

Two-part interview part 1 | Prof. Dr. Regina Birner on the green genetic engineering debate

Agricultural economist Birner calls for other forms of dialogue besides organized interest groups

Green genetic engineering continues to divide opinion in Germany in the same way as CRISPR/Cas and other genome editing (GE) techniques. What are the consequences for the bioeconomy, which involves key areas of biotechnology? We talked with Prof. Dr. Regina Birner, agricultural economist and head of Hohenheim University's Department of Social and Institutional Change in Agricultural Development at the Institute of Agricultural and Social Economics in the Tropics and Subtropics. She is studying the challenges of global food security and sustainable agricultural development. Birner stepped down as a member of the Federal Government's Bioeconomy Council in July, and advises on national and international committees.

The concept of the bioeconomy¹ has changed. In what way?

Agricultural economist and member of the Bioeconomy Council, Prof. Dr. Regina Birner
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Early discussions focused on substituting fossil raw materials with biologically produced raw materials. At the time, oil prices were high, oil stocks were deemed limited ("peak oil"), and alternatives were being sought. As energy prices fell, climate protection came to the fore, justified by the necessity to reduce the use of fossil resources. Added

to this, biotechnological processes have played a role in the bioeconomy concept from the outset. We are talking about a revolution in the life sciences and the new possibilities of synthetic biology and biotechnology. These are areas that (unlike bioenergy) do not necessarily require large amounts of biomass and therefore do not compete with food production. The third important aspect of the bioeconomy is sustainability. This and the prospect of new biotechnological possibilities have come to the fore in recent years.

Industry representatives² are calling for a new agricultural model. They claim that "consensual" genome editing (GE) techniques such as CRISPR/Cas deserve a more in-depth discussion in Europe because of their potential to accelerate plant breeding and counteract climate change with more drought-resistant crops. Is this realistic?

The new breeding methods have huge potential but we have to reach a consensus. The world is divided as far as the use of transgenic methods and organisms is concerned. Transgenic methods are widely used in North and South America and parts of Asia, but not elsewhere, especially Europe and large swathes of Africa. This is all down to a lack of consensus. How and whether the situation will change with regard to new methods such as CRISPR/Cas, and whether these methods will become consensual when the European Court decides whether they should no longer be subject to the same stringent regulations as other genetically modified organisms (GMOs) is still difficult to say.

CRISPR/Cas is relatively new. Do you know of any examples where this method is already being used in agriculture?

CRISPR/Cas is already being applied in the USA and Canada. One example is the often-cited mushrooms that do not turn brown. CRISPR/Cas has also been used to grow rapeseed. So yes, the method is very likely to be broadly applied in agriculture in the future, especially in regions where genetically modified crops are grown. Research is also being conducted into how various regions of the world regulate the use of GE. The issue is essentially whether it is the process or the product that should be regulated and whether CRISPR/Cas should be regulated on a case-to-case basis or as a general principle. However, it is often forgotten in the debate that genetic engineering is not used in Europe not because of regulations, but because of the lack of consumer acceptance. I do not think that a new genetic engineering law will change this, at least not as long the public do not accept it.

Plant breeders expect a lot from GE. What do we already know for certain?

Plant breeders claim that it is easier and less time-consuming to breed new plant varieties with GE, and this is proven knowledge. The method is suitable for plant properties determined by individual genes that can also be identified. But there are also characteristics such as yield, which are determined by many genes. In such cases, GE does not necessarily provide faster or better results, and other methods such as genomic selection are more suitable and socially acceptable than GE.

Are there any crops where we know the genetics so well that they could relatively quickly be considered for GE methods?

Yes, there are. Genome sequencing has already been applied to many crops. Researchers are of course very interested in finding out which genes are responsible for which properties. Researchers hope to learn a lot more about this issue by applying genome sequencing.

Traditional as well as "new" green genetic engineering continues to exercise people's minds. Within government, agricultural³ and environmental⁴ departments diverge considerably in their assessments. Under what circumstances could you see the industry reaching a consensus on CRISPR/Cas?

I believe that a consensus can only be achieved if there are other forms of dialogue besides the organized interest groups that we have seen so far. Groups like these

Genetic engineering for producing food is not accepted by consumers in some parts of the world including Europe.
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tend to present their members with established positions. It could hardly be otherwise. Urs Niggli, in an interview that featured on the cover of "taz"⁵ at the time when the debate started, pointed out that GE might also have benefits for organic farming. He was so heavily criticised for this that he has now changed his mind. This example shows how difficult dialogue on GE is. Consensus might potentially be reached in a dialogue that also takes into account other methods, and includes non-experts in the discussion. The fact that we are moving away from a type of agriculture that uses chemicals for plant protection is clearly shown in the debate about glyphosate. If we want to have agriculture with fewer chemicals, one idea would be to use GE plant breeding techniques to develop alternatives, e.g. for resistance against plant diseases. This may be a strategy that might lead to consensus. A consensus could also potentially be reached on another issue: breeding costs are quite high and companies have therefore concentrated on a few crops only. This means that they have not focused to the same degree on legumes for example. Therefore, the difference in yield between intensively researched crops and those that are of subordinate interest to large breeding companies has become greater. As a result, farmers are no longer interested in growing a variety of legumes. Using cheaper methods such as GE for breeding new plant varieties would potentially lead to a wider variety of crops, making it more profitable for farmers to grow a greater variety of plants again.

You don't seem too convinced about this....

I found the debate about these new methods very unfortunate because I have seen little effort from any side to establish new, consensual dialogue procedures. It seems to me that the same thing is happening as happened in the debate about conventional genetic engineering methods. If you ask me, I do not hold out a great deal of hope that the CRISPR/Cas method will be accepted.

Which forms of dialogue could get the discussion back on track and lure the adversaries out of their trenches?

Forms of dialogue that involve non-experts or ordinary members of the public rather than organised interest groups. It needs to be a longer process through consensus conferences or public assessment. The public could be given input from experts and be introduced to the point of view of stakeholders, before debating the issue and going back to the professionals to ask for their expert assessment. Maybe this kind of dialogue could be further developed with the help of digital methods.

In addition to the high-tech agriculture that the Bioeconomy Council envisages, are any other forms of agriculture conceivable and useful?

Organic farming can be done with modern technology, it is not a case of one or the other. It can be done using digitization, which helps make methods highly precise. Weeds can be detected automatically and eliminated mechanically. For me, this is key. Looking at the different agricultural systems in the world, it has to be taken into account that in Africa much agriculture is still done manually. The FAO (the United Nations' Food and Agriculture Organization) estimates that it is more than 70 percent. The transition to digital technologies is therefore not that easy. But interesting possibilities are opening up even in these geographic areas because many African countries have quite good mobile phone coverage. More and more small farmers own smart phones, so apps can be used for providing advice on farming.

How can different bioeconomic approaches be prioritised in different parts of the world?

This is very much on the agenda. A while ago, we did a research project on the bioeconomy and food security in a number of African countries. Bioeconomic issues - such as the most efficient use of all components of plant biomass - are also important for African agriculture. Cassava is one such example. A variety of products can be produced from cassava, which also boosts value creation. It is important that every country recognises its own bioeconomic potential. Bioeconomic trends such as sustainability and the circular economy are in the interest of all countries, including developing ones.

Species extinction and climate change are threatening our livelihoods. Does the bioeconomy provide the right answers? Do you think that a radical system change is likely to happen some time in the future?

Actually, the bioeconomy is a radical idea - a new economic system that uses biological principles and intelligent biological systems rather than fossil resources. But it's not just about technological solutions. We also need social change. That's the real challenge: how can this change be achieved in an open market economy and in a democracy? Consumers play an important role and could achieve a lot by changing their behaviour. This is an important aspect. Government attempts to control consumer behaviour prove highly unpopular. The debate about meat consumption (keyword "veggie days") showed this clearly. In addition, policies that focus on the producer side to achieve more sustainability are difficult to enforce. As the Scientific Advisory Council on Agricultural Policy, we have recently published a statement⁶ in which we call for an agricultural policy that serves the public good. In the agricultural sector, a huge amount of money is put into subsidies without taking advantage of their potential to make agriculture more friendly in terms of climate, biodiversity and animal protection. The European agricultural policy is currently being revised. Unfortunately, it does not look like that it is taking advantage of the opportunity to change things. The big challenge is implementing politically what both consumers and producers are calling for.

References

¹ Birner, Regina, Bioeconomy Concepts, in: Lewandowski, Iris (Ed.) (2018): Bioeconomy: Shaping the transition to a sustainable, biobased economy, S. 17ff. https://link.springer.com/chapter/10.1007/978-3-319-68152-8_3

² Klaus Kunz of Bayer CropScience DLF, 7.5.2019: "Modell der Landwirtschaft muss sich dringend ändern"

³ Scientific report on the new plant breeding and animal breeding methods and their applications in the fields of nutrition and agriculture - revised version of 23 February 2018

⁴ Declaration by German environmental and development organizations on the bioeconomy policy of the German Federal Government (Environment and Development Forum) <https://www.forumue.de/erklaerung-deutscher-umwelt-und-entwicklungsorganisationen-zur-biooekonomie-politik-der-bundesregierung/>

⁵ Article on the debate about the new genetic engineering method, <http://www.taz.de/!t5293316/>

⁶ Scientific Advisory Council on Agricultural Policy, Food and Consumer Health: Towards a Common Agricultural Policy of the EU after 2020: Key questions and recommendations. Opinion, April 2018

Continue reading: Two-part interview part 2 | Prof. Dr. Ortwin Renn

In the second part of the interviews on the debate on green genetic engineering, Prof. Dr. Ortwin Renn is talking about opportunities to improve communication about this controversial discussion.

Article

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Further information

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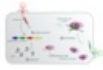
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Two-part interview part 2 | Prof. Dr. Ortwin Renn on the green genetic engineering debate

"Green genetic engineering is a scapegoat, but no longer an innocent one"

Many scientists are expecting revolutionary advances in research to come from new molecular biology tools such as the CRISPR/Cas gene scissors. These methods are very important for agriculture, especially plant breeding and nutrition. However, the debate on green genetic engineering 2.0 looks like it may once again be heading for ideological battles. We talked with Prof. Dr. Ortwin Renn and asked him about opportunities for better communication.