Policy brief

PAVING THE WAY TOWARDS AN INNOVATION-FRIENDLY ENVIRONMENT IN THE EU

A case study on enabling R&I for Biological Solutions

Plants for the Future
European Technology Platform

Executive Summary

The EU Green Deal, through its Farm to Fork Strategy, aims to reduce the use and risk of chemical pesticides in agricultural production systems by 50% by 2030. Biological solutions, a range of low risk plant protection solutions (PPS), hold immense potential to help reduce the use of chemical pesticides. However, that potential is currently stifled by the long approval process biologicals are currently subjected to and, for some, a lack of clear definitions. While regulatory timelines prescribe approval timelines of 2.5 to 3.6 years, in practice, the approval of new biological solutions takes anywhere from 5 to 10 years.

This long approval process has two main consequences:

The alternative, low risk, PPS needed to reach the Farm to Fork goals will be limited to biologicals that have already been developed and are currently undergoing the approval process

The extended timelines for biological solutions to reach the market threatens the return on investment, thereby creating uncertainty and barriers for developers, especially SMEs and AgBiotech start-ups. This results in a less attractive innovation environment, limiting investment in new biological solutions for the European market

With this Policy Brief, Plants for the Future aims to raise awareness of current regulatory constraints that negatively impact the investment and the development of new and innovative biological solutions, and provides recommendations for the short to long term, to alleviate this and foster an innovation-friendly ecosystem in the European Union.
It should be noted that the definition and categorisation of emerging technologies, such as RNA interference, peptides and proteins, is currently still under discussion. However, for the sake of this Policy Brief, we will consider them as biological solutions.

Main short term recommendations

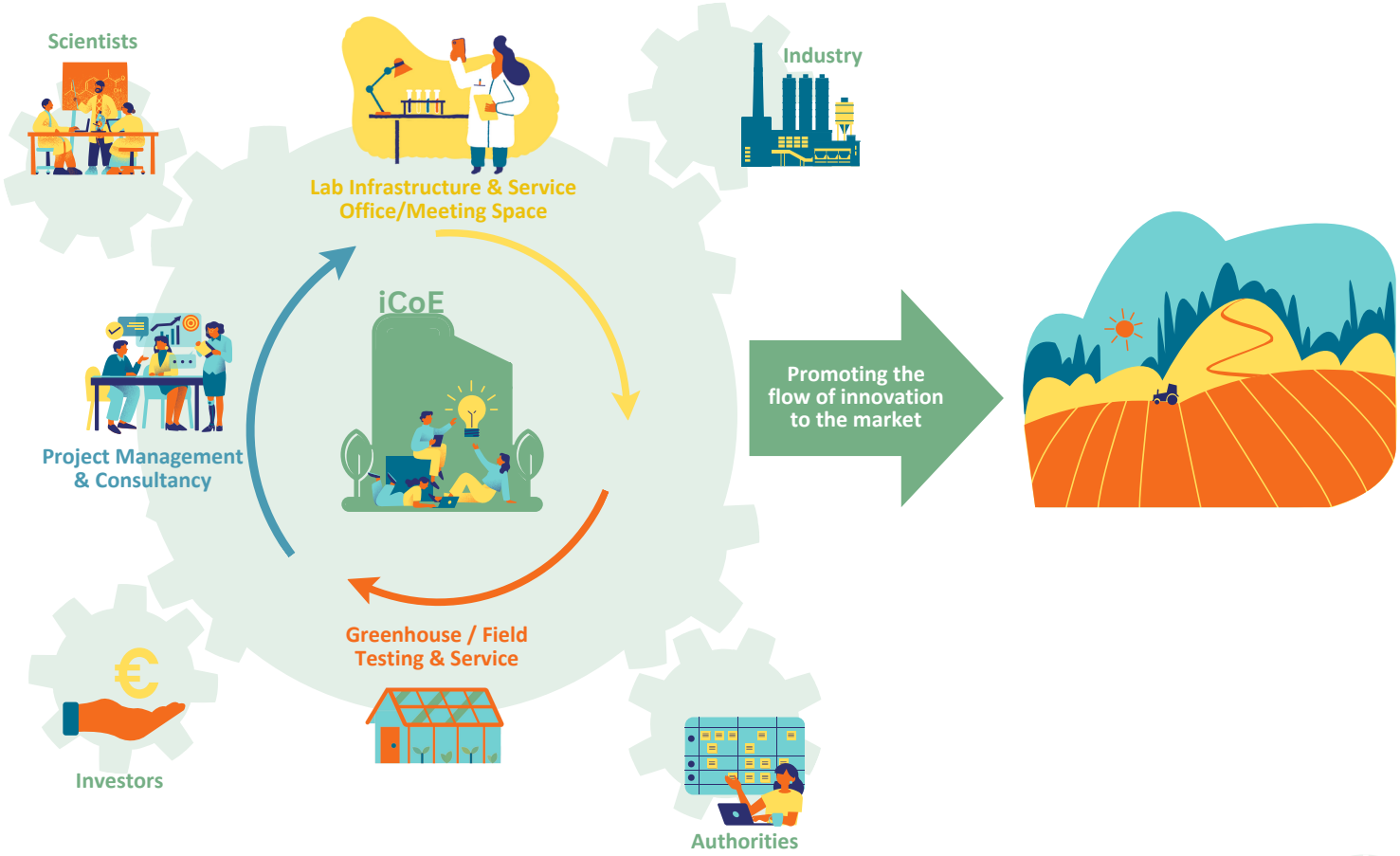
#1 Set priorities for the evaluation of biological active substances
Timelines for market access can be considerably reduced by prioritising or fast-tracking applications for approval of biological active substances.

Deploy dedicated "biologicals experts" #2
Establishing an EU wide group of biologicals experts from across Member States would guarantee a consistent and science-based approach that would considerably speed up procedures.

#3 Training and knowledge transfer
Training and knowledge transfer should be provided for farmers, independent advisors and for regulators to ensure a better understanding of how different biologicals work and how they should be applied in the field and to the crop for best performance.

Mid and long term recommendations

To foster a conducive and innovation-friendly environment, we recommend to establish de-centralised Innovation Centres of Excellence (iCoE) in the EU. These iCoE would offer a Collaborative-Innovation approach, with the purpose to attract early-movers and cutting-edge innovators, while facilitating the connection with investors, the scientific community and established industry partners.



This Policy Brief was prepared by members of **Plants for the Future** (Plant ETP)'s working group on Sustainable Agriculture with support from its wider membership and external experts, including representatives of the International Biocontrol Manufacturers Association (IBMA) and CropLife Europe (CLE).

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Background and mission of the Working Group Sustainable Agriculture

Plants for the Future (Plant ETP) supports the transition of agricultural value chains to more sustainable and innovative systems that remain within planetary boundaries. To actively contribute to this transition, Plant ETP established a multistakeholder working group on Sustainable Agriculture in 2019, which consists of experts from academia, the seed and breeding sector, agricultural service providers, and the farming community. The aim of this working group is to consider, from a plant sector perspective, the challenges, and opportunities of agricultural value chains in a holistic way, while developing a vision for future systems spanning food, feed, and biobased raw materials.

Introduction

The EU Green Deal puts forward two pesticide reduction targets by 2030, as part of the Farm to Fork strategy. The first is a 50% reduction of the use and risk of chemical pesticides, and the second is a 50% reduction of the use of more hazardous pesticides[1]. At the same time, climate change and market globalisation are driving the migration and overall increase of new and invasive pests and diseases, which is a major threat to all agricultural production systems, and consequently to food and nutritional security[2].

To safeguard European agriculture, integrated pest management (IPM) practices, alongside low risk solutions, such as biological solutions or biologicals (Figure 1), are being promoted. To ensure biologicals are efficient and readily available to farmers, it is essential that the development of new technologies and solutions be supported by an innovation-friendly policy environment that can keep up with the newest technological trends and scientific developments.

Currently, the biggest hurdle for biologicals to reach the market is the approval and authorisation process, as the current implementation of the EU Regulation (EC) No 1107/2009[3], is not sufficiently adapted for the assessment of non-chemical solutions. This results in a disproportionately long application process for such products, thereby stifling their development and deployment in the EU.

While work is already ongoing to amend the necessary regulations for the different categories of biologicals, this lengthy process also requires knowledge, capacity building and flexibility at the level of the competent authorities, to ensure they can keep pace with the latest technologies and scientific developments.

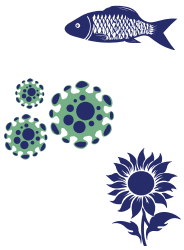
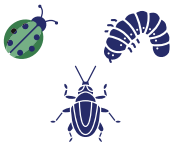
Semiochemicals are substances emitted by plants, animals and other organisms used for intra-species and/ or inter-species communication and have a target-specific and non-toxic mode of action.	
Microbials are based on microorganisms, including but not limited to bacteria, fungi, protozoans, viruses, viroids, mycoplasmas, and may include entire microorganisms, living and dead cells, any associated microbial metabolites, fermentation materials and cell fragments.	
Natural substances consist of one or more components that originate from nature, including but not limited to: plants, algae/microalgae, animals, minerals, bacteria, fungi, peptides, protozoans, viruses, viroids and mycoplasmas. They can either be sourced from nature or are nature identical if synthetised. This definition excludes semiochemicals and microbial.	
Invertebrate Biocontrol Agents (also called macrobials) are natural enemies such as insect, mite and nematode species providing control of pest populations through predation or parasitism.	

Figure 1 Categories of biological solutions. *Currently emerging technologies such as RNA interference, peptides and proteins, have not yet been defined and categorised, but of the sake of this policy brief, we will consider them biological solutions.*

This policy brief aims to raise awareness of current regulatory constraints that stifle investment in and development of new and innovative low risk solutions, based on biologicals and including emerging technologies (e.g. RNA interference, peptides, proteins). At the same time, it also highlights the impact the current legislative situation has so far had on the research, development and innovation environment in Europe, resulting in the consolidation of companies to better manage risks and uncertainties, instead of promoting the development of innovative and cutting-edge SME's and startups.

[1] EU Commission (2020) Farm to Fork Strategy.
[2] CIMMYT Alison Doody (2020) Pests and diseases and climate change: Is there a connection?
[3] REGULATION (EC) No 1107/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009.

The implementation of IPM is essential in the transition of agricultural value chains to more sustainable and innovative systems. The concept of IPM is commonly a four-layer approach: 1. Prevention, 2. Monitoring, 3. Non-chemical plant protection, 4. Chemical plant protection (Figure 2)[4].

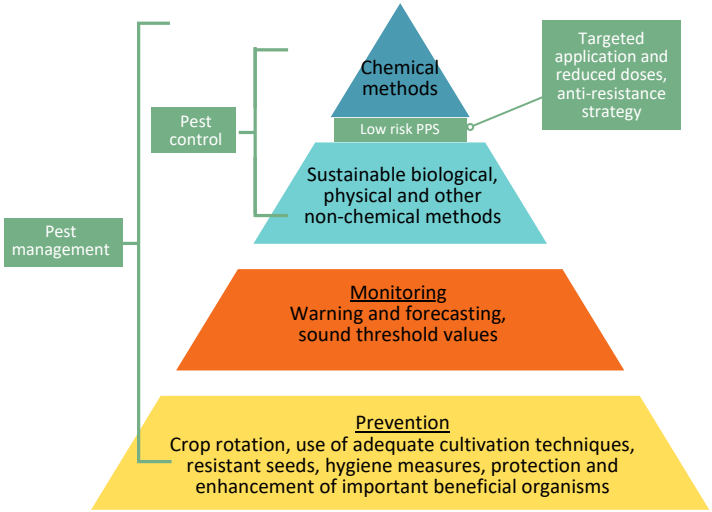


Figure 2 Integrated Pest Management approach.
Figure adapted from the EU Commission[4].

Low risk solutions, including many innovative emerging technologies - such as peptides, proteins, microbiomes, bacteriophages and RNA interference - are expected to become very important tools for more sustainable agriculture now and in the future.

While some of these approaches are about to become established alternatives, such as microbials, others are still in their infancy. There is currently a limited understanding of these new technologies from a safety assessment perspective.

Therefore, all of these new tools are not yet ready to complement the loss of current chemical plant protection solutions (PPS). To address this challenge and facilitate the registration of alternative, low risk, PPS the EU Commission has funded the EU project RATION[5], with the aim to develop a novel risk assessment scheme for such PPS.

It is worth mentioning that over the past few years the majority of new PPS approved in the EU are biological solutions and most of their products are authorised as low risk PPS[6].

In addition, a recent study from the International Biocontrol Manufacturers Association (IBMA) has shown that there are many biological solutions in the pipeline[6].

The current policy lanscape and bottlenecks

The current regulatory framework in the EU for PPS exists in order to safeguard European agriculture while ensuring safety of users, consumers and the environment. However, it is also one of the most strictly regulated, compared to other global jurisdictions[7,8]. Today, the majority of authorised PPS are based on synthetic chemicals, which were developed decades ago.

Whilst the safety profiles of these products have been significantly increased over the years, new areas of concern are constantly emerging (endocrine disrupting effects[9,10], relation to Parkinson disease, etc.) resulting in ever-increasing safety standards and market barriers within the EU. This in turn increases timelines for registration renewals and blocks much needed resources from competent authorities, reducing the possibility for them to focus on innovative solutions.

The current situation creates an environment of uncertainty that discourages new entrants, such as SMEs and start-ups, to invest and develop biologicals for the EU market. Simultaneously, the authorisation of many of the existing chemical PPS are most likely not being renewed (figure 3)[11].

[4] European Court of Auditors (2020) Sustainable use of plant protection products: limited progress in measuring and reducing risks.
[5] RATION (Risk Assessment Innovation for Low-Risk Pesticides)
[6] IBMA Biological control in the pipelines.
[7] REFIT Evaluation of the EU legislation on plant protection products and pesticides residues.
[8] IBMA (2022) Natural Substances as Plant Protection Products: Europe if Lagging Behind.
9] EFSA Guidance for the identification of endocrine disruptors in the context of Regulations (EU) No 528/2012 and (EC) No 1107/2009.
[10] EFSA Investigation into experimental toxicological properties of plant protection products having a potential link to Parkinson's disease and childhood leukaemia.
[11] EU Commission. Active substances, safeners and synergists.

It is important to note that chemical PPS are applicable to several crop species and effective against a range of pests, whilst biologicals have a different mode of action and are more specific to individual crop-pest combinations. Therefore, chemical PPS often need to be replaced by several biological solutions. This has resulted in a reduction of options for farmers, while at the same time, the impact of climate change is causing increased pest pressure.

A true dilemma?

The Farm to Fork's reduction target for chemical PPS is an ambitious goal that requires the development and adequate availability of biologicals as efficient alternatives. However, the timing is challenging, even more so when the reduction of approved PPS is not compensated by a comparable introduction of new solutions (Figure 3).

Why is that?

- Many of the novel biological solutions are still in their infancy. The flow of new technologies towards market entry takes time.
- There is evidence that multiple solutions for arable crops are due for submission by 2028, but that these may only be authorised for farmers' use five to ten years later[12].
- Knowledge and understanding of these new solutions must be acquired and capacity building ensured for regulators and competent authorities. This must be accompanied with the development of new infrastructures for research, development, supply chains, application technologies and training of the end users, i.e., the farming community.
- The current legal uncertainty generates risks and reduces confidence in developers to invest and develop new technologies at full speed.

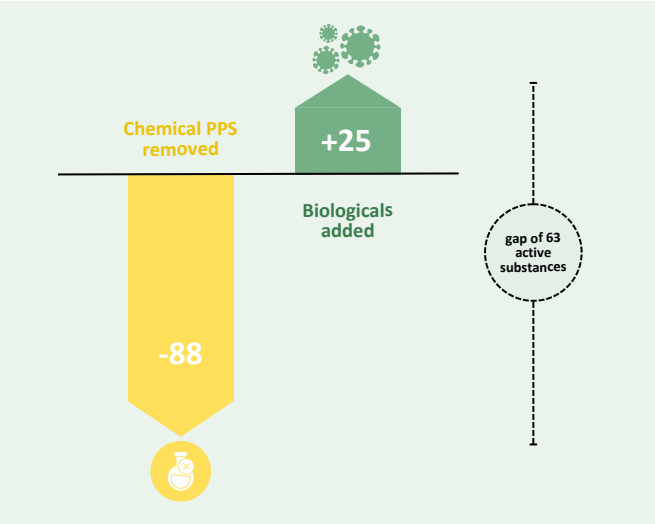


Figure 3 Active substances removed from or added to (approved) the EU market between 2016-2022*. Figure adapted from Euroseeds based on EU Commission data*[11].

What are the consequences?

It is still too early to describe the full impact of the gap between current PPS and biologicals. However, some trends and signals have already been observed:

- The Farm to Fork targets will be difficult to achieve without a reduction in agricultural production, since reliable low risk PPS are not readily available.
- For effective IPM approaches, farmers need access to both biological and chemical solutions.
- A lack of PPS may cause losses of crop varieties and yield stability in Europe.
- Legal uncertainty regarding emerging technologies for biological solutions may cause a loss of technology leadership in Europe, as other global regions are more attractive for developers and legislation more supportive.

[12] IBMA Biological control in the pipelines.

Short term recommendations

In the short term, the focus should be on speeding up the approval and authorisation process for biological solutions, providing a broader range of options for EU farmers to support the reduction of the use of chemical PPS. Not only should the products be available for farmers, but the farmers also need time to familiarise themselves with these and see that they can be used as efficient substitutes to more hazardous PPS. To safeguard high quality agricultural production, it is urgent and essential to compress timelines to bring biological solutions to farmers, from what now typically takes ten years to approximately four years, without compromising safety standards (Figure 4).

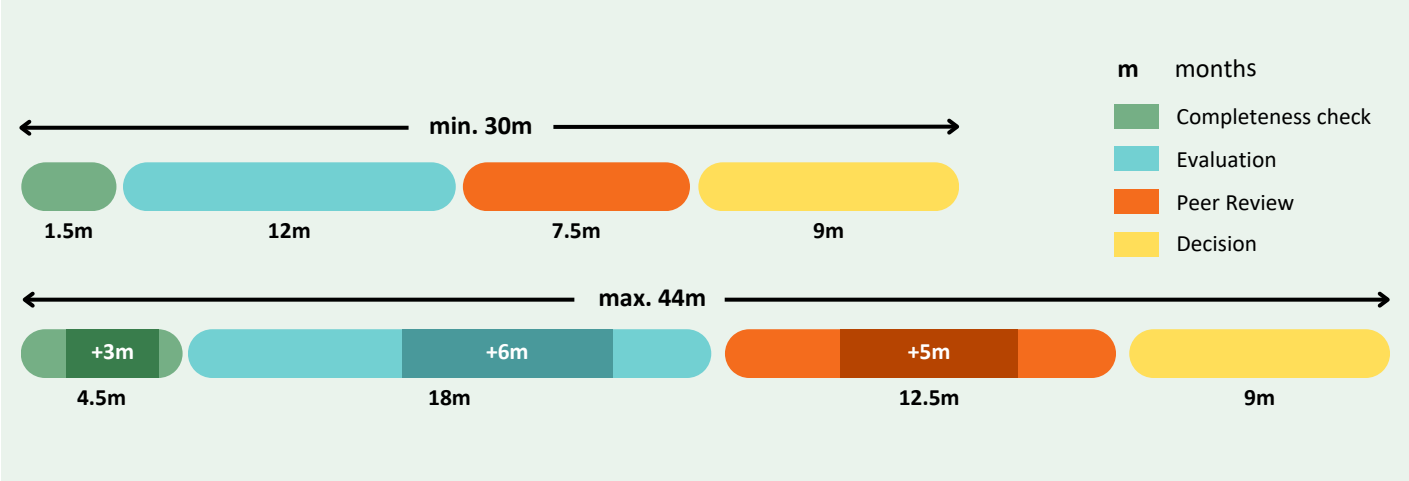


***Figure 4 Approval process and regulatory timeline**. This chart shows in detail the different steps of the approval process (completeness or admissibility check, evaluation, peer review and decision) with the minimum and maximum timelines (30 months and 44 months respectively) according to the published regulatory timelines. It should be noted that the timelines are taking longer due to official workloads in place.[13]*

In the following section, some recommendations to speed up the regulatory process are presented. The key actors are the European Commission, the European Food Safety Authority (EFSA), Rapporteur Member States (RMS) and Zonal Rapporteurs (ZR) respectively, and preferentially in a joint effort. It is acknowledged that some initiatives to speed up the regulatory process have already been initiated.

Short term recommendation #1

Set priorities for the evaluation of biological active substances*

Member states, as Rapporteur for the active substance (RMS) and as Zonal Rapporteur for the authorisation process, can reduce timelines for market access considerably by prioritising or fast-tracking applications for approval of biological active substances.

An **active substance is any chemical, plant extract, pheromone or micro-organism, that has an action against pests of diseases affecting plants, parts of plants or plant products. Before an active substance can be used within a PPS in the EU, it must be approved by the EU Commission*
(EU Commission website).

[13] Minimum and maximum timelines for approval procedure. pg.8, Vademecum 1107, Hans Mattaar, 2020.

Short term recommendation #2

Deploy dedicated 'Biologicals experts'

To guarantee a consistent and scientifically sound approach that would considerably speed up procedures, an EU wide group of biologicals experts from across Member States should be established. This team of biologicals experts would, in close cooperation with the EU Commission, be responsible for all evaluations and assessments of biological active substances submitted in the EU. A similar network of biologicals experts would be needed in EFSA.

It should be noted that a working group Biopesticides organised by the EU Commission already exists and is made up of biologicals experts, including from EFSA. Their work is currently not aimed at individual peer-review and assessment of biological active substances, but rather to contribute to the harmonised approach in the risk assessment. An extension of their role could be an effective short-term solution.

In addition, Member States can attract applicants for the evaluation of biologicals by strengthening their evaluation body with a dedicated biologicals team, with strong science-based expertise and sufficient staff and resources. Grants for such efforts have already been envisioned by the EU Commission and will support six Member States in such an initiative.

Short term recommendation #3

Training and knowledge transfer

Training and knowledge transfer should be provided for farmers, independent advisors and for regulators to ensure a better understanding of how different biologicals work and how they should be applied in the field and to the crop for best performance. The functionality and use of biologicals should have a prominent place in the training curricula for professional users and advisors. At the same time, the knowledge and experience that farmers have gained on the use of biologicals should also be communicated more widely, as peer-to-peer knowledge-sharing is the most efficient way to ensure uptake of new tools.

Farmer networks demonstrating biologicals in action and discussing overall agronomic practices to optimise IPM will be a key part of knowledge transfer.

Short term recommendation #4

Reinstall provisional authorisation for biological active substances

Another measure to facilitate the placing on the market of biologicals is to re-instate the option of the provisional authorisation for products containing new biological active substances that have been evaluated by the RMS and for which the RMS has concluded that the substance can be approved. If no decision on the approval of the active substance has been taken at EU level within 30 months from admissibility, the RMS can start to issue provisional authorisations. This can be done under the assumption that most biological active substances do not require the setting of a Maximum Residue Limit (MRL).

Short term recommendation #5

Allow extensions for biologicals in the renewal process

In the current renewal process of biologicals, the applicant is requested to submit a statement regarding its intended uses to demonstrate that no significant changes compared to previous authorisations (in the zone) exist. An exemption is made for minor uses[14]. An approach similar to that for minor uses could be followed to extend the use of a biological to additional crops and/or pests (i.e., label extensions). This extension must maintain the conditions that its use can be based on extrapolation and is already covered by the original risk envelope[15] assessment.

[14] OECD: Minor uses, which include the majority of nice crops, are the uses of PPS where the potential use is not large enough to justify its registration from an applicant's perspective alone. Typically minor uses involve crops grown on a small scale (minor crops) and often are high value niche crops.

[15] EU Commission Guidance document: The risk envelope is a concept that exploits the idea that in each area of assessment, the supported uses of a product can be grouped taking into account specific criteria (e.g., crop, application rate, number of applications, timing) and the assessment can cover a group of uses rather than individual uses.

Short term recommendation #6

Renewal for an unlimited period

In a similar way as for basic substances[16], the approvals of biological substances could be extended for an unlimited period, thus saving valuable evaluation resources without compromising safety. If needed, the EU Commission may review the approval of such a substance at any time.

Short term recommendation #7

Additional guidance documents or explanatory notes to evaluate biological active substances and extend justified exemptions to all data points

Issue additional tailored guidance documents or explanatory notes to ensure a consistent and harmonised assessment of biological active substances by all Member States[17]. Data requirements for which "justified exemptions can be made" or "a different approach may be taken if adequately justified" exist for some categories of biologicals and/or for some data points[18], but should preferably be extended to all data points. Decision trees, when scientifically sound, can provide valuable input to prepare these justifications, as well as to decide which approach to follow. An example is the "Data decision tree" for identifying potential risks for natural substances when used in plant protection[19].

Short term recommendation #8

Maximise the field of use i.e., breadth of crops for which a biological can be used, during the authorisation step

Extension, or extrapolation, of an authorisation for a given crop to another crop depends on considerations with regard to safety and efficacy. In many cases, biologicals are not subject to Maximum Residue Limits (MRLs) and, therefore, application in other crops will not raise additional safety concerns. Extrapolation of efficacy data from one crop to another one should therefore be encouraged and authorisations should be granted for all crops belonging to that crop group.

Mid & long term recommendations

Besides focussing on short-term measures to improve the market access and uptake of biologicals, it is also essential to accelerate the development of all possible new technologies, which can be used to extend the breadth of tools for farmers.

The current lengthy process for market access of PPS in the EU leads to ever increasing costs for applicants, and the ultimate risk of an innovation being rejected at a late stage of registration. This precarious process has led to careful considerations by developers when investing in innovation for the EU market. The high level of uncertainty in the regulatory environment threatens the market release of new biologicals, especially since most new technologies are discovered by entities such as research institutions, start-ups and SMEs that differ from the historical, risk-adverse, plant protection industry.

These smaller, more agile, innovators are often more willing to take risks and are therefore more likely to develop new out-of-the-box technologies for alternative solutions. However, at the same time, they often lack the capacity to scale up, as well as to address the complexity of the regulatory and market environment.

In addition to the short term recommendations listed previously, mid to long term recommendations are also suggested. One of these is to foster an Innovation Network for biologicals in the EU, based on co-creation, collaboration and co-innovation including all relevant stakeholders, from researchers to farmers.

[16] EU Commission: Basic substances are substances that are not predominantly used for plant protection purposes but may be useful in plant protection.
[17] EU Commission 2024 Guidance Document on Semiochemical Active Substances and Plant Protection Products.
[18] Commission Regulation (EU) No 283/2013 of 1 March 2013 setting out the data requirements for active substances, in accordance with Regulation (EC) No 1107/2009 of the European Parliament and of the Council concerning the placing of plant protection products on the market.

Innovation Centres of Excellence (iCoE)

In order to foster a conducive and innovation-friendly environment we recommend to establish de-centralised Innovation Centres of Excellence (iCoE) in the EU. These iCoE would offer a Collaborative-Innovation approach, with the purpose to attract early-movers and cutting-edge innovators, while facilitating the connection with investors, the scientific community and established industry partners. The iCoE would strive for excellence on selected technologies and modalities for biologicals, such as natural substances, and would interact with national competent authorities, to ensure knowledge transfer, regarding the newest innovations, and capacity building. In this way, potential risks and regulatory bottlenecks could be identified early on and, ideally, addressed by the time new and innovative biologicals are ready to be submitted for assessment.

The concept of iCoE already exists, albeit for different purposes and focusing on other topics. However, their setup, purpose and management can be of interest when it comes to establishing the iCoE described in this document. One such example is the AgriBiotech Hub in Ghent, Belgium: ranging from multinational industries to start-ups, and including the public research institute VIB, that already has a strong track record of supporting innovative ideas from basic research to providing value for society through the Venture Capital funds (V-Bio), that transform scientific innovation into products for more sustainable agricultural systems.

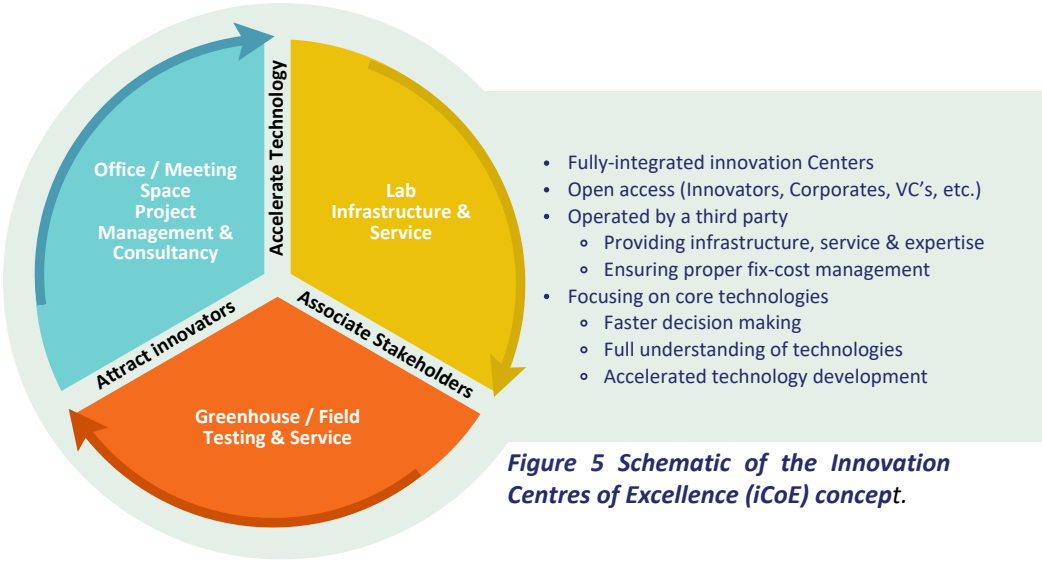


Figure 5 Schematic of the Innovation Centres of Excellence (iCoE) concept.

How could these iCoE be established and function?

An iCoE should consist of a network of laboratories, consultants, field stations, scientific experts and regulatory experts, that is operated by a third party provider, playing a neutral role, and who will be privileged to share its expertise and to provide guidance, without decision-making. The third party provider could be public or private, e.g., a Research Infrastructure funded under Horizon Europe, or a privately funded R&D infrastructure.

An iCoE would provide access to all innovators and enable the advancement of their technologies. Innovators that have not secured their own funding, could connect with interested investors through the network of an iCoE.

Established industries could also be part of this iCoE network, for scouting, acquisition, or extension of their R&D footprints. With such a set-up, the R&D investment costs and risks for new entrants would be significantly reduced, because assets would be used in a very flexible manner and costs shared between all users.

In order to support the Farm to Fork strategy, these iCoE would initially focus on the development and registration of biological solutions, as well as on how they can be most efficiently applied in IPM.

[19] Busschers, et al., (2023) Data decision tree for identifying potential risks for natural substances when used in plant protection, Biocontrol Science and Technology, 33:7, 597-629.

Governance and risk mitigation

To mitigate the risk of rejection at the approval or registration stage of product development, the project progress should be frequently evaluated by an expert group, that should also include national and/or EU level competent authorities. Such a close collaboration could improve trust among actors in the product development process, facilitate alignment on a unified strategy per project and accelerate knowledge transfer and capacity building around new technologies. Ideally, iCoE that are focused on selected technologies would interact and enable knowledge-sharing and capacity building for RMS competent authorities. These would in turn become the reference RMS for specific technologies. This strategy would enable regulatory procedures to be tailored for each technology. The tight connection between the iCoE and corresponding reference RMS could form clusters of excellence that represent a holistic approach, designed to be lean, efficient and fast.

Such an Open-Innovation approach should range across borders, and thus requires good cooperation, collaboration and coordination between Member States. To ensure this, coordination at EU level, led by a group of Members States, would be best suited to provide the strategic direction of the iCoE around specific technologies, install links between the clusters of excellence, and facilitate the exchanges of knowledge and goods across clusters and Member States.

For the iCoE to be successful, they must provide a common platform for engagement, where stakeholders can fully commit and share background and foreground knowledge. Such a pre-competitive environment will be needed to maintain momentum during the (re)iterative cycles of innovation assessment, that will be pivotal to achieve marketability. Therefore, the relevant authorities (EU level or a group of Member States) should also ensure appropriate rules are put in place to foster a safe and open space for innovators.

To facilitate the launch of successful iCoE in Europe, locations linked to the concentration of relevant expertise should be targeted. These iCoE could be regarded as Start-up villages, which are an aspect of the EU Commission's long-term vision for EU's rural areas to support rural development by creating local job opportunities[20].

CONCLUSION

In order to meet the EU Green Deal's goals of reducing the use and risk of pesticides in agricultural production, by 2030 and beyond, an innovation-promoting environment must be established in the EU. This can only succeed if it is accompanied by an innovation-friendly legislative framework. Through the establishment of iCoE, the outcome of a Collaborative-Innovation approach would be larger than the sum of the efforts of individual players across the EU.

[20] EU Science Hub European Startup Village Forum.