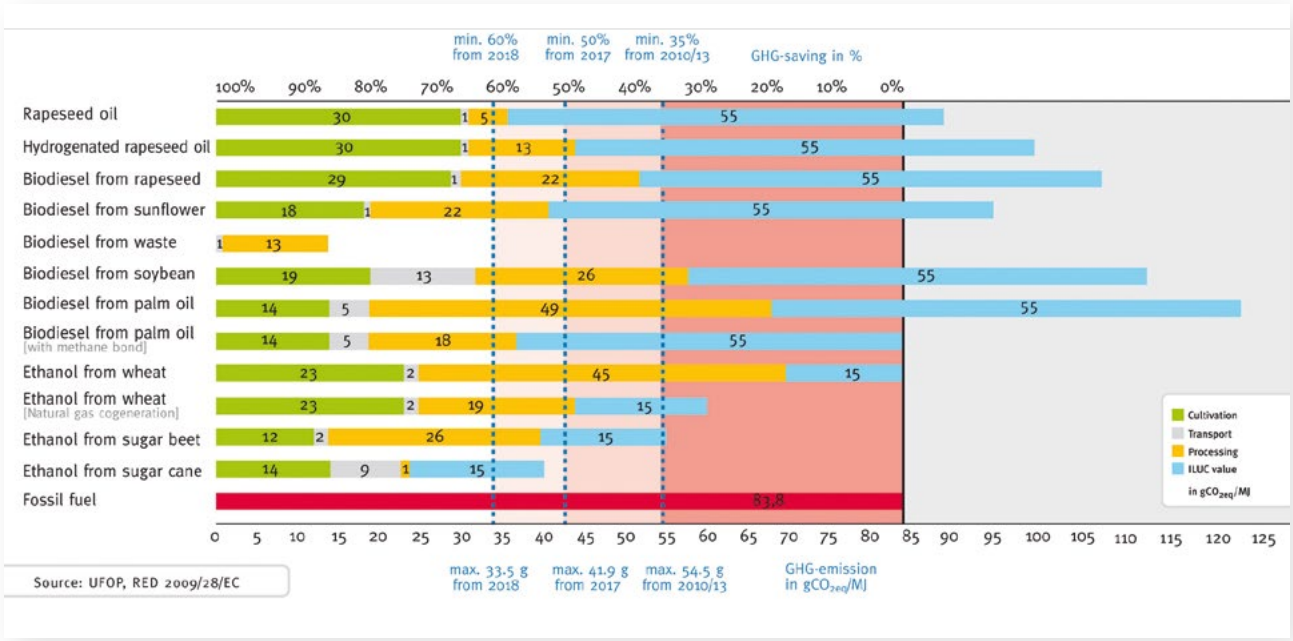
The entire value chain is therefore, in the light of the future discussion on the design of the funding policy framework for biofuels, advised to take the certification criteria seriously and to comply with or to improve upon the test criteria in the "checklist" of certification systems.

There is naturally a great fear that immense bureaucratic costs and cases of fraud cannot be ruled out. The certification systems must therefore quickly address potential vulnerabilities and qualify certification bodies appropriately. The experiences with the practical implementation already confirm that not only do environmental groups take a critical stance on the implementation, in particular in third countries (Asia, South America), but that the market players themselves judge the certification systems critically in terms of the documentation requirements and implementation quality if they fear a competitive disadvantage arising from them. This "monitoring process" accompanied by criticism is both desirable and necessary to improve the test criteria and the "on-site inspection" in the practical implementation of the certification. It must also be noted that the EU Commission must re-approve the certification systems after five years. This does give it the power to further develop the quality of sustainability certification in parallel, thus allowing any competitive differences caused by it to be excluded.

Germany is making progress: from the energy quota to the obligation to cut greenhouse gases

Germany will be the first country in the world to introduce the greenhouse gas (GHG) emission commitments into the fuel sector, starting on 1 January 2015. The petroleum industry will thus be forced to reduce their associated greenhouse gas emissions initially by 3.5 percent, from 2017 by four percent, and finally from 2020 by six percent, as measured by the fossil fuel volumes sold in a calendar year (diesel/petrol). New regulations will govern the biofuel supply chain, including biomass raw materials producers and the petroleum industry. The certification systems and their certification bodies must also expand their checklists and take into account additional training needs. Of particular significance is the fact that the greenhouse gas efficiency, as a new competitive factor among the biofuels being sold, will determine market access in the future. This means that the petroleum industry is interested not only in certified

Standard-GHG-emissions for biofuels + ILUC



sustainable biofuels that – commencing in 2017 – must demonstrate greenhouse gas savings over fossil fuels of at least 50 percent, but that the company will attempt to meet its targets with a minimum of biofuel and thus at the same time as economically as possible. There are no competitive conditions like it in any other sector of the economy!

What contribution does rapeseed cultivation make to indirect land use changes and the greenhouse gas balance?

If rapeseed is grown in this country for biodiesel production, there naturally arises the question of whether the corresponding amount of rapeseed oil is missing from the world market for use as food or as market supply. The conclusion suggests that to balance out needs, additional areas would have to be brought under cultivation or, in the worst case, forests in Asia would have to be cleared and thus lead to an indirect land-use change (ILUC). These newly created areas, such as palm oil plantations, could then produce the vegetable oil to compensate for the missing amount of rapeseed oil that went into the production of biodiesel owing to the EU biofuel policy. However, additional greenhouse gas emissions would emerge from this new acreage, for example through humus removal. Following the "polluter pays" principle, these emissions would then have to be charged against the rapeseed biodiesel for the deforestation as a greenhouse gas penalty (also called the "LUC factor"). To the detriment of rapeseed oil/vegetable oil, the EU Commission assumes that forest areas in particular are affected by this indirectly triggered land-use change. In consequence, the ILUC factor for biodiesel from vegetable oil compared to starches (corn) or sugar (sugar cane or beet) is correspondingly high (see Grafik – Standard-THG-Emissionen für Biokraftstoffe + ILUC*).

Calculating the ILUC factors has, as expected, generated much criticism from the biofuel industry and especially the agricultural industry regarding the verification of this theoretical model and the factors that are derived from it. Even highly critical experts make it clear that a calculation is not possible and that these factors could in any case be derived solely from model calculations. As part of an extensive network project, a new attempt will be made in the EU to re-examine these factors. It is doubtful that this will succeed without opposition from scientific circles as well, especially since the factors, depending on world market conditions, must be constantly recalculated at certain time intervals. Whether these can then stand up in court may therefore

be in doubt. The precondition is verifiability, including the verifiability of all the supporting data.

Is ILUC a "phenomenon" that concerns only biofuels?
The above cause-effect principle is, however, very general and can in practice be transferred to all political measures that lead indirectly to a land-use change or to a lowering of the existing management efficiency:

- Organic farming subsidy policy,
- "Greening" as a result of the reform of the common agricultural policy,
- Prohibition of a previously approved and revenue-assurance measure such as rapeseed treatment,
- Designation of conservation or extensification areas / farming requirements.

As such, the "ILUC question" remains the subject of environmental debate and must in future also include production or policy areas that trigger the above effects owing to legal demands. Environmental policy will therefore have to navigate this dilemma.
The key question, rather, is: does introducing ILUC factors help prevent deforestation?

The policy also overlooks the fundamental problem that, in the event that biodiesel is sanctioned by the introduction of a greenhouse gas penalty (ILUC = 55 gCO_2/MJ), this biodiesel can no longer be counted on to help meet the EU objectives and any marketing of the biodiesel is in practice ruled out. The bulk of the European biodiesel industry will then have no economic future. As far as environmental protection is concerned, this sanctioning will achieve nothing, because the actors in the international market will search for alternative markets. In short: the deforestation would continue unabated, because there are unfortunately also customers around the world that are not interested in sustainability certification, but merely in the cheapest plant-oil imports they can get. By introducing mandatory sustainability certi-

fication in third countries as well, the underlying conditions for the cultivation of raw materials and the social standards of the farm workers can be influenced directly.

The EU is in principle required to solve these environmental issues in the short term through bilateral negotiations and binding agreements.

The European rapeseed cultivation for biofuel production is bound up with questions that will be crucial for the orientation of the future resource and energy policy. In this environment, it must be proved that the cultivation, processing and utilisation of rapeseed intended for use as fuel makes a noticeable contribution to climate protection – that is, that the environmental and CO_2 balance is as positive as possible.

Rapeseed must therefore exploit not just its economic advantages, but its ecological advantages too.

Rapeseed has a high "rotation value", because it:

- extends the crop rotation as the so-called leaf crop in cereal crop rotation,
- enriches the soil humus content with its post-harvest residues,
- has a tap root that draws nutrients from deeper soil horizons than grain crops,
- prevents soil erosion, as it covers the ground quickly following sowing in August and protects it until the harvest in July the following year,
- leaves behind a good soil structure and reduces the cost of soil preparation for the succeeding crop.

Extensive research confirms the rotation value of rapeseed for the yield of the winter wheat that follows it. If winter wheat is sown following rapeseed, the wheat yield is on average about 10 percent higher than when a second crop of winter wheat follows on from the first, and at the same

time fertiliser expenses for the wheat are lower. Over an area of one million hectares planted with rapeseed for biodiesel production, the value of this rotation works out to around 0.7 million tonnes of additional wheat yield that depends on the effect of the preceding crop. The rapeseed is not only crucial to breaking up continuous cropping for environmental reasons, but also leads to higher grain yield. If it were taken into account in the models, the effect of the rotation would help to reduce the previously described "ILUC effect". The compensating effect of the by-products from rapeseed processing still has not been appropriately evaluated to this day. Put briefly, one million hectares of rapeseed for biodiesel production correspond to a soybean acreage of about 1.1 million hectares that in consequence need not be imported.

Questions being intensively discussed today not only in expert circles, but also by policymakers are: How good is the greenhouse gas balance of rapeseed for biodiesel production? What factors must be taken into account when making the calculations?

For biofuels to be recognised within the framework of the sustainability certification, the legislation stipulates – as shown previously – that the lifecycle greenhouse gas emissions they produce must currently be at least 35 percent lower than the equivalent emissions from fossil fuels and at least 50 percent lower in 2017: can rapeseed meet this demand in 2017, or will the greenhouse gas savings be even higher?

The EU renewable energy directive also attempts to answer this fundamental question. This directive also requires the method for calculating the greenhouse gas emission value of the respective biofuel types (bioethanol, biodiesel, etc.) based on the respective biomass raw materials (rapeseed, soy, sunflowers, wheat, sugar cane, etc.). The problem is that the crop types are compared with each other, but effects of preceding crops and hence the higher yield for the crop succeeding the rapeseed are left out. Advantages specific to crop type are therefore not taken into account.

Extensive feeding trials showed that rapeseed meal can completely replace soybean meal for feeding cows, cattle and fattening bulls. Rapeseed meal can also supplement pig feed as a protein source (for sows, piglets and fattening hogs).

The cultivation of one million hectares of rapeseed and the production of the 2.28 million tonnes of rapeseed meal associated with it again corresponds to an acreage of about 1.1 million hectares of soybean planted to generate an equivalent amount of soy meal. Foodstuffs could be grown on these 100,000 hectares instead. This side-effect also applies to commodities such as grain and sugar beets. In the case of rapeseed, it is therefore clear that the public discussion over whether the crop should fill up the petrol tank or dinner plate can be resolved. The wording should therefore be: "Petrol tank and dinner plate" - both can be filled.

Conclusion: Rapeseed is the ideal crop culture for expanding crop rotations in Germany and the European Union. As a source of raw materials, rapeseed opens up a multitude of possibilities for uses and end uses in the food and feed industry, and also in the energy and material use sectors. Rapeseed makes a considerable contribution to climate and resource protection.

Publisher:

UNION ZUR FÖRDERUNG VON
OEL- UND PROTEINPFLANZEN E. V. (UFOP)
Claire-Waldoff-Straße 7 · 10117 Berlin
info@ufop.de · www.ufop.de

Text: Dieter Bockey
Photo credits: fredredhat – Fotolia.com

December 2014