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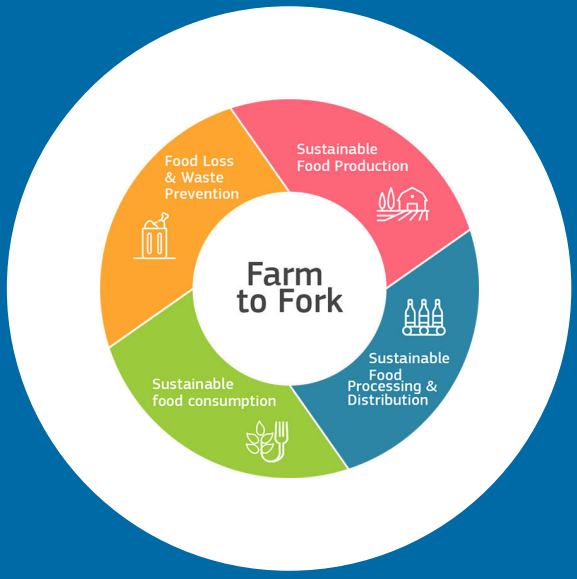

Farm to Fork Strategy

– Conflicting objectives between organic production and plant biotechnology

Dennis Eriksson | SLU Future Food

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The Farm to Fork Strategy
– Conflicting objectives between organic production and plant biotechnology

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Summary

The EU's Farm to Fork Strategy aims to ensure food security while also reducing the environmental and climate footprint of food production. The target of 25 per cent organic production by 2030 will mean changes in the sector, but Sweden is at the forefront. However, there are conflicts between the objective of increasing organic farming and the desire to use new biotechnologies in order to reduce dependence on plant protection products. A number of suggestions are discussed in this report.

The EU's Farm to Fork Strategy is part of the European Green Deal, which aims to make Europe the first climate-neutral continent by 2050. Focusing on the food system, this strategy aims to ensure food security while also reducing the environmental and climate footprint of food production. However, some of the measures are incompatible in the case of primary production.

The target for the Farm to Fork Strategy is for at least 25 per cent of EU farmland to be certified organic by 2030. At the same time, the strategy points to the importance of innovative new technologies (that is to say, biotechnological/molecular tools) to reduce dependence on plant protection products and ensure seed diversity. The problem with these two measures is that organic production does not allow the use of biotechnological, or molecular, tools in the breeding of varietal material that is certified organic. That is why it is important to examine the extent to which these two measures are possible without conflicting with, and adversely affecting, one another.

Sweden has long been at the forefront of organic production in particular, and more than 20 per cent of Swedish land is certified organic. Therefore, it should not be difficult to achieve the 25 per cent target of the Farm to Fork Strategy on a national level by 2030. However, the transition for the EU as a whole, where just over 7 per cent of the land is certified organic, will be much more difficult and probably involve major changes for the entire sector, possibly including legislative amendments.

The legal status of products of new genomic technologies has not yet been fully examined in the EU; that is to say, whether or not they will be regarded as GMOs. By law, GMOs are prohibited in organic production. One problem for the organic sector, however, is that the internal stance of the sector goes beyond the EU's definition of a GMO and focuses on "cell integrity". Thus a situation may arise in which crops that are permitted in conventional agriculture are not permitted under the organic sector's own framework. Altering this framework may affect consumer confidence in the organic sector.

Parallel focus on organic production and new innovations in plant breeding may have two consequences. Firstly, the costs for coexistence between these two systems will increase significantly. Secondly, the organic sector may face major problems due to the fact that some products of new biotechnologies cannot be traced or distinguished, making coexistence very difficult, if not impossible, to maintain.

Experimentation with at least two scenarios is possible with a view to countering these conflicting objectives in the EU's Farm to Fork Strategy. The conservative scenario involves clarifying and reinforcing the rules and strategy for coexistence, with both conventional and GM crops. However, this will be very costly and does not resolve the issue of traceability. The progressive scenario involves revising the organic sector's framework in order to specify the type of innovations permitted in plant breeding. In practice, this means that the sector has to abandon the principle of "cell integrity". However, this could mean a crisis of confidence for the sector.

The Farm to Fork Strategy states that the European Commission will prepare legislative proposals before the end of 2023 in order to accelerate the transition towards a sustainable food system. In this context, it is important to explore potential conflicts of objectives within the Farm to Fork Strategy, as well as their consequences and potential solutions. However, to make both concepts possible, it is likely that organic production will not be exactly the same in 2030 as it is today.

Alnarp, 2021
Dennis Eriksson, SLU

The EU's Farm to Fork Strategy and sustainable food systems

The European Green Deal is a set of policy initiatives from the European Commission that aims to make Europe the first climate-neutral continent by 2050. At the heart of this Green Deal is the Farm to Fork Strategy, which aims to reduce the environmental and climate footprint of the EU's food system while ensuring food security in the face of potential future climate change and reducing biodiversity loss.[1] The strategy has five areas. One area is primary production and the main objectives for 2030 are to:

- reduce pesticide use in agriculture by 50 per cent,
- reduce manure use by at least 20 per cent, and reduce nutrient leakage by at least 50 per cent,
- reduce sales of antibiotics for animal husbandry and aquaculture by 50 per cent, and
- increase the area of agricultural land under organic production to 25 per cent.

The target for the Farm to Fork Strategy is for at least 25 per cent of EU farmland to be certified organic by 2030. This is linked to the Action Plan on organic farming for 2021–2026, which is part of the EU's Biodiversity Strategy for 2030. Furthermore, in the context of plant protection, the Farm to Fork Strategy states that innovative new technologies, including biotechnology, can help to bring about increased sustainability, provided that the technology is safe for consumers and the environment. New technologies may speed up the process of reducing dependence on plant protection products. Sustainable food systems are also reliant on a secure supply of seeds and a wide range of seeds. However, the Farm to Fork Strategy does not set out specific actions or schedules for contributing to this. This is not a new idea from the EU authorities. Back in 2016, the European Parliament stated in a resolution that biotechnological innovations have the potential to contribute to more sustainable agriculture in the EU[2], and it has been stressed by Frans Timmermans, the man leading the European Commission's work on the European Green Deal, that the EU's aim is to enable farmers to take advantage of scientific advances to optimise seed production.[3] The Council of the European Union also welcomes the European Commission's description of innovative new technologies and their potential role in sustainability, while also welcoming the objective of organic production.[4]

The Farm to Fork Strategy launched by the European Commission has been welcomed by some and criticised by others. The World Wide Fund for Nature (WWF) sees the strategy as groundbreaking in reducing the environmental impact of agriculture and reducing biodiversity loss.[5] European Crop Protection (EPC), on the other hand, says that the Farm to Fork Strategy's target of a 50 per cent reduction in pesticide use could lead to more land going under the plough, and that EU farmers will be unable to produce enough food, thereby increasing imports.[6] Fertilizers Europe is of the opinion that the strategy is too ambitious in terms of achieving the targets for reduction of mineral fertiliser within the timeframe specified.[7] Copa-Cogeca, the united voice of farmers and agri-cooperatives, is even of the view that the Farm to Fork Strategy is an attack on EU farmers, adding that we need more cooperation rather than more directives and unreasonable demands.[8]

1 https://ec.europa.eu/food/farm2fork_en.

2 EU:s report 2015/2225(INI) Technological solutions for sustainable agriculture in the EU, https://www.europarl.europa.eu/doceo/document/A-8-2016-0174_EN.html

3 https://geneticliteracyproject.org/2020/10/22/eu-agriculture-ministers-back-pro-organic-farm-2-fork-plan-but-support-gene-editing-to-boost-sustainable-food-production

4 Council of the European Union, 12099/20, Brussels, 19 October 2020.

5 https://www.wwf.eu/?uNewsID=363733.

6 https://www.ecpa.eu/regulatory-policy-topics/farm-fork-biodiversity-strategy.

7 https://www.fertilizerseurope.com/news/fertilizers-europe-accepts-the-challenge-to-reduce-nutrient-losses-for-resilient-food-system.

8 https://copa-cogeca.eu/Download.ashx?ID=3775201&fmt=pdf.

The purpose of this study

As the organic sector has a policy of not allowing biotechnological, or molecular, breeding (that is to say, it only allows what the same sector terms "preservation of cell integrity") in the plant material grown, it is necessary to perform an analysis of how these two objectives in the EU's Farm to Fork Strategy may affect one another.

Boundaries

- This study deals with topics that fall primarily within the thematic area of "sustainable food production" of the European Commission's Farm to Fork Strategy.
- The study focuses on two factors in the Farm to Fork Strategy that are of relevance to primary production: 1) organic production, and 2) biotechnological innovations.
- The study will focus on the relevance for plants and plant production, although both organic production and biotechnological innovations are also of relevance to animal husbandry and breeding.
- Although the study deals with a strategy that is of relevance for the EU as a whole, particular emphasis will be placed on the circumstances in Sweden.

Questions

- To what extent will innovations in plant breeding be possible for conventional agriculture if 25 per cent of agricultural land is under organic production, when both systems have to coexist?
- Is it possible to increase the area under organic production to 25 per cent in the EU if biotechnological crops are grown on conventional land at the same time?

Background

Organic production in Sweden and the EU

Land under organic production in Sweden has increased steadily throughout the 21st century to date and in 2019 accounted for 20.4 per cent of the cultivated arable land, including land under conversion (Figure 1).[9] There is much less land under organic production in the EU as a whole (28 countries, including the UK for relevant figures in the near future), standing at 7.5 per cent in 2018 (Figure 2).[10]

Plant biotechnology in Sweden

Sweden has been successfully researching plant biotechnology for a long time. 2014's "Växtbioteknik för en biobaserad ekonomi" [Plant biotechnology for a bio-based economy] lists nine major research programmes or environments that include plant biotechnology.[11] The Swedish Foundation for Strategic Research has recently issued calls for research funding for biotechnology and plant breeding which will involve gene modification and gene editing using CRISPR/Cas.[12]

The legal status of products of plant biotechnology

The legal status of products developed using new genomic techniques, such as CRISPR/Cas gene editing, has not yet been clarified by the European Commission. In July 2018, the European Court of Justice ruled that the products of new mutagenesis techniques (that is, mutagenesis techniques developed since 2001) should be regulated as GMOs.[13] However, this does not mean that the products of gene editing will automatically be regulated as GMOs too, as gene editing and mutagenesis are not necessarily the same thing from a legal standpoint.[14]

Regardless of the legal status of these products, however, the organic production sector has taken a principled stance protecting "cell integrity". The consequence of this stance is that gene editing or other innovations in plant breeding that involve the introduction of genetic changes using in vitro cultures at any stage will not be permitted.[15] However, this could result in major problems for organic production if the European Commission eventually concludes that certain gene editing applications lead to products that should not be regulated as GMOs, as these would not need to be labelled, nor would they be subject to the coexistence rules that apply to GMOs. Sweden's position on the matter of the legal status of products of gene editing and other innovations has generally been that products should not be regulated as GMOs if there is no "foreign" DNA in the final product.[16] This approach is common in many countries outside the EU, too.[17]

9 https://jordbruksverket.se/om-jordbruksverket/jordbruksverkets-officiella-statistik/jordbruksverkets-statistikrapporter/statistik/2020-06-18-ekologisk-vaxtodling-2019.-omstallda-arealer-och-arealer-under-omstallning.

10 https://ec.europa.eu/eurostat/statistics-explained/index.php/Organic_farming_statistics.

11 https://lcpu.se/wp-content/uploads/2015/03/Agenda-växt_bioekonomi-2.pdf

12 https://strategiska.se/utlysning/ny-utlysning-bioteknik-och-vaxtforadling-mat-foder-och-skogsprodukter.

13 Case C-528/16, 25 July 2018, http://curia.europa.eu/juris/liste.jsf?language=en&td=ALL&num=C-528/16.

14 van der Meer P, et al., 2020. The status under EU law of organisms developed through novel genomic techniques. European Journal of Risk Regulation, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3730116.

15 IFOAM position paper, https://orgprints.org/33683/1/ifoam-2017-PlantBreeding-techniques-position_paper.pdf.

16 Eriksson, D., 2018. The Swedish policy approach to directed mutagenesis in a European context. Physiologia Plantarum, 164(4): 385-395, https://doi.org/10.1111/ppl.12740.

17 Eriksson, D., et al., 2019. A comparison of the EU regulatory approach to directed mutagenesis with that of other jurisdictions, consequences for international trade and potential steps forward. New Phytologist, 222(4): 1673-1684, https://doi.org/10.1111/nph.15627.

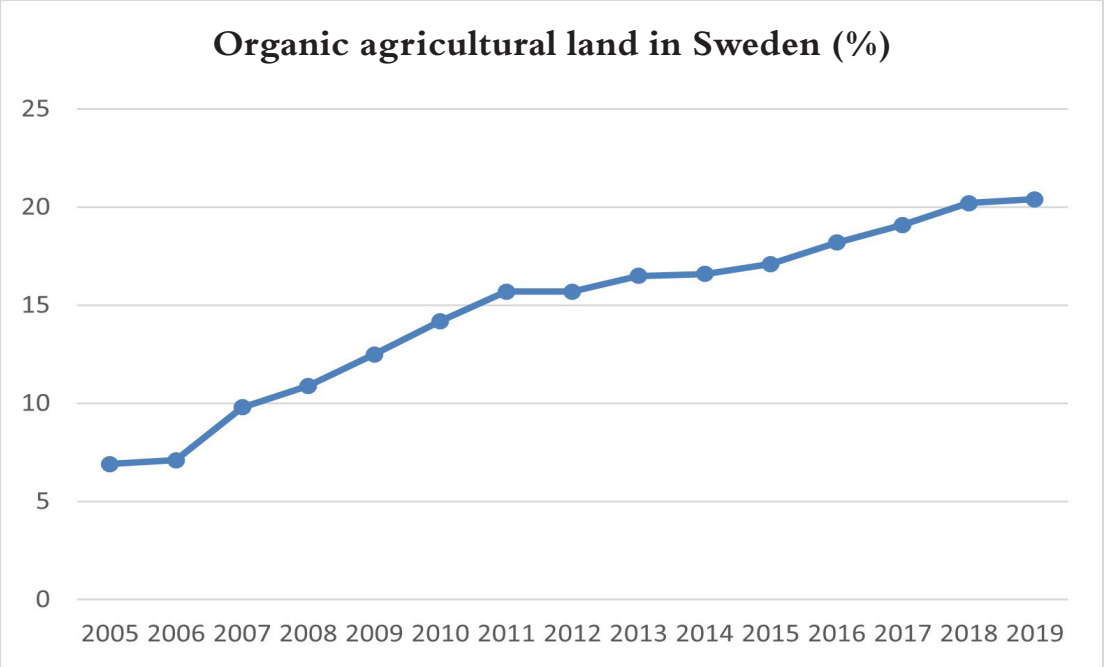

Figure 1: Organic agricultural land in Sweden (per cent). From the Swedish Board of Agriculture's report Ekologisk växtodling [Organic plant production], 2019. Converted areas and areas being converted, see https://jordbruksverket.se/om-jordbruksverket/jordbruksverkets-officiella-statistik/jordbruksverkets-statistikrapporter/statistik/2020-06-18-ekologisk-vaxtodling-2019.-omstallda-arealer-och-arealer-under-omstallning.

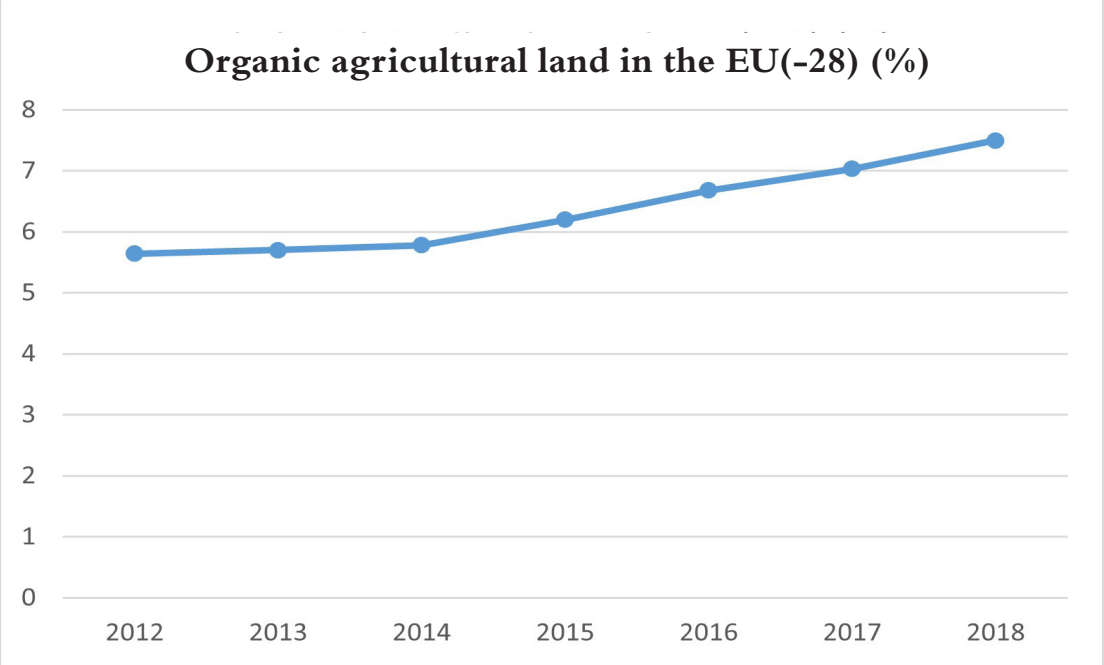

Figure 2: Organic agricultural land in the EU (per cent). From the EU's Organic farming statistics, see https://ec.europa.eu/eurostat/statistics-explained/index.php/Organic_farming_statistics.

Conflicting objectives

The question left unanswered by the Farm to Fork Strategy is how to promote both innovative biotechnology and organic farming at the same time. Although the legal status of new innovations in plant breeding has not yet been examined fully, it is possible that some of these products will not be regulated as GMOs under the current EU legal framework. At the same time, the regulatory framework for organic farming precludes the use of genetic engineering in the sense that it interferes with cell integrity. Both innovative biotechnology and organic farming have their respective advantages in contributing to the environmental and social sustainability of food production. As organic farming is legally incompatible with the use of GMOs in the EU, and incompatible with biotechnological innovations in breeding according to an internal principled stance (according to IFOAM), investments in one concept will inevitably have an adverse impact on the other.

In the long term, the organic sector is likely to face major problems in relation to its stance on "cell integrity", particularly if the EU adopts similar policy decisions as in many other countries with regard to gene editing and other innovations that do not leave detectable changes in the genome. This problem may be significantly exacerbated by the objectives of the Farm to Fork Strategy to promote both organic production and biotechnological innovations in plant breeding. The problems arise mainly from 1) costs relating to coexistence, and 2) traceability. However, the Farm to Fork Strategy has nothing to say about how these tensions are to be bridged.

Costs relating to coexistence

According to the European Commission's recommendations on coexistence between GM crops, conventional crops and organic crops, each Member State is free to decide on the guidelines for coexistence, which are crop-specific and largely determined by specific agroecological conditions.[18] Costs relating to coexistence can be significant throughout the value chain; in primary production and for marketers, seed processes and food producers, for example.

A 2016 econometric study on GM maize in Germany showed that the costs of ex-ante and ex-post coexistence measures can amount to more than EUR 300 per measure for individual farmers, which in most cases exceeded the increased income farmers expected to receive from GM maize.[19] A similar econometric study of GM oilseed rape in the EU in 2017 estimated the costs for coexistence mechanisms for oilseed rape production to amount to EUR 287 million annually, at an estimated value chain cost premium totalling 5 per cent.[20] Calculations based on an example from Brandenburg in Germany in 2005 also show that the cost of coexistence measures is a strong contributory factor in farmers not choosing to grow GM maize despite the otherwise economic advantages of cultivating such crops.[21]

The consequences of increasing the area of organically farmed land in Sweden to 25 per cent by 2030 are unlikely to be so dramatic, as 20.4 per cent of this land is already farmed organically (in 2019). However, this will largely depend on how widely available crops bred using new gene technology innovations become to Swedish farmers. However, the economic impact on agricultural and food production in the rest of the EU will be much greater than in Sweden, as the corresponding figure for organic production for the whole of the EU (EU28, i.e. including the UK) in 2018 stood at just 7.5 per cent.

18 Commission Recommendation of 23 July 2003 on guidelines for the development of national strategies and best practices to ensure the coexistence of gene edited crops with conventional and organic farming (2003/556/EC).

19 Venus, TJ., et al., 2016. The costs of coexistence measures for gene edited maize in Germany. Journal of Agricultural Economics, doi:10.1111/1477-9552.12178.

20 Venus, TJ., et al., 2017. The interaction among the regulation of new plant breeding techniques, GMO labelling, and coexistence and segregation costs: the case of rapeseed in the EU. LICOS Discussion Paper Series 389/2017, KU Leuven.

21 Beckmann. V., et al., 2010. Ex-ante regulation and ex-post liability under uncertainty and irreversibility: governing the coexistence of GM crops. Economics, 4: 2010-9.

Problems with traceability

Many applications of new innovations in plant breeding, such as CRISPR/Cas gene editing, do not result in foreign DNA being introduced into the plant. This distinguishes these from "regular" GM crops where a gene from another organism has been incorporated into their genome. The consequence of this is that it is very difficult to trace and identify the plants and their products. Although there are ways of detecting single base pair differences (mutations), it is not possible to technically prove how these have occurred, as they could just as easily have occurred through other conventional breeding methods, or even naturally. This has been consistently described by the European Network of GMO Laboratories, ENGL.[22]

As stated, the legal status of these innovations has not yet been clarified in the EU. The European Commission is currently investigating the issue.[23] Recently, however, an analysis of the 2018 decision of the European Court of Justice, as well as the EU definition of GMOs, showed that there is reason to expect that some applications, such as those described above, will not be classified as GMOs.[24]

If gene editing with CRISPR/Cas, for example, is not classified as GMO, this means that organic production will not be able to separate these crops in primary production; that is to say, maintain coexistence in the field in an acceptable manner. Bred crops that are not accepted in organic production according to principled stances are at risk of spreading into this production. Organically grown seed should be used in organic production in the first instance, but exceptions may be made for conventionally grown seed if supply is insufficient. However, this is not applicable if biotechnological material is present in the seed. This may have severe consequences for organic production, as this bases its entire brand and concept on disassociating itself from certain inputs and biotechnological breeding.

22 European Network of GMO Laboratories (ENGL), Detection of food and feed plant products obtained by new mutagenesis techniques, 26 March 2019 (JRC116289).

23 EU study on new genomic techniques, https://ec.europa.eu/food/plant/gmo/modern_biotech/new-genomic-techniques_en.

24 van der Meer P, et al., 2020. The status under EU law of organisms developed through novel genomic techniques. European Journal of Risk Regulation, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3730116

Potential solutions to the conflicting objectives

What will happen to organic production if biotechnological innovations in plant breeding are promoted and incorporated into conventional agriculture? How will the issue of coexistence be resolved if organic production covers 25 per cent of EU farmland? These are issues that the European Commission must address early on in its efforts to implement the Farm to Fork Strategy. To make both concepts possible, in line with the Farm to Fork Strategy, it is likely that organic production will not be exactly the same in 2030 as it is today.

Two scenarios

There are at least two scenarios to counter these conflicting objectives in the EU's Farm to Fork Strategy, but this requires a more in-depth analysis in order to explore the legal and political possibilities and the consequences.

The conservative scenario

This involves the EU reworking its coexistence strategy and establishing clearer guidelines. At present, individual Member States can decide on many details regarding the coexistence strategy themselves, but this can lead to uncertainty in the market and major challenges if the land under organic production increases. A more in-depth analysis is needed in order to see how different coexistence strategies can reduce the tensions between the two concepts.

Challenges: However, there are two problems with this scenario. Firstly, it involves high costs. Despite the fact that only just over 7 per cent of arable land is under organic production in the EU, the costs of coexistence are already significant. If the land percentage rises to 25 per cent, it will cost enormous amounts of money over several stages. Secondly, a better coexistence system will not resolve the issue of traceability, if certain types of crops bred using gene technology approaches are present in conventional farming and are neither controlled nor labelled.

The progressive scenario

This involves both the EU, and the organic sector internally, making a revision in order to specify the type of plant breeding innovations that are compatible with organic principles. One solution could be to adapt the rules for breeding in organic production and essentially make them consistent with the principle of what the UN Convention on Biological Diversity classifies as a "living modified organism", i.e. to abandon the principle of "cell integrity" and only risk regulate plants containing genetic modifications that could not have arisen naturally. The consequence of this could be that certain gene edited crops, such as those using CRISPR/Cas, could be permitted in organic production. In particular, this would resolve the issue of traceability, which the organic sector is otherwise finding it difficult to deal with.

Challenges: The immediate problem with this scenario is that the organic sector would have to revise one of its established principles, which could risk weakening the credibility of the entire concept.

Legislation and policy development

The Farm to Fork Strategy states that the European Commission will prepare legislative proposals before the end of 2023 in order to accelerate the transition towards a sustainable food system. In this context, it is important to explore potential conflicts of objectives within the Farm to Fork Strategy, as well as their consequences and potential solutions.

A new directive for organic production in the EU was drafted in 2018 and entered into force on 1 January 2021.[25] This directive, like the previous one from 2007, stipulates that organic production must exclude the use of GMOs or their derived products. What is important in this context, from a legal standpoint, is to clarify precisely what the EU defines as a GMO. This has been the subject of interpretation for a number of years in the light of new gene editing techniques.

Whatever the outcome of this issue on the definition of GMOs, it is necessary for the European Commission to investigate what kind of possibilities there are for traceability of gene edited product, be it technical or by means of "paper track". If these are not classified as GMOs, traceability will be a problem for the organic sector; if they are classified and regulated as GMOs, traceability will be a problem for the EU's entire agricultural sector as it will be difficult to monitor these products in international trade in food products.

If land under organic production increases to 25 per cent in the EU, it is likely that the nationally defined measures for coexistence will need to be reviewed, or possibly harmonised requirements may need to be established within the EU in order to facilitate matters for producers. A more in-depth economic analysis needs to be performed in order to investigate the economic consequences of increasing land under organic production under current EU and national legislation, and it is desirable for both the EU and its Member States to make this a priority in the implementation of the Farm to Fork Strategy.

Research and innovation is also a very important driver in order to accelerate the transition to sustainable, healthy and inclusive food systems from primary production to consumption. Under Horizon Europe, the EU's next research framework programme, EUR 10 billion will be invested in research and innovation related to food, bioeconomy, natural resources, agriculture, fisheries, aquaculture and the environment. It is of course important for both of these concepts to be given financial scope within Horizon Europe so as to stimulate the development of both organic production and innovative breeding techniques in accordance with the Farm to Fork Strategy.

25 Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on organic production and labelling of organic products and repealing Council Regulation (EC) No 834/2007.

The role of Sweden and SLU

The Swedish food chain employs more than 300,000 people and generates an annual added value of over SEK 200 billion.[26] Despite this, imports are continuing to increase. This suggests that further initiatives are necessary, and it is pleasing to see investments in research related to the food system from several of the national research councils, including Formas, in recent years.[27] With these investments, Swedish researchers – and not least, the Swedish University of Agricultural Sciences, with its sectoral responsibility directed towards the agricultural and forestry industries – are well placed to make significant contributions to the EU Commission's Farm to Fork Strategy.

The Swedish government's 2017 food strategy sets out approaches that are relevant to both concepts in this analysis. As regards biotechnological crops, it states that "*an assessment should be performed on the basis of the overall characteristics of each individual crop and its impact on human and animal health and on the environment, regardless of the plant breeding technology used*".[28] Sweden has long pursued a similar line towards the EU's authorities[29], and the significance of this should not be underestimated when it comes to influencing the European Commission to reach conclusions on the issue. It is important for the Swedish authorities to maintain this line, as the application of biotechnological innovations in plant breeding would be facilitated considerably as a consequence of Sweden's line.

Moreover, the Swedish food strategy states that the production, consumption and export of organic products should increase. It is emphasised that clear, effective and simple EU rules for organic production are a prerequisite for organic farming in Sweden, and in this respect it may be appropriate to review the Swedish guidelines for coexistence (particularly if biotechnological innovations in plant breeding are being applied on a larger scale), and also to raise at EU level the fact that some harmonisation in the EU should be investigated.

Sweden is very much at the forefront of developments in terms of both organic production and biotechnology. In the government's latest research bill, which was presented on 17 December 2020, a total of SEK 380 million is earmarked for the national food research programme for 2021–2024.[30] It is desirable for a significant proportion of these funds to be allocated to research and development in both organic production and biotechnological innovations in plant breeding, as emphasised in the Farm to Fork Strategy, while at the same time addressing and remedying the problems with conflicting objectives as indicated in this report.

26 Swedish Board of Agriculture, 2021. Utvärdering och uppföljning av livsmedelsstrategin – årsrapport år 2021 [Evaluation and monitoring of the food strategy – 2021 annual report]. Report 2021:1.

27 https://formas.se/om-formas/vad-vi-gor/nationella-forskningsprogram/livsmedel.html.

28 https://www.regeringen.se/regeringens-politik/en-livsmedelsstrategi-for-jobb-och-hallbar-tillvaxt-i-hela-landet.

29 Eriksson, D., 2018. The Swedish policy approach to directed mutagenesis in a European context. Physiologia Plantarum, 164(4): 385-395, https://doi.org/10.1111/ppl.12740.

30 https://www.regeringen.se/4af915/contentassets/da8732af87a14b689658dadcfb2d3777/forskning-frihet-framtid--kunskap-och-innovation-for-sverige.pdf.

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