

# LOCK-INS AND BARRIERS SURROUNDING A TRANSITION AWAY FROM RELIANCE ON SYNTHETIC PESTICIDES

## Introduction

This factsheet provides an overview of the key lock-ins and barriers identified as affecting a transition away from reliance on synthetic chemical pesticides in agriculture. Drawing on mixed-methods qualitative research, we identify the key dimensions surrounding these lock-ins and barriers.

### What is a 'lock-in' mechanism?

**Underlying and often invisible causal processes that lead to the occurrence of barriers, either on their own or in combination with other processes.** These provide a systemic stabilizing dynamic that reinforces business-as-usual and hinders transition. The main categories of lock-in mechanisms identified in our research include: Agronomy & research, Economics, Knowledge, Policy, Regulation and Cognitive dimensions.



### What is a 'barrier'?

**A direct limiting factor as part of a broader system lock-in.**

For example, one barrier to sustainable plant protection is a lack of biocontrol products that can replace chemical pesticides for treating a specific pest or disease. This barrier is part of a broader lock-in mechanism: historical dependency on current patterns of industry funding which does not favour radically new technologies and approaches.

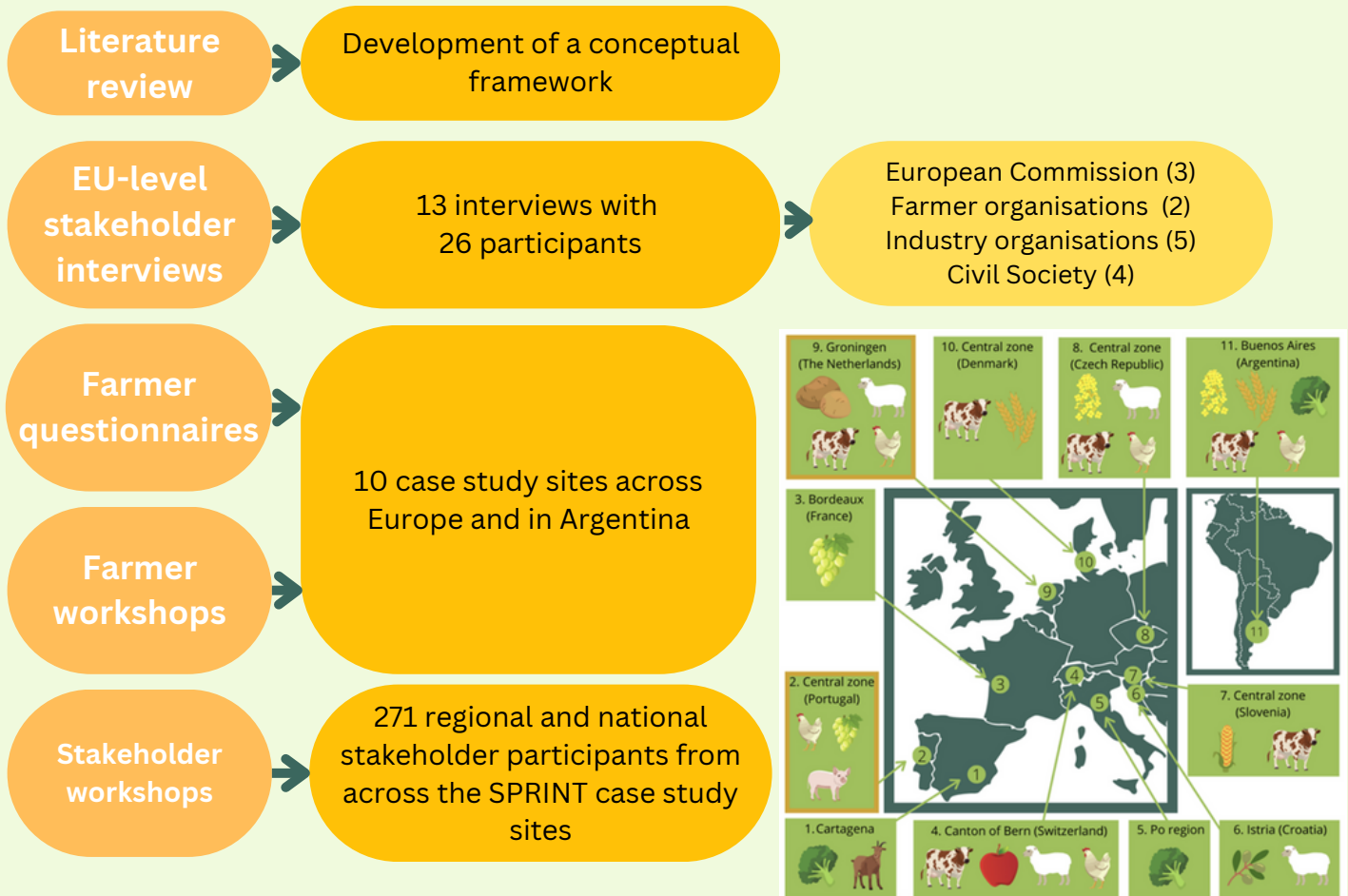


Lock-in mechanisms and barriers interact and reinforce each other, resulting in a complex picture. For example, where biocontrol is costly, there is limited openness to non-chemical alternatives and willingness to experiment. In addition, where farmers have already invested capital, time and knowledge around machinery for chemical pesticide applications, and whilst authorities rely on emergency authorisations and do not consider the possibility of substantial change, transition becomes difficult to achieve. To break the pesticide lock-in situation it is therefore important to take a systemic approach, addressing the multiple lock-in mechanisms and barriers at the same time.



# LOCK-INS AND BARRIERS SURROUNDING A TRANSITION AWAY FROM RELIANCE ON SYNTHETIC CHEMICAL PESTICIDES

## Methods



## Dimensions affecting transition

Drawing on inspiration from research on socio-technical systems, available literature on transitions towards pesticide-free agriculture, as well as an inductive analysis of data from SPRINT research, we identified several categories of lock-in mechanisms. These are used going forward as a way of understanding both the lock-ins and barriers surrounding a transition away from reliance on chemical pesticides:

**Agronomy & Research**

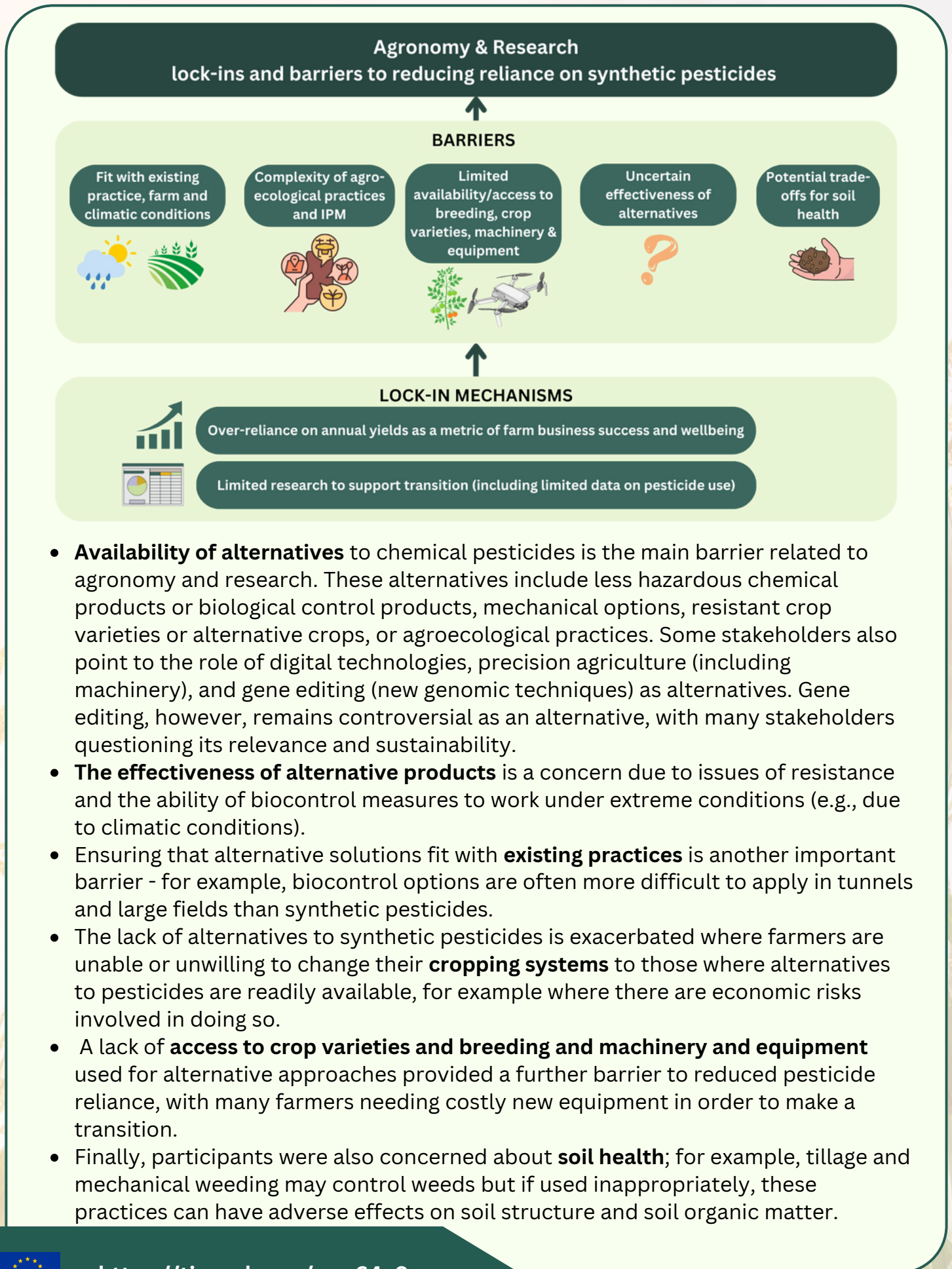
**Economics**

**Knowledge**

**Policy**

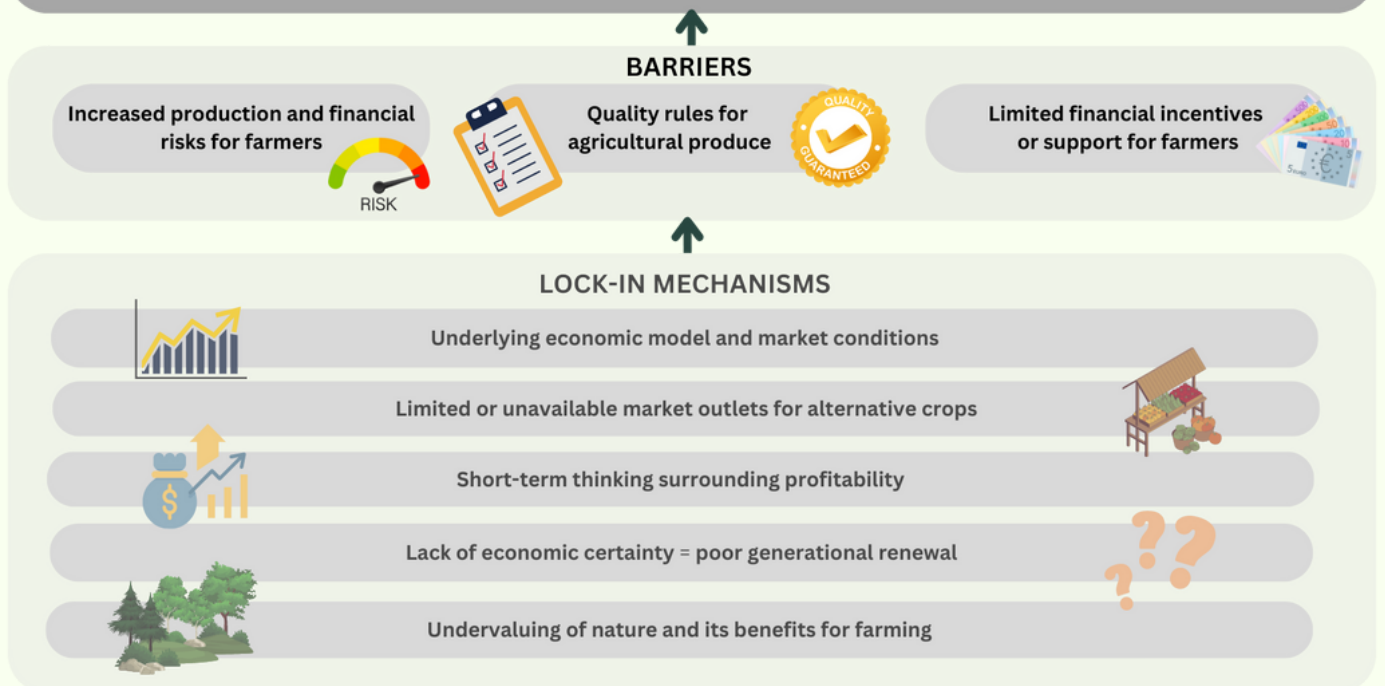
**Regulation**

**Cognitive dimensions**



- **Availability of alternatives** to chemical pesticides is the main barrier related to agronomy and research. These alternatives include less hazardous chemical products or biological control products, mechanical options, resistant crop varieties or alternative crops, or agroecological practices. Some stakeholders also point to the role of digital technologies, precision agriculture (including machinery), and gene editing (new genomic techniques) as alternatives. Gene editing, however, remains controversial as an alternative, with many stakeholders questioning its relevance and sustainability.
- **The effectiveness of alternative products** is a concern due to issues of resistance and the ability of biocontrol measures to work under extreme conditions (e.g., due to climatic conditions).
- Ensuring that alternative solutions fit with **existing practices** is another important barrier - for example, biocontrol options are often more difficult to apply in tunnels and large fields than synthetic pesticides.
- The lack of alternatives to synthetic pesticides is exacerbated where farmers are unable or unwilling to change their **cropping systems** to those where alternatives to pesticides are readily available, for example where there are economic risks involved in doing so.
- A lack of **access to crop varieties and breeding and machinery and equipment** used for alternative approaches provided a further barrier to reduced pesticide reliance, with many farmers needing costly new equipment in order to make a transition.
- Finally, participants were also concerned about **soil health**; for example, tillage and mechanical weeding may control weeds but if used inappropriately, these practices can have adverse effects on soil structure and soil organic matter.

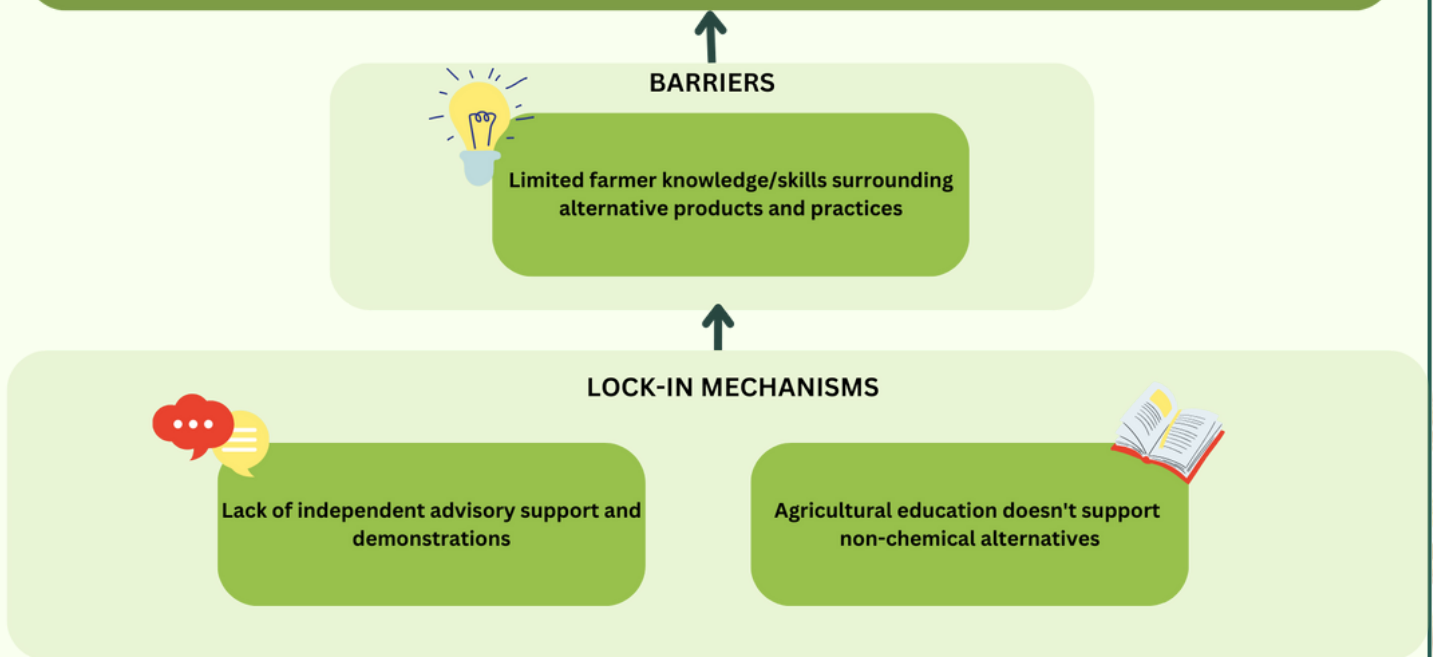
## Economics: Lock-ins and barriers to reducing reliance on synthetic pesticides



Unless farmers feel that they can use alternatives to chemical pesticides without significant economic risks, they are unlikely to consider their uptake. Key factors here include:

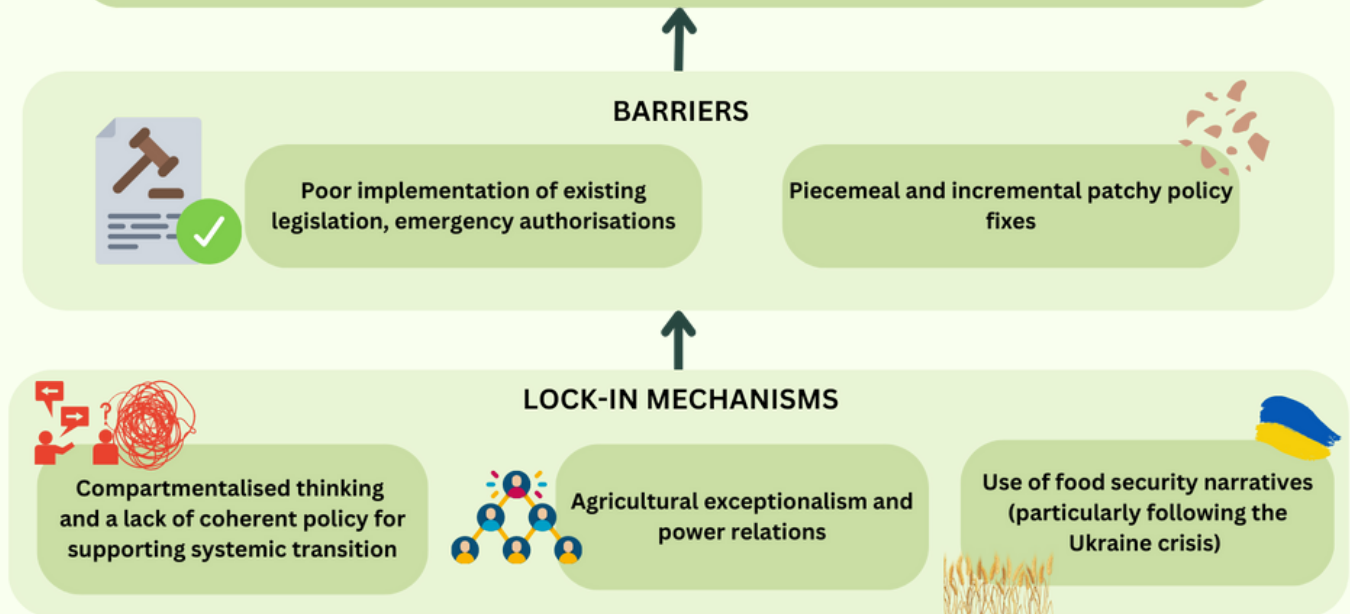
- **Unclear economic benefits and potential negative impacts on farm profitability** - with **yield losses** (both in terms of quantity and quality) seen as the biggest cause for concern among conventional farmers
- **Increased labour requirements**, with many alternative approaches requiring additional effort and labour. This can affect well-being as well as the timings of farming practices
- **Cost of alternative products and required investment** - for example, resistant seed varieties can be more expensive than their counterparts. In addition, any initial investment required in, for example, equipment, may also be too costly for many
- **Limited or unavailable market for alternative crops**, with farmers needing reassurance that they can sell crops that enable pesticide reductions
- **Lack of consumer awareness and resulting visual requirements**, with farmers concerned that their crops will be rejected by consumers where they do not look a certain way (e.g., straight carrots) as a result of not using chemical pesticides
- **Increased production and financial risks**, for example where alternative products are not proven in terms of their effectiveness
- **Lack of economic certainty resulting in poor generational renewal**, with ageing populations of farmers and economic uncertainty being linked to low uptake of new practices and lower interest by younger people to continue or enter farming
- **Underlying economic model and market conditions**, including a reliance on exports, high concentration in agricultural supply industry, unfair competition, the power of retailers, and financing structures which favour chemical protection (e.g., bank loans)

## Knowledge: Lock-ins and barriers to reducing reliance on synthetic pesticides



- **Lack of farmers' knowledge and skills** surrounding alternative products and practices is an important barrier across all farming systems. Alternatives to chemical pesticides often require extensive knowledge of the specificities of each crop, the available and most relevant alternatives for a specific farm (whether product, agronomic practices, systemic approaches), and various strategies for how to ensure that the risk to plant health is minimized. Knowledge, if available and used, can buffer against the risk of loss of yield during the transition period.
- **Lack of independent advisory support and demonstrations**, with insufficient support from experts, independent advisors, peers and basic education to reduce reliance on chemical pesticides. The importance of peer-to-peer demonstration and direct advice for farmers is important also to counter any distrust that farmers' have towards top-down approaches and regulatory restrictions.
- **Lack of agricultural education that supports non-chemical approaches.** There is insufficient emphasis in basic training and agricultural education on how to farm without the use of synthetic pesticides, as well as around the risks arising from the excessive use of chemical pesticides.

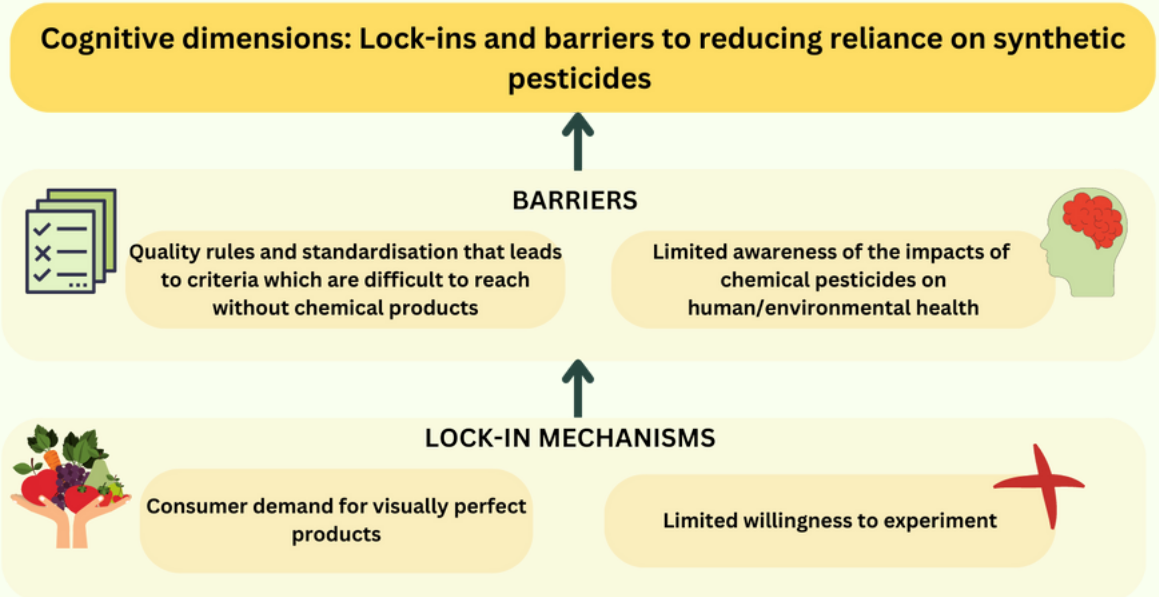
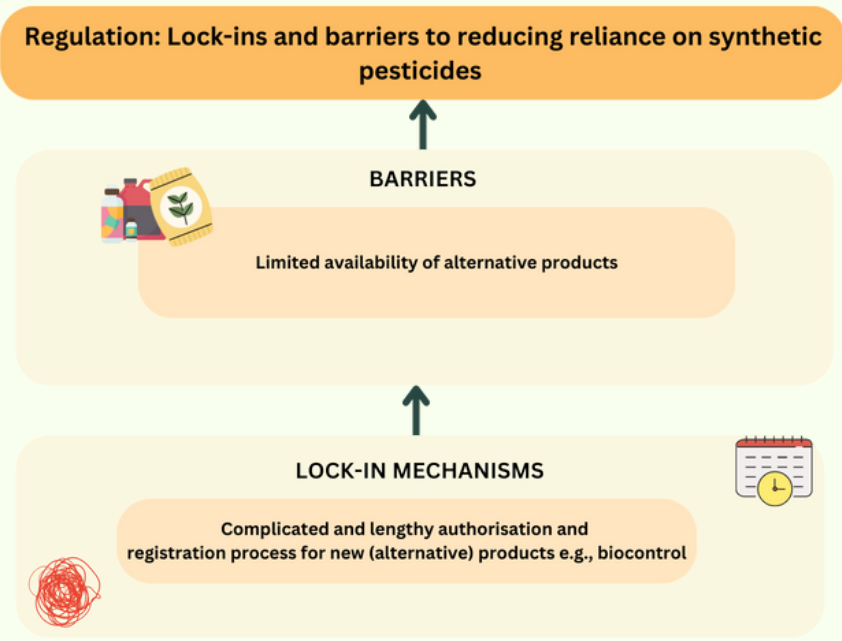
## Policy: Lock-ins and barriers to reducing reliance on synthetic pesticides



Policies play a central role in addressing the multiple causes of overreliance on chemical pesticides. However, the way policies are developed contains multiple lock-ins and barriers, including:

- **Compartmentalised thinking and a lack of coherent policy for supporting systemic transition** means that complex problems are not addressed sufficiently.
- **Agricultural exceptionalism and power relations** in Brussel creates difficulties in challenging the dominant narratives. This is exacerbated by the dominant influence of agricultural stakeholders in agricultural policies.
- **Use of food security narratives** to delay concrete action on reducing the use of synthetic pesticides, particularly following the Ukraine crisis.
- **Piecemeal and incremental patchy policy fixes** due to political landscape and the vested interest in the status quo. This restricts farmers in their current practices without offering coherent support for moving to alternative production models.
- **Poor implementation of existing legislation, and overuse of emergency authorisations**, particularly as the availability of approved active substances is restricted. The Sustainable Use Directive is criticised for its ineffectiveness.

- **Complicated and lengthy authorisation and registration for new products** limits approval of new substances, whether lower hazard or biocontrol. The assessment process for biocontrol products is not differentiated from that for synthetic pesticides thereby slowing down the registration process.
- **Differential regulations and availability of synthetic pesticides in an open market,** results in prohibition in one country leading to the import of harvest from non-prohibited countries.



- **Food quality rules and standardisation criteria** constrain production without chemical products
- **Limited awareness of the impact of chemical pesticides on human and environmental health** both in the farming community and more broadly, including at the EU level.
- **Limited willingness to experiment** with new production systems and practices with a preference for the status quo and adhering to cultural norms.
- **Consumer demand for visually perfect products** driven by established expectations.

## Conclusions

The research results have highlighted that progress towards reduced reliance and dependence on chemical pesticides is hindered by the pesticide lock-in situation.

There are many interrelated processes and direct barriers that mutually reinforce each other to limit or substantially slow down a wider transition away from a reliance on chemical pesticides. We have identified the key lock-in mechanisms and barriers across different dimensions including agronomy and research, economics, knowledge, policy, regulation and cognition.

While specific barriers may vary, many apply across different farming systems. The interaction of these mechanisms and barriers creates a complex situation. For example, the absence or high cost of biocontrol limits openness to non-chemical alternatives, while farmers have already invested substantial resources in mechanised pesticide applications. Furthermore, authorities rely on emergency authorisations, rather than considering alternatives like growing other crops or the redesign of farming systems due to the cost and effort involved.



## What comes next?

SPRINT will now work with stakeholders to identify possibilities and opportunities for breaking the pesticide lock-in situation identified here. We will develop possible pathways which better support the emergence and diffusion of alternatives to chemical pesticides, including through working with those who have already transitioned away from a reliance on chemical pesticide use.



### Deliverable 7.1 Pesticide lock-in and barriers to transition towards sustainable plant protection

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