BRIEFING
STOA Options Brief

European Parliament

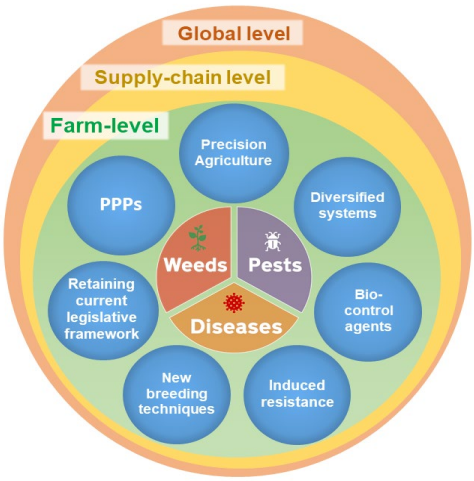
The future of crop protection in Europe

Crop protection is necessary to prevent yield and quality loss in plant production. Pests, weeds and diseases have to be controlled to ensure a fair income for farmers, to increase competitiveness, to protect food quality and to ensure food resilience. Crop protection in the EU also needs to move towards achieving sustainability in agriculture, in line with the objectives of the European Green Deal. This briefing presents policy options for the future of crop protection and summarises their possible consequences.

A systems perspective

European Union (EU) crop protection policy has to be developed in such a way that all nine objectives of the common agricultural policy will be served. This will prevent undesirable clashes between policy goals, which could occur, for example, if a strict crop protection policy resulted in lower yields and increased land use for agricultural production, which would be harmful for the wider environment. Moreover, crop protection measures can be embedded in policy oriented at consistency at farm level. This means that requirements for crop protection measures are balanced with requirements for other production processes and inputs.

Figure 1 – Policy options proposed by the study embedded in a systems perspective



Source: Created by the authors for the purpose of this study.

Practices to protect crops against pests, pathogens and weeds are not equally applicable to all three groups of agents that harm crop production. The most effective crop protection strategies are therefore those that combine practices to optimise the control of each group of agents. The policy options (blue bubbles) are presented in Figure 1, embedded in a systems perspective. This systems perspective places crop protection in the wider context of the farm, supply chain and international trade influencing crop protection and subject to adjacent policy areas. This opens the possibility to combine direct and indirect policy options at different stages and levels of the supply chain.

Policy options

Retaining the current legislative framework

The baseline policy option is to retain the existing policies and legal framework. The main instruments are Regulation (EC) 1107/2009 concerning the placing of plant protection products (PPPs) on the market and Regulation (EC) 396/2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin. These regulations will be revised according the regulatory fitness and performance programme (REFIT) study recommendations. The criteria for registration of PPPs and for setting maximum residue levels will remain unchanged. Developments in breeding, biocontrol and precision agriculture will continue, based on private-sector initiatives.

Under this option, little progress is likely on protecting the environment and biodiversity, and negative effects will continue. European farmers' income will not improve. Crop protection will continue to depend largely on PPPs. The approval and introduction of new PPPs is uncertain, since the EU is not an attractive market for the PPPs industry and current registration procedures take a long time, with an uncertain outcome. EU farm competitiveness will deteriorate if producers outside the EU are able to innovate and improve their production processes, including new techniques for crop protection.

Removing legislative barriers to new breeding techniques

The development of new plant breeding techniques (NPBTs) can be supported by increasing investment in fundamental research, which will enhance the speed of innovation. Such NPBTs include a diverse set of technologies for improving the efficiency and precision of plant breeding. However, at present, the most important constraint to the development and uptake of new varieties is a number of drawbacks with the current legislation. To resolve this situation, the European Commission Group of Chief Scientific Advisors have concluded that 'the GMO Directive (Directive 2001/18/EC) should be revised' and 'put much more emphasis on the features of the end product, rather than on the production technique'.

Using a product-based approach implies that the breeding techniques should not be the main criterion for determining whether new varieties can be placed on the market. Instead, it should be the genetic composition of the end product. If DNA in a new variety comes from the species being improved, or from a species that can be crossed from this species using traditional methods, then the technique used should be exempt from GMO legislation. It follows that a rational policy option is to adjust the legislation to take into account the latest breeding techniques. If the EU legislation is not adjusted, a policy option is to close the EU borders to products from varieties that are classified as GMOs, because they are produced by a technique that is not allowed in the EU.

The potential of innovative breeding techniques will only be fully realised if the resulting new varieties are authorised for commercial production. Adjustment of the EU legislation from a process to a product-based approach will enable this uptake. Use of new breeding techniques will support a more targeted development approach and can significantly improve the speed of introduction of new varieties with better resistance against pests and diseases. More resistant varieties will lead to lower use of PPPs. Closing the EU borders to products from varieties that are classified as GMO according to EU legislation will contribute to a level playing field with exporting countries for European farmers.

Developing and promoting the use of biocontrol

Biocontrol includes augmentative control, conservation biocontrol, and the use of biopesticides, semiochemicals and plant defence stimulators. Biopesticides refer to the use of arthropods, microorganisms, nematodes, viruses and products derived from these organisms for crop protection. To enhance the development and uptake of biopesticides, the EU may consider several policy options.

Policy-makers could increase investment in fundamental and applied research to develop new biocontrol agents. Separate legislation could be proposed for the placement on the market of biocontrol agents, oriented at ensuring the same level of safety, but different procedures and endpoints, compared to chemical PPPs. A policy option could also be to tolerate low levels of micro and macro-organisms on fresh food products, providing that they do not pose a threat to human health or biodiversity. This is important because biocontrol agents may not control pests or diseases completely, and biocontrol agents are often themselves micro or macro-organisms. As a result some biocontrol agents, pests or diseases may be present on food products. Such a policy option would need to be linked to phytosanitary policy. Lastly, policy-makers could stimulate the creation of experimental farms and farmers' networks to develop and implement biocontrol on farms and provide support from knowledgeable innovation brokers and suppliers of biocontrol agents, for farmers to learn new techniques and share experiences, aiming at improving sustainability for the benefit of farming communities.

Developing a wide range of biocontrol agents will take a significant amount of time. Separate legislation for biocontrol agents could increase the speed and ease of registration. Reviewing the zero tolerance requirement for pests and diseases on fresh food products would increase the scope for using biopesticides.

Adopting them requires farmers and workforces gain new knowledge and skills, and education and training would therefore be needed.

Funding research and training on crop-induced resistance

The defence mechanisms of plants can be induced by a variety of biotic and abiotic agents. In contrast to breeding for resistance, the genome of the plant is not altered by induced resistance. The development of techniques for inducing resistance through the use of biotic and abiotic agents is quite recent. Commercial products are not yet available and more research is needed.

One policy option is to increase investment in fundamental and applied research. It is expected that successful practical implementation will require further development to find the most effective application methods. Another policy option is to invest in the education and training of extension workers and farmers in plant propagation and cultivation and to create farmers' networks to share experiences and insights for the benefit of all. The review undertaken found no negative impacts from the use of substances to induce resistance and there are no regulatory requirements specifically concerning induced resistance. Nevertheless, it may be necessary to consider authorisation for commercialising biotic and abiotic agents. The purpose would be to prevent misuse of this category of substances as an easy route for placing PPPs on the market.

Successful commercial implementation of biotic and abiotic elicitors to induce crop resistance to pests and diseases would reduce the need for chemical PPPs. Formal regulation of placement on the market of both biotic and abiotic agents would safeguard against environmental and health risks, and prevent the sale of agents that are ineffective.

Promoting genetically diversified cropping systems

Diversified systems span a wide range of cropping practices, which increase genetic diversity and resilience to abiotic and biotic stressors. First, by supporting applied research to develop practical options for farmers to increase the level of (genetic) diversity in their cropping systems. Secondly, by stimulating the creation of experimental farms and farmers' networks.

Once the diversification is successful in controlling pests and diseases, there is less need – or no need – for pesticides, and there is a corresponding reduction in the negative impacts of PPPs on the environment and biodiversity. Diversified systems that increase diversity at field, farm and landscape level will not only contribute to functional agrobiodiversity, but also to wider biodiversity. They can have positive impacts on crop yields, benefitting farm incomes. However, diversified systems can also lead to increased costs and less overall income than conventional cropping, particularly monoculture. For example, some additional crops in a rotation may provide less income than the existing crops.

Supporting precision agriculture

Precision agriculture (PA) concerns the optimisation of all inputs, such as labour, fertilisers and the use of machinery. The development of PA is likely to have an increasingly large impact on both conventional and alternative farming systems in the future. To make best use of the potential it offers, some political decisions are required. Relevant to all areas of agriculture, several policy options may be considered to stimulate the development and use of PA.

The use of PA technology could be enhanced for specific applications in monitoring crop pests and diseases (detection, identification and quantification) and for selective weed control. The use of precision spray application techniques could be enhanced to optimise the amount of PPPs applied and to reduce drift. Next, automised data collection could be used to optimise crop protection strategies. Investments and efforts are needed to improve the technological, environmental and managerial knowledge and skills of farmers and their employees with respect to precision agriculture. Next, an open data approach throughout the food chain should be established, with adequate standards that facilitate data exchange, as well as safeguards to control the flow of farmers' data to other stakeholders. Lastly, site-specific use of PPPs should be included in legislation.

The use of PA technology in crop protection reduces the use of PPPs in three ways: PA observation technology supports the early detection of pests and diseases, enabling the farmer to intervene early; it enables the farmer to reduce the amount of PPPs applied by treating only the affected spots; and environmental emissions can be reduced by adjusting the treatment to the specific circumstances in the field. A further benefit is that PA technology contributes to the protection of non-target organisms.

Restricting the use of chemical PPPs

Changes in the composition and use of agrochemicals and the widespread adoption of alternatives are critical factors for the future of crop protection. All crop protection options discussed in previous sections potentially have positive impacts on the environment, as they reduce the need for agrochemicals. Policy-makers also have the possibility to shape the negative impacts of chemical PPPs directly.

They could prohibit any use of chemical PPPs or adjust the rules for applying them, including those relevant to PA technology. They could adjust the criteria for approval and registration of active ingredients or PPPs, for example by reducing the concentration of active substances, and limit the number of emergency authorisations. Finally, they could make PPPs more expensive by adding levies to the cost price.

Prohibiting the use of chemical PPPs will significantly affect crop yields per hectare, as is evident from organic agriculture. This will result in an increase in the area of land under cultivation in order to maintain food production in the EU. Extending the land area under cultivation will harm biodiversity. It is therefore necessary to increase efforts to develop sustainable alternatives to chemical PPPs that do not result in lower crop yields, in order to limit any long-term increase in the area of land under cultivation. Adjustment of the rules for applying PPPs (for example, regarding wind speed) to suit the available technology may lead to their reduced use due to more precise application. Adjustment of the approval and registration criteria will have consequences for the availability of PPPs. Stricter criteria will increase the costs for development, approval and registration. This will also lead to higher prices for PPPs and possible additional financing costs. Higher costs may reduce PPP use, if acceptable alternative crop protection measures are available. Farmers will adjust their use to maximise the financial return. Levies may be justified by using the proceeds to compensate for the negative impacts of PPPs, for example by improved protection for human health, the environment and biodiversity.

This document is based on the STOA study 'The future of crop protection in Europe'. The study was written by Johan Bremmer, Marleen Riemens, Machiel Reinders, Bas Allema, Dirk van Apeldoorn, Yuling Bai, Corne Kempenaar, and Marcel Wenneker of Wageningen University and Research (WUR) at the request of the Panel for the Future of Science and Technology (STOA), and managed by the Scientific Foresight Unit, within the Directorate General for Parliamentary Research Services (EPRS), European Parliament. STOA administrator responsible: Lieve Van Woensel.

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