

Commission Response  
to  
Council Decision (EU) 2022/2572 of 19 December 2022

requesting that the Commission submit a study complementing the existing impact assessment of the proposal for a Regulation of the European Parliament and of the Council on the sustainable use of plant protection products and amending Regulation (EU) 2021/2115.

## Executive Summary

Council Decision (EU) 2022/2572 of 19 December 2022 requested the Commission to submit to Council a study complementing the impact assessment of the proposal for a Regulation of the European Parliament and of the Council on the sustainable use of plant protection products and amending Regulation (EU) 2021/2115 and to propose follow-up actions, if appropriate in view of the outcomes of the study. The afore-mentioned Commission proposal was adopted on 22 June 2022 as part of a package of measures to reduce the environmental and health footprint of the EU's food system and help mitigate the economic losses that we are already suffering due to climate change and biodiversity loss.

The Commission's response provides information on the specific aspects listed in the Council Decision, notably the potential impacts of the Commission proposal on food production in the Union and on food and feed prices, the potential consequences on food and feed availability in the EU, the potential impacts of increased administrative burden on competitiveness and profitability of small and medium-sized farms, the availability of alternatives to plant protection products and the potential increased risk of introduction and spread of harmful organisms in the EU, the potential impact of banning the use of plant protection products in sensitive areas, especially in areas used by the general public and in human settlements and the potential impacts of the proposed restriction concerning the use of plant protection products on forest stands and forest dependent biodiversity. It confirms the conclusion of the impact assessment that there is a need to revise the Sustainable Use Directive to address important policy issues such as poor and variable implementation across Member States, the lack of national targets and the need to protect sensitive areas, and supports the measures set out in the Commission proposal.

The potential impact of the Commission proposal on food and feed availability in the Union and the possibility of increased dependence on imports as well as reductions of exports will depend on the potential effect on crop yields. This needs to be seen in two dimensions – while an unmanaged or badly managed reduction may indeed lead to yield reductions, a well-managed transition will not have such negative effects. At the same time, it is also clear that over medium and long term, the lack of pollinators will negatively affect yields. The information provided in *Chapter 1 – Economic issues* of this response highlights several studies that already provide quantitative data on the potential impacts on agricultural yields for the main crop types in the Union, following a reduction of pesticide use and risk by 50 %. Given the lack of empirical data on pesticide use, the published impact studies have employed broad assumptions of yield decline or elicited crop- and region-specific estimates of yield declines based on expert opinions. The largest yield impacts in these studies were estimated to occur in crops that have limited relevance for food and feed security, such as grapes, hops and tomatoes. These estimates of potential yield impacts are to be seen as an upper bound due to several factors not considered in these studies, as explained in more detail later in the response. A significant reduction of pesticide use and risk may also be achieved in non-food and non-feed sectors, thereby contributing to the reduction targets without any impact on food security, food production, availability or prices. The existing heterogeneity in current pesticide use between similar farmers also implies a reduction potential without significant repercussions to crop yields.

A key element of the Commission proposal is that it allows Member States to decide, in their National Action Plans, how to apply the reduction targets, taking account of the need to protect production of specific crops, in specific regions or by specific practices. In this way, they can limit the effect of the measures, distributing them to less critical areas. Very significant progress towards achieving the

pesticide reduction targets has already been achieved through a substitution of higher risk substances with low-risk substances without having any effect on crop yields. A broad variety of alternative agronomic and technological strategies also allow for reductions in pesticide use and risk while preserving crop yields. Numerous precision technologies allow for targeted applications of pesticides or provide alternatives to pesticides altogether. These are supported by the Commission proposal and a range of parallel actions, including through the use of Common Agricultural Policy funding.

As regards the request in the Council Decision to consider the availability of alternatives to plant protection products, which is covered in *Chapter 3 – Alternatives to chemical pesticides*, it should be noted that several actions to increase the knowledge and the spreading of holistic integrated pest management (IPM) principles and relevant tools are already underway, strongly supported by research and innovation. Moreover, the Commission has taken a number of actions that already establish a legal framework for accelerated approvals of low risk and biocontrol substances (such as data requirements for approval of microorganisms) and is taking steps to expand this further with a broader range of types of biocontrol. Suggestions are also made as to how amendments in the SUR proposal could further facilitate the market in low risk and biocontrol substances. With the framework provided by the Commission, with actions being taken by industry, and with Member State authorities providing the appropriate priorities and resources, the current information indicates that sufficient tools will be available generally within the timeframe of the 2030 targets to provide the reduction in chemical pesticide use and risk required.

*Chapter 4 – Sensitive areas* notes that a published Commission non-paper that was transmitted to the European Parliament and to the Council on 15 November 2022 sets out various options for the use of biocontrol and low risk substances in all sensitive areas, and for all but more hazardous substances in agriculture within ecologically sensitive areas, including all substances authorised for use in organic farming. The purpose of proposing restrictions on the use of pesticides in sensitive areas is primarily to protect human health and the environment. Public and urban areas are protected primarily because of the higher possibility of human exposure. Areas protected under environmental legislation for habitat or water protection reasons are prioritised because of their ecological importance. A transition towards pesticide-free management may require a change in aesthetics and to the overall approach to weed management, which can be done without affecting overall financial costs and with positive effects on the environment. There are particular challenges, especially in cemeteries and sports grounds, but many technical solutions are available to dramatically reduce the use and risk of pesticides in such areas without negative economic impacts. Pesticides are already generally prohibited in non-productive areas as part of Good Agricultural and Environmental Condition standard 8. An additional requirement to use only low-risk pesticides or biological control in a 3-metre buffer zone could contribute in a modest way to that biodiversity function. In practice, the buffer zone will only affect farms larger than 10 hectares where the increase of the non-productive area due to the buffer zone will be less relative to the overall size than it would be for a smaller farm.

Allowing only biological control and low-risk pesticides in urban areas covered by watercourse or water feature, recreational/ bathing water and areas designated for the protection of economically significant aquatic species is expected to have a limited impact on agriculture. Given the environmental importance of surface water and the negative medium-term outlook for water quality, it appears prudent to provide for such a restriction. The Commission's published non-paper of November 2022 includes various options for the protection of drinking water resources. In addition to the aims of protecting human

health and the good status of water bodies, there is also a high economic cost (borne by the consumer) that arises from the need to treat water polluted by pesticides, thus there are strong economic reasons to address the contamination at source in line with the prevention at source principle. The inclusion of Natura 2000 and areas protected under national legislation and reported to the nationally designated protected areas inventory (Common Database on Designated Areas (CDDA)) will help to protect rare and threatened species and rare natural habitat types and to maintain, enhance, or restore the integrity, connectivity and resilience of all ecosystems.

Concerning the Council request to provide a quantification of the impacts of the proposed restriction concerning the use of plant protection products on forest stands and forest dependent biodiversity, it should be noted that the Commission does not possess data at Union level on pesticide use in forest stands, although research shows that such use is rare compared to agriculture. As pesticide restrictions in forest stands are part of wider proposed restrictions on pesticide use in sensitive areas, the Commission has also provided information on this point.

As regards the potential increased risk of introduction and spread of harmful organisms in the Union, the Commission proposal will help to address biodiversity loss and the availability of alternatives to chemical pesticides. The SUR proposal already provides for exceptions to allow pesticide use for control of harmful organisms in relation to restrictions in sensitive areas to mitigate that risk. Consideration could potentially be given during the negotiations to further expanding this in certain circumstances.

*Chapter 2 – Administrative burden*, compares the potential additional administrative burden of the Commission proposal to the current Sustainable Use Directive for small and medium-sized farms (as professional pesticide users) is calculated as 10 hours per year per farm. Depending on the hourly tariff used, this could equate to a cost of 161-210 EUR per year per farm, including non-wage labour costs and a standard 25% for overheads. This can be compared with the administrative burden on farmers in other areas arising from compliance with EU legislation or rules. For example, a study analysing administrative burden arising from the Common Agricultural Policy assessed the average cost related to aid administration in the EU to be around 220 EUR per farm. There could be an additional possible cost of 180 EUR per year for such small and medium-sized farms to obtain annual obligatory “strategic advice” under the Commission proposal, although providing such advice via group or online/remote means would have the potential to reduce this cost significantly. Member States could decide to compensate farmers for these costs via CAP Strategic Plans. Evidence from the Commission’s published impact assessment and supporting external study suggests that the cost of advice received could also be partially or even wholly recouped from reduced use, and associated cost, of pesticides to farmers. The Commission does not have precise, harmonised EU-level data to assess the potential quantified impacts of such an increased administrative burden on the competitiveness and profitability of small and medium-sized farms. Concerning the terminology and specific request included in the Council Decision, it should be noted that there is no standardised EU definition of what constitutes a small or medium-sized farm. Such an interpretation of a small or medium-sized farm would be expected to differ substantially between different Member States, also taking account of the type of farming practised (e.g. greenhouses versus field crops). Numerous options are available to the co-legislators to reduce and mitigate any such additional potential costs and administrative burden, especially for small and medium-sized farms.

## Glossary

Term or acronym	Meaning or definition
AKIS	Agricultural Knowledge and Innovation System
AMIS	Agricultural Market Information System
BTSF	Better Training for Safer Food
CAP	Common Agricultural Policy
CAP SP	Common Agricultural Policy national strategic plan
CAPRI	Common Agricultural Policy Regional Impact
CDDA	Common Database on Designated Areas
CEETTAR	European Organisation of Agricultural, Rural and Forestry Contractors
COCERAL	European association of trade in cereals, oilseeds, rice, pulses, olive oil, oils and fats, animal feed and agrosupply (Comité du Commerce des céréales, aliments du bétail, oléagineux, huile d'olive, huiles et graisses et agrofournitures)
COP	Cereal, oilseed, and protein crop
COP15	Fifteenth meeting of Parties to the United Nations Convention on Biological Diversity
COPA-COGECA	Committee of Professional Agricultural Organisations-General Confederation of Agricultural Cooperatives
CORINE	Coordination of information on the Environment
DG	Directorate-General
DG AGRI	Directorate-General for Agriculture and Rural Development
DG SANTE	Directorate-General for Health and Food Safety
DWD	Drinking Water Directive
EAA	Economic accounts for agriculture
ECI	European Citizens' Initiative
EEA	European Environment Agency
EFSA	European Food Safety Authority
EIP-AGRI	European Innovation Partnership for Agricultural productivity and sustainability

EU	European Union
EU27	The 27 EU Member States after the UK left the EU
Eureau	European Federation of National Associations of Water Services
Eurostat	Statistical office of the EU
F2F1	First Farm to Fork Strategy pesticide use and risk reduction target to reduce the use and risk of chemical pesticides by 50% by 2030
F2F2	Second Farm to Fork Strategy pesticide use and risk reduction target to reduce the use of the most hazardous pesticides by 50% by 2030
FADN	Farm Accountancy Data Network
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
FAS	Farm Advisory Service
FP	Framework programme
GAEC	Good Agricultural and Environmental Condition
GBIF	Global Biodiversity Information Facility
GDP	Gross domestic product
GSA	Geospatial aid application
GSBI	Global Soil Biodiversity Initiative
HICP	Harmonised Index of Consumer Prices
HRI	Harmonised risk indicator
IA	Impact assessment
IACS	Integrated Administration and Control System
IBMA	International Biocontrol Manufacturers' Association
IED	Industrial Emissions Directive
IFPRI	International Food Policy Research Institute
IPBES	Intergovernmental science Policy Platform on Biodiversity and Ecosystem Services
IPM	Integrated pest management
IPPC	International Plant Protection Convention

ITPS	Intergovernmental Technical Panel on Soils
JRC	Joint Research Centre of the European Commission
LAU	Local administrative unit
LPIS	Land Parcel Identification System
LUCAS	Land use/ cover area frame statistical survey
MS	Member State
MTO	Medium-term outlook
NAP	National action plan
NCP	National control plan
NGO	Non-governmental organisation
NGT	New Genomic Technique
NOEC	No observed effect concentrations
NRL	Nature Restoration Law
OECD	Organisation for Economic Co-operation and Development
OG	Operational Group
PAE	Pesticide application equipment
PPP	Plant protection product
R&D	Research and development
R&I	Research and innovation
SAIO	Statistics on agricultural inputs and outputs
SAPEA	Science Advice for Policy by European Academies
SCBD	Secretariat of the Convention on Biological Diversity
SME	Small and medium-sized enterprise
SMR	Statutory Management Requirement
SUD	Sustainable use of pesticides Directive
SUR	Sustainable use of plant protection products Regulation
TF	Types of farms

UBA	German Federal Environment Agency (Umweltbundesamt)
UEFA	Union of European Football Associations
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
USDA	United States Department of Agriculture
WDPA	World Database of Protected Areas
WEcR	Wageningen Economic Research

## Introduction

Following the request made by the Council to the Commission in Council Decision (EU) 2022/2572, the Commission has prepared additional inputs to complement the impact assessment for the proposal for a Regulation of the European Parliament and of the Council on the sustainable use of plant protection products (hereinafter 'SUR').

This additional input addresses the specific requests set out in Article 1 of the Council Decision:

*Chapter 1 – Economic issues (page 3)* addresses points (a), (b) and (c) of the request, which concern the quantitative impacts of the Commission proposal on food production in the Union, on food and feed availability in the Union and on food and feed prices.

*Chapter 2 – Administrative burden (page 83)* addresses point (d) of the request, which concerns impacts on competitiveness and profitability of small and medium-sized farms.

*Chapter 3 – Alternatives to chemical pesticides (page 115)* addresses point (e) of the request, which concerns the availability of alternatives to plant protection products.

*Chapter 4 – Sensitive areas (page 128)* addresses points (f) and (g) of the request, which concern the impact of the proposal on agricultural production in sensitive areas and the use of plant protection products on forest stands and forest-dependent biodiversity. It also partially covers the issue in point e) of the potential increased risk of introduction and spread of harmful organisms in the Union.

Previously identified data limitations remain, and this is particularly the case as regards the level of pesticide and crop-specific use data at EU level in Member States. Consequently, it is not possible to further quantify the impact on agricultural yields for the main type of relevant crops and plant products individually, while taking into account, in the context of setting the national reduction targets, the specific conditions in the Member States, including different climate regions. This is fully explained in Chapter 1.

On the other hand, the Commission has updated its analysis using data made available since the impact assessment, including updated pesticide sales data now available to the Commission, new results of studies and publications from a review of scientific literature, contacts with scientific institutes with relevant research outcomes and information received from Member State competent authorities and particular cities.

## Chapter 1 – Economic issues

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## Summary

This study has been conducted following the publication of the Council Decision (EU) 2022/2572, which requested the Commission to submit a study complementing the impact assessment of the proposal for a Regulation on the sustainable use of plant protection products. The study aims to address the concerns of the Council that the impact assessment does not consider the long-term impacts of the regulation on food security, and particularly because the impact assessment was conducted prior to Russia's invasion of Ukraine.

The Commission has already conducted an analysis of the drivers of food security, published in January 2023 as a Staff Working Document ([Analysis of main drivers on food security \(europa.eu\)](#)), which concluded that agrochemicals, including chemical pesticides, can have a detrimental effect on soil, health, and biodiversity and this in turn is a major threat to food production and food security. The analysis further concluded that the short-term effect of the use of pesticides is not significantly affected by Russia's invasion of Ukraine and explained the need to transition away from a pesticide-centric food production system.

Section 1.1 summarizes the evidence on food and feed security impacts of Russia's invasion of Ukraine. In the short-term, high energy and fuel prices may result in mechanical weeding being a costly alternative compared to crop protection via chemicals (e.g. herbicides). However, in the medium-term energy markets are expected to ease and Russia's invasion of Ukraine is not expected to have a significant impact on global food markets. In fact, in the current 2022/23 marketing season, EU agricultural markets have already partly absorbed the short-term impacts resulting from the war, which leads experts to anticipate no considerable disruptions in a medium-term context (2030, EU Medium-Term Agricultural Outlook).

This study focuses on addressing the following points from the Council decision, a) economic impacts on food production and yields, b) consequences on the availability of feed and food and finally c) potential impact on food and feed prices. It includes updated analysis of data and consideration of developments since the impact assessment was carried out, such as the evolution of progress towards pesticide reduction targets and technological and policy developments.

The information presented is complemented by three additional inputs to the Council Decision addressing the point d) on profitability of small and medium enterprises, point e) on alternatives and point f) on sensitive areas

Several studies already provide quantitative data on the potential impacts on agricultural yields for the main crop types in the European Union following a reduction of pesticide use and risk by 50 %, as described in section 1.2. Given the absence of empirical data on pesticide use, impact studies have employed broad assumptions of yield decline or elicited crop- and region-specific estimates of yield declines based on expert opinions. The largest yield impacts in these studies were elicited to occur in crops that have limited relevance for food and feed security.

These estimates of potential yield impacts are to be seen as an upper bound due to several factors not considered (see sections 2 to 4). In summary, the studies assumed that a) the full 50 % reduction in pesticide use and risk takes place immediately and must occur for all pesticides, all crops and across all areas, b) no positive ecological feedbacks on agricultural yields are generated through the pesticide reduction, and c) there will be no agronomic and technological progress that may supports a pesticide reduction without yield impacts. Section 2 and 3 show that:

- i) a significant reduction of pesticide use and risk may occur in non-food and non-feed sectors, thus allowing reduction without impact on food security, food production, availability or prices. The specific Articles of the SUR proposal and the options in the non-paper on sensitive areas (particularly urban and public areas) are designed to support this.
- ii) the existing heterogeneity in current pesticide use between similar farmers implies a reduction potential without significant repercussions to crop yields
- iii) the variation in pesticide use on specific crops could be exploited in national plans which in turn would flatten the EU-wide yield shocks (if any) across different commodities. The SUR proposal already allows MS through their National Action Plans to apply subsidiarity and take actions in different crops, regions or practices that would limit the effects and distribute across different areas.
- iv) since the 2017 baseline, progress towards the pesticide reduction targets has already been achieved through a substitution of higher risk substances with low-risk substances without having any effect on crop yields
- v) the Farm to Fork target on organic farming will deliver part of the pesticide reduction target; estimated to be around one third of the pesticide reduction target
- vi) a reduction in pesticide use and risk will improve ecosystem services that will directly benefit crop yields (i.e., natural pest control, pollination services, and soil health)
- vii) a broad variety of alternative agronomic and technological strategies allow for reductions in pesticide use and risk while preserving crop yields

Strategies to support the reduction of pesticide use and risk without affecting crop yields are already available (section 4 and alternatives paper ([link](#))). These strategies are supported by a range of parallel actions being undertaken in parallel to the SUR proposal and indeed supported by the SUR proposal which has the implementation of Integrated Pest Management at its core. The sound integration of agronomic and technological tools is formulated into the Integrated Pest Management principles. Precision technologies allow for targeted applications of pesticides or provide alternatives to pesticides altogether, and again are supported by both the SUR proposal and in the use of CAP funding. Decision support systems are designed to improve spatiotemporal pesticide use and in doing so lower the need for pesticide use. New breeding techniques may provide varieties with durable resistances and tolerances to key pests which in turn could enable a system-wide rethinking of crop protection. Improvements in agro-ecological design, both at field- and landscape-level, support pest prevention and in doing so could further lower dependency on chemical pesticides while possibly increasing crop yields through improved ecosystem services. To facilitate the adoption of alternatives to pesticides, outreach to farmers is necessary to build confidence in the efficacy of low-pesticide food production systems, the role of independent advisors in the SUR proposal is intended to facilitate this. The required food system transformation may be supported through financial mechanisms within the Common Agricultural Policy budget, and again this is expanded in the increased possibility of using such funding for all the requirements of the SUR applicable at farm level in Art 43 of the SUR proposal (section 5).

The impacts on food and feed availability in the Union and the possibility of increased dependence on imports as well as reductions of exports are largely dependent on the impacts to crop yields (see section 1.2). Studies that elicited impacts to yields following a reduction of pesticide use generally suggested an increase in prices, a decline in exports, and an elevated dependency on imports, by model-design. The limitations of these estimates presented above (section 2 to 4) equally apply here. In other words, if crop yields are impacted to a

considerably lower degree than assumed in the existing modelling studies, imports, exports, and prices will equally be lower than those simulated in existing studies.

The potential impact on food and feed prices are again dependent on the impacts to crop yields (see section 1.2). Broadly speaking, increases in crop prices are expected to be transmitted more directly to higher feed prices that would affect livestock producers through higher production costs. The share of commodity costs on total production costs for food products is smaller than for feed. Therefore, higher crop prices would not be transmitted in similar magnitudes to the consumers of food products. Arguably, if EU-wide crop yields are less affected due to any or all of the aforementioned points, prices will be less affected as well.

## 1. The current role of pesticides in food and feed security

Plant pests and diseases can cause considerable impacts on crop yields, and in turn food and feed security. The Food and Agriculture Organization estimates that plant pests cost approximately USD 220 billion annually.<sup>1</sup> Globally, up to 40 % of crops are lost each year due to plant pests and diseases (Renault et al., 2022; Savary et al., 2019). Globalisation with the associated increase in international travel and trade can unintentionally spread pests and diseases, which may lead to significant impacts on crops, native plants and the environment (Hulme, 2021).

Keeping healthy crops has become more challenging due to climate change and the associated changes in pest habitats (Lawton et al., 2022), and possible reductions in pesticides' efficacy due to different environmental conditions (Matzrafi, 2019). According to the International Plant Protection Convention (IPPC), rising temperatures likely will influence pest movement and establishment in unprecedented ways.<sup>2</sup> An increased presence of plant pests, and occurrence of drastic outbreaks, are stressors that may reduce yields of crops leading to an overall lower production and repercussions for food and feed security. Global yield losses of wheat, rice, and maize are projected to increase by 10 to 25 % per degree of global mean surface warming due to insect pests alone (Deutsch et al., 2018).

Consequently, sound crop protection is pivotal to safeguard food and feed security. Whereas globally, significant shares of harvests are lost to pests and diseases (Oerke, 2006; Savary et al., 2019), losses in the EU are considerably lower due to the high level of pest and disease management in place. While farmers apply a multitude of agronomical and technological strategies to minimize pest and disease impacts in their fields, currently a key tool remains the use of pesticides (Aktar et al., 2009; Anket Sharma et al., 2019). The term pesticide is to be understood as plant protection products under Article 2(1) of Regulation (EC) No 1107/2009 on the placing of plant protection products on the market and most commonly refers to herbicides, fungicides, and insecticides, which include a wide range of chemical compounds that impair or kill weeds, fungi, and insects, respectively. Each year, farmers apply millions of tonnes of pesticides on fields across the world (Anket Sharma et al., 2019; Tang et al., 2022). In the EU, 348 000 tonnes of pesticides were sold in 2020 according to Eurostat. Across the EU Member States, generally less than 1 % of all active ingredients are used in forestry.<sup>3</sup> While the quantity of pesticides sold in the EU has remained relatively stable, the first Farm to Fork Strategy pesticide use and risk reduction target has shown a decline in recent years<sup>4</sup> (see section 2.4). This indicates that while the volume of pesticides has not changed, there is a trend towards using lower risk substances.

In the scientific literature, pesticides are referred to as *damage abatement inputs* (Lichtenberg & Zilberman, 1986). Damage abatement inputs reduce potential shortfall rather than further increase output (Lansink & Carpentier, 2008). This has analytical implications when measuring pesticides' contribution to crop yields, and in turn to food and feed security. Namely, pesticides safeguard the maximum yield, which itself is determined by other environmental, agronomic, and economic factors (Licker et al., 2010). By safeguarding against downward yield risk, pesticides support yield stability. However, the magnitude of risk managed depends, among others, on the pest pressure in an area within a particular year.

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<sup>1</sup> <https://www.fao.org/documents/card/en/c/cb4769en>

<sup>2</sup> <https://www.fao.org/3/cb7056en/cb7056en.pdf>

<sup>3</sup> <https://hal.science/hal-00468013/document>

<sup>4</sup> [https://food.ec.europa.eu/plants/pesticides/sustainable-use-pesticides/farm-fork-targets-progress\\_en](https://food.ec.europa.eu/plants/pesticides/sustainable-use-pesticides/farm-fork-targets-progress_en)

For most pests and diseases, the weather conditions are critical determinants of pressure and impact (Olatinwo & Hoogenboom, 2014). For example, farmers in view of a weather forecast use many fungicides preventively. As weather forecasts are inherently uncertain, some fungicide applications will have therefore managed disease impact that would have occurred while others would have not been necessary (Lázaro et al., 2021). Studies in Denmark, the Netherlands and France have estimated the overuse of pesticides at 10 % to 20% (Guyomard et al., 2020). The estimation of pesticides' contribution to crop yields (or quality) is complicated and depends on the statistical specification used, (possibly unobserved) pest pressure, pest resistances to the used substances, actions on neighbouring farms, and the general production risk of the farmer (Frisvold, 2019).

There are acknowledged economic and social benefits associated with the use of pesticides (Carvalho, 2017; Popp, 2011), such as safeguarding yields by eliminating or reducing competition from weeds and attacks by pests, but also by reducing potential post-harvest food waste. In the absence of sound alternatives, a reduction of pesticides can have repercussions on crop yields (Dewar, 2017; Kauppi et al., 2021; Mahillon et al., 2022; Viric Gasparic et al., 2021). The use of pesticides has become the main approach to ensuring the availability of low-priced fruits and vegetables of good quality, which makes them affordable for consumers. By reducing harvest losses, the use of pesticides also reduces demand for land for food production which in turn makes more land available for other uses, e.g., amenity, natural parks, and protection of biodiversity. Lastly, the European plant protection industry is a significant economic player on the world market and an important employer in Europe.<sup>5</sup>

## 1.1 Food and feed security considering Russia's invasion of Ukraine

The analysis of the potential impacts of the PPP reduction targets put forward by the SUR on the agricultural sector were all conducted before Russia's invasion of Ukraine. The criminal aggression of the Russian Federation on Ukraine shocked the world and caused significant disturbances in global agricultural markets.

### 1.1.1. Immediate impacts

Although many fundamental elements of agricultural markets have been affected, the Russian invasion has had no major impact on pesticide availability and affordability. As mentioned in EC (2023)<sup>6</sup> an increase in transport and energy costs due to the Russian aggression in Ukraine may have resulted in a modest increase of pesticides prices in the EU, but likely to a considerably lesser extent than for fertilisers and did not result in disruption to supply of pesticides. So far, it appears that a reduction of pesticide use, of a similar magnitude as the expected reduction of fertilisers use due to the increased price of fertilisers, for 2022/23 may not occur autonomously. Spikes in energy and fuel prices may result in short term effects, such as for example, mechanical weeding being a less attractive alternative to herbicides, making crop protection via chemical tools more competitive.

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<sup>5</sup> <https://croplifeurope.eu/wp-content/uploads/2021/09/CP-industry-economic-footprint-Oxford-Economics.pdf>

<sup>6</sup> EC (2023). Drivers of Food Security. Commission Staff Working Document (2023)4.

### 1.1.2. Medium-term impacts

Despite the short-term disruptions brought along by lower production of cereals and oilseeds in Ukraine and the reduced exports from the Russian Federation, the impact of this on the feasibility of reaching the targets without putting at risk food or feed security is negligible for two main reasons.

*Short-term disruptions are typically absorbed by markets within a few years.*

First, the targets put forward by the SUR are set for 2030. The 2022 editions of the two main medium-term outlooks (MTOs) for agricultural markets (OECD-FAO and DG AGRI) consider that the disruption caused by Russia's invasion of Ukraine will have no impact in 2030. In fact, short-term disruptions are typically absorbed by markets within a few years and are not assumed to affect markets in a medium to long-term context (i.e., the COVID pandemic<sup>7</sup> or the African swine fever outbreak in China<sup>8,9</sup> were treated similarly in previous years). This is evident from a comparison of the projected production levels of the 2021 (pre-invasion) editions to the 2022 ones (Table 1).

*Table 1. World production (million tonnes) forecasted to 2030 by the 2021 (pre-invasion) and 2022 (post-invasion) for main crops affected by Russia's invasion of Ukraine in different mid-terms outlooks.*

Commodity	OECD-FAO <sup>1</sup> (for World)		DG AGRI <sup>2</sup> (for EU)	
	<i>Pre-invasion</i>	<i>Post-invasion</i>	<i>Pre-invasion</i>	<i>Post-invasion</i>
Wheat	839.7	833.3	127	137
Maize	1,312.2	1,320.9	68	64
Vegetable oils	246.9	246.5	16	16

<sup>1</sup> OECD/FAO (2021), OECD-FAO Agricultural Outlook 2021-2030, OECD Publishing, Paris & OECD/FAO (2022), OECD-FAO Agricultural Outlook 2022-2031, OECD Publishing, Paris

<sup>2</sup> EC (2021), EU agricultural outlook for markets, income and environment, 2021-2031. European Commission, DG Agriculture and Rural Development, Brussels & EC (2022), EU agricultural outlook for markets, income and environment, 2022-2032. European Commission, DG Agriculture and Rural Development, Brussels

Therefore, from a medium-term baseline perspective, the war is assumed to end within the next one or two years (even if not stated explicitly). This is for example the case in the 2022 OECD and EU agricultural MTOs from which the data for Table 1. Under this assumption, the impacts of the Russian invasion of Ukraine on the analysis of the impacts of SUR in 2030 should be minimal. However, simulations undertaken to understand the impacts of the

<sup>7</sup> EC (2020), EU agricultural outlook for markets, income and environment, 2020-2030. European Commission, DG Agriculture and Rural Development, Brussels.

<sup>8</sup> EC (2019), EU agricultural outlook for markets and income, 2019-2030. European Commission, DG Agriculture and Rural Development, Brussels.

<sup>9</sup> OECD/FAO (2021), OECD-FAO Agricultural Outlook 2021-2030, OECD Publishing, Paris

unlikely event that the war were to continue until 2030, do show that such a situation could have significant impacts on the global grain markets. The 2022 edition of the OECD-FAO outlook, for example, concludes that a full loss of Ukraine's wheat exports combined with a 50 percent loss of Russia's wheat exports would lead to an increase of global wheat prices by 34%.

It is important to note though, that such price increases would lead to considerable increases in grain exports from the other main exporting countries, so most of the lost Ukrainian grain exports are expected to be replaced by grain from other sources which can increase their production (see below). Thus, the impact of a persistent conflict would not affect availability of grain, but rather its affordability. Preliminary global export figures for March 2023<sup>10</sup> point to an increase in global wheat production and trade in 2022/23 as compared to 2021/22, thus corroborating these results. For example, wheat supply has increased in Kazakhstan by nearly the total value of Ukrainian exports pre-war. Also rice production is expected to reach peak value thanks to an extremely favourable crop in India. The latest forecasts from the Agricultural Market Information System (AMIS) initiative of the G20<sup>11</sup> foresees increases in world production of wheat, rice and soybean productions ranging from 2 to 7 per cent. Even in the Middle East and north African regions, which is highly dependent on imports from the Black Sea region, the loss of Ukrainian exports only has a modest impact on food consumption of around -0.5 percent according to our simulations. In the EU, the impact on food consumption is negligible.

#### *Evidence that markets have already start absorbing the shock*

Secondly, even before 2030, we see that agricultural markets have already started absorbing the shock resulting from the war. Looking into the Commission's short-term outlook for agricultural markets, we see that the last pre-invasion edition<sup>12</sup> predicted a 2021/22 EU cereals production of 292.2 million tonnes and a 30.4 million tonnes production of oilseeds. Both figures represented a 4.9% and 3% increase compared to the previous 5-year average. The first edition after the invasion<sup>13</sup> further increased the production levels in the EU for the 2022/23 season mainly driven by the response of producers to the higher prices induced by the disruption of Ukraine's and Russia's exports. The increase in production was partly not realised due to an exceptionally hot and dry spring in the EU<sup>14</sup> for cereals, while oilseed production was not affected and even further increased due to the derogation to allow sowing of crops on fallow land. Production of oilseeds managed to compensate the loss of supplies from Ukraine. The latest available edition of the short-term outlook<sup>15</sup> foresees a fall in cereal production to 265 million tonnes in the EU mainly driven by the drought conditions and high input prices, together with an ease of high cereal prices after the supply from Ukraine was recovered thanks to the Black Sea initiative. 2023 has also seen a continuation of the high production levels for oilseeds driven by the exceptionally high prices for the commodities, with a record production expected for 2024.

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<sup>10</sup> USDA (2023). Grain: World Markets and Trade. March 2023. [www.fas.usda.gov/data/grain-world-markets-and-trade](http://www.fas.usda.gov/data/grain-world-markets-and-trade)

<sup>11</sup> AMIS Market Monitor No. 106 March 2023 - [www.amis-outlook.org](http://www.amis-outlook.org)

<sup>12</sup> EC (2021), Short-term outlook for EU agricultural markets, Autumn 2021 (Edition 31). European Commission, DG Agriculture and Rural Development, Brussels.

<sup>13</sup> EC (2022), Short-term outlook for EU agricultural markets, Spring 2022 (Edition 32). European Commission, DG Agriculture and Rural Development, Brussels.

<sup>14</sup> EC (2022), Short-term outlook for EU agricultural markets, Summer 2022 (Edition 33). European Commission, DG Agriculture and Rural Development, Brussels.

<sup>15</sup> EC (2023), Short-term outlook for EU agricultural markets, Spring 2023 (Edition 35). European Commission, DG Agriculture and Rural Development, Brussels.

In the same sense, the assessment of the impact of the Russian invasion of Ukraine made by IFPRI just after the invasion<sup>16</sup> focused on the high shares in global markets of Russia's and Ukraine's exports. This share was above 20% for wheat, barley and sunflower and above 70% for sunflower oil. The main concern was that this concentration was even higher for specific regions of the world, with North Africa and the Middle East importing over 50% of their cereal needs and a large share of wheat and barley from Ukraine. The disruption of this export flow could have significant impacts on the availability and affordability of food in those regions. The overall impacts of the war would lead to 22.3 million more people at risk of undernourishment in 19 least developed countries (less than 2% of the total population in the countries analysed) and more than half of this would be driven by higher fuel and fertilizer prices and not by higher food prices<sup>17</sup>. At global level, the concern was more about the impact of natural gas and fertilizer prices on agricultural costs and how those could translate into even higher prices. Impacts on production were rarely mentioned with more concerns around the risk that some countries may seek to insulate domestic producers by restricting exports, further aggravating the price shocks as seen during the 2007-2008 and 2010-2011 food crises<sup>18</sup>.

One year later what has happened is that as the war continued through 2022, international markets adjusted and adapted, and — while high prices and other problems persist — the worst-case scenarios for agricultural trade and food security were largely averted<sup>19</sup>. By August 2022 prices had fallen back to pre-war levels. Importers adjusted to market disruptions and found alternative suppliers. The partial re-opening of ports through the Black Sea Grain Initiative helped facilitate additional exports from Ukraine. However, maize and wheat production in Ukraine are still projected to be 40% down from pre-war levels<sup>20</sup> approximately 80% of those reported from the 2014 season before Ukraine started its agricultural expansion. In May, price volatility levels for wheat and maize reached the highest levels in more than 10 years, but by early February 2023 they had fallen back to within historical ranges. The main lesson of 2022 is that global markets have generally worked well when not impeded by government actions like export restrictions.

In summary, when revisiting the impact assessment of the SUR with the existing evidence of the impact of the Russian aggression on Ukraine we see that:

- a) The war has had no visible effect on effect on pesticides availability.
- b) There might be an increase in the price competitiveness of herbicides as a control option due to the higher costs associated with fuel, which is a main input for mechanical alternatives.
- c) Agricultural markets so far have been capable of providing a supply response based on economic fundamentals.

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<sup>16</sup> Glauber, J. & Laborde, D. (2022). How will Russia's invasion of Ukraine affect global food security? IFPRI Blog posted on 24.02.2023 - [www.ifpri.org/blog/how-will-russias-invasion-ukraine-affect-global-food-security](http://www.ifpri.org/blog/how-will-russias-invasion-ukraine-affect-global-food-security)

<sup>17</sup> Arndt, C., Diaon, X., Dorosh, P, Pauw, K. & Thurlow, J. (2023). The Ukraine war and rising commodity prices: implications for developing countries. *Global Food Security* 36: 100680.

<sup>18</sup> Abay, K.A., Breisinger, C., Glauber, J., Kurdi, Laborde, D. & Siddig, K. (2023). The Russia-Ukraine war: Implications for global and regional food security and potential policy responses. *Global Food Security* 36: 100675.

<sup>19</sup> Glauber, J. (2023). Ukraine one year later: impacts on global food security. IFPRI Blog posted on 23.02.2023 - [www.ifpri.org/blog/ukraine-one-year-later-impacts-global-food-security](http://www.ifpri.org/blog/ukraine-one-year-later-impacts-global-food-security)

<sup>20</sup> Martyshev, P., Nivievskyi, O. & M. Bogonos (2023). Regional war, global consequences: Mounting damages to Ukraine's agriculture and growing challenges for global food security. IFPRI Blog posted on 27.03.2023 - <https://www.ifpri.org/blog/regional-war-global-consequences-mounting-damages-ukraines-agriculture-and-growing-challenges>

- d) Impacts are mainly on wheat and sunflower, for which the potential worst-case impacts on yields of reduced pesticide use is expected to be comparatively low (see next section).
- e) MS have the ability to choose pesticide reductions in use on different crops.
- f) Within the medium-term time scale for the implementation of the SUR it could be expected that the short-term economic impacts of the conflict on agricultural markets would not affect the conclusions of the different studies nor the additional insights provided in the different section of this document.

## 1.2 Existing evidence on the potential negative impacts of a pesticide reduction

Several publications have attempted to provide estimates of the potential impacts of achieving the Farm to Fork targets, including the pesticide reduction targets. These publications cover a broad range of methodologies, including computable general equilibrium models (Beckman et al., 2020), partial equilibrium models for the agricultural sector (Barreiro-Hurle et al., 2021; Bremmer et al., 2021; Henning et al., 2021), extrapolation of assumptions to actual market data (COCERAL and Unistock, 2021; Noleppa & Carlsburg, 2021), and farm-level simulations (Guyomard et al., 2020). While methodologically diverse, the analyses were generally conducted under similar assumptions, as will be discussed shortly. None of the publications can be considered a fully-fledged impact assessment of the policy, but their results provide some insights into the economic impacts of policy decisions limiting the use and risk of plant protection products. These modelling studies suggested that, without proper adaptation, EU crop production might be negatively affected by a pesticide reduction. In turn, there may be an impact on the EU trade balance from increased imports and a decline in EU exports of agri-food products to third countries.

These assessments, in general terms, introduce assumptions as regards the change in farming practices that may result from reducing pesticide use, under assumptions as regards related impacts on yields (i.e., the impacts were not derived through data-driven estimations but rather expert-elicitations or explorative assumptions). There are, however, various limitations to these modelling exercises. For instance, Barreiro-Hurle et al. (2021) assumed a reduction in costs associated with the lower use of plant protection products, an increase in other costs (e.g., due to higher efforts for mechanical weeding), and an increase in the use of cover crops as a pest management alternative (Table 2). While modelling changes in expenses is easily implemented in economic models, an accurate yield response function to assess the effects of a lower pesticide use on yields is lacking. In turn, a general assumption of a yield loss of 10 % was made (Barreiro-Hurle et al., 2021). The 10 % yield reduction was, however, not well supported by evidence nor does this estimate account for potential differences across crops and bioclimatic regions. Alternative strategies to pesticides that do not result in yield losses were not assessed (further discussed below). Possible changes on the demand side were also not included - for example, changes in the products consumed (Tang et al., 2022), or price-mediated nudges toward low-pesticide production (Nielsen et al., 2023). Hence, it is likely that all analyses produced worst-case estimates (Barreiro-Hurle et al., 2021), which arise out of a limited representation, or a lack of representation, of the ability of the EU food system to adapt and innovate.

Table 2 Simulated EU27 supply changes, relative to a baseline projection to 2030, for the individual Farm to Fork targets and the combined scenario. Source: Barreiro-Hurle et al. (2021)

	Pesticide reduction	Increased land under organic farming	Increased area under high-diversity landscape	Reduction of gross nitrogen surplus	Combined
Total agricultural output	-2.7	-0.4	-2.1	-7.0	-11.2
Cereals	-7.9	-4.4	-6.0	-3.3	-14.9
Oilseeds	-11.0	-6.4	-2.3	-1.6	-15.5
Vegetables and Permanent crops	-10.4	-5.0	-0.3	-0.1	-12.1
Pasture	-0.4	1.0	0.5	-11.1	-10.0
Dairy Cows	-0.3	0.3	-0.7	-7.4	-10.1
Beef meat activities	-0.9	0.1	-1.2	-10.5	-14.3
Pig fattening	-1.0	-0.4	-0.7	-12.2	-15.5
Sheep and Goat fattening	-1.9	-1.4	-0.6	-6.4	-10.0
Poultry fattening	-1.7	-0.8	-0.9	-11.2	-15.9

Another related study, conducted by Wageningen Economic Research (WECR), was published in December 2021 (Bremmer et al., 2021). The main advantage of this report is the case-study design with elicited yield impacts of reduced pesticide use based on a selection of 25 country/crop combinations (Table 3). The main disadvantage is that the pesticide reduction was overly pessimistic and various positive ecological feedbacks following a pesticide reduction were ignored (discussed below). Furthermore, the elicitation did not take account of potential technological progress until 2030. The study concluded on a variable yield loss, with greater effects on perennial crops, and a considerable potential impact on trade with third countries. Estimates ranged from a yield decline of 2 % to 28 %, depending on the crop and region. The impact from the pesticide reduction was elicited by discussing, at farm level, the best approaches for a reduction. Namely, through reducing the total volume, or switching to lower risk alternatives, through Integrated Pest Management, or precision application technology. Next, the costs of such a change were assessed to assess potential

price effects due to quality losses. The analysis of the questionnaires indicated that a potential yield-effect is mostly determined by the availability of alternatives. While reaching the 50 % pesticide reduction target was suggested to result in yield losses in some crops (e.g. grapes in France), in other crops no effects on yield nor cost were anticipated in the same region (e.g. maize in France). For maize, a substitution of high- with low-risk active ingredients was found to be feasible. The study was recently updated with an assessment on potential impacts to greenhouse production (Bremmer et al., 2023). Here, yield impacts were suggested to be difficult to assess but yield losses in the production of vegetables up to 20 % were proposed to be possible.

Both of the WEcR reports were not peer-reviewed and commissioned by industry. The report that suggested drastic impacts to arable crops was commissioned by CropLife Europe and CropLife International which are organisations that represents the crop protection industry. The report that suggested drastic impacts to greenhouse production was commissioned by Glastuinbouw Nederland which is an organization that represents the horticultural sector.

As will be further discussed below, while this is not presented as such in the WEcR reports, these results speak for a reduction potential with minimal impacts on yields, and in turn food and feed security. This is because the Farm to Fork targets (also included in the SUR) do not mandate a flat-rate reduction of 50 % across all crops but rather allows for a strategic targeting, taking national circumstances into account, such that impacts on production are minimized. It should be noted that it does not mandate a total 50 % reduction of use of all chemical pesticides. Since the risk indicator gives a higher weighting to pesticides in higher risk categories, a 50 % reduction in the risk indicator can be achieved by reducing a smaller number of higher risk pesticides, thus giving Member States further flexibility in designing their strategies to meet the targets.

*Table 3 Elicited yield (price) effects of a pesticide reduction in different crops and countries.  
Source: (Bremmer et al., 2021)*

	<b>Finland</b>	<b>France</b>	<b>Germany</b>	<b>Italy</b>	<b>Poland</b>	<b>Romania</b>	<b>Spain</b>
Wheat	0 (0)	-5 (0)	-10 (0)			-7 (-5)	
Rapeseed	0 (0)		-10 (-5)		-13 (0)		
Sugar beet		-3 (0)	-15 (-5)		-10 (-15)		
Maize		0 (0)				-4 (0)	
Apples				-8 (-6)	-20 (0)		
Tomatoes				-20 (-10)			-20 (0)
Grapes		-28 (0)		-20 (-5) / -6 (0)			0 (0) / -18 (0)
Olives				-30 (0)			-13 (0)
Citrus				-7 (0)			-10 (0)
Hops			-20 (-10)		-8 (-1.5)		

Another analysis was published in 2021 by the USDA Economic Research Service (Beckman et al., 2020). The report, based on some broad assumptions on the possible application of the

EU Green Deal strategies to the EU, assessed potential implications of the combined policies (including the pesticide reduction) at a global level. However, it should be noted that the SUR does not have any extra-territorial application outside the EU. The report suggested a 12 % reduction in agricultural yields and a 17 % increase in prices due to application of the whole range of targets (pesticide reduction, antimicrobial resistance, fertiliser reduction, and 10 % set-aside land) at EU level. As with most of the other studies, the report did not assess possible mitigating measures such as precision agriculture, new plant protection products coming on the market, implementation of improved IPM, reduction of food waste, etc.

Henning et al. (2021) published a non-peer-reviewed study commissioned by the food and feed industry (Grain Club). Similar to Barreiro-Hurle et al. (2021), the study used the CAPRI model to simulate potential impacts of various Green Deal targets. Namely, i) a reduction of mineral fertilizer use by 20 %, ii) reduction of pesticide use by 50 %, iii) reduction of the nitrogen-balance surplus by 50 %, iv) share of high diversity landscape features of at least 10 %, and v) a share of organic farming of at least 25 %. The study finds that the reduction of the nitrogen-balance surplus has the strongest production effect, with a 20 % decline in beef that is suggested to increase beef prices by 58 %. A decline in yields of 21.4 and 20 % for cereals and oilseeds, respectively, was suggested to increase their prices by 12.5 and 18 %. The production impacts were suggested to result in a decline in the trade balances and leakage effects of environmental emissions to non-EU countries. Arguably, these results are a direct consequence of the imposed assumptions of a yield decline of 10 % and an increase in ‘other costs’ by 50 %, following the reduction of pesticide use. This modelling work, therefore, suffered from the same data limitations faced in Barreiro-Hurle et al. (2021) – i.e., the unavailability of data on the actual yield-responses to pesticide reductions.

Possible price effects of potential yield declines can be anticipated with the price *elasticities* for each crop. The term elasticity describes the degree of price responses following changes in production quantity, and vice versa. While a discussion on analytical complications when estimating these parameters is out of scope for this report, it is critical to note that the elasticity parameters are fundamental to economic market-models and a key driver for simulating price changes following production shocks. The CAPRI model used for policy-assessments by the European Commission (e.g., Barreiro-Hurle et al., 2021; Henning et al., 2021) is one such model. The crop-specific distributions of feed and food elasticities from CAPRI across the EU-27 countries are depicted in Table 4. For example, a 1 % decline in apple production may lead to a 2 % increase in prices whereas a 1 % decline in the production of soya may lead to a 6.7 % increase in prices. With regards to sector competitiveness, the price effects of the simulated production changes due to the pesticide reduction in Barreiro-Hurle et al. (2021) and Henning et al. (2021) resulted in an increase of agricultural income. This is precisely a consequence of the general inelasticity of the demand of food products, which can result in price increases per unit that can compensate the income loss provoked by lower production levels, leading to higher total income generated.

While this reflection on the underlying parameter values gives indicative insights into the potential price responses following a decline in production, the values must be interpreted with caution. First, the CAPRI model more comprehensively simulates market-feedbacks through trade and changes in market balance (human consumption, feed and biofuels use, etc.), which may result in adaptations through substitutions that will ultimately affect the simulated price change. Hence, while the elasticity values are key drivers for price change, other parameters (e.g., cross-price elasticities) are determinants of the final price response as well. Second, the food and feed value chains are considerably different from one another. Commodity inputs generally stem from a smaller share of the total costs in the production of food, for which processing steps generally account for a larger share of the production costs

(Morrison Paul & MacDonald, 2003).<sup>21</sup> Consequently, while the elasticity values<sup>22</sup> for food in Table 4 are larger than for feed, an increase in commodity price would likely not be transmitted in full to the final food product prices given that the crop price increase would affect a smaller share of the overall production costs. In turn, price effects for the final food products would be considerably below the indicative values presented via the crop elasticities. Conversely, feed-costs are generally a considerable share of the total production costs for livestock producers.<sup>23</sup> Hence, potential price increases for crops likely transmit more directly into production cost increases for feed, which may affect livestock producers in stronger ways than consumers of final food products. Having said that, our presentation of own-price elasticities does not account for the fact that in feed production some level of substitution of agricultural inputs is possible. This substitution would allow producers to shift away from crops that experience higher price increases, thereby reducing the increase in production costs for feed to a certain extent.

*Table 4 Distribution of crop-specific elasticities across the EU-27 countries as used for calibration of the CAPRI model. The values correspond to the percentage of the price increase if production declines by one percent.*

	Food			Feed		
	Minimum	Mean	Maximum	Minimum	Mean	Maximum
Apples	2.00	2.08	2.21	2.00	2.33	11.40
Barley	1.87	1.94	2.33	0.45	0.49	0.71
Citrus fruits	2.05	2.21	2.72	2.00	2.00	2.00
Grain maize	1.90	2.11	2.98	0.46	0.57	1.54
Oats	1.88	1.96	2.17	0.49	0.52	0.60
Olive oil	0.60	0.88	2.31	2.00	2.00	2.00
Potatoes	2.02	2.18	2.42	2.00	2.40	24.18
Protein-rich feeding				0.39	0.65	1.11
Pulses	2.00	2.05	2.57	0.49	0.52	0.59
Rape seed	1.93	2.00	2.03	0.64	0.80	1.14
Rice	1.91	2.01	2.33	0.48	0.55	2.00
Rye	1.88	2.01	2.26	0.47	0.54	0.61
Soya cake	6.67	6.67	6.67	0.48	0.60	1.20
Sunflower cake	6.51	6.64	6.67	0.46	0.48	0.51

<sup>21</sup> <https://www.fao.org/faostat/en/#data/GFDI>

<sup>22</sup> As noted above, the term elasticity describes the degree of price responses following changes in production quantity, and vice versa.

<sup>23</sup> [https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/739328/EPRS\\_BRI\(2023\)739328\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/739328/EPRS_BRI(2023)739328_EN.pdf)

Wheat	2.77	4.61	6.67		0.44	0.49	0.82
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While a discussion of elasticities is a considerable simplification of the underlying market dynamics, the estimates provide a perspective on potential price effects associated with yield losses. None of the aforementioned studies was able to employ a data-driven estimation of crop-specific yield responses to a pesticide reduction. Consequently, in view of the lack of data, the imposed assumptions of a 10 % yield decline should be met with scepticism. What the elasticities tend to illustrate is that the national targets for reaching the 50 % decrease in pesticide use and risk, which can be achieved by means that vary greatly from crop to crop, could consider among other aspects also the anticipated crop-and-region-specific price effects if yields were assumed to decline. Member States could therefore take various aspects into account when designing their national strategy to reach the pesticide use reduction, namely, i) the current intensity of pesticide use in different crops, ii) the availability of alternative management approaches in different crops, and iii) possible repercussions on food and feed prices if production were to decline. We will continue the discussion on this in more detail within the next section.

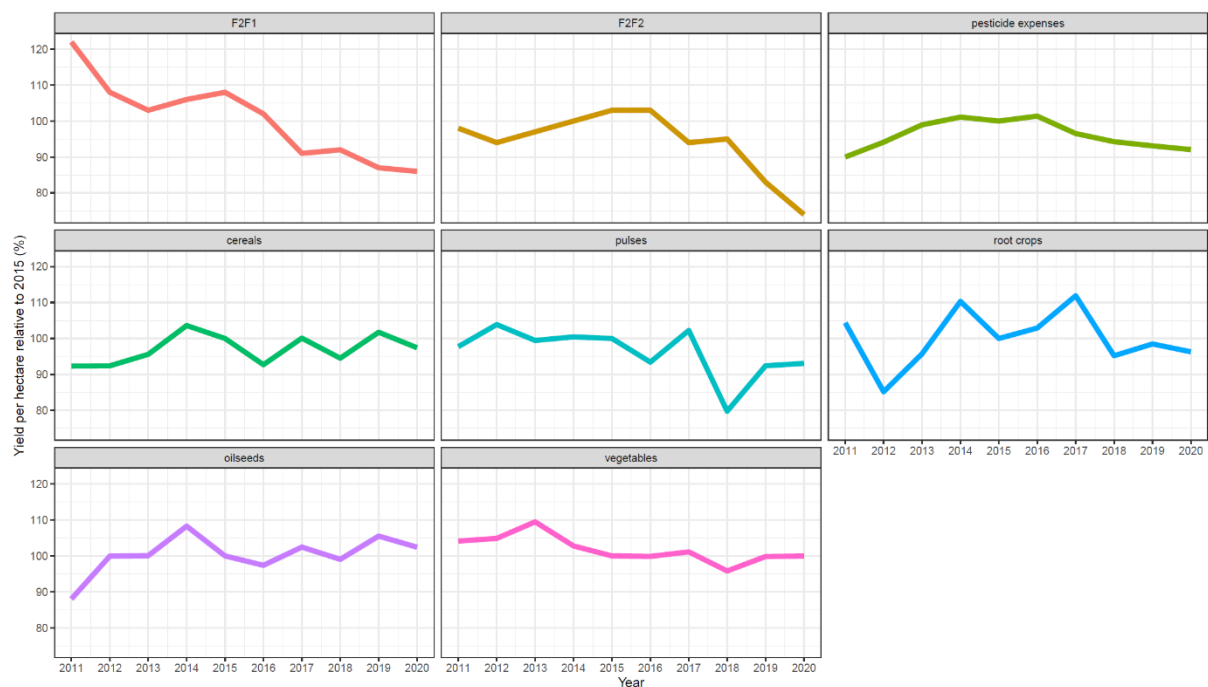
It is worth noting that the largest impacts were elicited to occur in some of the crops that play a relatively minor role for food and feed security concerns (c.f. Table 3). Food and feed security concerns of potential yield impacts first must be addressed through a more nuanced perspective on which crops actually contribute to food and feed security. According to FAOSTAT wheat and its products provide a major part of the calorie and protein supply. Olives, sunflowers, and rapeseed contribute sizeable shares to the fat supply. Barley, maize, potatoes, and wheat contribute sizeable quantities to feed use in livestock production. Hence, if evidence collection were to suggest that sizeable yield impacts from a lower pesticide use in those crops must be expected and that no alternatives to pesticide exists, other crops may be targeted to achieve the Farm to Fork targets.

Lastly, it may be worth looking beyond the existing modelling studies and assess whether empirical changes in production have been observed in the last years. The progress toward the Farm to Fork targets has been computed for the years 2011 to 2020 with the baseline being the years 2015 to 2017. Figure 1 depicts i) the EU-wide development of the two indicators used to track the Farm to Fork targets (F2F1 and F2F2), ii) EU-wide expenses for plant protection products which were deflated using a general consumer price index (HICP) to account for the general inflation, and iii) production of food and feed security relevant crop-groups. The panel data on production was interpolated with the average of the nearest non-missing observations to correct existing data-gaps in Eurostat. Next, the total production figures by Member State were standardized to yields per hectare to account for expansions and retractions of the area of production over the years. The Member States' contribution to the overall EU production was used to compute a weighted-average yield per hectare for the EU. Lastly, the values across years are visualized relative to the baseline period of 2015 to 2017 to ease the comparison with the pesticide use and risk indices.

As shown in Figure 1, the F2F1 dropped from 122 points in 2011 to 86 in 2020 and representing an EU-wide progress of 14 % from the baseline 2015 to 2017 values. Similarly, the F2F2 declined to 74 points in 2020 which represents a progress of 26 %. At the same time, EU-wide expenses for plant protection products have remained nearly constant suggesting that the underlying transformation in the pesticide use and risk has not caused significant cost increases. While annual variation is evident from the graphs on production, the average yields per hectare across the EU for cereals, pulses, root crops, oilseeds, and vegetables do not exhibit a clear downward trend as would be suggested by the

aforementioned modelling studies that had assumed direct yield repercussions following any reductions in pesticide use and risk.

Figure 1 EU-wide development of the Farm to Fork targets, expenses for plant protection products, and yields per hectare from 2011 to 2020. Source: Eurostat



**Box 1. Takeaway points of section 1**

- 1) Sound crop health management and yield stability are critical to safeguard food and feed security, especially under a changing climate and the increasing interconnectedness of landscapes due to globalization.
- 2) Russia's invasion of Ukraine may have had short term impact on mechanical alternatives to pesticides, but there is no impact identified in increase prices of pesticides. The main crops impacted have a relatively low yield impact from pesticide reduction and the agricultural market has provided a supply response such that the short term impact of the conflict on agricultural markets is not seen to affect the insights in this report.
- 3) Studies on the pesticide reduction target concluded that there were varying levels of potential yield impact, with the largest impacts estimated to occur in crops that play a relatively minor role for food and feed security. Farmers and Member States can also then substitute crops or prioritise pesticide reductions in crops that have little or no impact on food security.
- 4) To the best of our knowledge, none of the existing studies modelling achievement of the targets has investigated how a strategic and crop-specific approach to the national 50 % reduction target may affect production levels; instead, an immediate flat rate 50 % reduction across all crops and for all pesticides was assumed which led to worst-case estimates.
- 5) Even under worst-case yield shocks, modelling work suggests an increase in agricultural income because of price responses.
- 6) The significant progress made in the reduction of pesticide use and risk monitored between 2011 and 2020 has not been attributed to any significant cost increase or yield effect for major crops, and thus has had no effect on food security.

## 2. A decomposition of the pesticide reduction target

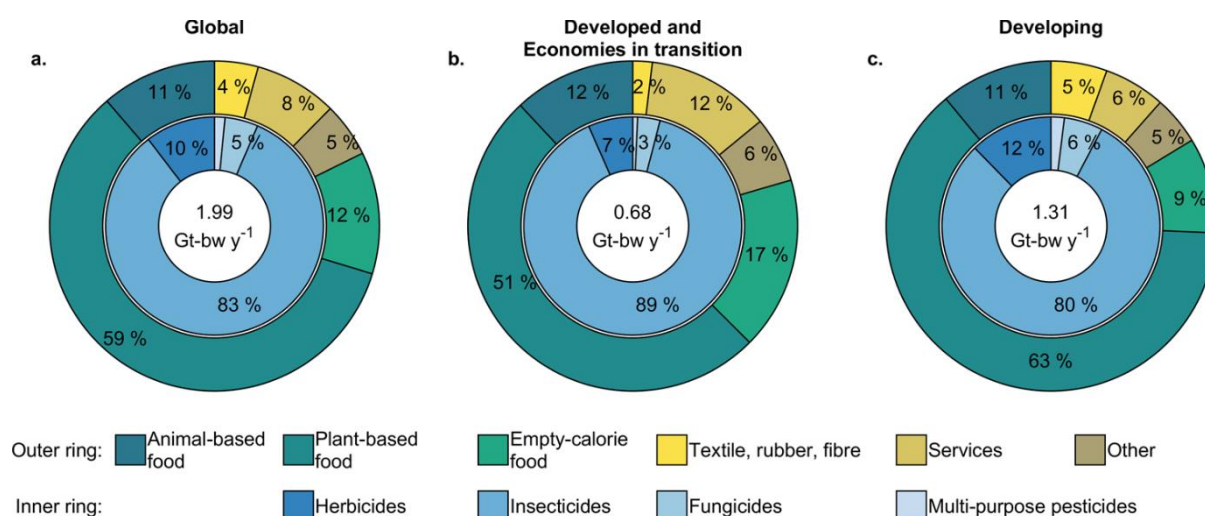
A critical oversight of many of the aforementioned modelling studies on potential impacts of reducing pesticides was the (implicit) assumption that pesticides use and risk will be halved in all crops and across all geographic areas. In what follows, we will show that a debate on potential food and feed security risks related to a reduction in pesticide use and risk must take various aspects into account that were unfortunately largely overlooked in the described analyses. A decomposition of the target is essential to shed light on the share of the 50 % pesticide reduction in use and risk that will not only affect crops that are relevant to food and feed security, but also crops for which alternatives to pesticides are lacking. In this section, we will review evidence on i) the potential for pesticide reduction in non-food areas, ii) the existing heterogeneity, and in turn reduction potential, in the current pesticide use within the same crops, iii) pesticide intensity across crops and implications of that for a strategic design of national reduction plans, iv) the feasibility of substituting high-risk active substances with low-risk ones, and v) the synergies with the organic farming target. Lastly, vi) food and feed security relevant feedbacks of a pesticide reduction through improved provisions of ecosystem services, and vii) the availability of alternative tools, are such critical aspects that we dedicate separate sections to those points. All these aspects have been largely absent in the existing studies on potential impacts of achieving the targets. In turn, the estimates on potential impacts provided above are to be seen as an upper bound (Barreiro-Hurle et al., 2021).

### 2.1 Pesticide use and risk reduction in non-food sectors

Part of the reduction will come from reduction of pesticide use in urban areas, sport and leisure facilities, non-agricultural parts of ecologically sensitive areas, agricultural land devoted to non-productive features, etc. Arguably, a reduction of pesticide use outside agricultural fields will have no implications for crop yields nor food and feed security. While many citizens may not be aware of this, pesticide use in Europe is currently not restricted to food and feed production. Pesticides can be, and are, used to manage green spaces in parks, playgrounds, sport facilities, private gardens, roads and railways, airports, non-edible crops such as cotton and ornamental horticulture, etc. The SUR specifically addresses pesticide use and risk in ‘sensitive areas’, which among others comprises urban areas. While the level of contribution from reduction in non-agricultural use of pesticide is expected to differ across Member States, evidently not the full 50 % reduction in use and risk will fall on food and feed production.

Concerning the raised food and feed security concerns, it is worth noting that a considerable share of the current pesticide footprint embedded in consumption (incl. imports) is related to products and services that are not essential to food and feed security. In developed economies, the aggregate of the pesticide footprint linked to the consumption of textiles, services, other, and ‘empty-calorie food’ (i.e., foods that have little to no nutritional value) accounts for a share of 37 % in developed countries (Tang et al., 2022) (Figure 2). The shares are very similar for the EU-27 (Fiona Tang, *personal communication*). Around a third of the total pesticide footprint is internationally traded. These estimates do not account for pesticide use in non-cropland (e.g., urban areas). Arguably, even under the assumption of yield impacts, a reduction of pesticide use in these sectors would have little to no repercussions for food and feed security.

Figure 2 Decomposition of the pesticide footprints across sectors. Source: (Tang et al., 2022).



In view of the fact that some of the 50 % reduction will come from reduced pesticide use in non-agricultural areas as well as in non-food and non-feed crops, it becomes evident that the aforementioned studies assumed larger shocks than applicable. Barreiro-Hurle et al. (2021) provided estimates of the expected changes in crop yields for a 50 % and a 30 % reduction of pesticide use. While the rather pessimistic assumption of a flat-rate reduction across all crops still applies, the 20 % difference of the pesticide reduction already resulted in lower estimates for the worst-case yield impacts (Table 5). In turn, it is clearly necessary to acknowledge that the 50 % reduction does not in its entirety fall onto agricultural areas as assumed in the existing evidence on impacts.

Table 5 Simulated EU27 supply changes, relative to a baseline projection to 2030, for a pesticide reduction at two different levels. Source: Barreiro-Hurle et al. (2021)

	<b>50% reduction</b>	<b>Rescaled to a 30% reduction</b>
Total agricultural output	-2.7	-1.6
Cereals	-7.9	-4.7
Oilseeds	-11.0	-6.6
Vegetables and Permanent crops	-10.4	-6.2
Pasture	-0.4	-0.2
Dairy Cows	-0.3	-0.2
Beef meat activities	-0.9	-0.5
Pig fattening	-1.0	-0.6
Sheep and Goat fattening	-1.9	-1.1
Poultry fattening	-1.7	-1.0

## 2.2 Heterogeneity in the current pesticide use

Pesticides use intensity depends on many aspects, ranging from i) biological factors such as pest abundance, local climate, soil type, regional crop diversity, over ii) agronomic factors such as decisions on tillage, sowing date, variety susceptibility, fertilisation, crop rotation, the use of precision agriculture, to iii) economic factors such as the expected yield and the on-farm economic and financial situation (Andert et al., 2015; Lechenet et al., 2016). The multitude of relevant factors results in a considerable spatial heterogeneity in pesticide use on a global scale (Tang et al., 2021; Tang & Maggi, 2021), and even in “geographically speaking” small countries (Habran et al., 2022). Various studies have found sizeable variability in pesticide use not only across different years and between different regions within a country, but also across farms that essentially faced the same environmental and socio-economic conditions (Andert et al., 2015; Lechenet et al., 2017; Nause et al., 2021). This illustrates the importance of farmers’ personal decision-making process, which is, amongst other factors, determined by their attitude to production risks (Frisvold, 2019; Rommel et al., 2022). Globally, around a third of the cross-country differences in the pesticide pollution risk is linked to differences in the underlying food systems and pesticide regulations (Wuepper et al., 2023). This existing heterogeneity, both at farm- and country-level, in turn speaks for a considerable reduction potential. Raising awareness of the environmental implications as well as signals by peers are crucial drivers for farmers’ motivation in reducing pesticide use (Bakker et al., 2021). This reduction potential has not been accounted for in the studies on potential impacts. The existing heterogeneity implies that some farmers could reduce their use without any impacts on crop yields or food and feed security.

## 2.3 Crop-specific pesticide intensity

The magnitude of the pesticide-intensity varies considerable across crops and regions (Habran et al., 2022; Lechenet et al., 2016, 2017; Tang et al., 2021, 2022). In turn, Member States will likely reach their national targets not through a flat-rate reduction across all crops and areas but rather through a strategic targeting; for example, targeting specific crops that contribute more strongly to their current aggregate pesticide use and risk, and/or targeting crops for which management alternatives are readily available or on which higher risk substances are used. There are two critical implications of this. Namely, Member States particularly concerned with food and feed security might prioritize reductions in pesticide use in high-intensity crops that are not relevant to food and feed security. As different Member States may prioritize different crops under consideration of their national circumstances, even under the assumption that there are indeed adverse effects on yields following the reduction of pesticides, the crop-specific supply-shocks across the EU would be considerably more evened out across commodities compared to the modelling studies reviewed above. To recall, the modelling studies assumed a 50 % pesticide use cut in all crops across all Member States, and of all pesticides. This approach to the Farm to Fork target seems unlikely, as national decision-makers could reflect strategically on their current use patterns across crops.

To further illustrate the heterogeneity across Member States and cropping systems, Table 6 depicts a measure of partial productivity across the EU-27 Member States and nine different farm-types using data from the Farm Accountancy Data Network for averages between 2018 and 2020. The measure of partial productivity is the output value divided by the expenses for plant protection products both in Euro. It can be seen see that, in general across Member

States, specialized cereal, oilseed, and protein crop (COP) farm-types have the lowest productivity score whereas specialist horticulture the highest. However, different Member States have different pesticide productivities for different farm-types and decision-makers might target the least productive farm-types when designing their national pesticide reduction plan. When using data on pesticide expenses, however, it remains unclear whether higher expenses are due to a higher use of pesticides or conversely because products with less harmful active substances are more expensive. To enable a sound analysis of pesticide-productivity in different crops and countries, pesticide use data are necessary. The critical need for pesticide use data are also specifically addressed in the adopted SAIO and SUR proposal.

Similarly, different crops have different relative profit margins across different Member States. Figure 3 depicts the quantiles of the country-specific distribution of crop profit margins. Grids coloured in yellow indicate that this particular crop is, compared to other crops, relatively more profitable in a particular country. Vegetable production in green houses and flower production generally have the highest margins per hectare across countries. However, for other crops (e.g. apples, berries, and potatoes) a considerable heterogeneity exists across countries. Crops with higher profit margins can be expected to be able to better cope with potential cost increases due to, for example, improved IPM practices or use of precision farming tools that facilitate reduced pesticide use. When designing the national reduction targets, Member States could take the economic situation of different crops into account.

Arguably, these different analyses are a simplification and national reduction plans should consider various indicators. However, clearly there is heterogeneity in i) land-use across Member States, ii) national cultures and cuisines with associated preferences for foods, iii) pesticide intensity across crops, iv) risk-levels of the applied active substances, v) availability for alternatives to pesticides across different crops, and vi) margins that allow for cost increases associated with alternative management approaches across different crops. Consequently, despite the shared objective of a 50 % reduction of pesticide use and risk a heterogeneity in national strategies can be expected and indeed is built into the approach in the proposal of National Action Plans in the SUR. This heterogeneous response in turn would spread the potential impacts on yields (if any were assumed) across various commodities, which would even out the supply-shock considerably below what has been assumed in existing modelling studies (c.f. section 1.1).

Figure 3 Crop-specific quantiles of the country-specific distribution of economic margins per hectare. Source: (Kremmydas et al., 2021)

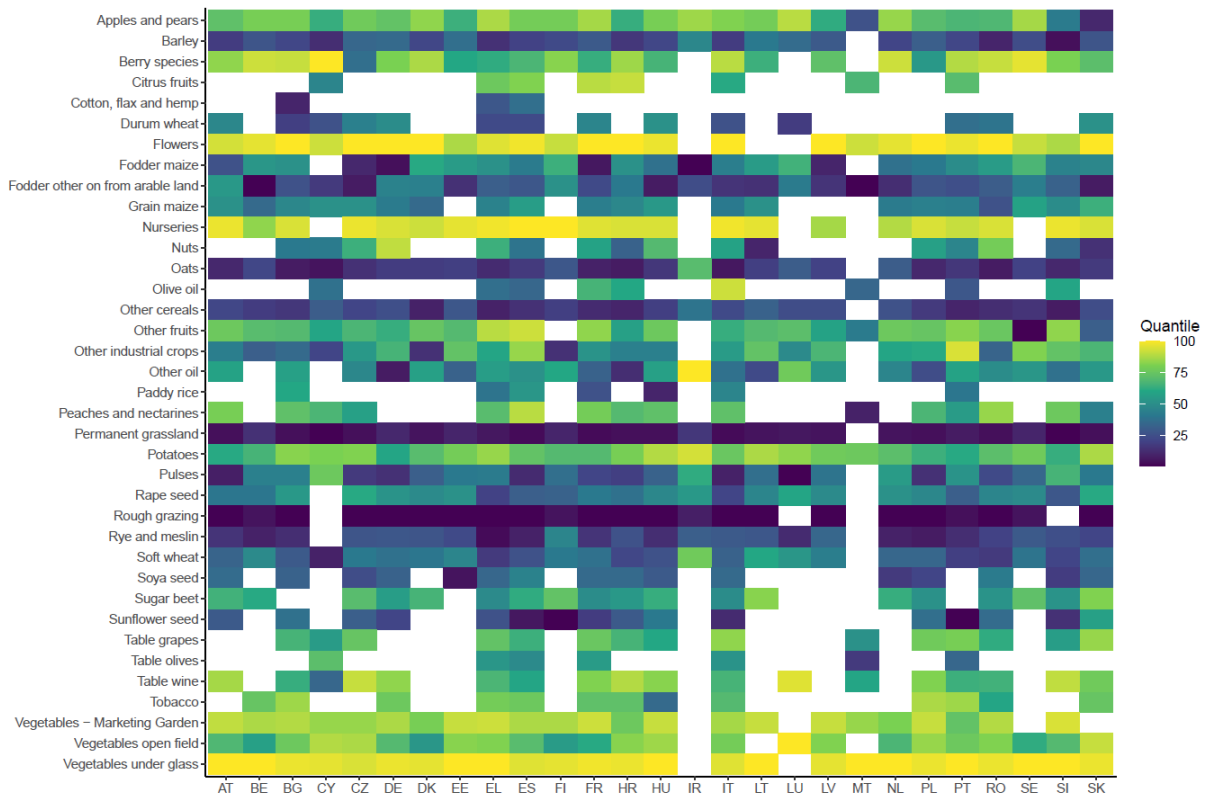


Table 6 Output values divided by expenses for plant protection products (partial productivity) across all EU-27 countries for different farm-types, averaged for the years 2018 to 2020. Source: FADN

Member State	Specialist COP*	Specialist field-crops	Specialist horticulture	Specialist wine	Specialist orchards fruits	Specialist olives	Permanent crops	Mixed crops	Mixed crops and livestock
(AT) Austria	16.4	17.0		25.2	13.2			18.6	15.6
(BE) Belgium		10.6	49.4		13.2			10.5	8.7
(BG) Bulgaria	11.3	18.9	24.8	7.7	10.0			12.9	15.3
(CY) Cyprus		16.1	14.8	13.5	10.7		13.5	13.8	22.9
(CZ) Czechia	7.6	9.5	53.1	19.1	8.4			12.4	8.8
(DE) Germany	8.6	12.2	77.2	30.4	13.6		14.3	13.1	10.2
(DK) Denmark	11.4	11.4	71.1		28.1			17.6	12.8
(EE) Estonia	10.9	22.9	91.2		144.3				12.2
(EL) Greece	13.6	12.7	14.6	12.4	12.4	28.1	20.0	16.3	22.5
(ES) Spain	16.5	13.9	20.4	18.9	14.7	18.0	19.1	16.9	21.7
(FI) Finland	13.0	16.3	86.1						19.6
(FR) France	7.0	10.2	60.2	23.3	16.7		20.8	15.0	7.3
(HR) Croatia	9.3	10.7	31.2	14.4	11.1	35.4	25.2	12.3	18.2
(HU) Hungary	11.3	14.7	40.5	12.2	7.6			10.9	12.0
(IE) Ireland	9.3								9.1

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(IT) Italy	13.5	20.5	33.3	23.0	16.7	28.2	19.2	20.7	22.3
(LT) Lithuania	10.3	13.8	45.8		27.2			22.8	14.6
(LU) Luxembourg		10.5		23.6					8.6
(LV) Latvia	8.5	22.1						34.0	14.9
(MT) Malta		35.0	28.6					26.9	24.8
(NL) Netherlands		9.4	44.8		16.3			21.1	10.1
(PL) Poland	11.0	14.6	68.1		12.7			21.8	13.4
(PT) Portugal	9.9	11.7	19.3	21.4	16.1	15.3	31.5	17.8	22.7
(RO) Romania	12.1	18.7	24.4	9.1	13.2		13.4	17.0	16.7
(SE) Sweden	13.0	19.1	72.3						14.5
(SI) Slovenia	12.9	19.5	25.6	29.4	10.6		13.8	20.2	23.2
(SK) Slovakia	7.5	9.1							8.7
<b>EU27 (2020)</b>	<b>10.0</b>	<b>13.1</b>	<b>37.7</b>	<b>22.2</b>	<b>14.6</b>	<b>21.1</b>	<b>19.5</b>	<b>16.9</b>	<b>10.8</b>

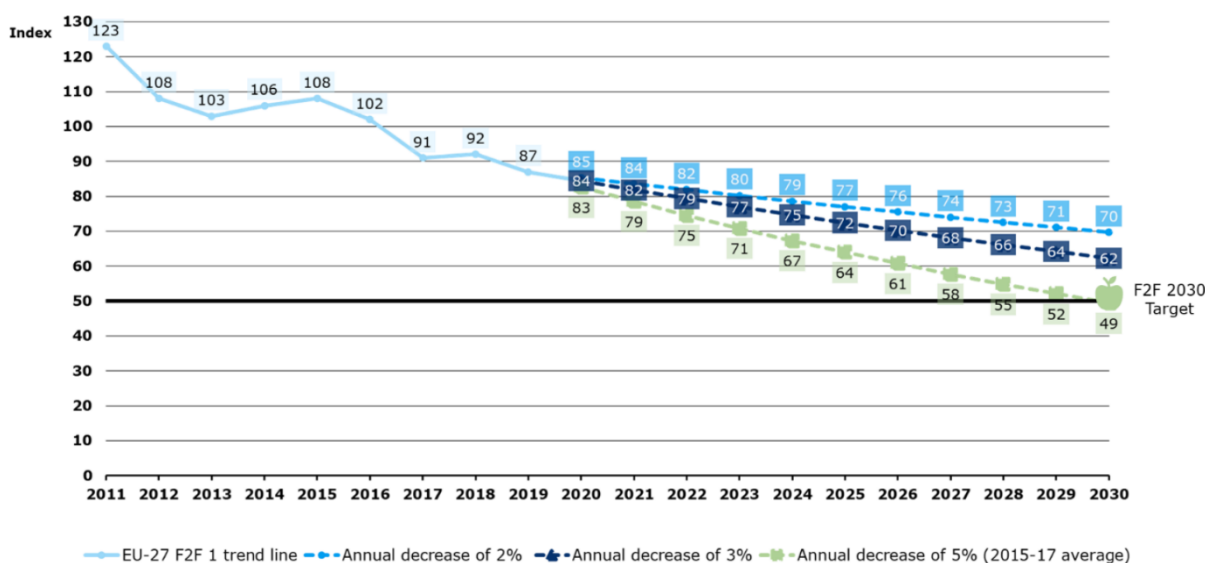
\*COP = cereals, oilseed, and protein crops

## 2.4 Substitution of active substances

The index used to track progress towards the Farm to Fork target 1 is computed as a weighted aggregate for chemical pesticides that takes into account not only used quantities but also a weighting factor. The weighting depends on the risk-class of a given active substance. In turn, it is possible that a mere substitution from high-risk substances to low-risk alternatives delivers progress toward the targets, as well as environmental and social benefits, without affecting the availability of chemical management tools for farmers, or the overall volume of pesticide sales. The underlying motivation for the weighting is that more hazardous substances cause more drastic externalities and could be prioritised in the strategies for reduction. Taking the toxicity of substances into account is pivotal as a reliance on quantities alone may lead to favouring more toxic substances that can be used in lower amounts, which can result in elevated toxic loads in non-targets (Bub et al., 2023; Cech et al., 2022; Schulz et al., 2021).

53 of the approximately 453 active substances approved for use in the EU fall into the category ‘candidates for substitution’ with a weight of 16; compared to less hazardous substances which receive a weighting of 1 or 8. Achieving Farm to Fork target 2 (i.e., the reduction in use of more hazardous substances) would result in an automatic drop of around 10 % for the index that measures target one. At EU-level from the 2015 to 2017 baseline to 2020, a 14 and 26 % reduction compared to the baseline period was already observed for the Farm to Fork target 1 (Figure 4) and 2, respectively. An extrapolation of the current trend line taking into account the historical data shows that further reductions can be expected in a no-change scenario, in the range of 1 and 5 % per year at an EU level. At the same time, the quantity of pesticides sold remained relatively constant over that period, and agricultural production has remained unaffected by this substitution of active substances. In other words, the reduction already achieved mostly came from the withdrawal of high-risk active substances and an expanded portfolio of, and/or increased sales/use of, low-risk alternatives without significant effects on EU production or food and feed security. During the bilateral discussion between DG SANTE and Member States’ authorities, various Member States indicated that the substitution of active substances was the main driver for the achieved progress toward the target. Scientific advances already contribute via the development of low-risk alternatives such as bee-friendly insecticide alternatives (De La Peña et al., 2023), as well as via approaches to dose rate optimization/reduction (Bažok, O’Keeffe, et al., 2021; Lázaro et al., 2021).

Figure 4 Current and projected trend of the HRI under various scenarios.



To illustrate this substitution effect further, Figure 5a below presents the trend in the approval of low hazard active substances in the EU. As part of the Farm to Fork Action Plan, the Commission has prepared four draft Regulations regarding the data requirements, the approval criteria, and evaluation principles for active substances that are microorganisms and the plant protection products containing them with the objective of facilitating access to the market for these biopesticides (Commission Regulation 2022/1438, 2022/1439, 2022/1440, 2022/1441).<sup>24</sup> Figure 5b presents the trend in the application for new active substances and clearly shows that the share of new dossiers for biopesticides is increasing over time.. As explained in the associated input on alternatives a number of actions are being taken to facilitate this market-based response and facilitate and prioritise the bringing of these biocontrol substances to the market. This market-based response to societal concerns on hazardous substances can be expected to continue

<sup>24</sup> <https://eur-lex.europa.eu/eli/reg/2009/1107/2022-11-21> ;  
<https://eur-lex.europa.eu/eli/reg/2013/283/2022-11-21> ;  
<https://eur-lex.europa.eu/eli/reg/2013/284/2022-11-21> ;  
<https://eur-lex.europa.eu/eli/reg/2011/546/2022-11-21>

Figure 5 Trends in the approval of low hazard active substances in the EU since 2009 (a); and trends in the applications for approval of plant protection product new active substances in the EU since 1996 (b). Sources: ccxlii, ccxliii.

Figure 5 (a)

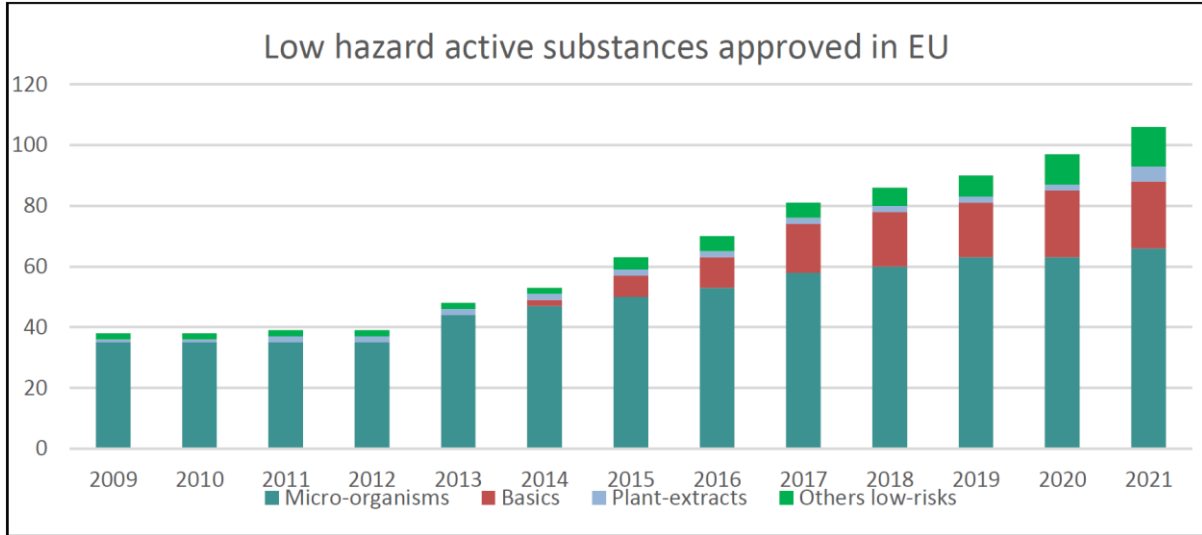
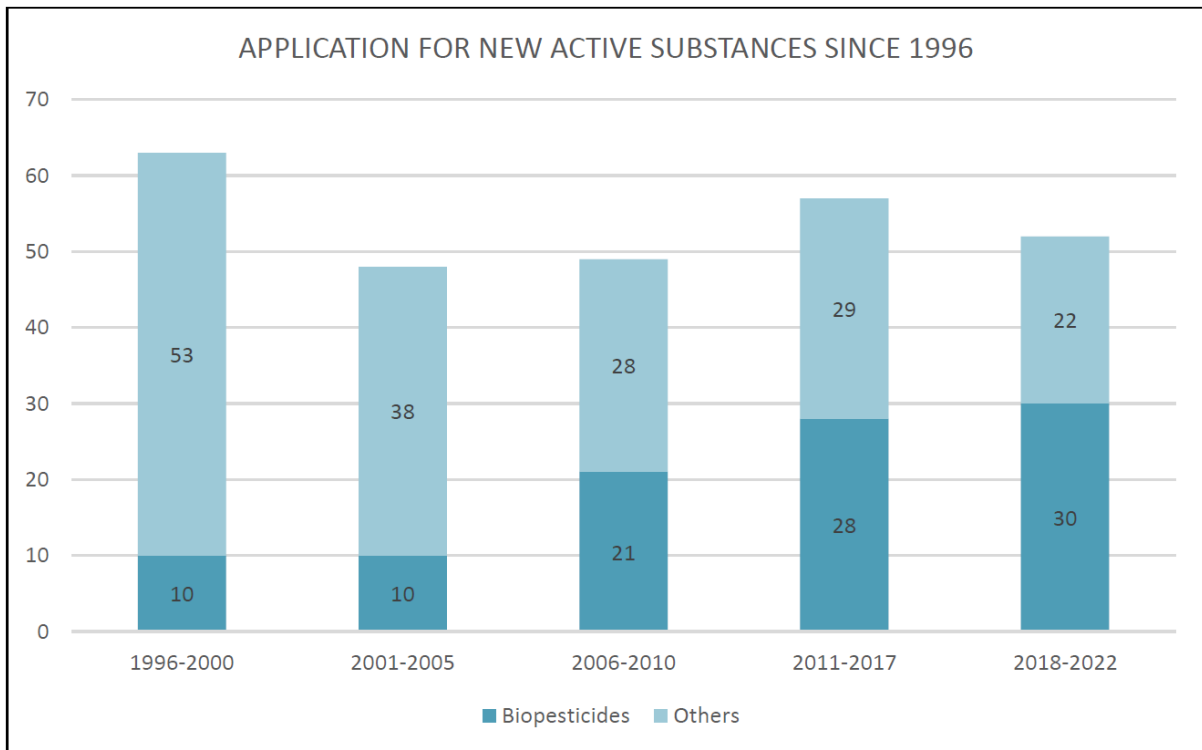


Figure 5 (b)



## 2.5 Organic farming

The Green Deal proposed a comprehensive set of strategies to elevate the EU's ambition of a sustainable society. In the previous section, we discussed the considerable market-driven substitution of high- with low-risk active substances within conventional food systems, and the considerable progress towards the Farm to Fork target such substitution has already generated. In line with this, a more system-wide reduction in the active substances used, as well as a reduction in their quantities, is reflected in the transition of conventional to organic farming. Organic production is a system of rules about agricultural production, marketing, imports labelling and control that aims at producing and processing food and feed at lower environmental costs.<sup>25</sup> The organic production rules, including the use of plant protection products and fertilisers, are laid down in EU legislation.<sup>26</sup> In Europe, organic farming is generally associated with a reduction in the use of chemical pesticides (Benbrook et al., 2021; Wuepper et al., 2023), which is also reflected through a considerable reduction of pesticide residues detected in organic foods (European Food Safety Authority, 2021). The Farm to Fork strategy set a clear target of increasing the area under organic farming from the current 12 % to 25 % by 2030. A relevant effect of this expansion of the area under organic farming will be a reduction in the use of agricultural inputs such as mineral fertilizers and chemical pesticides. Previous research suggests that 25 % of area under organic farming would decrease the fertilizer and pesticide purchases by 12.7 % and 14.5 %, respectively.<sup>27</sup> Hence, nearly a third of the Farm to Fork pesticide target will possibly be automatically achieved through the target on organic farming. This is another critical contribution to the decomposition of the pesticide target, which has clearly been ignored in the aforementioned modelling studies that had generally assumed a full 50 % reduction in pesticide use and risk in all crops.

The parallel action on increased availability of biocontrol alternatives (which could be used in organic farming) would favour and support organic farming as more tools would be available. The Commission non-paper on sensitive areas specifically proposes for the co-legislators an option for the use of products approved for organic farming in ecologically sensitive areas, thus providing a synergy with the target for increased organic area.

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<sup>25</sup> <https://www.organicseurope.bio/news/study-on-the-environmental-impacts-of-achieving-25-organic-land-by-2030-published/>

<sup>26</sup> Regulation (EU) 2018/848

<sup>27</sup> Page 68 in [https://www.europarl.europa.eu/RegData/etudes/STUD/2020/629214/IPOL\\_STU\(2020\)629214\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2020/629214/IPOL_STU(2020)629214_EN.pdf)

**Box 2. Takeaway points of section 2**

- 1) Part of the progress towards the F2F targets will come from reduction of pesticide use in non-agricultural areas (e.g., urban areas, sport and leisure facilities, private gardens, non-agricultural ecologically sensitive land, etc.). Furthermore, the aggregate of the pesticide footprint linked to the consumption of textiles, services, other, and ‘empty-calorie food’ (i.e., foods that have low nutritional value) accounts for a share of 37 % in developed countries. Arguably, a reduction of pesticide use and risk in non-agricultural areas or non-food and non-feed crops would have no repercussions to food and feed security.
- 2) Current pesticides use intensity depends on many aspects. Various studies have found sizeable variability in pesticide use not only across different years and between different regions within a country, but also across farms that essentially faced the same environmental and socio-economic condition. This existing heterogeneity, both at farm- and country-level, in turn speaks for a considerable reduction potential.
- 3) Heterogeneity in current pesticide use and economic conditions across Member States will likely result in a diversity of national pesticide use reduction strategies that would spread potential supply shocks (even if any were assumed) across commodities and in turn result in lower impacts as were assumed in existing studies.
- 4) Considerable progress towards the target has already been achieved from the targets’ reference baseline period of 2015-2017, without significantly affecting EU production or food and feed security.
- 5) Regulatory actions at EU level have been achieved to foster the access of low-risk pesticides to the market but their implementation by Member States will be central to realise the F2F targets.
- 6) Progress towards achieving the F2F target of an expansion of the area under organic farming in the EU to 25 % would also be expected to result in a decline in pesticide purchases and use.

### 3. Food and feed security relevant feedbacks of a pesticide reduction

Besides the pesticides' intended function as damage control agents, their use also leads to unintended consequences, so called *externalities*. The consequences for the environment and human health from misuse of these chemicals are of societal concern (Carvalho, 2017; Edlinger et al., 2022; Köhler & Triebkorn, 2013; Nicolopoulou-Stamati et al., 2016; Akanksha Sharma et al., 2020). Pesticide residues are found in soils, surface water, groundwater, non-target plants, food and feed, animals and humans (Aktar et al., 2009; Popp et al., 2013; Anket Sharma et al., 2019); some pesticides can remain in the environment for years and accumulate in soils and water (Akanksha Sharma et al., 2020).

At the same time, pesticides are a cheap management approach. This raises the question as to whether environmental and societal externalities are properly internalized into the product prices in the current markets (Finger et al., 2017; Grovermann et al., 2017; Popp et al., 2013; Steingrimsdóttir et al., 2018). A failure to internalize societal costs into the products' price leads to an excessive use, which not only goes beyond the environmentally sustainable level but also the optimal level from an economic point of view (Frisvold, 2019; Steingrimsdóttir et al., 2018). A recent paper published by the German Environment Agency<sup>28</sup> mentions that current annual costs of biodiversity loss due to intensive agriculture in Germany alone have been estimated to amount to 50 billion Euros. While a valuation of ecosystem services remains challenging (de Groot et al., 2010), societal benefits of the 2009 Thematic Strategy EU pesticide regulation package overall have been estimated at 15 to 54 billion Euros, equating to 70 to 250 Euros per EU household.<sup>29</sup>

The assumption that an adherence to the pesticide dependent production practices of the last decades may safeguard the EU's food and feed security in the long run is a considerable fallacy. A reluctance to change the current system-design would instead likely continue to contribute to the downward spiral that led to the degradation of natural resources in the first place; and very likely result in serious risks to food and feed security (SAPEA, 2020). While pest management in the EU food system is currently pesticide-centric, the notion that a continuation of this is in any way a safer path that would ensure food and feed security is very much unsupported by the scientific evidence, as will be discussed in the next section. Various environmental stressors, from climate change, over soil erosion, to a loss of biodiversity, have already started to affect EU food systems. The use of pesticides generates unintended effects, so-called *externalities*, which are a significant contributor to many agro-environmental problems. Many of these externalities adversely feedback to crop yields, and in turn also to food and feed security.

#### 3.1 Biodiversity loss

Biodiversity loss and ecosystem collapse are among the most serious threats humanity will face in the next decades. The world already lost an estimated 3.5 to 18.5 trillion Euros per year in ecosystem services from 1997 to 2011 due to land-cover change and an estimated 5.5 to 10.5 trillion Euros per year due to land degradation.<sup>30</sup> Biodiversity is crucial for

<sup>28</sup> <https://www.umweltbundesamt.de/publikationen/towards-sustainable-plant-protection>

<sup>29</sup> <https://data.europa.eu/doi/10.2779/070159>

<sup>30</sup> [https://ec.europa.eu/commission/presscorner/api/files/attachment/865555/factsheet-business-case-biodiversity\\_en.pdf.pdf](https://ec.europa.eu/commission/presscorner/api/files/attachment/865555/factsheet-business-case-biodiversity_en.pdf.pdf)

safeguarding the EU's and global food and feed security. A rich biodiversity underpins healthy and nutritious diets and improves rural livelihoods by supporting agricultural productivity (Dainese et al., 2019). There is an overwhelming scientific consensus that biodiversity loss threatens mankind's food systems in unprecedented ways, putting food security and nutrition at serious risk.<sup>31</sup>

The EU's biodiversity strategy for 2030<sup>32</sup>, one of the flagship initiatives under the European Green Deal, is a comprehensive, ambitious and long-term plan to protect nature and reverse the degradation of ecosystems. The strategy aims to put Europe's biodiversity on a path to recovery by 2030, and contains specific actions and commitments<sup>33</sup>. The biodiversity strategy stipulates that at least 10% of agricultural area should be under high-diversity landscape features, and that the uptake of agro-ecological practices should be significantly increased. In addition, the farm to fork strategy sets the objective that at least 25% of agricultural land should be under organic farming. This will open space for biodiversity in productive parts of agricultural landscapes and support the transition to a sustainable food production system. To aid biodiversity recovery in agricultural ecosystems, it is also critical to reduce pressure from chemical pollutants and other substances.

The SUR proposal, adopted by the European Commission in June 2022, proposes legally binding targets at EU level to reduce by 50% the use and the risk of chemical pesticides and the use of the more hazardous pesticides by 2030, and proposed measures to improve integrated pest management where chemical pesticides can only be used once all non-chemical options are exhausted. The proposal obliges Member States to adopt legally binding national targets corresponding to the EU-level targets. It also restricts pesticide use in sensitive areas, including in areas that sustain pollinator species that are at risk of extinction.

To restore damaged ecosystems across Europe and enable the long-term sustained recovery of biodiverse and resilient nature, the European Commission adopted a first EU-wide proposal for a regulation on nature restoration<sup>34</sup> in June 2022. It entails an overarching restoration objective coupled with binding targets for specific ecosystems. Action on restoration in agricultural land include restoring ecosystem functions and services, of which animal pollination is one of the most essential. Proposed obligations on agricultural ecosystems include enabling the recovery of grassland butterflies and farmland bird populations, rewetting peatlands, and increasing the share of agricultural land with high-diversity landscape features.

Soils host over 25 % of all biodiversity on our planet (FAO, ITPS, GSBI, SCBD, 2020). In the EU, there are 2.8 million potentially contaminated sites (Paya Perez & Rodriguez Eugenio, 2018), and 83 % of agricultural soils show residual of chemical pesticides (JRC work on LUCAS 2018 in progress). In addition to agricultural soils with nutrient inputs at levels risking eutrophication, cropland soils losing carbon at a rate of 0.5 % per year. Around 24 % of land suffers from unsustainable water erosion rates (Paganos et al., 2020). Approximately 23 % of land is characterized by high density subsoil due to compaction (Montanarella & Panagos, 2021). Lastly, 25 % of land is at high or very high risk of desertification in Southern, Central, and Eastern Europe (Práválie et al., 2017). The costs associated with soil degradation in the EU already exceed EUR 50 billion per year.<sup>35</sup> For six land degradation processes (water erosion, loss of phosphorus, loss of carbon due to soil

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<sup>31</sup> [https://ec.europa.eu/commission/presscorner/detail/en/fs\\_20\\_906](https://ec.europa.eu/commission/presscorner/detail/en/fs_20_906)

<sup>32</sup> [COM\(2020\) 380 final](#)

<sup>33</sup> [COM\(2020\) 380 final annex](#)

<sup>34</sup> [COM\(2022\) 304 final](#)

<sup>35</sup> [https://environment.ec.europa.eu/publications/eu-soil-strategy-2030\\_en](https://environment.ec.europa.eu/publications/eu-soil-strategy-2030_en)

erosion and land use change, sediments removal and management of contaminated sites), the JRC estimated a cost of 15 billion per year. The 12 million hectares of agricultural land in the EU that suffer from severe water erosion are estimated to lose around 0.43 % of their crop productivity annually, with estimated annual cost of 1.25 billion Euros (Panagos et al., 2018).

Presently, conventional agriculture accounts for around 88 % of the agricultural areas in the EU. In areas in which agricultural inputs, such as fertilizers and pesticides, are used intensively, direct pressure on biodiversity can be observed. Pesticides are among the pollutants that can adversely affect soil-, field-margin-, and water-organisms, thereby contributing to environmental degradation and ecosystem service losses that may lead to repercussions for food and feed security. Globally, around 64 % of agricultural land is at risk of pesticide pollution and 31 % is at high risk (Tang et al., 2021). Among the high-risk areas, 34 % are high-biodiversity regions and therefore at risk of serious environmental damage from pesticide pollution (Tang et al., 2021). These estimates are globally, and the numbers may differ for the EU. Various studies attempted to quantify the societal costs of pesticides. The adverse effects of pesticides on pollinators (Desneux et al., 2007; Johansen, 1977; Sponsler et al., 2019; Tosi et al., 2022) threaten ecosystem services with an estimated worth of hundreds of billions of dollars (Gallai et al., 2009; Losey & Vaughan, 2006). Annual losses in developing countries due to effects of pesticides on non-target organisms were estimated at \$8 billion (Aktar et al., 2009). In the United States, inadvertent resistance building in pests from pesticide applications was estimated to cost \$10 billion per year (Sexton et al., 2007). Nevertheless, a comprehensive meta-analysis on the aggregate monetary externalities of pesticide-centric management, and particularly in an EU context, is, to the best of our knowledge, not available.

Undoubtedly, some of the externalities of pesticide use have direct impacts on farming activities that will lead to negative impacts on food and feed security. Biodiversity is crucial for safeguarding EU and global food and feed security (FAO, 2019), by supplying many vital ecosystem services, such as soil and water quality, nutrient cycling, soil respiration, pollination, natural pests control, and by providing habitat for wildlife (Chagnon et al., 2015; Dainese et al., 2019). A rich biodiversity makes food systems and livelihoods more resilient to shocks and stress (Chagnon et al., 2015; Dardonville et al., 2022), including those caused by climate change. The adverse effects of pesticides on flora and fauna, in turn, are of particular relevance when discussing the relationship between pesticides and crop yields, food and feed security, and prices.

In relation to food and feed security, the loss of functional biodiversity directly translates into the decrease of several critical ecosystem services (Grab et al., 2019; Greenop et al., 2021; Hooper et al., 2012; Marshman et al., 2019). The unprecedented decline in biodiversity and the associated functions has led to the exploration of desperate alternatives via anthropogenic solutions. For example, attempts are made to replace the loss of pollinators and the pollination service they provide by managed pollinators and/or artificial pollination. The labour costs for hand pollination of agricultural crops were estimated at 90 billion Dollars per year in the United States alone.<sup>36</sup> The loss of predators of pests and the natural pest control service they provide is being substituted with the use of more chemical pesticides. The loss of soil biodiversity and the nutrient cycling service is being substituted with the use of more mineral fertilisers. These substitutive actions, besides being costly, may not provide outcomes comparable to the ones provided by natural processes, such as the improvement of fruit quality and the economic value provided by insect pollination (Garratt et al., 2014).

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<sup>36</sup> <https://www.routledge.com/The-Business-of-Bees-An-Integrated-Approach-to-Bee-Decline-and-Corporate/Atkins-Atkins/p/book/9781783534357>

Evidence shows that restoring agroecosystems can have positive impacts on food productivity and food and feed security through higher yields, improved nutritional content, and a stronger resilience and stability against climate-change-related as well as socio-economic disturbances (Liquete Garcia et al., 2022). More (bio)diverse and resilient agricultural ecosystems also reduce the dependence on imports. The restoration of nature can therefore be seen as an insurance policy for the EU's long-term food and feed security. A reduction in pesticides use must certainly be part of the solution to achieve such a restoration.

In what follows, we restrict our discussion on externalities that have repercussions to crop yields, and subsequently on food and feed security. Adverse impacts on, for example, human health and freshwater systems are omitted as they do not directly relate to crop yields. Nevertheless, these externalities generate societal and environmental costs that must certainly be considered by decision makers.

### 3.2 Natural pest control

A rich biodiversity is essential for natural pest control (Albrecht et al., 2020; Bonato et al., 2023; Díaz-Sieffer et al., 2022; Gong et al., 2022). In other words, adverse effects of pesticides on biodiversity can reduce the natural pest control, which in turn leads to an elevated need for pesticides to manage crop health. This so-called *pesticide dependency* in agriculture is a complex challenge and often characterized as a treadmill (Hedlund et al., 2020). The degree of dependency is, among other factors, related to the bioclimatic conditions and the plant species cultivated (Popp et al., 2013). The contribution to pest control of natural enemies of crop pests has been estimated to account for at least 50 % of pest control occurring in crop fields (Pimentel et al., 2005).

Agronomic designs, e.g. flower strips, can support natural pest control. Martin et al. (2019) found a 1.4-fold increase in pest control and a 1.7-fold increase in pollination within landscapes with a higher field-edge density. Albrecht et al. (2020) estimated that intact flower strips and hedgerows enhance pest control by 16 %, whereas Tschumi et al. (2015, 2016) found a 40 to 61 % reduction of pest-induced crop damage near wildflower strips. In some crops, the natural pest control via flower strips can therefore be an effective alternative to insecticides (Tschumi et al., 2015; Tschumi, Albrecht, Collatz, et al., 2016). Furthermore, the inclusion of flower strips can in some cases translate directly into higher crop yields (Mei et al., 2021; Tschumi, Albrecht, Bärtschi, et al., 2016). However, such agronomic designs may also play a role as a reservoir for polyphagous pests and diseases which could necessitate control of organisms that, without flower strips, do not pose risks.

While studies quantifying the overall value of natural pest control at the EU scale are missing, individual studies on single crops/regions can be illustrative of the importance of this service. The economic value provided by natural pest control on wheat in South-East England alone has been estimated to be around £2.3 million over a 5 years period (Zhang et al., 2018). Daniels et al. (2017) estimated a farm income loss related to a lack of natural pest control between 89 to 2187 Euros per hectare annually. In North America, the value of natural control of insects pests alone has been estimated at 4.5 billion USD annually (Losey & Vaughan, 2006).

Ecosystems influenced by agriculture have generally experienced a dramatic loss of terrestrial and aquatic biodiversity, beyond pollinators (Chagnon et al., 2015). For example,

this is demonstrated by a 57 % decline of European farmland birds between 1980 and 2017.<sup>37</sup> Besides their critical role in the food web, wild birds are also known to reduce crop damage and pest abundance while increasing crop yields through natural pest control (Díaz-Sieffer et al., 2022). Pesticides can affect birds directly through ingestion of pesticide-treated seeds or contaminated insects, or indirectly through a general reduction of food resources. A considerable prevalence of contamination of mammals with a broad mixture of active substances was found in French samples, with no statistical difference between conventional and organic fields (Fritsch et al., 2022). Similar to birds, mammals have critical roles in the agro-ecosystem, among others, due to predation of weed seeds and invertebrates (Fritsch et al., 2022).

Arguably, several factors are driving the biodiversity decline and in turn the loss of natural pest control. Nevertheless, it is scientific consensus that pesticides are a major part of the problem. That the current use of chemical pesticides, especially insecticides and fungicides, is a key driver of biodiversity loss across the EU has been established (Chagnon et al., 2015; Potts et al., 2010).<sup>38</sup> Available data links intensive agriculture, with its use of pesticides with hazardous active substances, with serious environmental problems especially in aquatic ecosystems.<sup>39</sup> While aggregated EU-level data on the relationship between the intactness of natural pest control and the use of pesticides is lacking, in general across scientific disciplines there is a widespread consensus that pesticide application is having an adverse impact on biodiversity. These adverse impacts can result from a direct poisoning of non-target organisms on the treated fields (or in proximity of such), as well as through a reduction of food resources for non-target organisms.

### 3.3 Pollination services

The unprecedented loss of biodiversity threatens food systems globally, putting food and feed security and nutrition severely at risk (Goulson et al., 2015; Marshman et al., 2019; Potts et al., 2016). Next to natural pest control, pollination services are severely impacted by this adverse trend. While the main cereal staple food are self-pollinated, pollinators do influence 35 % of global human food supply (Marshman et al., 2019; Tscharntke et al., 2012). Consequently, pollinating insects especially wild pollinators (Garibaldi et al., 2013; Goulson et al., 2015; Weekers et al., 2022), provide vital ecosystem services to crops and wild plants. Over half of the global GDP depends on nature and the services it provides. More than 75 % of global groups of food crops rely on animal pollination (Klein et al., 2007; Potts et al., 2016). In the EU, around 84 % of crop species and 78 % of wild flower species depend, at least in part, on pollinators. At global level, pollinators are required for reproduction of almost 90 % of angiosperms (Tscharntke et al., 2012). In the EU, 31 % of the income generated through crop production depends on pollinators (Schulp et al., 2014). There is no shortage of evidence, nor any lack of consensus, that pollinators are pivotal to food and feed security and that current food systems with the associated use of pesticides are adversely affecting them (Marshman et al., 2019; Potts et al., 2010, 2016).

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<sup>37</sup> [https://pecbms.info/trends-and-indicators/indicators/indicators/E\\_C\\_Fa/](https://pecbms.info/trends-and-indicators/indicators/indicators/E_C_Fa/)

<sup>38</sup> <https://www.eea.europa.eu/airs/2018/environment-and-health/pesticides-sales>

<sup>39</sup> <https://www.eea.europa.eu/publications/state-of-water>

The EU Pollinator initiative was the first-ever EU framework to tackle the decline of wild pollinators. The European Commission has recently adopted the communication ‘A new deal for pollinators’<sup>40</sup> revising the 2018 EU Pollinators Initiative. This responds to increasing calls for action, including from the European Court of Auditors<sup>41</sup> and the ECI ‘Save bees and farmers’<sup>42</sup>, to improve pollinator conservation and tackle the causes of their decline and its consequences on food security, human health, quality of life and ecosystems. Insects, particularly pollinators, are key indicators of the health of agroecosystems and are vital for agricultural production and food security. As mentioned in the communication ‘A new deal for pollinators’ and shown by evidence, intensive agriculture and pesticide use are causing biodiversity and pollinator loss, together with other factors such as land-use change and urbanisation, climate change and invasive alien species.

The proposed nature restoration law includes a specific legally binding target for Member States to reverse the decline of pollinator populations by 2030 and achieve an increase thereafter. It also includes a method for regular monitoring of pollinators. Under the nature restoration proposal, Member States are expected to submit national restoration plans to the European Commission showing how they will meet the targets. They would also be required to monitor and report on progress.

The SUR proposal sets legally binding pesticide targets and proposing measures to improve integrated pest management, ensuring that chemical pesticides are only used as a last resort option. The proposal also restricts pesticide use in sensitive areas, including in areas that sustain pollinator species that are at risk of extinction.

At EU-level, only the pollination services provided by bees has been estimated to account for 8 to 20 % of the total yield value of pollination dependent crops or 10 billion euro (Vallecillo et al., 2019). A complete pollinator loss would translate into a decline of production across all crops over current consumption levels of 12 % for fruits and 6 % for vegetables (Gallai et al., 2009). The absence of pollinators was estimated to result in a 7 % reduction of crop production in the EU (Schulp et al., 2014). These estimates of production impact do not account for the fact that pollinators fulfil a pivotal role in the ecological food webs in general (Chagnon et al., 2015). To recall, Barreiro-Hurle et al.’s (2021) worst-case estimates of production losses associated with a reduction in pesticide use and risk was 2.7 % of EU’s total agricultural output (Table 5), and the USDA’s worst-case estimate for a scenario in which the entire Green Deal policies are globally enforced was a 12 % decline in crop yields. Hence, irrespective of all the arguments put forward in this report on why these estimates are to be seen as an upper-bound, evidently the impact of a pollinator loss alone (i.e., ignoring natural pest control and soil health) is expected to be worse than the most extreme estimates of a yield-decline due to the reduction of pesticide use and risk. The reduction of pesticide use and risk, however, is only part of the solution to prevent a collapse of pollinators in the EU.

The pollinators’ abundance and diversity can directly increase crop productivity (Garibaldi et al., 2016), and quality (Stanley et al., 2015). A diverse community of pollinators, including wild species, generally provides more effective and stable crop pollination than any single species, such as honeybees (Garibaldi et al., 2013). Pollination limitation due to a lack of pollinators is a common cause of lower crop yield (Klein et al., 2007; Reilly et al., 2020). For example, studies identified increases in crop yield following the introduction of wildflower strips and field margins in farmlands (Mei et al., 2021). A higher abundance of bees leads to

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<sup>40</sup> [COM\(2023\) 35 final](#)

<sup>41</sup> [European Court of Auditor's Special Report 15/2020: Protection of wild pollinators in the EU — Commission initiatives have not borne fruit.](#)

<sup>42</sup> ECI “[Save bees and farmers](#)”

higher crop yields and gross margins, ranging 15 to 40 %, therefore directly benefiting farmers (Catarino et al., 2019). While oilseed rape may self- and wind-pollinate, the presence of insect pollination was found to increase yields by 20 to 35 % (Bommarco et al., 2012; Perrot et al., 2018). Maintaining high floral diversity and perennial floral plantings is essential for the effectiveness of these pollinators. In turn, there is a clear antagonism between pesticide use and bee abundance (Catarino et al., 2019). Adverse effects of pesticide use on bees are not limited to lethal doses but also arise through a continuous exposure at sub-lethal levels (Harry Siviter et al., 2021; Stanley et al., 2015; Tosi et al., 2022; Woodcock et al., 2016). The antagonism likely also extends to flower-visiting insects in broader terms (Uhl & Brühl, 2019). While quantifying this critical contribution in monetary terms is challenging, a recent study conservatively estimated the global value of animal pollination to crop production at EUR 158 to 412 billion per year (Stout et al., 2016). Collectively, pollinators provide more than EUR 14 billion per year to the market value of European crops (IPBES, 2016), and up to over EUR 1500 per hectare.

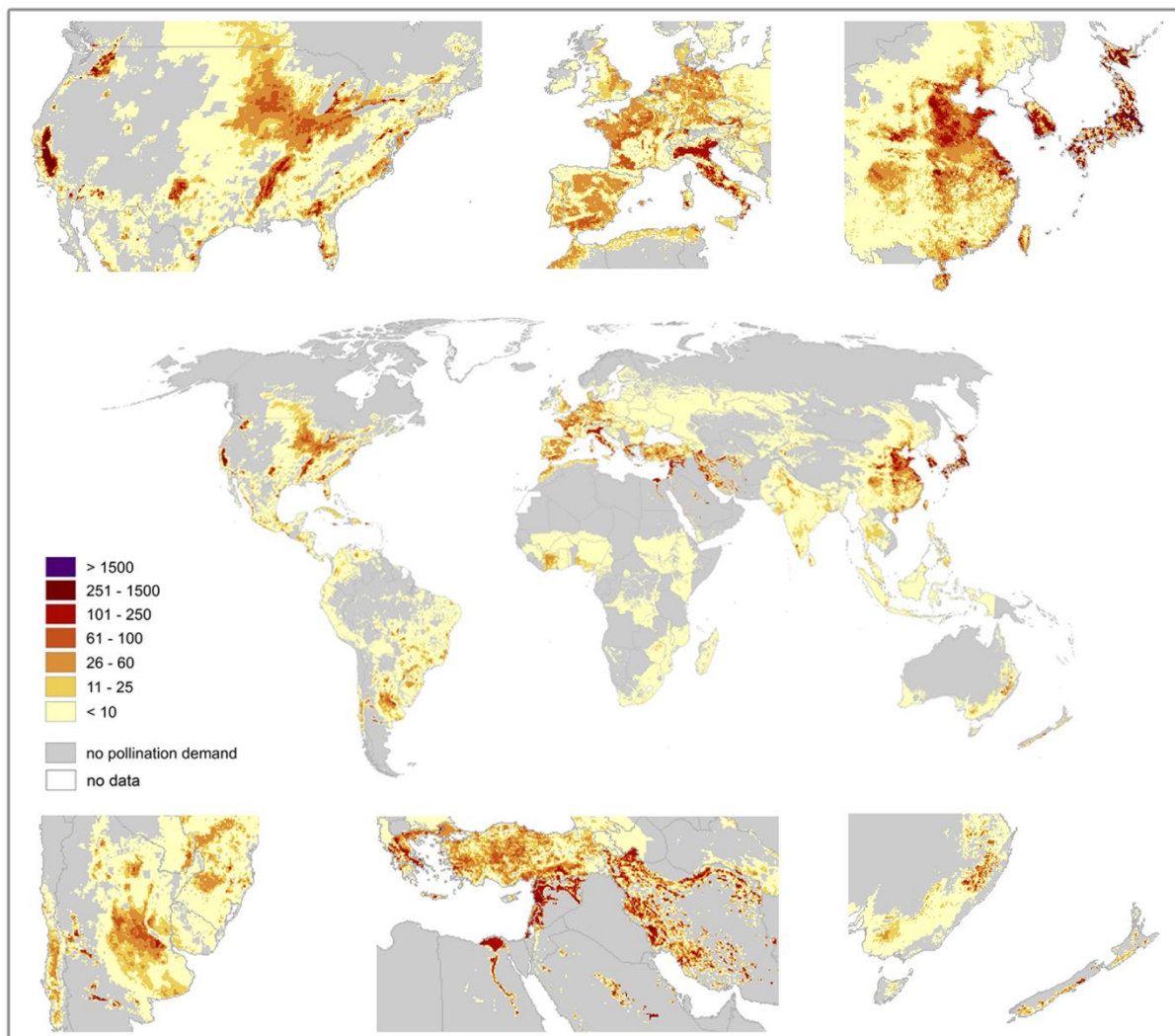
In addition to the evidence on food quantity, pollinated crops are vital global for food and feed security also in relation to their importance as sources of micronutrients. Around 90 % of the crops that provide vitamin C, 70 % of those providing vitamin A, and the majority of those providing calcium, fluoride, and folic acid requiring pollination (Eilers et al., 2011; Potts et al., 2016). A collapse of pollination services could therefore lead to elevated rates of preventable diseases, with estimates suggesting a potential of 1.4 million additional deaths annually because of dietary deficiencies (Smith et al., 2015).

Mediterranean Europe is among the hotspots for the economic benefits associated with pollination services (Lautenbach et al., 2012) (Figure 6). Despite this, in October 2020 the Commission published the results of the EU-wide ecosystem assessment, which also included insects-pollination services (Maes et al., 2020). The results revealed that 50 % of the land cultivated with pollinator-dependent crops faced a deficit in pollinators.<sup>43</sup> The drastic decline in bees and other pollinating insects in the last 50 years is a complex problem with several driving factors (Goulson et al., 2015; Meeus et al., 2018). However, that pesticides contribute to the decline of bees has been established (Goulson et al., 2015; Rundlöf et al., 2015), and this negative effect is aggravated by other anthropogenic drivers (Knauer et al., 2022; H. Siviter et al., 2021).

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<sup>43</sup> [https://agriculture.ec.europa.eu/system/files/2022-02/factsheet-farmtofork-comparison-table\\_en\\_0.pdf](https://agriculture.ec.europa.eu/system/files/2022-02/factsheet-farmtofork-comparison-table_en_0.pdf)

Figure 6 Estimated benefits of pollination services in the year 2000 in Euro per hectare.  
Source: (Lautenbach et al., 2012)



A drastic decline in both wild and domesticated pollinators has been reported in several regions of the world (Potts et al., 2010; Powney et al., 2019). Globally, around 17 % of pollinator species face extinction. In Europe, around 9 % of bees and butterflies are threatened, with an increasing trend (Potts et al., 2016). There are widespread reports that populations of pollinators and other flying insects have strongly declined over the last decades in Europe (Barendregt et al., 2022; Hallmann et al., 2017, 2020; Møller, 2019; Vogel, 2017).<sup>44</sup> On average across these national or regional reports, insect populations have been declining by about 20 to 30 % per decade, or 2 to 3 % annually. At EU-level, between 1991 and 2018 the populations of common grassland butterflies have decreased by 25 %.<sup>45</sup> The decline in insect populations is also impacting the populations of their natural predators, particularly in agro-ecosystems. While the populations of all common birds in the EU declined by 12 % and the populations of common forest birds declined by 5 % between 1990 and 2021, the populations of common farmland birds have declined by 36 % during that period according to Eurostat.

<sup>44</sup> <https://cdn.buglife.org.uk/2022/05/Bugs-Matter-2021-National-Report.pdf>

<sup>45</sup> <http://www.eea.europa.eu/publications/the-european-grassland-butterfly-indicator-19902011>

Recent assessments (extensive review provided by Mamy et al. (2022)) show that pesticide use is linked to a wide range of direct (both lethal and non-lethal) and indirect effects on biodiversity, contributing to observed declines in populations of bees and other organisms (birds, bats, earthworms, aquatic plants, fish, and amphibians, among others). In some cases, the negative impacts can be connected to recently banned substances such as neonicotinoid insecticides, whose toxicity to bees, terrestrial mammals and birds is well documented, or the insecticide chlorpyrifos in relation to bats. However, a growing body of evidence suggests that several currently approved substances also have adverse effects, for example glyphosate on non-target plants (relevant as food plants for pollinators) or cypermethrin (a pyrethroid) on non-target animal species; just to name a few.

In view of this, a constant monitoring scheme of pesticide exposure to pollinators is called for (Kaila et al., 2022). In this regard, the Commission currently implements the INSIGNIA project,<sup>46</sup> which monitors environmental pollution, including pesticides, using honeybees as sentinels. The project has been funded by the European Parliament.

### 3.4 Soil health

Soils are the basis for agricultural food production (D'Hose et al., 2014), they also act as a buffer against climate change risks to food and feed security. Soil health is also a pressing global issue that sits at the heart of four UN conventions (UNCBD, UNCCD, IPBES, and UNFCCC) and of the Sustainable Development Goals. Soils host over 25 % of all biodiversity on our planet (FAO, ITPS, GSBI, SCBD, 2020), and they are the foundation of the food chains for humans and animals alike. As majority of food comes from terrestrial sources, the ability to provide sufficient, safe, and nutritious food and a range of vital ecosystems services such as clean water, habitats for biodiversity, nutrient cycling, and carbon storage depends on maintaining soil health, for example through a reduction of pollutants such as pesticides (Kibblewhite et al., 2008).

The EU soil strategy for 2030<sup>55</sup> stresses the importance of soil biodiversity for ecosystem health and sets out specific actions to better understand and protect soil biodiversity, including through the Horizon Europe Mission, A Soil Deal for Europe<sup>56</sup>. Halting and reversing the loss of soil biodiversity is an essential aspect of the strategy's vision to achieve healthy soils by 2050. As the EU's largest terrestrial ecosystem, healthy soils sustain many sectors of the economy while soil degradation is costing the EU several tens of billion euros per year<sup>47</sup>. The Soil Strategy builds on and significantly contributes to several of the objectives of the Green Deal, the Farm to Fork, Biodiversity and Chemicals Strategies and the Zero Pollution Action Plan. Sustainable soil management practices are part of broader agro-ecological principles which are at the heart of the farm to fork and biodiversity strategies and their targets to bring back at least 10% of agricultural area under high-diversity landscape features, to reduce nutrient losses and risk and use of chemical pesticides by 50% by 2030, to increase the proportion of agricultural land under organic farming and to increase soil organic matter. Moreover, prevention of soil pollution remains one of the most effective and cheapest way to ensure clean and healthy soils in the long term. This can be done, for

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<sup>46</sup> <https://www.insignia-bee.eu/>; Grant number: 09.200200/2021/864096/SER/ENV.D.2

<sup>47</sup> Estimated at EUR 50 billion in the report of the Mission board for Soil health and food (2020), "Caring for soil is caring for life", <https://op.europa.eu/en/publication-detail/-/publication/4ebd2586-fc85-11ea-b44f-01aa75ed71a1>

example, by more efficient fertiliser application or reduced pesticide use and risk<sup>48</sup>. The SUR proposal translates the Farm to Fork pesticide reduction targets into legally binding targets and proposing measures to improve integrated pest management where chemical pesticides are only used as last resort option.

The main drivers of soil degradation in Europe are human activities, such as intensive agriculture, drainage, and the spread of persistent pollutants such as certain pesticides (Ankit et al., 2020; Kibblewhite et al., 2008). Of all management factors, pesticide residues are suggested to have the biggest influence on the soil microbiome (Walder et al., 2022). Effects of pesticides range from direct impacts through acute or chronic toxicity, to indirect effects (e.g., through continuous sub-lethal exposure) that alter behaviour, functional roles, and/or the food web dynamics (Chagnon et al., 2015).

Around 60 to 70 % of soils in the EU are not healthy (Veerman et al., 2020), with severe degradation processes continuing to put pressure on the systems.<sup>49</sup> Unsustainable land use and management as well as emissions of pollutants such as pesticides advance the degradation of soils across the EU. The pesticide residues in EU soil samples are considerable (Hvězdová et al., 2018), because many of the soil ecosystem services are biologically mediated (Chagnon et al., 2015). In 2019, the distribution of 76 pesticide residues was evaluated in 317 agricultural topsoil samples across 11 EU Member States and 6 cropping systems (Silva et al., 2019). Over 80 % of the samples contained pesticide residues (25 % of samples had residues of one active substance, and 58 % of samples had residues of multiple active substances). Glyphosate and its metabolite AMPA, DDTs, and the broad-spectrum fungicides boscalid, epoxiconazole, and tebuconazole were the most frequently detected compounds (Silva et al., 2019).

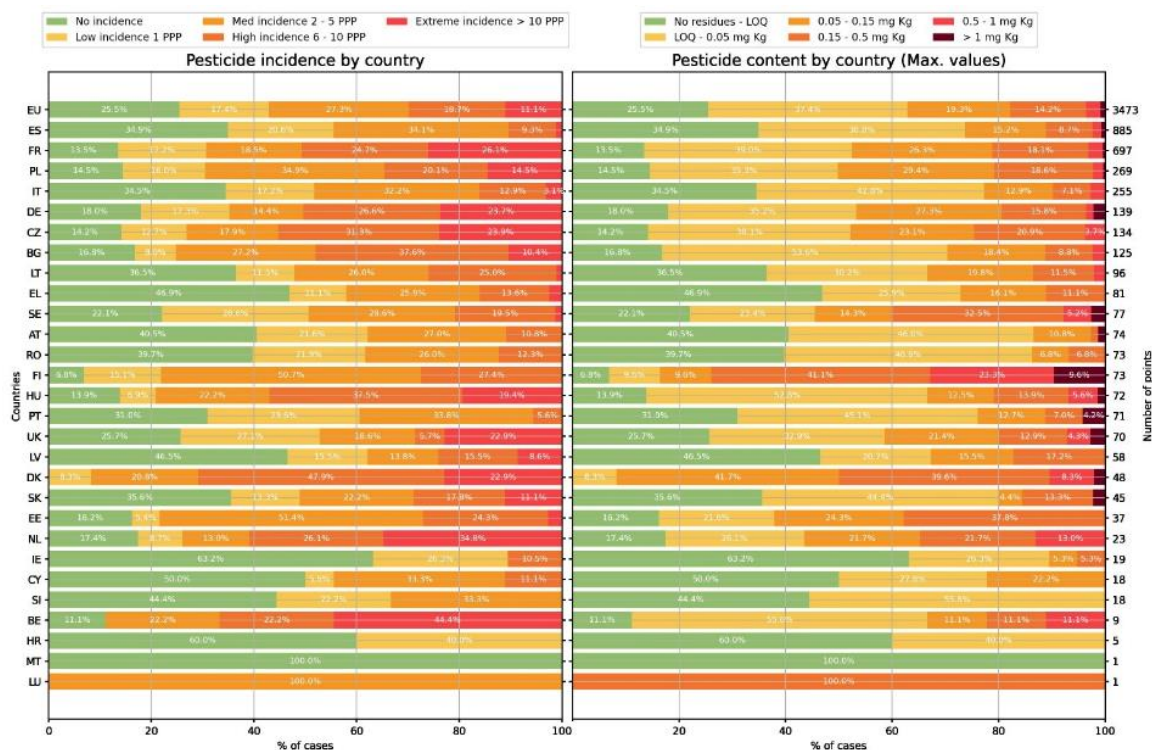
The European Commission's Joint Research Centre is currently preparing a technical report on pesticide contaminations in EU soils based on sampling data from LUCAS. In summary, 25.5 % of EU soil samples show no presence of pesticides residues. For most of the EU soil samples (57.1%) at least 2 different residues were detected, and of those, 29.8% comprised more than 5 different residues with 11.1 % of samples holding more than 10 different pesticides residues. Most of the EU soil samples (62.1% total) present concentrations levels classified as low to no detection, and from those, 37.8 % presented concentrations above the detection limit. On the other hand, 37.9 % of samples show pesticide residues concentrations above 0.05 mg Kg, being 17.9% of the total above the 0.15 mg Kg threshold, and 3.6% above the 0.5 mg Kg<sup>-1</sup>. As expected, samples from cropland present the highest incidence of pesticide residues with 85.8% of samples presenting at least one pesticide residue, while in grassland areas the low incidence class is less represented, whereas 48.0% of the samples present at least one pesticide residue. On the pesticide residue content, more than half of the soil samples from cropland (52.4%) present maximum pesticide residues concentrations below 0.005 mg Kg<sup>-1</sup>, but an important number of samples (22.9%) evidence concentration values above 0.15 mg Kg<sup>-1</sup> (Figure 7).

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<sup>48</sup> [COM\(2021\) 699 final](#)

<sup>49</sup> <https://www.eea.europa.eu/soer/2020>

Figure 7 Pesticide incidence in EU and EU Member States (left) by number of soil samples (right) as measured in LUCAS 2018 samples. Source: (Joint Research Centre, in preparation)



Next to pesticides, various agricultural inputs and management approaches impact soil health. The fertiliser use and intensity of production are strongly related to pest pressure albeit under complex interdependencies. Pesticides reduce the functioning of beneficial plant symbionts in soils, which has critical implications for the nutrient transfer to crops (Edlinger et al., 2022). A decrease in the efficiency of nutrient uptake can affect crop yields and/or lead to higher applications of fertilizer with the associated increase in production costs and eutrophication (Bebber & Richards, 2022; Darch et al., 2014). A higher fertiliser use in some crops results in a greening of the plant that can attract certain pests, in turn demanding a higher pesticide use. Conversely, nutrient deficiencies lower the general resilience of the plant, which may affect the impacts under varying levels of pest or disease pressure. The use of pesticides adversely affects soil biota involved in nitrogen fixation which may lead to an elevated need of fertilizers with the associated environmental repercussions (Fox et al., 2007).

While these system design choices are already being addressed, for example through improved guidance on Integrated Pest Management and payments linked to eco-schemes, a fundamental challenge remains the fact that a landscape-wide food system design implies a coordination of a large number of independent farmers with personal preferences and objective functions (Schneider et al., 2021). While this is challenging, in a Dutch sample farmers collective actions were found to be a driver of farmers’ motivation to lower pesticide use (Bakker et al., 2021).

A high diversity of functional organisms is pivotal to soil health (Banerjee & van der Heijden, 2023; Kibblewhite et al., 2008). Unhealthy soils will lower the yield potential while also being less resilient to extreme weather events (D’Hose et al., 2014). This will lead not only to increased impacts of climate change, but also in a higher volatility in crop yields (Anderson et al., 2020). The current levels of degradation of soils could result in serious food and feed security concerns. Unfortunately, the restoration of soils is a time-consuming task.

For some soil degradation processes, such as the loss of soil carbon, erosion, compaction, or soil sealing, it can take decades or even hundreds of years to restore the proper soil status. Residues of pesticides used in conventional production can be detected in soils even after two decades under organic production (Riedo et al., 2021). Therefore, it is important to apply sustainable soil management practices that prevents soil degradation processes.

Soil degradation results in a decline of the biodiversity of essential soil organisms, which affects the efficiency in nutrient cycling and productivity, which negatively influences the yield potential and therefore food and feed security. Nowadays, agricultural soils are contaminated with a broad mixture of pesticides which causes substantial stress on the soil biota and in turn soil health (Panico et al., 2022; Pelosi et al., 2014; Tang & Maggi, 2021; Walder et al., 2022). Ammonia-oxidizing bacteria, archaea, and sulphur-oxidizing bacteria are among the organisms which are sensitive to pesticide pollution, with various studies confirming a considerable decline in their abundance in contaminated soil samples (Feld et al., 2015; Karas et al., 2018; Wan et al., 2014). These bacteria are critical contributors to the nutrient cycle that convert, e.g., nitrogen into forms that are usable by plants (Tang & Maggi, 2021). Similarly, nitrogen-fixing rhizobia bacteria are known to be adversely impacted by pesticide use with direct repercussions to their recruitment, nodule production, nitrogenase activity, and crop yields (Fox et al., 2007; Laatikainen & Heinonen-Tanski, 2002; Riedo et al., 2021). The pesticides' disruption of signalling between host plants and rhizobia bacteria leads to an elevated need for fertilization with the associated environmental repercussions (e.g., eutrophication). Pesticides also affect various other soil organisms with critical roles in the soil ecosystem; for example, by disrupting enzymatic activities, increasing mortality rates, decreasing fecundity and growth, and adversely affecting feeding rates, all leading to a substantial reduction in the abundance of earthworms (Maggi & Tang, 2021; Panico et al., 2022; Pelosi et al., 2014). C. Pelosi et al. (2021) detected at least one pesticide in all sampled soils and in 92 % of sampled earthworms in France, with 46 % of earthworms sampled showing contamination levels which pose a high risk of chronic toxicity. The prevalence of contamination of soils and earthworms with Glyphosate were comparable and spanned samples taken from conventional cereal fields, fields under organic farming, and hedgerows (Pelosi et al., 2022).

Soil conservation measures (e.g. increased vegetation cover throughout the year, reduced tillage) and crop management are key measures to restore the soil fertility on arable lands. Improvements to the soil structure, the water retention capacity, and soil organic content may be achieved through better crop diversification. To restore the crucial soil biodiversity, a reduction of pesticides is essential (Walder et al., 2022). All these changes will benefit crop yields and consequently food and feed security. Evidently, addressing the decline in soil health across the EU is a multifaceted challenge. A reduction in pesticide use, however, is certainly one of the elements that can contribute to the necessary restoration of soil health.

**Box 3. Takeaway points of section 3**

- 1) Besides the pesticides' intended function as damage control agents, their use also leads to unintended negative consequences, so called *externalities*.
- 2) Pesticides are among the pollutants that that may adversely affect soil-, field-margin-, and water-organisms if not used in integrated pest management strategies and according to the authorised uses, thereby potentially contributing to environmental degradation and ecosystem service losses that may lead to repercussions for food and feed security.
- 3) The adverse effects of pesticides on biodiversity can reduce the natural pest control, which in turn leads to an elevated need for pesticides to manage crop health.
- 4) A high pollinator abundance and diversity can directly benefit crop productivity. Pesticides adversely affect pollinator abundance and diversity, thereby causing unintended negative effects to food and feed security.
- 5) Pesticides negatively affects various soil organisms with critical functions, which among other aspects affects soil fertility and in turn food and feed security.

**4. Tools for the transition to low-pesticide food systems**

Broadly speaking, there is consensus on the need to move away from chemical pesticide-centric food systems, both in the public domain and in academia (Aktar et al., 2009; Bakker et al., 2021; Chagnon et al., 2015; Köhler & Triebkorn, 2013; Mustafa et al., 2021; Akanksha Sharma et al., 2020; Anket Sharma et al., 2019; Tang et al., 2021, 2022; Wuepper et al., 2023). The ambition was echoed in the recent UN Convention on Biological Diversity (COP15) in which the 50 % reduction target was also agreed upon. This is likely because "Truth-seeking actors can find ample evidence for pesticides' adverse effects on environmental and human health" (Hofmann et al., 2023, p.430). However, it is pivotal that such reduction efforts not only target quantities at the expense of using lower amounts of more toxic substances, which may lead to elevated toxic loads (Bub et al., 2023; Cech et al., 2022; Schulz et al., 2021).

Arguably, a successful transition towards a lower pesticide use in agriculture and forestry must build on the diversity of knowledge on complementary strategies for crop protection,

which is overarchingly formulated in the Integrated Pest Management principles. However, this transformation must take a systems-perspective which acknowledges the multifaceted nature of this challenge (Jacquet et al., 2022). Such a transition will minimize the negative impacts of pesticides on food and feed security (i.e., supporting ecosystem services which may promote yields and resilience) and the environment, while assuring that pesticides' intended functions (i.e., supporting yield stability through targeted applications and providing an emergency tool against severe pest and disease outbreaks) are utilized.

While the severity of the pest impacts is expected to increase due to climate change (Deutsch et al., 2018), also the availability of alternative solutions to widespread chemical plant protection products is expected to widen. A systemic change on how pests are managed can be achieved with widespread implementation of Integrated Pest Management and intensity of use can be reduced with improved prediction of pest risk, early detection, and targeted application of plant protection products. A broadening of the perspectives on plant health through a holistic view, i.e., the "One Health" approach, will likely be conducive toward positive changes in crop-, animal-, human-, and ecosystem-health. In addition, R&D and innovation promoting low intensity solutions, such as nature-based agriculture, agro-ecology, organic farming, etc. can enhance natural protection of crops while increasing their productivity. In what follows, some agronomic and technological avenues for sustainable crop protection practices that may redesign food systems going forward will be sketched; this list is by no means exhaustive.

#### 4.1 Integrated Pest Management

Integrated Pest Management (IPM) principles were first introduced by Stern et al. (1959). IPM describes the careful consideration of all available plant protection methods and subsequent integration of appropriate measures that discourage the development of populations of harmful organisms and keep the use of plant protection products and other forms of intervention to levels that are economically and ecologically justified and reduce or minimise risks to human health and the environment. An important role in IPM is played by biological control: the use of natural enemies against pests and diseases. This can be done by the one-off release of natural enemies against invasive pests (classical biocontrol), the repetitive release of insects or micro-organisms against recurring pests (augmentative biocontrol) or the protection of the elements in agro-ecosystem in which naturally occurring beneficial insects occur (conservation biocontrol). IPM emphasises the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms and uses chemical control only when all other control means are exhausted.

The EU Framework Sustainable Use of Pesticides Directive 2009/128/EC provides a more operational translation of IPM by laying out eight general principles. Namely, (i) prevention and suppression, (ii) monitoring, (iii) decision-making, (iv) non-chemical methods, (v) pesticide selection, (vi) reduced pesticide use, (vii) anti-resistance strategies, and (viii) evaluation. Sound IPM is a knowledge-demanding and context-specific systems approach, which consequently utilizes a wide range of tools and technologies (Barzman et al., 2015; Göldel et al., 2020; Veres et al., 2020). Hence, crop protection is more and more acknowledged to be more nuanced than an exclusive reliance on pesticides, and particularly chemical pesticides. In the public consultation conducted during the IA of the SUR proposal, more tailored IPM guidance was viewed as positive by pesticide users and industry (110 out of 151) as well as NGOs and civil society organisations (21 out of 22). Product-specific information on which pesticides may best complement holistic IPM schemes could be useful

(Böckmann et al., 2019). The SUR impact assessment also found current implementation of IPM to be at sub-optimal levels. Supporting better uptake, however, could play a major role in reducing pesticide use and risk. The SUR proposal therefore aims to improve the application and enforcement of IPM through requiring development and use of crop specific rules which is key to making it implementable and enforceable on the ground.

In this respect, sharing the extensive information on IPM approaches developed for years is key for the uptake of IPM by the farming community and beyond. This was the purpose in particular of the pilot project “*Farmer’s Toolbox for Integrated Pest Management*” conducted between December 2020 and November 2022 over 1300 IPM strategies and over 270 crop specific guidelines from 24 EU countries were identified and made available in a common database.<sup>50</sup> The conclusions show that most of the guidelines can be directly used by farmers (72 %) and more than half (53 %) are used by authorities for controlling implementation of IPM by farmers. Table 7 shows the coverage of existing IPM specific guidelines by country and type of crop. Around 96 % of Member States have guidelines on arable crops, following by fruits and vegetables, viticulture, and other crops. From the 273 crop specific guidelines in EU countries, 145 guidelines are used by authorities for controlling the current implementation of IPM by farmers. Currently, only seven countries control the implementation of IPM guidelines. In addition, the demonstration and knowledge exchange are key to further promote the implementation of IPM practices.<sup>51</sup>

To facilitate this the SUR proposal includes steps to increase implementation of IPM such as the provision of clear crop specific rules and independent advice that are intended to facilitate the farmer to make relevant decisions on a case by case basis.

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<sup>50</sup> <https://datam.jrc.ec.europa.eu/datam/mashup/IPM/index.html>

<sup>51</sup> <https://ipmworks.net/>

Table 7 Overview of existing IPM guidelines across Member States

Country	Crops coverage					
	Arable crops	Viticulture	F&V	Ornamental	Horizontal	Others
<i>Austria</i>	X	X	X	-	-	X
<i>BE-Wallonia</i>	X	X	X	X	-	X
<i>BE-Flanders</i>	X	X	X	-	X	X
<i>Bulgaria</i>	X	X	X	-	-	X
<i>Cyprus</i>	X	X	X	-	-	X
<i>Czech Republic</i>	X	X	X	-	-	X
<i>Germany</i>	X	-	-	-	-	X
<i>Denmark</i>	X	-	-	-	-	-
<i>Estonia</i>	X	-	-	-	-	-
<i>Spain</i>	X	X	X	-	-	X
<i>Finland</i>	X	-	X	-	-	-
<i>France</i>	X	X	X	-	-	X
<i>Greece</i>	X	X	X	-	-	X
<i>Croatia</i>	X	X	X	-	-	-
<i>Hungary</i>	X	X	X	-	-	-
<i>Ireland</i>	X	X	X	-	-	X
<i>Italy</i>	X	X	X	-	-	X
<i>Lithuania</i>	X	-	X	-	-	-
<i>Latvia</i>	X	-	X	-	-	X
<i>Poland</i>	X	X	X	-	-	X
<i>Portugal</i>	X	X	X	-	-	X
<i>Slovenia</i>	X	X	X	-	-	-
<i>Slovakia</i>	-	X	X	-	-	-
<i>Sweden</i>	X	-	X	-	-	X
<b>Percentage</b>	<b>96%</b>	<b>71%</b>	<b>88%</b>	<b>4%</b>	<b>4%</b>	<b>67%</b>

During bilateral discussion held between DG SANTE and Member States' authorities regarding the progress made in achieving reductions in the indicators used to set targets in the SUR proposal, nine countries highlighted the positive correlation between implementation of IPM and progress toward achieving the pesticide targets. Success factors for IPM implementation include linking IPM with financial support (Czech Republic), targeted training for younger and older farmers (France), and availability of a broad set of crop specific IPM guidelines (Poland and Slovak Republic). However, some countries such as Ireland expressed concerns of the potential to further reduce pesticide use based on IPM implementation as the current level of implementation was suggested to be close to its maximum.

## 4.2 Precision farming

Technological development can also play a role in reducing the quantity of pesticides used. Technology enables a more tailored management of crop health by acknowledging inter- and intra-field variability. The use of digital tools is broadly referred to as *precision farming*. The use of precision farming technologies for pest prediction, early detection, and application can significantly reduce the use of pesticides (Marković et al., 2021). However, current adoption levels are low (Barnes et al., 2019), which in turn implies an untapped potential for reducing pesticide use and risk without repercussions to crop yields.

The potential of precision farming to reduce pesticide use can be achieved via four main pathways: accurate prediction of outbreaks, pest identification, better spray deposition, and optimization of pest and disease control operations. The reduction in pesticide use and risk is possible via lower dosages (mainly due to better application and improved detection through analytical support on the environmental and climatic conditions), lower treatment frequencies (mainly due to prediction and decision support systems), and through the replacement of pesticides with alternative measures (mainly related to mechanical weeding replacing herbicide use). Based on a systematic literature review carried out by the European Commission's Joint Research Centre and the Agricultural University of Athens, the rate of research outputs related to precision farming and pesticide reduction has been increasing in recent years. Since 2020, more than 50 papers per year have been published on related topics. While research related to pest prediction has mainly occurred before 2012, most of the outputs relate to pest detection (76 % of studies). However, research and innovation on application optimization is considerably increasing since 2017, which is likely a result of the recent commercialization of cheaper and more effective sensors.

Precision farming with the aim of reducing pesticides has been studied for both arable (60 % of studies) and permanent crops (40 % of studies). Regarding the types of pests addressed via precision farming research, most research to date has focused on weeds. This is likely a consequence of multiple approaches to manage weeds. Namely, via precision application of herbicides and the full replacement of herbicides through automatized mechanical weeding. The latter can reach accuracy rates close to 90 % for sugar beet and soy bean (Kunz et al., 2015), or maize (Quan et al., 2022), and close to 100 % in tomato (Raja et al., 2020).

Reduction in pesticide use and risk due to adoption of precision farming also leads to ancillary benefits in terms of improved water and soil quality (mentioned in more than 50 % of the studies identified in the systematic review) and biodiversity (mentioned in 45 % of the studies identified in the systematic review). Importantly, the use of precision farming in pest

detection, as well as pesticide application is generally reported to not have any negative impact on overall pest control. Furthermore, the benefits are achieved with an improved productivity due to input and labour savings in more than 90 % of the studies analysed.

Regarding pest prediction and identification via data gathering, a significant number of sensors are utilized in precision farming to map the spatial and temporal variability of various parameters and assist farmers with their management decisions. Commercial Red-Green-Blue, multispectral, hyperspectral, and thermal cameras, as well as other sensors like Light Detection and Ranging as well as weather stations are used alone or in combination. These sensors allow to estimate crucial indicators like crop vigour and pest severity. After some transformations of raw inputs (e.g., using spectral vegetation indices in the case of optical sensors), this information can lead to the identification of management zones and the administration of variable rate inputs such as plant protection products (Anastasiou et al., 2023; Ioannou et al., 2019). In addition, the measurements from these sensors can be used in forecasting necessary pesticide applications (e.g., by predicting the local pest infection). Such analytical support is derived by determining when and where key parameters, for example, the number of consecutive hours with high humidity, have been exceeding predetermined pathosystem-specific criteria. Examples of pesticide savings due to improved predictions are considerable; with reductions ranging from 75 to 86 % for fungicide use for tomato and potato (Khattab et al., 2019), and up to 60 % for cherry orchards (Ioannou et al., 2019). While the pesticide reduction potential is currently favouring herbicides (with up to a 96 % reduction (López-Granados et al., 2016)), other substances such as insecticides may be considerably reduced as well (e.g. up to 36 % (Miranda et al., 2019)).

Data and digitalization have the potential to reshape the agricultural sector in unprecedented ways (Mondejar et al., 2021; Rolandi et al., 2021; Talaviya et al., 2020). An increasing interconnectedness of analytical insights ranging from soils,<sup>52</sup> over crops (Acharya, 2022; Granwehr & Hofer, 2021; Shafi et al., 2019), to remote sensing based analyses of the environment and crop health (Hornero et al., 2020; Zarco-Tejada et al., 2018). Such advances in analytical capabilities will, and in part already do, enable spatio-temporal support in crop protection that improves the precision with which we may manage food systems (Cros et al., 2021). Improved analytical support on crop health is needed to consider heterogeneity in disease pressure, which in turn improves farmers' judgement on whether pesticide applications are needed in a given location at a given point in time (Jalli et al., 2020; Jørgensen et al., 2020). Furthermore, such technologies allow for targeted, more nuanced, applications of pesticides (Mogili & Deepak, 2018; Shafi et al., 2019; Talaviya et al., 2020; Zangina et al., 2021), or provide alternatives to pesticides altogether (Machleb et al., 2020; Talaviya et al., 2020; Weis et al., 2008; Xiong et al., 2017). Many technologies are now available for assessing and managing the spatial and temporal variability of the physical, biological, and chemical properties of soils. Global positioning systems, geographic information systems, yield monitors, and remote and proximal sensors can be used to identify crop variability possibly linked to pests, while automatic guidance of farm machinery and variable rate pesticide application technologies are used to target application and reduce the amount of inputs, including pesticides (Talaviya et al., 2020). Improvements in the decision support systems, over conventional calendar-based rules, can more than halve fungicide use without increasing disease risk and without yield reductions (Jørgensen et al., 2020; Lázaro et al., 2021; Prah et al., 2022).

Developments of precision application of pesticides follows the principles of variable rate technology used for nitrogen use optimization. Developments in application modes to reduce pesticide use relate both to the use of different platforms (e.g. unmanned aerial vehicles,

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<sup>52</sup> <https://esdac.jrc.ec.europa.eu/resource-type/european-soil-database-soil-properties>

spraying robots) as well as technological components included in tractor-mounted sprayers. Such developments are crop and location specific but significant savings have been reported for orchards (over 50 % (Chen et al., 2013; Vieri et al., 2013)), arable crops (over 75 % (Carballido et al., 2013)) and vineyards (over 60 % (Nackley et al., 2021)). A summary of the identified savings in the reported field trials using precision application options is presented in Table 8. Evidently, with the exception of fungicides in wheat, savings are around or above 50 % and the tools cover a considerable variety of crops. Arguably, precision farming approaches and the use of digital and data technologies in general, can go hand in hand with other farming/ production approaches, such as IPM or organic farming.

Table 8 Overview of the pesticide saving potential from precision application found in the scientific literature.

<b>Crop</b>	<b>Pesticide Class</b>	<b>Reduction achieved (average if multiple data reported)</b>	<b>reference</b>
Orchards	Not specified     Insecticides	50%	<a href="https://doi.org/10.4081/jae.2013.313">doi.org/10.4081/jae.2013.313</a>
		53%	<a href="https://doi.org/10.13031/trans.56.9839">doi.org/10.13031/trans.56.9839</a> .
		31%	<a href="https://doi.org/10.3390/ijerph14070715">doi.org/10.3390/ijerph14070715</a> .
		43%	<a href="https://doi.org/10.13031/trans.12455">doi.org/10.13031/trans.12455</a>
		46%	<a href="https://doi.org/10.25165/j.ijabe.20181101.3183">doi.org/10.25165/j.ijabe.20181101.3183</a>
		98%	<a href="https://doi.org/10.3390/agronomy9100608">doi.org/10.3390/agronomy9100608</a> .
Sugar beet	Herbicides	76%	<a href="https://doi.org/10.5424/sjar/2013113-3812">doi.org/10.5424/sjar/2013113-3812</a> .
Winter wheat	Fungicide	8%	<a href="https://doi.org/10.1002/ps.4225">doi.org/10.1002/ps.4225</a>
	Herbicide	50%	<a href="https://doi.org/10.1007/s11119-022-09888-1">doi.org/10.1007/s11119-022-09888-1</a> .
	Fungicide	45%	<a href="https://doi.org/10.1007/s11119-022-09888-1">doi.org/10.1007/s11119-022-09888-1</a> .
Maize	Herbicides	96%	<a href="https://doi.org/10.1007/s13593-016-0405-7">doi.org/10.1007/s13593-016-0405-7</a> .
Cotton	Insecticides	75%	<a href="https://doi.org/10.1016/j.cropro.2017.07.016">doi.org/10.1016/j.cropro.2017.07.016</a> .
	Herbicides	79%	<a href="https://doi.org/10.3390/rs10020285">doi.org/10.3390/rs10020285</a> .
Potato	Not specified	25%	<a href="https://doi.org/10.1007/s11540-018-9357-4">doi.org/10.1007/s11540-018-9357-4</a> .
Sunflower	Herbicides	37%	<a href="https://doi.org/10.3390/rs10020285">doi.org/10.3390/rs10020285</a> .
Olives	Not specified	54%	<a href="https://doi.org/10.1016/j.compag.2019.04.040">doi.org/10.1016/j.compag.2019.04.040</a> .
Vineyard	Not specified	70%	<a href="https://doi.org/10.21273/HORTTECH04794-21">doi.org/10.21273/HORTTECH04794-21</a> .

### 4.3 Plant breeding

Integrated Pest Management is centred around varieties with biotic resistances (Birch et al., 2011). In principle, resistance is defined as the reduction of the multiplication of the pest or pathogen whereas tolerance defines the degree of a loss, or lack thereof, of the plants' performance under pest or pathogen pressure (Ferrero et al., 2020). Plant breeding may broadly be described by three phases (Ceccarelli, 2015). First, genetic variability is generated through crossing of available elite varieties, the introduction of exotic germplasm, the inducement of mutations, or by using genetic engineering techniques. Second, promising recombinants or mutants are selected and tested. Lastly, the variety is commercialized and, ideally, adopted by farmers. The difficulty of introducing a new trait, e.g. a resistance to a certain pathogen, into a marketable variety strongly depends on the heritability of the trait and the generation time of the plant species (Ceccarelli, 2015). Notably, the source of the genetic variability has considerable implications for the resources needed for selecting and testing the recombinants. Often, the main time- and resource-sink that breeders face is not the process of introducing the trait of interest but rather the procedure of removing undesirable genetic material that was inadvertently inherited during the crossing of parental lines (Tracy, 2004). As the germplasm of wild species remains an invaluable source of biotic resistances and other agronomic traits (Lee, 1998; Nelson et al., 2018; Tanksley & McCouch, 1997), resources spent on removing genetic drag in conventional breeding programs are significant. *New Genomic Techniques* effectively prevent genetic drag. In turn, the development time and costs of new varieties is reduced and, more importantly, the technologies enable the introduction of multiple resistance genes into market-ready varieties in which quality traits of the original variety remain unchanged. Varieties with *stacked* resistances enable a system-wide rethinking of crop protection, which allows for significant reductions of pesticides, e.g. fungicides by 80 to 90 %, without affecting yields (Haverkort et al., 2016; Kessel et al., 2018).

### 4.4 Agroecology

The current intensity of pesticide use is critically determined by the present system design. Since the green revolution, the agricultural system has moved to an approach to manage pest based on the use of chemical pesticides. At the same time, diminishing returns in crop yields in response to increased fertilizer applications point to ecological changes possibly linked to the use of pesticides (Fox et al., 2007). The standardization of farming systems with less biodiversity at farm level (mono-cropping, fewer rotations, varietal uniformity, etc.) and landscape level (larger plots, removal of hedges, a concentration on a smaller number of crops, etc.) increases the risk of pest outbreaks (Albrecht et al., 2020; Bonato et al., 2023). It has long been recognized that the landscape configuration and composition is closely related to pest spread and therefore also the impact (Bonato et al., 2023; Epanchin-Niell et al., 2010, 2012; Topping et al., 2015). The strong reliance on chemical control, through selective pressure, results in the development of pests' resistance to the applied chemicals; which may lead to an increase in pesticides use or a shift to different active ingredients with the associated mixture effects on the environment (Tang & Maggi, 2021).

The intensity of production influences the level of natural pest control, the attractiveness of fields for pests, and the economic risk of pest and disease outbreaks (Albrecht et al., 2020; Bonato et al., 2023; Díaz-Sieffer et al., 2022). Agricultural diversification aims at intentionally designing functional biodiversity to cropping systems at various spatial and temporal scales,

which enhances biodiversity, nutrient cycling, soil fertility, water regulation, and pest control without compromising crop yields (Tamburini et al., 2020). Landscape heterogeneity and organic farming practices can enhance flora and fauna richness or abundance in agroecosystems by more than 50 % (Stein-Bachinger et al., 2021). Complex spatial configurations of hosts, e.g., intercropping or strip-cropping, can require less pesticide use while also being more productive (Albrecht et al., 2020; Breitenmoser et al., 2022; Li et al., 2023). While increased agro-ecological diversity holds promise in reducing the dependency on pesticides (Tamburini et al., 2020), these designs complicate agricultural intensification as they may limit the scalability of equipment and processes. Support for technological progress that addresses this bottleneck is therefore needed to ensure the economic viability.

A sound integration of agro-ecological principles, both at field- and landscape-level, supports the prevention of pest and disease impact (Petit et al., 2020; Ricci et al., 2019). A system-rethinking based on agronomic principles can enable significant reductions to pesticide use, e.g. herbicides through alternative weed management (Petit et al., 2015; Vasileiadis et al., 2015). On farm-level, various agronomic decisions may determine the resilience to pest and disease outbreak, and in turn the need (or lack thereof) of applying pesticides. Farmers generally practice a temporal rotation of crops that allows for an optimization of nutrient use, a reduction of pests, and improvements to the soil biota with feedbacks to crop yields (Bažok, Lemić, et al., 2021; Dias et al., 2015; Lorenzo Furlan et al., 2022; Jalli et al., 2021). Similarly, improved spatial configurations (e.g., intercropping, strip-cropping) of hosts can enable natural pest control both at field- and landscape-level (Boudreau, 2013; Ditzler et al., 2021; Juventia et al., 2021; Ricci et al., 2019). Complex landscapes, in turn, can lower pesticide use (Nicholson & Williams, 2021). Intercropping can support nutrient access, suppress weeds, and provide flower resources to pollinators. Such improvements in the agronomic design, for example under-sowing oats with clovers, can in turn achieve the needed support of pollinators while being an alternative to herbicides without any yield reductions (Boetzel et al., 2023). Furthermore, legumes are known to replenish nitrogen in the soils and improve the health of *Rhizobium* bacteria which convert atmospheric nitrogen into forms usable by plants (Fox et al., 2007). This speaks for the synergetic restoration potential of alternative food system designs which may, on first thought, ‘only’ aim at substituting pesticides; in this case by suppressing weeds.

Pest populations are spatial phenomena by nature (Turchin, 2013). Consequently, Knipling (1980) introduced the idea of area-wide pest management via collective actions. More and more landscape-wide designs of crop protection are promoted in which total pesticide usage, as opposed to farm-level usage, is optimized (Epanchin-Niell et al., 2010; Topping et al., 2015). Just as temporal problems involve choosing a strategy that comprises a path of decisions which are interdependent across time (Fousekis & Stefanou, 1996), optimal control in a spatial system involve simultaneously choosing actions across an interconnected landscape (Epanchin-Niell et al., 2012). Differences in the landscape configuration can also result in differences in the environmental burden from pesticide (Topping et al., 2015, 2016). A pivot to a more holistic landscape-perspective requires communication and coordination among farmers, which is increasingly facilitated through better communication technologies (Dara, 2019; El Bilali & Allahyari, 2018; Tao et al., 2021). In a Dutch sample, farmers were aware of the benefits of such coordination in controlling pests (Bakker et al., 2021).

#### 4.5 Behaviour and capacity building

Despite the promising results reported above widespread adoption of these alternatives to pesticides remain limited. Farmers currently struggle, however, to change their pest management practices (Lamine, 2011), and chemical pest control remains the mainstream option for farmers when dealing with pests (Pretty et al., 2018). Besides classic barriers related to investment costs and lock-ins due to past investment decisions, farmers' decision-making is also based on personality and ideological motivations. According to Bakker et al. (2021) attitude, injunctive norms, descriptive norms, and perceived behavioural control all emerged as significant predictors of intentions to adopt alternatives to chemical pesticides. Also beliefs in lack of efficiency of alternatives and demand for undamaged products by retailers further hinder the adoption. Results from a Delphi survey to 175 experts on crop protection and agronomy carried out by the Joint Research Centre highlight that perceived lack of usefulness of alternatives to chemical pesticides is the main barrier for adoption, even more so than the cost of the investments related to precision agriculture. In order to overcome this, outreach to, and inclusion of, farmers is crucial as an awareness of alternatives to pesticides is fundamental to support their confidence in transitioning to low-pesticide management systems (Bakker et al., 2021).

The aforementioned Delphi survey shows that precision farming can play a key role on reducing pesticide use and risk. This is consistent across crops and types of pests. Over 70 % of respondents stated that they expect that the uptake, in particular for precision application, will have increased by 2030. Higher levels of adoption will be mainly driven by the interaction between farmers and providers of machinery. The main policy intervention that may facilitate adoption is the provision of financial support to reduce investment costs, as well as the promotion of advisory services to increase perceived usefulness and familiarity with these novel solutions to manage crop health.

A key hurdle for adoption is the perception of farmers that substituting pesticide use for alternative control measures is a risk increasing activity. Broadly speaking, farmers are familiar with the use and application of pesticides and have experiences regarding the products' effectiveness. In adoption of alternatives may require developing new skills and gaining knowledge. These additional efforts together with the uncertainty regarding an alternative's effectiveness likely hampers uptake of novel approaches to crop health, as it increases the subjective perception regarding the riskiness of the production activities. The perceived risk also influences farmers in following pesticide use recommendations (Möhring, Wuepper, et al., 2020). There is ample evidence that farmers on average are risk averse, which implies that they consider losses as more important than gains and that they tend to overestimate the probability of improbable events (Rommel et al., 2022). In turn, an actionable approach to manage perceived risks associated with novel technologies that are intended to substitute pesticides is an aspect that cannot be neglected. A promising avenue of future research may be the bundling of such technologies with insurance schemes. Support to farmers through the provision of independent advice at least annually, plus the availability of crop specific rules, are written into the SUR proposal as ways of providing support to such decisions and dealing with risk.

A sound management of the production risk via insurance tools may nudge farmers to adopt alternatives and lower their pesticide use. There is some evidence that such an approach might enhance adoption and lead to a reduction of pesticide use. Mao et al. (2023) and Möhring et al. (2020) show how crop insurance significantly decreases farmers' use of fertilisers and pesticides, albeit that the latter might be offset by an expansion of the area under cultivation. Similar findings are reported for the positive effect of combining insurance

with reduction of nitrogen inputs (Metcalf et al., 2007). The limited experience of combining IPM with insurance in Europe shows that IPM for maize can be promoted using mutual funds (L. Furlan et al., 2015; L. Furlan & Chiarini, 2017) (Furlan et al. 2015; Furlan and Chiarini 2017). Such approaches are more realistic and implementable under the approach provided for in the SUR proposal to allow Member States to use CAP funding for implementation of the SUR at farm level, without an imposed baseline.

**Box 4. Takeaway points of section 4**

- 1) A successful transition must build on the diversity of knowledge on complementary strategies for crop protection, which is overarchingly formulated in the Integrated Pest Management (IPM) principles. Sound IPM is a knowledge-demanding and context-specific systems approach, which consequently utilizes a wide range of tools and technologies.
- 2) Existing technologies allow for targeted, more nuanced, applications of pesticides, or provide alternatives to pesticides altogether. Improvements in decision support systems already reduce pesticide needs by over 50 %, precision farming tools allow for reductions up to 96 % in certain crops.
- 3) Varieties with stacked resistances enable a system-wide rethinking of crop protection, which allows for significant reductions of pesticides. New breeding techniques could support the development of such varieties, and in a shorter timescale.
- 4) A sound integration of agro-ecological principles, both at field- and landscape-level, supports the prevention of pest and diseases thereby reducing the need for pesticides. Evidence suggests that such design improvements can also directly lead to increased crop yields.
- 5) A key hurdle in the adoption of IPM and novel technologies is the uncertainty farmers face regarding their effectiveness and proper use. In order to overcome this, outreach to, and inclusion of, farmers is crucial to support their confidence in transitioning to low-pesticide management systems.

## 5. Funding and supporting the transition

The Common Agricultural Policy (CAP) includes multiple measures providing funding to farmers for practices and investments beneficial for the sustainable use of pesticides. The reformed CAP, which started on January 2023, consolidates these funding possibilities (with e.g., the new eco-schemes) and Member States will have a wide range of policy instruments to make a coherent toolbox for farmers contributing to meeting the Farm to Fork objective for the pesticides reduction.

First and foremost, most of funding directly provided to farmers and other CAP beneficiaries (such as all direct payments in the form of income or environmental support and a number of rural development payments) come with the obligation to adhere to Good Agricultural and Environmental Condition and meet Statutory Management Requirements (GAECs and SMRs) under the mechanism known as “conditionality”<sup>53</sup>. SMRs and GAECs include the most relevant provisions for farmers of the current SUD and the future SUR. Depending on the Member State certain IPM practices can be part of the requirements of conditionality and therefore not incentivised by additional CAP payments, which would only be allowed for improvements that go beyond legal requirements. Other such IPM practices designed by Member States as voluntary may therefore be funded by eco-schemes and management commitments (see below).

However, to support the transition towards an ambitious reduction of the use of pesticides, the Commission has included in the SUR proposal a derogation to allow funding by the CAP of practices compulsory by law (thus in the baseline) during a period of 5 years. Member States may thus decide to use the agreed CAP funds to fund practices for pesticide reduction, which could not previously be done due to the “baseline” rule. There is, nevertheless, no “new” money provided for by the SUR proposal in the CAP budget and Member States will have to use the available budget.

Second, the Eco-schemes, which are a type of direct payments to farmers, may finance beneficial practices going beyond the baseline, including the sustainable use of pesticides and organic farming. Overall, 23% of the direct payments budget is devoted to financing practices that contribute to environmental, climate and animal welfare objectives, practices beneficial for the environment and climate may also be supported by rural development Management Commitments (formally known as Agri-Environmental and Climate Measures). While Eco-schemes fall under the so-called first pillar and may support only farmers, Management Commitments fall under the so-called second pillar and may support more broadly land managers (such as farmers but also associations, foresters, etc.). While eco-schemes cover mostly annual commitments and payments, management commitments may finance longer-term commitments for beneficial farming practices. Overall, 48% of the rural development budget will be devoted to financing practices or investments that contribute to environmental, climate and animal welfare objectives, including interventions for a better management of pesticides.

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<sup>53</sup> In strict terms, this is not a support scheme as such but a link between CAP payments and the respect of legal requirements (such as those under the SUD and SUR) by way of a system of reduction of CAP payments granted to the farmer in case of infringement.

**Box: The CAP support to pesticide risk and use reduction in numbers**

When drafting their CAP Strategic Plans Members States were required to link the CAP interventions to the different results indicators. Reviewing the data available on 31<sup>st</sup> March 2023 we can see that in total expenditures adding up to 33 660 million Euros have identified as contributing to pesticide reduction in the CAP, representing 10% of the total EU CAP budget (Table 99). The total public expenditure is higher as rural development measures have compulsory national co-financing.

Table 9. EU contribution under the CAP related to pesticide reduction results indicator (millions of Euros)

Country	Direct Payments	Rural Development	Total
Austria	-	529.12	529.12
Belgium*	159.28	107.38	266.66
Bulgaria	214.76	206.77	421.53
Croatia	-	225.86	225.86
Cyprus	44.97	27.81	72.78
Czech Republic	1,191.88	224.47	1,416.35
Denmark	346.17	-	346.17
Estonia	124.12	21.60	145.72
Finland	-	169.09	169.09
France	8,557.69	1,169.26	9,726.95
Germany	2,297.39	3,316.87	5,614.25
Greece	1,769.39	499.20	2,268.58
Hungary	995.00	726.33	1,721.33
Ireland	-	531.47	531.47
Italy	1,819.79	1,432.91	3,252.70
Latvia	201.48	162.54	364.02
Lithuania	315.71	245.82	561.52
Luxembourg	32.59	8.34	40.94
Malta	8.56	5.00	13.56

Netherlands		963.90	423.91	1,387.81
Poland		82.21	973.79	1,056.00
Portugal		664.42	3.48	667.90
Romania		-	748.07	748.07
Slovakia		513.01	224.38	737.39
Slovenia		56.16	178.21	234.37
Spain		-	789.22	789.22
Sweden		350.72	-	350.72
EU27	Million EUR	20,709.20	12,950.89	33,660.09
	% of CAP Budget	8.01	16.65	10.01

\* Belgium submitted two CAP SP (one for Flanders and one for Wallonia) the reported figures are the sum of budgets allocated in both CAP SP

Source: own elaboration based on approved CAP SP

In addition to the expenditure from Direct Payments and Rural Development interventions, some Member States<sup>54</sup> declare that their expenditure in certain sectoral programmes also contribute to pesticides reductions. However, the expenditure for these specific sectors is only reported for the total sectoral programme while only a limited number of the interventions included contribute to pesticide reduction. Therefore, adding the financial allocation for these specific programmes as CAP expenditure contributing to pesticide reduction would lead to a significant overestimate. Thus, they are not taken into account in the reported figures.

The markets policy under the CAP also makes available instruments to promote the sustainable use of pesticides, complementing the funding possibilities since direct payments have a lesser impact in certain sectors where there is often an intense use of pesticides. This is the case for instance of the sector in fruits and vegetable where EU legislation provides that national Operational Programmes must devote part of the budget to environmental practices such as IPM or pesticides reductions. In addition, farmers will also be encouraged, as part of the Rural Development interventions, to invest in new technologies that can allow the implementation of some of the pesticide reduction practices. Last, financial risks incurred by farmers using alternative to pesticides may also be funded by the CAP second Pillar' instrument for Risk Management (insurances, mutual funds).

<sup>54</sup> Austria, Belgium, Czech Republic, Germany Italy and the Netherlands for Fruit and Vegetables; Italy also for Olive oil and table olives and potatoes.

More broadly, under the CAP, Member States must provide advice to farmers on a number of issues, including sustainable use of pesticides with e.g., integrated pest management or precision agriculture, through the so-called Farm Advisory Services (FAS). The FAS must be linked to research and innovation networks in the Agricultural Knowledge and Innovation System (AKIS). The CAP can finance knowledge transfer, such as setting-up FAS and the use of FAS by farmers. In addition, the CAP also provides funding for Operational Groups (OGs) under the European Innovation Partnership for Agricultural productivity and Sustainability (EIP-AGRI). OGs are project based and support the development of innovations seeking solutions to a certain (practical) problem by groups of relevant actors in a bottom-up manner. From over 2600 OGs which were operational in December 2022, 447 are working on finding solutions for the sustainable use of pesticides<sup>55</sup>. These include for example apps to schedule pesticides applications for vineyards in Spain or to monitor pests and diseases in Italy. As part of its Better Training for Safer Food initiative DG SANTE is also providing training for competent authorities for Member States officials and advisors during the period 2018-2022<sup>56</sup>.

In addition, the EU Research and Innovation Framework Programmes, the seventh Framework programme (FP7), Horizon 2020 and Horizon Europe, help to develop a wide range of tools for prevention, early detection, monitoring, control and management of plant pests and diseases, along with promoting breeding of plant varieties with improved characteristics like pest resistance. Since 2007 over 61 projects with a total budget of over 288 million euros have been funded. Moreover, R&I actions on integrated crop management, agroecological approaches and low-input strategies are key areas also covered.<sup>57</sup> Knowledge and innovative solutions are made available to advisors and farmers through Thematic<sup>58</sup> and Advisory Networks<sup>59</sup> funded by EU R&I programmes.

Lastly, the EU CAP Network also supports farmers in the transition towards the sustainable use of pesticides. In April 2023 a workshop ‘Innovative arable crop protection - using pesticides sustainably’ will be organised in Amsterdam. It will focus on exchanging knowledge and sharing innovative, inspirational practices that support farmers, advisors and other stakeholders to ensure greater uptake of non-chemical plant protection methods in arable crops by using economically and ecologically sustainable approaches.

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<sup>55</sup> <https://ec.europa.eu/eip/agriculture/en/news/eip-agri-activities-related-sustainable-use>

<sup>56</sup> [https://better-training-for-safer-food.ec.europa.eu/training/course/search.php?areaid=core\\_course-course&q=ipm](https://better-training-for-safer-food.ec.europa.eu/training/course/search.php?areaid=core_course-course&q=ipm)

<sup>57</sup> [https://research-and-innovation.ec.europa.eu/research-area/agriculture-forestry-and-rural-areas\\_en](https://research-and-innovation.ec.europa.eu/research-area/agriculture-forestry-and-rural-areas_en)

<sup>58</sup> Examples of relevant Thematic Networks: <https://cordis.europa.eu/project/id/773864>

<sup>59</sup> Topic in Horizon Europe Cluster 6 Work Programme 2023-2024: Developing EU advisory networks to reduce the use of pesticides.

**Box 5. Takeaway points of section 5**

- 1) The Common Agricultural Policy (CAP) includes multiple measures providing funding to farmers for practices and investments beneficial for the sustainable use of pesticides.
- 2) To support the transition towards an ambitious reduction of the use of pesticides, the Commission has included in the SUR proposal a derogation to allow funding by the CAP of practices compulsory by law (thus in the baseline) during a period of 5 years.
- 3) The Eco-schemes, which are a type of direct payments to farmers, may finance beneficial practices going beyond the baseline, including the sustainable use of pesticides and organic farming.
- 4) Farmers will also be encouraged, as part of the Rural Development interventions, to invest in new technologies that can allow the implementation of some of the pesticide reduction practices.
- 5) Financial risks entailed by farmers using alternative to pesticides may also be funded by the CAP second Pillar' instrument for Risk Management (insurances, mutual funds).

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## Chapter 2 – Administrative burden

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## Summary

The Council Decision requests information on the quantified impacts of SUR proposal increased administrative burden on competitiveness and profitability of small and medium-sized farms. In general terms, efforts to reduce the use of pesticides can result in cost-savings to farmers and other pesticide users through a reduced spending cost on pesticides purchased. It should be noted that there is no standardised EU definition of what constitutes a small or medium-sized farm. Such an interpretation of a small or medium-sized farm would be expected to differ substantially between different Member States, also taking account of the type of farming practised (e.g. greenhouses versus field crops). A variety of hourly tariffs are available for different categories of workers at EU and individual Member State levels to quantify possible administrative burden, for example EU hourly average earning of 16.10 EUR for elementary occupations or 21.00 EUR for skilled agricultural and fishery workers. Data have already been presented in the Commission's published impact assessment and supporting external study to quantify extra administrative burdens of the SUR, compared to the present SUD. It is also possible for farmers and other professional pesticide users to outsource or sub-contract some of these tasks to specialist contractors which has the potential to realise certain economies of scale and some cost efficiencies in completing such tasks and potentially reduce the total associated administrative burden to small and medium-sized farmers.

In this document the Commission assesses the potential extra administrative burden of the provisions of the SUR compared to the present SUD for small and medium-sized farms (as professional pesticide users) as 10 hours per year per farm (depending on the hourly tariff used this could equate to a cost of 161-210 EUR per year per farm, including non-wage labour costs and a standard 25% for overheads). This can be compared with administrative burden to farmers in other areas arising from compliance with EU legislation or rules, for example a study analysing administrative burden arising from the CAP assessed the average cost related to aid administration in the EU to be around 220 EUR per farm<sup>60</sup>, or about 2% of total costs. There could be an additional possible cost of 180 EUR per year for such small and medium-sized farms to obtain annual obligatory "strategic advice" under the SUR, although providing such advice via group or online/remote means would have the potential to very significantly reduce this cost. Evidence from the Commission's impact assessment and supporting external study<sup>61</sup> suggests that the cost of advice received could also be partially or even wholly recouped from reduced use and associated cost of pesticides to farmers.

The Commission does not have precise data to assess the potential quantified impacts of such an increased administrative burden on competitiveness and profitability of small and medium-sized farms. The Commission's non-paper on sensitive areas of November 2022<sup>62</sup> also stated that constructive discussions with Member States should continue on other key issues covered by the proposal, such as administrative burden, for which appropriate solutions can be found. Numerous options are available to the co-legislators to reduce and mitigate such potential costs and burden, especially for small and medium-sized farms, for example support under the CAP through the National Strategic Plans, alternative national funds, introducing some possible exemption thresholds in the SUR for small and medium-sized farms or reducing the detail or frequency of

<sup>60</sup> [Analysis of administrative burden arising from the CAP - Publications Office of the EU \(europa.eu\)](https://ec.europa.eu/eip/agriculture/publications/analysis-administrative-burden-arising-from-the-cap)

<sup>61</sup> [https://food.ec.europa.eu/system/files/2022-06/pesticides\\_sud\\_eval\\_2022\\_ia\\_report.pdf](https://food.ec.europa.eu/system/files/2022-06/pesticides_sud_eval_2022_ia_report.pdf)

<sup>62</sup> [https://food.ec.europa.eu/system/files/2023-01/pesticides\\_sud\\_sur-non-paper\\_en.pdf](https://food.ec.europa.eu/system/files/2023-01/pesticides_sud_sur-non-paper_en.pdf)

some of the record-keeping or other administrative obligations outlined in the SUR proposal or specifying that obligatory strategic advice to professional pesticide users (and small and medium-sized farmers in particular) be provided at a lower frequency than annual and/ or via a less costly route than by individual physical visits to farms such as advice being delivered to groups of farmers, to farmers growing the same or similar crops, or using online means to deliver this advice. The Commission's non-paper of November 2022 highlights that constructive discussions with Member States should continue on key issues covered by the proposal, such as administrative burden, for which appropriate solutions can be found.

### **Increased administrative burden of the SUR proposal**

The Commission's Better Regulation Toolbox<sup>63</sup> (a means for the Commission to implement its Better Regulation guidelines and principles) specifies that administrative burden consists of administrative activities carried out because of legal obligations. Administrative net costs are assessed by multiplying the average cost of the required administrative activity (Price) with the total number of activities performed per year (Quantity) and by subtracting the cost of administrative activities removed (at EU/national level). The average cost per activity can be estimated by multiplying a tariff (based on average labour cost per hour and including non-wage labour costs and additional cost of overheads, 25% by default as specified in Better Regulation Toolbox) and the time required per action (hours). The quantity will be calculated as the frequency of required actions multiplied by the number of entities (farms/farmers) concerned. The issues of national pesticide use and risk reduction targets (which are addressed to Member State competent authorities and not individual farmers or pesticide users) and possible impacts due to a possible prohibition of pesticide use in sensitive areas are addressed in separate sections of this document addressing specifically Article 1.1 (a,b,c,f) of the Council Decision.

Eurostat's 2018 Structure of earnings survey, Labour Force Survey data for Non-Wage Labour Costs<sup>64</sup> gives a variety of hourly tariffs for different categories of workers at EU and individual Member State levels, for example for:

- Elementary occupations: EU hourly average earning of 16.10 EUR with a range from 2.90 EUR in Bulgaria to 34.00 in Denmark;
- Service workers and shop and market sales workers: EU hourly average earning of 18.60 EUR with a range from 3.00 EUR in Bulgaria to 32.40 in Denmark;
- Plant and machine operators and assemblers: EU hourly average earning of 19.10 EUR with a range from 3.80 EUR in Bulgaria to 41.50 in Denmark;
- Skilled agricultural and fishery workers: EU hourly average earning of 21.00 EUR with a range from 3.00 EUR in Bulgaria to 36.10 in Denmark;
- Craft and related trades workers: EU hourly average earning of 21.40 EUR with a range from 4.20 EUR in Bulgaria to 42.60 in Denmark.

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<sup>63</sup> [https://commission.europa.eu/system/files/2023-02/br\\_toolbox-nov\\_2021\\_en.pdf](https://commission.europa.eu/system/files/2023-02/br_toolbox-nov_2021_en.pdf)

<sup>64</sup> [https://ec.europa.eu/eurostat/databrowser/view/LC\\_NCOST\\_R2\\_custom\\_1281363/default/table?lang=en](https://ec.europa.eu/eurostat/databrowser/view/LC_NCOST_R2_custom_1281363/default/table?lang=en)

The Better Regulation Toolbox states that the effort of assessment should remain proportionate to the scale of the administrative costs imposed by the legislation and should be determined according to the principle of proportionate analysis. The Toolbox states that there is no need to assess the administrative costs when these are bound to be insignificant, for instance, when little equipment is required, if the amount of time per action is small and the frequency low. Such decisions on a lack of specific administrative costing should be taken on a case-by-case basis and should be justified. In order to keep assessment of costs at a reasonable level and ensure comparability of results, the Toolbox states that estimates will be based on standard assumptions simplifying the complex reality of the EU.

As described in the Commission's impact assessment, the main increased administrative burdens of the SUR proposal on professional pesticide users (and in particular small and medium-sized farms as specified in the Council Decision request), compared to the existing legislative and administrative obligations under the SUD, are considered to be as follows. It should be noted that, in line with the European Commission Digital Strategy<sup>65</sup> and digital by default principle, some of the electronic record-keeping provisions of the proposal (for example on pesticide use records, see below) are considered to offer the potential to reduce overall administrative burden compared to current legislative requirements that such records be kept for example in paper form:

- **Compulsory electronic integrated pest management (IPM) record-keeping (assumed time required of 6 hours per year on average per small and medium-sized farmer):** such record-keeping (to be differentiated from pesticide use record-keeping described below) is believed to be not presently required in almost all Member States. It should be noted that the implementation of IPM has been legally obligatory for professional pesticide users (including any small and medium-sized farms included therein) under the 2009 SUD, although record-keeping on IPM is not specifically required or specified under the SUD. The results from the impact assessment (and from the supporting external study survey with national authorities) suggested that no Member State so far has a mandatory electronic IPM record-keeping in place. Only one Member State has a system for voluntary record-keeping on IPM in place (Finland). Another Member State (Denmark) has a system in which they require farmers to answer questions regarding IPM. Competent authorities in other Member States such as Belgium use documented checklists to assess how IPM is being implemented by professional pesticide users and electronic monitoring dashboards have been used to record or assess IPM implementation in other Member States such as the Netherlands. The external study supporting the Commission's impact assessment states that the IPM record-keeping framework could take the form of a decision-making tree with an assumption that, on average, a farmer would have to spend around 6 hours per year on recording decisions in such a framework. The external study states that estimation on time spent is based on observations from the existing IPM-recording system in Finland in which farmers can voluntarily record IPM measures. The time is purely for recording and not for field observations and planning, which is part of the normal IPM implementation process and not the actual recording. It should also be mentioned that many farmers, in general, already record all agronomic practices from land preparation to harvest and that the time assumed here is for

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<sup>65</sup> [https://commission.europa.eu/publications/european-commission-digital-strategy\\_en](https://commission.europa.eu/publications/european-commission-digital-strategy_en)

transferring information into the recording framework to be provided by the national authorities. It can be assumed that the time needed could be significantly reduced by potentially using the existing management systems under the Integrated Administration and Control System<sup>66</sup> (IACS) of the Common Agricultural Policy (CAP). The IACS systems include a Land Parcel Identification System (LPIS) and provide for geospatial aid applications (GSA) which farmers use to declare the agricultural land subject to their aid claim under the CAP. Provided Member States use the said provision, this could lead to a significant alleviation of the administrative burden for record-keeping. It should be noted, however, that the IACS system was not originally designed to include pesticide or IPM record-keeping linked to the SUR proposal and there might be in certain cases a need for adaptation. Moreover, it is important to also note that this system would not normally be expected to be used for record-keeping linked to non-agricultural pesticide use or that portion of agricultural use not linked to or supported by the CAP. It could also be assumed that the administrative burden for this record-keeping would decrease over time if additional recording of IPM practices as required by the SUR proposal gets more standardised and streamlined. Electronic recording systems would normally be expected to have predefined alternatives/drop-down menus that would make the recording easier and quicker. However, in different climatic and geographical zones experiencing higher or lower pest pressure and varying crops grown, the time spent on such record-keeping could of course be potentially higher or lower than the assessment made by the Commission's impact assessment and supporting external study;

- **Applying for a derogation for the aerial spraying of pesticides (no extra assumed time per year per small and medium-sized farmer compared to existing system of applying for such derogations under the SUD):** a requirement to apply for a derogation for aerial spraying exists already in Member States under the SUD. The external study supporting the Commission's impact assessment stated that the costs and administrative burden associated with this policy option would be equivalent to a no change scenario compared to the current SUD. The study noted that few derogations are granted by Member States for aerial spraying and no information is available on derogations concerning drones. Some Member States entirely prohibit aerial spraying under the SUD and indicated in the supporting external study survey that they plan to continue this prohibition under the SUR, meaning that professional pesticide users (including small and medium-sized farmers therein) in those countries might not be able to apply for these derogations at all, thus not presenting an additional administrative burden for them to prepare and submit such applications. Given that the present SUD already requires derogation applications to be submitted for aerial spraying, retaining this derogation system under the SUR would not be considered to present a significant additional administrative burden for small and medium-sized farmers. It is also possible that small and medium-sized farmers might be less likely to apply for, and carry out, aerial spraying compared to larger farmers owing to the costs involved in carrying out such spraying, size of areas to be covered/sprayed in a time and cost-effective way and the cost and overheads potentially associated with the aerial application equipment to be used. The SUR proposal foresees that in the future spraying by drones might be exempted from the

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<sup>66</sup> See: [https://agriculture.ec.europa.eu/common-agricultural-policy/financing-cap/assurance-and-audit/managing-payments\\_en](https://agriculture.ec.europa.eu/common-agricultural-policy/financing-cap/assurance-and-audit/managing-payments_en)

need to apply for an aerial spraying derogation, which would reduce the administrative burden accordingly if spraying was being performed using drones;

- **Requiring pesticide use records to be kept in electronic form (assessed to represent a potential reduction in time per year per small and medium-sized farmer compared to presently keeping such records in paper form):** Commission Implementing Regulation (EU) 2023/564<sup>67</sup> as regards the content and format of the records of plant protection products kept by professional users will require pesticide use records to be in electronic form in all Member States from 1 January 2026. Compulsory electronic pesticide use records are already in place in Member States such as Denmark and Slovakia and planned to become compulsory in Spain. The Commission does not have information on the proportion of professional pesticide users (including small and medium-sized farms) who may be already voluntarily keeping in electronic form their pesticide use records required under Commission Regulation (EC) 1107/2009, but it is entirely plausible and realistic to assume that a significant number of farmers, including small and medium-sized farms, may be using computer or mobile phone software applications to keep farm records, including on pesticide use. Commission Implementing Regulation (EU) No 2022/1173 foresees that, where relevant for CAP interventions for sustainable use of pesticides under Articles 31 and 70 of Regulation (EU) 2021/2115, Member States may decide to use this information in respect to the record-keeping of plant protection products laid down in Article 67(1) of Regulation (EC) 1107/2009. The external study supporting the Commission's impact assessment stated that potentially combining IPM and pesticide use record-keeping in one electronic system could minimise administrative burden for pesticide users (small and medium-sized farmers in the context of the Council Decision). The SUR proposal also foresees that such IPM and pesticide use record-keeping be accommodated in a single electronic system to facilitate relevant synergies and efficiencies and minimise any extra associated administrative burden for professional pesticide users, including small and medium-sized farms;
- **Applying for a derogation to use pesticides in sensitive areas (assumed time required would vary, zero hours if a small and medium-sized farmer is outside the scope of sensitive areas definition, 0-4 hours per year depending on the crops grown and pesticide used if a small and medium-sized farmer is inside the scope of sensitive areas definition):** although the SUD obliged Member States to take action to minimise or prohibit the use of pesticides in sensitive areas, the Commission's evaluation of the SUD and supporting external study concluded that many Member States did not implement this provision in a comprehensive or effective manner. Against this background, the Commission is not aware if many Member States have already introduced a derogation system for users to apply to use pesticides in such areas. The Commission's impact assessment states that professional pesticide users would face costs and an administrative burden to submit derogation applications if they needed to use pesticides in sensitive areas. The administrative burden to apply for such an individual derogation could be expected to be similar to that for pesticide users to apply for an aerial spraying derogation, for example 1 hour to prepare and submit such a derogation application, although the frequency of applying for a derogation to use pesticides in

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<sup>67</sup> [EUR-Lex - 32023R0564 - EN - EUR-Lex \(europa.eu\)](#)

sensitive areas might be higher compared to submitting derogation applications to carry out aerial spraying. The SUR proposal states that such derogations to apply pesticides in sensitive areas could have a duration of 60 days and the Commission's non-paper on sensitive areas of November 2022<sup>68</sup> suggests that this could be for a longer duration of 120 days. The additional burden for small and medium-sized farms could thus be estimated in a range of 0-4 hours per year. If a small or medium-sized farm is not located in a sensitive area this provision and administrative burden of applying for such derogations and displaying public notices when spraying is carried out would not be expected to be applicable at all to those farms. The Commission's non-paper on sensitive areas identifies various possible options to the co-legislators on how the proposed provision on sensitive areas could be adapted to protect agricultural production while still minimizing risks to health and the environment, for example as regards land areas to be included in the definition of sensitive areas, or not, and pesticides to be used in such areas, or not;

- **Receiving annual advice from an independent advisor (estimated cost of €180 per year to receive and record such advice, which could be potentially funded by the CAP and/or the costs reduced if the advice was provided in a group setting or by remote/virtual means. Implementing the advice would also be expected to reduce the quantity and potential costs of pesticides used):** The Commission's impact assessment states that introducing this requirement would increase the direct cost of advisory services for professional pesticide users (including any small and medium-sized farmers therein) but the supporting external study also assumed and concluded that the change would lead to a decrease of pesticide use overall (due to increased quality of the service and decoupling from commercial interest) which may balance the increased costs. The external study supporting the Commission's impact assessment stated that the costs from the change of this advisory system could be partly balanced by higher subsidies or support to independent advisory structures. Member States may also make full use of their Farm Advisory Services (FAS) established under the CAP, which would reduce the costs for national administrations and the administrative burden for farmers. Such support to compulsory advice could be potentially funded under the CAP, under the derogation to the funding of legal requirements provided for in the SUR proposal or additional national support schemes if established by the Member States, under the derogation to the funding of legal requirements provided for in the SUR proposal. For additional voluntary advice the CAP can also support overheads and ancillary expenses of advisory services and possibly also the cost of advice for farmers where it is charged and where Member States decide to support it. The SUR proposal does not specify how such annual advice shall be provided, whether in-person or by written or electronic means, whether on an individual basis or as group advice to farmers growing the same crops or using similar pesticides. Taking account of the system already applied in certain Member States (e.g. France), the external study supporting the Commission's impact assessment estimated a cost of 180 EUR per year for smaller farms for obligatory "strategic advice". It is assumed, based on a national assessment of the system applied in France, that the provision and implementation of such advice would lead to a decrease of pesticide use overall which may partially, or even totally, outweigh the increased costs of obtaining the advice. In an

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<sup>68</sup> [https://food.ec.europa.eu/system/files/2023-01/pesticides\\_sud\\_sur-non-paper\\_en.pdf](https://food.ec.europa.eu/system/files/2023-01/pesticides_sud_sur-non-paper_en.pdf)

assessment of the French advisory system mentioned in the external study, it was estimated that farms could save up to 25% of their pesticide input costs, which in some cases could more than offset the additional costs for obtaining the advice;

- **Registering pesticide application equipment (PAE) in a register and updating these registration details when the equipment is bought or sold or permanently removed from use (time per year per small and medium-sized farmer assessed to be negligible since registration would only take very limited time and would be a one-off cost either when buying or selling equipment):** such registers of varying level of complexity already exist in many Member States, as mentioned in the external study supporting the Commission’s impact assessment. The Commission’s impact assessment states that registration would only take a very limited time and would be a one-off cost (for example when buying new equipment) and those costs can be considered generally negligible. Assuming a PAE inspection frequency of once every 3 years, a turnover of 10% of PAE annually and 5% of PAE being removed from use annually, the administrative burden to individual small and medium-sized farms annually to update such PAE registration details is assessed as being negligible;
- **Requirement for professional pesticide users to be trained to purchase and use pesticides (no extra assumed time per year per small and medium-sized farmer compared to existing system of training applying under the SUD):** in the external study supporting the Commission’s impact assessment, it is stated that Member States indicated that they have already implemented such a training requirement under the SUD. It is therefore concluded that there would be no additional cost or administrative burden expected for individual small and medium-sized farmers resulting from the SUR provision. The Commission’s impact assessment states that for rolling out the training, it is assumed that only little cost would occur since almost all countries can build on a well-established training system.

The afore-mentioned administrative tasks could be estimated to amount in total to up to 10 hours per year for a professional pesticide user (small or medium-sized farm in the specific context of the Council Decision request), 6 hours for IPM record-keeping, 0-4 hours for applying for derogations to use pesticides in sensitive areas, plus a cost of 180 EUR per year to receive obligatory strategic advice. This burden could be counterbalanced by time and cost efficiencies gained in converting from paper to electronic pesticide use records and reduction in pesticide use and costs from implementing the obligatory strategic advice received. On an individual case-by-case basis, depending on the climatic zone, whether the farm is located in a sensitive area, crops grown, pesticides used and application techniques such as aerial spraying being used or not, the administrative burden could be either higher or lower for individual farmers and pesticide users and small and medium-sized farmers in particular in different Member States. Using the skilled agricultural and fishery workers EU hourly average earning tariff of 21.00 EUR would imply a cost of 210 EUR per year per farm (10 hours multiplied by hourly tariff of 21.00 EUR). Using the lower elementary occupations EU hourly average earning of 16.10 EUR would imply a cost of 161 EUR per year per farm (10 hours multiplied by hourly tariff of 16.10 EUR). The estimated cost of 180 EUR per year for smaller farms to obtain annual obligatory “strategic advice” would be in addition to this, although, as stated earlier, it could be mitigated by potential savings in the cost and use of pesticides based on implementation of the advice received or

advice being provided in a less costly way, for example by remote/electronic means or to groups of farmers at the same time who grow the same crops and use similar pesticides, with potential costs and burdens thus being collectively shared or individually reduced by such means.

## Defining small and medium-sized farms

In trying to establish the number of small and medium-sized farms that might experience an increased administrative burden linked to the SUR proposal, as requested in the Council Decision, it should be noted that the Commission does not receive from Member States any precise information on the number of professional pesticide users in each of their national territories, or the distribution of these professional pesticide users between different farm types and sizes and also non-agricultural use. Broadly-speaking, one could consider three distinct groups of farms in the EU:

- (i) semi-subsistence farms, which are agricultural holdings producing primarily for their own consumption<sup>69</sup>;
- (ii) small and medium-sized farms that are generally family-run businesses and;
- (iii) large agricultural enterprises which are more likely to have a legal form or be cooperatives.

These distinctions are made clearer by analysing farms in terms of their economic size. Of the EU's 9.1 million farms, 3.3 million had a standard output below EUR 2 000 per year and were responsible for only 1 % of the EU's total agricultural economic output<sup>70</sup>. These very small farms are at the (semi-)subsistence end of the farming scale; about two-thirds of such farms in the EU consumed more than one half of their own production in 2016. Semi-subsistent farmers in this category would generally not be expected to be professional pesticide users themselves or to fall within the scope of many of the provisions of the SUR (or existing SUD) or any associated administrative burden. A further 2.5 million farms had an economic output within the range of EUR 2 000 - EUR 8 000 per year. Together these very small and small farms accounted for two-thirds (63.7 %) of all farms in the EU in 2020. Semi-subsistent farms (estimated 1.74 million plant/mixed and 2.53 million only livestock farms at EU level) would not generally be expected to constitute professional pesticide users<sup>71</sup> or to be affected by many of the administrative burdens that would be imposed by the SUR proposal. In contrast, 299 000 farms (3.3 % of the EU total) each produced a standard output of EUR 250 000 per year or more in 2020 and were responsible for a majority (56.4 %) of the EU's total agricultural economic output; these farms could be considered as large in economic terms and would thus not be expected to fall into the definition of small and medium-sized farms stipulated in the Council Decision.

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<sup>69</sup> [https://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/495861/IPOL-AGRI\\_ET\(2013\)495861\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/495861/IPOL-AGRI_ET(2013)495861_EN.pdf)  
p. 23-24

<sup>70</sup> Main source: Integrated Farm Statistics [Data - Agriculture - Eurostat \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&plugin=1)

<sup>71</sup> This could be confirmed or better evaluated were Member States to provide to the Commission data on the number of existing professional pesticide users on their territories, linked to implementation of the 2009 SUD.

It is also not known to what extent small and medium-sized farms using pesticides may outsource the use of pesticides to specialist contractors who have more expertise and experience in the use of pesticides and, through potential economies of scale and specialisation, may be able to somewhat reduce any associated administrative burden on the small and medium-sized farms (through possible cost efficiencies by the task being performed by a highly specialist contractor, although it should be made clear that the farmer would still be obliged to pay the contractor for their work and tasks performed). The European Organisation of Agricultural, Rural and Forestry Contractors (CEETTAR) has estimated that more than 50% of agricultural work in the EU is executed by contractors and for some specialised harvesting activities this figure can rise to over 80% or 90%<sup>72</sup>. It is, however, not known for all Member States to what extent pesticide use (and some of the associated administrative burden) is outsourced by farmers, and small and medium-sized farms in particular, to professional contractors

The concepts of small and medium-sized farms are not formally defined at EU level or in a standardised way. In CAP regulation (Art 28 and Art 29 of 2021/2115) reference is made to the concept of small farms. The definition of small farms under the CAP is also left to the discretion of Member States. Member States opting for the payments for small farmers<sup>73</sup> have accordingly defined small farms in their CAP strategic plans, as approved by the Commission. However, this definition of small farms is done with a perspective of simplification of the management of CAP support. It may be the case that small farms in the context of the CAP are large farms in economic terms (e.g. specialised horticulture) and this definition is not in many cases relevant for the use of pesticides. A definition of what is to be considered a ‘small or medium farm’ is context-specific. What is considered small from the perspective of SUR differs from what is small from the perspective of the Industrial Emission Directive (IED)<sup>74</sup> or with respect to subsidy beneficiary for example.

At EU level, farms can be classified according to their annual theoretical turnover, under 8 000 EUR, >8 000 to <250 000 EUR, >250 000 EUR. Tables in Annex A show at EU and individual Member State level the average number of persons working on farms in the Member States in 2016 in these different categories and the share of farms and agricultural area in the different economic size classes, share of farms in the different area size classes and share of utilised area in the different area size classes.

An alternative way of defining small and medium-sized farms and assessing any associated administrative burden would be to consider the quantity of pesticide use on each farm and assume that the administrative burden would be proportionate to the pesticide use. This would require a definition of small and medium-sized farms in relation to their pesticide use. Some farms although small in physical size might still use a high amount of pesticides (e.g. production in greenhouses), or vice versa. Since pesticide use data are currently not available to the Commission, data on costs of crop protection materials, available at farm level in the Farm Accountancy Data Network (FADN)<sup>75</sup>, could be used as a potential proxy. Total farm-level costs of crop protection materials could be considered as a proxy for total use and farm level pesticide

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<sup>72</sup> <https://www.ceettar.eu/sectors.php?cat=1&item=4>

<sup>73</sup> Article 28 of Regulation (EU) 2021/2115

<sup>74</sup> <https://ec.europa.eu/environment/industry/stationary/ied/legislation.htm>

<sup>75</sup> FADN concerns a sample of EU farms consisting of about 80 000 farms representative for EU and Member State professional farms (not subsistence farms), stratified per region based on physical and economic size and farm type

costs per hectare a proxy for use intensity (see Table 1). Large levels of variation in such parameters are recorded between Member States and within Member States between different crop production sectors. However, on average the higher the economic size of the holding, the higher the costs of crop protection materials (per farm and per hectare, see Table 2). For results by country see Tables 1a, 1b, 2a and 2b in the annex.

**TABLE 1. FADN-survey based economic results of farms, by types of farms (TF8 groups) in EU27**

The results are calculated as averages for years 2018-2020.	Annual average for FADN survey in EU27	(1) Fieldcrops	(2) Horticulture	(3) Wine	(4) Other permanent crops	(5) Milk	(6) Other grazing livestock	(7) Granivores	(8) Mixed
	(SE300) Crop protection costs (€/farm)	3 034	5 022	5 562	4 336	2 444	1 438	483	3 838
Crop protection cost, € / ha (SE300/SE025)	82	100	832	277	200	32	11	96	67

**TABLE 2. FADN-survey based economic results of farms, by classes of economic size of farms (classes of Standard Output) for EU27**

The results are calculated as averages for years 2018-2020.	Annual average for FADN survey in EU27	(3) 4 000 - < 8 000 EUR	(4) 8 000 - < 15 000 EUR	(5) 15 000 - < 25 000 EUR	(6) 25 000 - < 50 000 EUR	(7) 50 000 - < 100 000 EUR	(8) 100 000 - < 250 000 EUR	(9) 250 000 - < 500 000 EUR	(10) 500 000 - < 750 000 EUR	(11) 750 000 - < 1 000 000 EUR	(12) 1 000 000 - < 1 500 000 EUR	(13) 1 500 000 - < 3 000 000 EUR	(14) >= 3 000 000 EUR
	(SE300) Crop protection costs (€/farm)	3 034	224	510	841	1 526	3 024	6 798	13 748	20 353	26 127	37 055	56 470
Crop protection cost, € / ha (SE300/SE025)	82	39	46	51	55	61	81	109	121	122	123	128	135

Source of data for the two tables above is FADN survey results. Table 1. can be reproduced from data published in

<https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html>.

Table 2. uses a more detailed disaggregation of economic sizes than available in the above online database. That disaggregation follows the table in point B ECONOMIC SIZE CLASSES OF HOLDINGS of Annex V of Commission Implementing Regulation (EU) 2015/220.

Regarding the differences between the type of farms (sectors), horticulture farms have much higher costs of crop protection materials, followed by wine, other permanent crops and cereals farms. The administrative burden to be expected will in addition be dependent on the variety of crops on the farm, variety of pesticide products used, the number of treatments required, as well as the variety of alternatives to pesticide use for pest control.

In addition, farms using less pesticides and more alternative pest controls techniques may have a higher administrative burden in case they have to report more techniques in detail, for example in their IPM records.

One can also assume a relationship between the automation of reporting and the (economic) size of the farm. For farms with a large/intense use of pesticides it makes more sense to invest in automation of the application (and recording), which entails a larger initial investment cost but

lower operating costs per application. For smaller farms the initial investment in automation may be lower, but the variable operating costs relatively higher.

### **Quantified impacts on profitability of small and medium-sized farms**

The Better Regulation toolbox states that profitability can be measured by net profit margin or return on assets. The Commission's impact assessment supporting study states that the agricultural sector generates a lower economic return than other economic sectors. Farmers receive around 40% less income than workers in other sectors, a situation in turn motivating the CAP to further support the economic viability of farmers. The SUR proposal foresees potential financial support under the CAP for an initial 5-year period for farmers to comply with the requirements of the SUR. As an example of administrative burden in other areas, a study analysing administrative burden arising from the CAP<sup>76</sup> assessed the average cost related to aid administration in the EU to be around 220 EUR per farm, or about 2% of total costs. However, this estimate does not take into account Member State and sector specificities.

The Commission, through Eurostat, possesses agricultural census data<sup>77</sup> for a large number of potential analyses, relating to farm numbers, age and sex of the farmers, labour force, other activities, rented or own land, turnover and specialisation. The Commission does not however have information on the economic situation at individual farm level, which makes it difficult to objectively and quantitatively assess what could be the potential implications of the aforementioned administrative burdens on the competitiveness and profitability of farms in general and small and medium-sized farms in particular, as requested in the Council Decision.

As previously stated, the theoretical turnover (as expressed in standard output and as shown in Tables in Annex 1) could be a criterion for fixing the classification of small – medium – large farms: for example < 8,000€ would be small, 8,000€ – 250,000€ – medium and >250,000€ would be large. However, it has to be noted that this theoretical turnover does not indicate in any way the actual income of the farmer, as no inputs have been valued and subtracted from the potential revenues the turnover represents.

An alternative means of potentially trying to assess profitability, but concluded overall not to be helpful in trying to respond to the specific Council Decision request, would be to use economic accounts for agriculture (EAA) data<sup>78</sup> on factor income and entrepreneurial income for agriculture as a whole and not classified by size of farms. The agricultural factor income represents all the value engaged in agricultural production activity (land, capital and labour), which is the gross value added adjusted for the consumption of fixed capital, subsidies and taxes on production. Within EAA, the entrepreneurial income account makes it possible to measure income, which is similar to the concept of current profit before distribution and taxes on income, as customarily used in business accounting. The balancing item of this account is entrepreneurial

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<sup>76</sup> [Analysis of administrative burden arising from the CAP - Publications Office of the EU \(europa.eu\)](#)

<sup>77</sup> [Database - Agriculture - Eurostat \(europa.eu\)](#)

<sup>78</sup> [Database - Agriculture - Eurostat \(europa.eu\)](#)

income. In the case of sole proprietorships, entrepreneurial income represents, on the one hand, the compensation of the work performed by the agricultural holder (and the work of non-salaried family members) and, on the other hand, the income remaining with the enterprise, without it being possible to separate these two components (the term ‘holder’ as used here naturally refers to all persons who run sole proprietorships in this industry). It is, therefore, a mixed income. Like any other industry, however, the agricultural industry comprises production units that belong to different types of institutional units: companies and sole proprietorships and there is a difference between entrepreneurial income generated by sole proprietorships and that generated by units organised as companies. In the latter case, it represents net entrepreneurial income as it excludes any labour income (compensation of work has to be regarded as compensation of paid labour even if it relates to the administrators and shareholders of the company). For example, if the farmer is a private person, they may not pay themselves a salary but rather the net profit of the farm accrues to them in place of a salary. If the farm is structured as a company, it is possible that the farmer may have an executive role receiving a salary. This means that the profit (called here entrepreneurial income) can in fact both be the salary of the farmer (depending on how the company is set up) or the company profit margin.

FADN (sample of about 80 000 professional farms in EU) provides detailed data on farmers’ income and the different cost factors, for example relating to costs of crop protection materials and products (these do not include services, nor any administrative costs). Based on these FADN data, on average in the EU, costs of crop protection materials are 9% of the total input costs for field crop farms. It is difficult however to relate these crop protection costs directly to administrative costs and burden linked to the SUR proposal. FADN data suggest that the average ratio between costs of crop protection materials and income of field crop farms ranges between 20 to 35% in the EU. Agricultural incomes are generally assessed as being low in the EU, about 50% of the average wage in the economy<sup>79</sup>.

The FADN Dashboard<sup>80</sup> provides some aggregated data for many FADN variables. The table below shows average Farm Net Income for EU farms, disaggregated by type of farming (FT14) and Economic size (which could be potentially used as a proxy for “farm size”). The income could be potentially used as an indicator of profitability and the calculated increased administrative burden in monetary terms could be compared to the farm income to assess whether it is significant or not. To note that the Table headings and categorisations relate to Economic Size/ thresholds as a measurement of farm size rather than actual physical farm size/ area farmed, given that Economic Size is one of the design dimensions of the FADN survey. These FADN data are per farm, not per individual farmer. Depending on turnover and productivity levels and different types of production and crops grown, farms may be physically bigger or smaller in terms of areas farmed in different Member States for the same category of Economic Size. A more detailed breakdown of the FADN Dashboard data per individual Member States could lead to data representativeness issues owing to the sample sizes of number of farms in individual Member States involved. It should also be noted that net farm income can occasionally be negative depending on the year and type of farming practised.

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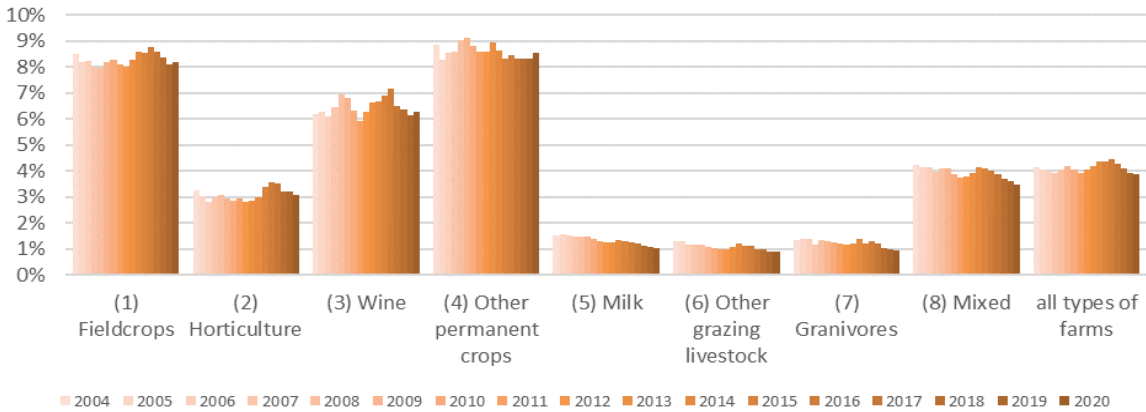
<sup>79</sup> [Jobs and growth in rural areas \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&code=sdg-8-10&plugin=1)

<sup>80</sup> <https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html>

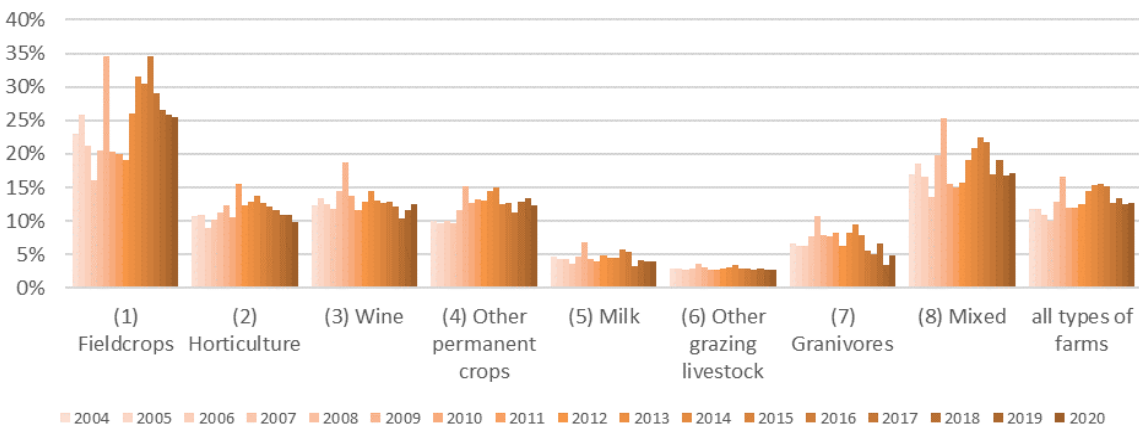
Table 2: Average annual EU Farm Net incomes by sector and economic threshold (expressed in EUR per farm, by types of farming and economic size classes). Source FADN dashboard.

<b>14 Types of Farming</b>	<b>Economic Size</b>	(1) 2 000 - < 8 000 EUR	(2) 8 000 - < 25 000 EUR	(3) 25 000 - < 50 000 EUR	(4) 50 000 - < 100 000 EUR	(5) 100 000 - < 500 000 EUR	(6) >= 500 000 EUR
(15) Specialist COP		2,270	8,177	15,463	29,096	58,827	214,799
(16) Specialist other fieldcrops		2,961	8,990	17,189	29,100	58,512	151,406
(20) Specialist horticulture		3,182	13,469	19,430	37,258	83,673	327,125
(35) Specialist wine		6,117	10,411	19,280	33,740	69,280	211,641
(36) Specialist orchards - fruits		5,543	15,459	23,523	43,865	85,782	395,128
(37) Specialist olives		4,020	12,630	24,462	45,590	126,274	-
(38) Permanent crops combined		5,771	11,393	22,744	37,377	75,514	177,530
(45) Specialist milk		1,659	6,632	16,706	29,366	62,487	168,554
(48) Specialist sheep and goats		2,434	10,802	20,803	34,691	44,680	388,593
(49) Specialist cattle		2,195	7,342	12,713	22,174	44,221	206,291
(50) Specialist granivores		864	4,890	17,612	24,609	46,677	196,570
(60) Mixed crops		2,212	9,215	20,710	35,742	60,251	251,456
(70) Mixed livestock		716	5,677	11,446	21,766	39,997	108,653
(80) Mixed crops and livestock		2,241	7,087	14,086	24,545	50,030	130,848

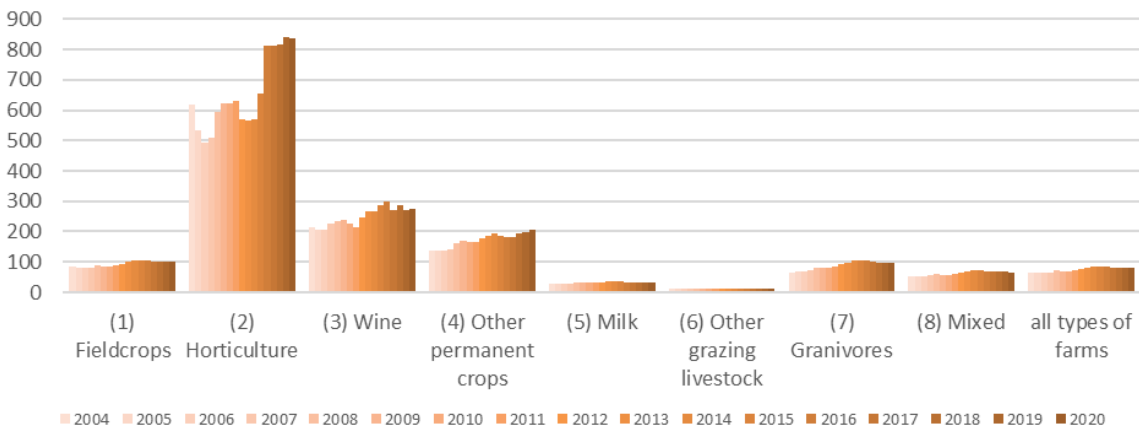
EU27, Costs of crop protection materials in total inputs (SE300/SE270), %



EU27, Costs of crop protection materials to farm net income (SE300/SE420), %



EU27, Costs of crop protection materials by utilised agricultural area (SE300/SE025), EUR/ha



Source of data for the charts above: FADN survey results. The charts can be reproduced from data published in <https://agridata.ec.europa.eu/extensions/FADNPublicDatabase/FADNPublicDatabase.html>.

## Quantified impacts on competitiveness of small and medium-sized farms

The Better Regulation toolbox states that EU initiatives are likely to affect competitiveness when they affect at least one of the following drivers:

- a sector's capacity to produce products at a lower cost and/or offer them at a more competitive price (cost/price competitiveness). The cost of an enterprise's operations includes the cost of inputs (including resources such as raw materials and energy) and production factors which may be directly or indirectly affected by the policy proposal;
- the quality or the originality of a sector's supply of goods or services (innovative competitiveness);
- technological development and innovation (of products and/or processes) are of primary importance for both the cost of inputs and the value of outputs;
- effective market competition and undistorted access to markets including inputs and materials, public procurement, etc.;
- the sector's market shares in international markets, which reflect the comparative advantages of the European industries in international perspective.

Competitiveness aspects may be divided into a number of separate pillars: capacity to innovate, cost and price, international competitiveness and SME competitiveness. Overall cost and price competitiveness links to the cost of doing business which includes cost of intermediate inputs and production factors. Capacity to innovate relates to the capacity of the business to produce more and/or higher quality products and services that meet better customers' preferences.

As regards the potential impact of the afore-mentioned administrative burden on the competitiveness of small and medium-sized farms, as requested in the Council Decision, and considering the fact that farmers outside the EU would not be expected to comply with such requirements, the first question to be answered is whether these administrative burdens are likely to have a significant effect on the sectoral competitiveness of these farms or not, in terms of cost and price competitiveness, capacity to innovate and international competitiveness.

Points to be considered include:

- (1) affected sectors;
- (2) identified impacts on these sectors of policy options;
- (3) qualitative estimate of the nature and magnitude of impacts; – How big is the expected impact?; – Is it a direct or indirect result of the intervention?; – When is it expected to occur?; – Is the impact transitory or permanent (duration of the impact)?;
- (4) the probability that the impact will take place; – How likely is the impact?; – Does it depend on critical assumptions?

The effect on the sector's international competitiveness also needs to be considered, if a policy proposal is likely to increase costs for EU producers (by e.g. introducing stricter requirements on the EU market) and if their non-EU competitors do not face the same requirements.

As an example, more detailed and electronic records on the use of pesticides, application of integrated pest management and use of advisors and PAE could add to the capacity to innovate for farmers and other professional pesticide users (including for small and medium-sized farmers). Independent and trained advisors may help farmers (including small and medium-sized farmers) to apply more advanced, efficient and effective techniques and products in overall plant protection treatments.

International competitiveness could be boosted by more effective and efficient measures being taken in the EU to reduce the use and risk of pesticides in line with the objectives of the SUR proposal (supported and verified by relevant administrative records and confirmations). This could be used to improve the international image and marketing attractiveness of EU agriproducts (including from small and medium-sized farms) as being potentially produced in a healthier, more environmentally friendly and more sustainable way.

The Better Regulation toolbox also highlights that if certain sectors are disproportionately affected or disadvantaged from a competitiveness perspective, possible mitigating measures could be considered with the aim to achieve the policy objectives without compromising the competitiveness of EU industries. Such possible mitigating measures would include:

- Full or partial exemption of certain sectors or subsectors, which might include less onerous compliance requirements or deeming a certain subset of rules not applicable to certain sectors;
- Extended transition/compliance periods before the rules come into force or where lighter compliance requirements are set for the introductory phase;
- Varying requirements by type and/or size of business or type of product/service, for example for SMEs.

However, when considering potential mitigating measures, it is also always important to consider the relevant trade-offs. For instance, excessively extending transitional periods or varying requirements by type of business may entail a risk of reducing the effectiveness of the initiative and may privilege certain types of enterprises and, therefore, harm fair competition. It is worth noting that in terms of mitigation measures, the SUR proposal foresees financial support to be provided under the CAP for farmers (including small and medium-sized farmers where relevant) to adapt to the new legal requirements introduced, which could also help to mitigate the additional administrative burdens and costs imposed.

In assessing potential impacts on SME, the Commission uses as a relevant data source Eurostat's Structural Business Statistics. However, these statistics currently exclude the agricultural sector so the Commission does not possess the usual value added/turnover data that would be available for SMEs in other sectors. Eurostat has recently released a newer version of the Structural Business Statistics covering more sectors (but with fewer variables), but agriculture is still not included in this newer version.

COPA-COGECA (Committee of Professional Agricultural Organisations-General Confederation of Agricultural Cooperatives) does publish some reports on profitability index at EU level and for individual countries. According to COPA-COGECA<sup>81</sup>, in 2017, the EU agricultural industry produced a total output value of € 427 billion, 50% of this value came from crops, 40% from

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<sup>81</sup> <https://www.copa-cogeca.eu/europeanfarming#b188>

livestock and the remainder from secondary activities. The sector's total factor productivity has been climbing over time - in 2017 it reached 109.5% of its level in 2005. Other reports<sup>82</sup> are available studying the financial needs in the agriculture and agri-food sectors in EU Member States and the planning and programming of the use of financial instruments in their CAP Strategic Plans.

However, due to the afore-mentioned data limitations, the Commission itself is unfortunately not in a position to assess the quantified impacts on competitiveness of small and medium-sized farms specifically of the identified administrative burden and costs associated with the SUR proposal, as requested in the Council Decision. Therefore, only a general assessment can be made of the impacts the outlined administrative burden costs could have on the income, profitability and competitiveness of small and medium-sized farms, also considering Member State specific variation in farm sizes and types, crops grown and pesticides used etc. The Commission nevertheless recognises that, based inter alia on public feedback received, administrative burden for farmers (including small and medium-sized farms), other professional pesticide users and Member State competent authorities linked to the SUR proposal represents a major concern for stakeholders, including administrative burden and costs for Member State competent authorities (for example linked to development and revision of national action plans, approving IPM crop-specific rules and introducing other record-keeping, monitoring and reporting systems. It should be noted, however, that the Council Decision request on administrative burden was linked only to small and medium-sized farms rather than the potential administrative burden and costs for other professional pesticide users and Member State competent authorities.

The Commission's non-paper<sup>83</sup> of November 2022 states that constructive discussions with Member States should continue on key issues covered by the SUR proposal, such as administrative burden, for which appropriate solutions can be found. Many potential options and solutions could be considered by the co-legislators to reduce or mitigate potential administrative burden and costs, including for small and medium-sized farms which were the specific focus of the Council Decision in this respect. Specific exemptions or thresholds for small and medium-sized farms for some of the SUR provisions, including extra IPM record-keeping or compulsory independent annual advice, could be considered, recognising that small farms in particular would be expected to comprise a relatively small proportion of overall EU agricultural production. By extension it could be assumed that such small farms might represent a relatively small proportion of overall EU agricultural pesticide use and associated health and environmental risks accordingly. Taking IPM record-keeping as an example, Member States such as Belgium and the Netherlands have developed checklists and monitoring dashboards respectively which could offer the potential to reduce the administrative burden and costs to individual farmers and other professional pesticide users, including small and medium-sized farmers as mentioned in the Council Decision. Thresholds or exemptions for obtaining compulsory advice or reducing the level of detail or frequency of such advice or reducing some of the proposed details on PAE registration could also be considered by the co-legislators as a potential means of reducing any undesired extra administrative burden or costs on small and medium-sized farmers, while still

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<sup>82</sup> <https://www.fi-compass.eu/eafrd/fi-compass-study-financial-needs-agriculture-and-agri-food-sectors-24-eu-member-states>

<sup>83</sup> [https://food.ec.europa.eu/system/files/2023-01/pesticides\\_sud\\_sur-non-paper\\_en.pdf](https://food.ec.europa.eu/system/files/2023-01/pesticides_sud_sur-non-paper_en.pdf)

ensuring that the overall goals of the SUR to reduce the use and risk of pesticides to protect health and the environment would be achieved in practice.

### Supporting tables

**TABLE 1a. FADN-survey based costs of crop protection materials, €/farm annually (SE300), by types of farms (TF8 groups) in EU27 Member States**

<i>The results are calculated as averages for years 2018-2020.</i>	<b>Annual average for FADN survey</b>	(1) Fieldcrops	(2) Horticulture	(3) Wine	(4) Other permanent crops	(5) Milk	(6) Other grazing livestock	(7) Granivores	(8) Mixed
BE	8 624	12 877	12 774		33 296	4 360	2 887	4 985	10 949
BG	4 309	9 584	1 498	9 041	1 889	237	65	1 095	654
CZ	19 370	26 648	2 222	3 795	10 008	18 310	784	3 618	35 091
DK	11 111	13 101	20 375		3 052	7 416	1 214	21 713	9 765
DE	8 793	17 046	6 111	5 182	11 784	3 187	1 914	8 718	13 271
EE	4 522	7 316	1 231		69	5 583	44	2 350	4 960
IE	917	14 098				543	165	0	5 309
EL	990	1 526	3 707	1 453	843		160	74	295
ES	3 314	3 787	10 111	2 739	4 048	974	395	1 378	1 382
FR	9 805	18 483	4 793	9 577	10 666	4 443	1 751	4 821	10 678
HR	1 188	2 506	1 308	2 844	1 322	674	287	573	427
IT	2 222	2 672	4 396	2 884	2 024	1 412	322	3 137	1 388
CY	1 020	1 781	2 413	803	723		207		215
LV	2 863	6 915				276	38		1 054
LT	2 089	5 015	1 794		436	251	59	2 523	1 053
LU	4 789	8 184		7 501		4 329	2 925		8 270
HU	3 570	4 710	2 422	3 040	3 553	3 692	415	1 822	2 298
MT	612	520	949			255	56	95	386
NL	10 499	24 601	26 725		19 767	1 906	683	1 964	8 893
AT	1 740	4 149		3 385	5 735	292	292	2 684	2 432
PL	1 199	1 724	875		1 873	428	177	1 743	772
PT	1 356	2 948	1 792	2 274	1 802	1 051	186	58	484
RO	913	2 946	436	6 013	1 323	202	217	652	282
SI	594	952		1 667	1 342	383	100	1 378	451
SK	35 289	43 413				26 218	1 954		69 266
FI	2 020	2 230	6 730			828	631	5 352	2 792
SE	4 291	8 786	8 912			1 568	619	7 780	6 808
EU27	3 034	5 022	5 562	4 336	2 444	1 438	483	3 838	2 154

**TABLE 1b. FADN-survey based costs of crop protection materials, €/ha annually (SE300/SE025), by types of farms (TF8 groups) in EU27 Member States**

<i>The results are calculated as averages for years 2018-2020.</i>	<b>Annual average for FADN survey</b>	(1) Fieldcrops	(2) Horticulture	(3) Wine	(4) Other permanent crops	(5) Milk	(6) Other grazing livestock	(7) Granivores	(8) Mixed
BE	164	220	1 019		1 459	71	48	205	172
BG	63	67	498	256	165	11	3	51	38
CZ	93	130	429	329	358	56	6	145	93
DK	95	110	626		100	42	27	114	90
DE	94	134	681	378	360	40	28	115	92
EE	33	46	156		3	23	1	86	39
IE	19	159				9	4	0	80
EL	105	110	914	248	158		10	48	33
ES	71	59	1 294	107	172	27	5	48	14
FR	110	158	477	393	368	45	16	100	88
HR	80	111	393	503	253	35	12	68	51
IT	104	102	818	325	208	40	7	120	51
CY	97	81	519	175	190		14		119
LV	43	74				5	1		22
LT	44	68	127		14	8	2	64	28
LU	55	116		895		41	33		91
HU	80	80	301	290	297	52	7	102	65
MT	235	155	384			69	25	120	146
NL	264	420	2 008		1 399	32	28	196	245
AT	52	79		179	465	11	9	82	63
PL	61	76	163		209	19	10	66	44
PT	58	154	470	217	136	56	4	10	20
RO	52	60	255	335	234	25	17	48	45
SI	56	105		294	299	21	9	76	48
SK	79	114				35	5		79
FI	30	37	474			11	7	53	31
SE	41	75	2 011			10	8	73	50
EU27	82	100	832	277	200	32	11	96	67

**TABLE 2a. FADN-survey based costs of crop protection materials, €/farm annually (SE300), by classes of economic size of farms (classes of Standard Output) for EU27 Member States**

<i>The results are calculated as averages for years 2018-2020.</i>	<b>Annual average for FADN survey</b>	(3) 4 000 - < 8 000 EUR	(4) 8 000 - < 15 000 EUR	(5) 15 000 - < 25 000 EUR	(6) 25 000 - < 50 000 EUR	(7) 50 000 - < 100 000 EUR	(8) 100 000 - < 250 000 EUR	(9) 250 000 - < 500 000 EUR	(10) 500 000 - < 750 000 EUR	(11) 750 000 - < 1 000 000 EUR	(12) 1 000 000 - < 1 500 000 EUR	(13) 1 500 000 - < 3 000 000 EUR	(14) >= 3 000 000 EUR
BE	8 624					4 651	6 055	10 189	18 394	19 362	26 523	22 620	
BG	4 309	196	370	622	1 285	3 131	9 768	27 772	46 920	73 282	106 266	156 075	241 471
CZ	19 370		298	799	1 504	4 781	10 789	23 528	48 197	66 996	97 183	147 570	272 966
DK	11 111			718	1 874	3 349	9 814	18 354	19 173	20 402	24 763	36 759	61 954
DE	8 793				1 588	2 875	5 694	11 181	19 052	25 229	44 154	76 404	175 490
EE	4 522	35	88	180	1 003	2 851	9 742	19 098	29 473		48 011	78 564	
IE	917		71	153	425	1 321	2 021	4 807					
EL	990	317	642	1 107	1 782	3 628	5 367						
ES	3 314		1 110	1 334	2 274	3 504	5 971	12 074	12 810	17 223	25 305	33 463	57 352
FR	9 805			1 059	2 046	3 762	9 456	18 139	26 324	29 223	29 049	37 820	
HR	1 188	360	621	913	1 768	4 060	8 960	9 023					
IT	2 222		454	749	1 290	2 427	4 700	9 783	13 926	16 265	17 629	27 015	16 655
CY	1 020	361	507	908	917	1 936	4 946						
LV	2 863	68	126	341	794	3 021	10 349	33 372	68 771				
LT	2 089	76	214	493	1 565	4 308	13 580	35 945	72 610				
LU	4 789				1 442	3 134	3 923	5 671	9 821				
HU	3 570	322	625	1 332	2 361	5 052	11 858	24 047	44 648	76 142	103 009	101 058	191 397
MT	612	183	294	732	1 348	3 329	668	348	1 788				
NL	10 499				1 288	3 555	6 846	7 401	9 694	14 302	16 205	37 531	123 576
AT	1 740			344	687	1 469	3 991	8 832					
PL	1 199	184	382	662	1 276	2 428	5 980	15 934	26 857	43 068	47 886	93 386	
PT	1 356	317	490	778	1 584	2 630	4 835	11 077					
RO	913	207	400	634	1 486	3 589	12 432	29 881	52 377	72 494	99 976	135 363	
SI	594	244	271	457	662	1 573	3 975						
SK	35 289				2 642	5 231	14 355	32 092	66 835	76 514	119 732	179 025	
FI	2 020		461	792	2 091	2 006	2 896	4 397	7 765				
SE	4 291			454	1 278	2 451	5 241	10 251	10 493	21 554	21 138	28 205	
EU27	3 034	224	510	841	1 526	3 024	6 798	13 748	20 353	26 127	37 055	56 470	111 759

**TABLE 2b. FADN-survey based costs of crop protection materials, €/ha annually (SE300/SE025), by classes of economic size of farms (classes of Standard Output) for EU27 Member States**

The results are calculated as averages for years 2018-2020.	Annual average for FADN survey	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
		4 000 - < 8 000 EUR	8 000 - < 15 000 EUR	15 000 - < 25 000 EUR	25 000 - < 50 000 EUR	50 000 - < 100 000 EUR	100 000 - < 250 000 EUR	250 000 - < 500 000 EUR	500 000 - < 750 000 EUR	750 000 - < 1 000 000 EUR	1 000 000 - < 1 500 000 EUR	1 500 000 - < 3 000 000 EUR	>= 3 000 000 EUR
BE	164					143	123	152	211	247	360	571	
BG	63	46	37	33	39	43	57	66	67	72	77	75	72
CZ	93		18	34	34	64	74	65	99	102	101	110	119
DK	95			43	65	58	87	102	95	88	96	112	153
DE	94				53	67	83	101	113	115	125	107	100
EE	33	2	4	5	13	21	34	37	44		47	52	
IE	19		3	5	9	20	27	43					
EL	105	75	104	118	103	107	130						
ES	71		66	58	62	57	57	105	122	129	126	291	603
FR	110			139	54	61	99	134	177	205	271	277	
HR	80	69	75	62	80	82	88	64					
IT	104		66	75	83	92	100	151	141	185	193	176	160
CY	97	132	128	123	69	72	130						
LV	43	4	5	10	13	26	45	79	94				
LT	44	6	8	13	26	40	65	87	111				
LU	55				46	74	56	47	58				
HU	80	51	55	60	58	62	76	83	93	111	160	123	116
MT	235	93	137	257	327	657	214	110	762				
NL	264				88	188	220	166	158	230	281	737	2 159
AT	52			19	28	41	78	110					
PL	61	24	36	43	55	63	84	105	126	101	126	138	
PT	58	49	45	50	53	56	49	136					
RO	52	47	47	39	42	43	55	60	61	61	60	70	
SI	56	48	33	44	43	67	114						
SK	79				39	42	59	61	82	76	94	91	
FI	30		19	19	33	26	28	35	52				
SE	41			14	26	32	38	52	39	67	59	56	
EU27	82	39	46	51	55	61	81	109	121	122	123	128	135

**Table 3. Average number of persons working on farms (including managers and family members) and share of farms by their annual theoretical turnover (in EUR)**

	Average number of persons working on farms			Share of farms by their annual theoretical turnover		
	<8000	>8000 - to <250.000	>250.000	<8000	>8000 - to <250.000	>250.000
<b>BE</b>	1.46	1.65	2.61	6.29%	63.89%	29.82%
<b>BG</b>	1.91	2.65	12.06	80.81%	17.68%	1.51%
<b>CZ</b>	1.94	2.65	26.02	31.50%	57.68%	10.86%
<b>DK</b>	1.30	1.51	4.27	11.50%	66.56%	21.91%
<b>DE</b>	1.51	2.00	4.20	10.51%	70.38%	19.11%
<b>EE</b>	1.75	2.18	13.91	65.99%	30.42%	3.47%
<b>IE</b>	1.69	2.00	2.89	31.67%	65.27%	3.06%
<b>EL</b>	1.62	2.01	5.15	67.70%	32.15%	0.15%
<b>ES</b>	1.90	1.96	4.64	52.89%	44.42%	2.69%
<b>FR</b>	1.33	1.72	3.16	18.87%	64.92%	16.20%
<b>HR</b>	2.18	2.68	9.86	69.14%	30.28%	0.57%
<b>IT</b>	1.48	1.96	4.53	50.57%	46.65%	2.78%
<b>CY</b>	1.96	2.43	5.85	81.22%	17.64%	1.17%
<b>LV</b>	1.99	2.88	14.65	76.85%	22.04%	1.12%
<b>LT</b>	1.44	1.94	22.81	75.94%	23.42%	0.65%
<b>LU</b>	1.50	2.20	3.25	8.21%	62.56%	29.23%
<b>HU</b>	1.64	2.37	19.24	83.25%	15.96%	0.79%
<b>MT</b>	1.53	2.23	4.00	84.43%	15.04%	0.64%
<b>NL</b>	2.03	2.27	4.04	4.17%	48.24%	47.59%
<b>AT</b>	1.90	2.59	4.95	31.31%	66.73%	1.97%
<b>PL</b>	1.94	2.54	7.94	64.79%	34.55%	0.66%
<b>PT</b>	2.10	2.67	9.05	72.84%	25.96%	1.20%
<b>RO</b>	1.72	2.46	11.02	94.57%	5.32%	0.11%

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<b>SI</b>	2.57	3.09	8.52	58.83%	40.83%	0.36%
<b>SK</b>	1.79	2.33	24.08	68.28%	26.50%	5.18%
<b>FI</b>	1.85	2.23	4.15	23.60%	70.79%	5.61%
<b>SE</b>	1.61	2.10	4.09	39.10%	52.91%	7.98%
<b>EU27</b>	1.75	2.15	4.92	68.33%	28.99%	2.68%

**Table 4: Share of farms in the different economic size classes**

Share of farms in the different economic size classes	< 8000 €	>8000 - < 250,000€	> 250,000€
<b>European Union - 27 countries (from 2020)</b>	65.59%	31.16%	3.25%
<b>Belgium</b>	6.25%	63.61%	30.17%
<b>Bulgaria</b>	67.27%	30.34%	2.40%
<b>Czechia</b>	38.29%	51.54%	10.10%
<b>Denmark</b>	30.49%	50.58%	18.90%
<b>Germany</b>	15.80%	65.26%	18.93%
<b>Estonia</b>	53.56%	40.99%	5.28%
<b>Ireland</b>	29.77%	65.96%	4.29%
<b>Greece</b>	63.25%	36.43%	0.31%
<b>Spain</b>	49.12%	47.46%	3.42%
<b>France</b>	14.21%	66.10%	19.69%
<b>Croatia</b>	73.05%	26.54%	0.42%
<b>Italy</b>	36.72%	59.61%	3.67%
<b>Cyprus</b>	79.24%	19.00%	1.73%
<b>Latvia</b>	77.82%	20.88%	1.30%
<b>Lithuania</b>	75.03%	24.04%	0.92%
<b>Luxembourg</b>	13.83%	60.11%	25.53%
<b>Hungary</b>	67.94%	30.26%	1.80%
<b>Malta</b>	81.57%	17.52%	0.78%
<b>Netherlands</b>	5.98%	44.97%	49.07%
<b>Austria</b>	24.52%	72.48%	3.01%
<b>Poland</b>	63.91%	35.19%	0.90%
<b>Portugal</b>	71.87%	26.60%	1.53%

<b>Romania</b>	93.67%	6.18%	0.15%
<b>Slovenia</b>	65.09%	34.52%	0.41%
<b>Slovakia</b>	58.28%	34.69%	7.03%
<b>Finland</b>	27.31%	66.27%	6.44%
<b>Sweden</b>	38.05%	53.24%	8.73%

**Table 5: Share of agricultural area in the different economic size classes**

Share of agricultural area in the different economic size classes			
	< 8000 €	>8000 - < 250,000€	> 250,000€
<b>European Union - 27 countries (from 2020)</b>	9.97%	55.97%	34.06%
<b>Belgium</b>	0.58%	46.96%	52.46%
<b>Bulgaria</b>	5.38%	38.85%	55.77%
<b>Czechia</b>	2.08%	25.39%	72.53%
<b>Denmark</b>	2.61%	31.37%	66.01%
<b>Germany (until 1990 former territory of the FRG)</b>	2.00%	40.24%	57.76%
<b>Estonia</b>	7.03%	44.34%	48.63%
<b>Ireland</b>	10.91%	76.15%	12.95%
<b>Greece</b>	15.55%	55.44%	29.01%
<b>Spain</b>	8.30%	71.13%	20.57%
<b>France</b>	2.53%	58.97%	38.50%
<b>Croatia</b>	17.31%	51.84%	30.85%
<b>Italy</b>	7.21%	65.84%	26.95%
<b>Cyprus</b>	26.14%	53.65%	20.20%
<b>Latvia</b>	16.86%	48.41%	34.72%
<b>Lithuania</b>	16.71%	56.71%	26.58%
<b>Luxembourg</b>	0.75%	44.20%	55.05%
<b>Hungary</b>	8.06%	51.97%	39.97%
<b>Malta</b>	60.92%	36.94%	2.14%
<b>Netherlands</b>	0.54%	23.96%	75.50%
<b>Austria</b>	5.53%	84.79%	9.68%
<b>Poland</b>	21.32%	64.12%	14.56%

<b>Portugal</b>	15.28%	58.00%	26.72%
<b>Romania</b>	30.26%	40.79%	28.95%
<b>Slovenia</b>	27.51%	64.91%	7.58%
<b>Slovakia</b>	3.14%	22.10%	74.76%
<b>Finland</b>	6.09%	75.35%	18.55%
<b>Sweden</b>	5.61%	50.70%	43.69%

Table 6: Share of farms in the different area size classes

Share of farms in the different area size classes	Zero ha	>0 - < 5 ha	>5 - < 50 ha	> 50 ha
<b>European Union - 27 countries (from 2020)</b>	1.39%	62.39%	28.74%	7.47%
<b>Belgium</b>	1.94%	11.58%	60.06%	26.42%
<b>Bulgaria</b>	4.11%	59.91%	25.90%	10.07%
<b>Czechia</b>	1.63%	23.63%	46.97%	27.78%
<b>Denmark</b>	2.70%	16.02%	50.39%	30.90%
<b>Germany</b>	1.49%	6.68%	60.28%	31.54%
<b>Estonia</b>	2.11%	8.27%	63.41%	26.12%
<b>Ireland</b>	-	5.66%	74.63%	19.71%
<b>Greece</b>	1.02%	73.02%	24.86%	1.10%
<b>Spain</b>	0.87%	50.68%	36.83%	11.62%
<b>France</b>	1.14%	18.50%	34.40%	45.96%
<b>Croatia</b>	2.08%	68.53%	26.57%	2.83%
<b>Italy</b>	1.10%	63.00%	31.42%	4.48%
<b>Cyprus</b>	1.15%	86.37%	11.19%	1.35%
<b>Latvia</b>	2.49%	44.46%	43.56%	9.48%
<b>Lithuania</b>	1.28%	48.89%	41.35%	8.49%
<b>Luxembourg</b>	2.66%	13.83%	31.38%	52.66%
<b>Hungary</b>	7.87%	57.02%	27.26%	7.85%
<b>Malta</b>	3.79%	92.81%	3.40%	0.00%
<b>Netherlands</b>	2.58%	17.36%	56.25%	23.82%
<b>Austria</b>	0.49%	20.32%	68.23%	10.98%
<b>Poland</b>	0.32%	51.97%	44.60%	3.11%
<b>Portugal</b>	1.39%	72.00%	22.26%	4.35%
<b>Romania</b>	1.58%	88.74%	8.74%	0.94%
<b>Slovenia</b>	1.19%	60.76%	37.13%	0.95%

<b>Slovakia</b>	8.46%	31.48%	42.23%	17.88%
<b>Finland</b>	0.55%	2.52%	63.64%	33.31%
<b>Sweden</b>	0.88%	9.87%	64.45%	24.83%

**Table 7: Share of utilised area in the different area size classes**

	< 5 ha	5 -< 50 ha	> 50 ha
<b>European Union - 27 countries (from 2020)</b>	5.78%	26.07%	68.15%
<b>Belgium</b>	0.86%	35.00%	64.14%
<b>Bulgaria</b>	2.51%	13.67%	83.83%
<b>Czechia</b>	0.33%	7.10%	92.58%
<b>Denmark</b>	0.63%	12.62%	86.75%
<b>Germany</b>	0.22%	18.93%	80.85%
<b>Estonia</b>	0.29%	12.14%	87.57%
<b>Ireland</b>	0.48%	44.80%	54.72%
<b>Greece</b>	16.87%	43.50%	39.64%
<b>Spain</b>	3.80%	23.49%	72.71%
<b>France</b>	0.54%	10.80%	88.66%
<b>Croatia</b>	12.55%	32.76%	54.69%
<b>Italy</b>	10.28%	42.28%	47.44%
<b>Cyprus</b>	25.99%	38.07%	35.94%
<b>Latvia</b>	3.52%	22.68%	73.80%
<b>Lithuania</b>	5.39%	26.47%	68.14%
<b>Luxembourg</b>	0.42%	9.59%	90.00%
<b>Hungary</b>	3.88%	19.76%	76.36%
<b>Malta</b>	78.78%	20.00%	0.00%
<b>Netherlands</b>	1.23%	36.53%	62.24%
<b>Austria</b>	2.32%	57.83%	39.85%
<b>Poland</b>	11.70%	52.98%	35.32%
<b>Portugal</b>	9.22%	22.54%	68.24%
<b>Romania</b>	22.85%	23.17%	53.98%
<b>Slovenia</b>	19.95%	65.10%	14.95%

<b>Slovakia</b>	0.71%	6.87%	92.43%
<b>Finland</b>	0.11%	27.94%	71.95%
<b>Sweden</b>	0.71%	20.96%	78.34%

## Chapter 3 – Alternatives to chemicals

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### Summary

This chapter will address part of Article(1)(e) of the Council Decision, which requests that the Commission address the aspect of the availability of alternatives to plant protection products. The second part of this point on the potential increased risk of introduction and spread of harmful organisms in the Union is dealt with under Chapter 4 - Sensitive Areas.

The Staff Working Document as well as the Impact Assessment accompanying the SUR proposal acknowledge the need for alternatives to chemical pesticides and that more research and policy actions are needed to increase the availability of alternatives to support the transition to more sustainable practices.

Section 4 ‘Tools for the transition to low-pesticide food systems’ of Chapter 1 nonetheless highlights how existing technologies already allow for targeted, and thus reduced, applications of pesticides, or provide alternatives to pesticides altogether. For example, improvements in decision support systems already reduce pesticide needs by over 50 %, precision farming tools allow for reductions of up to 96 % in certain crops. Moreover, it concludes that resistant plant varieties, when included in a system-wide rethinking of crop protection, allow for significant reductions of pesticides, and new breeding techniques would increase the availability of such varieties. In general, it recognises that a successful transition must build on the diversity of knowledge on complementary strategies for crop protection, which is overarchingly formulated in the Integrated Pest Management (IPM) principles.

This chapter describes a number of ongoing and future actions which are being undertaken in parallel with the SUR proposal that will help with facilitating and accelerating market access for low-risk plant protection products through easier approval systems, simplified data requirements and risk assessment and capacity building in Member States. Concrete additional actions which can immediately be taken by the different players in the approval process for low-risk active substances and plant protection products are listed at the end of the document, as are the provisions in the existing SUR proposal that will also facilitate this transition. The Commission’s research, dissemination and training projects on bio-control, low pesticide input management

systems such as integrated pest management and organic farming, as well as new plant breeding technologies, will help farmers and other pesticide users to engage in more sustainable agriculture with reduced chemical pesticide use.

## 1. Ongoing actions

### (a) Facilitating market access for low-risk plant protection products

The current legislation on plant protection products (Regulation (EC) No 1107/2009) already provides incentives to develop low-risk active substances, with both an easier approval system and a longer initial approval period. Four **Implementing Regulations** in force since November 2022 further simplify data requirements and risk assessment principles for living micro-organisms such as bacteria, fungi and viruses used in plant protection products, which cover most current biocontrol approvals. They are expected to ease the administrative burden for submission of dossiers, reduce costs for applicants and Member States, and accelerate the processing of approval and authorisation requests.

Already today ca. 170 (37%) out of the total 453 EU-approved active and basic substances are 'natural means of biological origin or substances identical to them' and are therefore not considered as 'chemical' for use reduction purposes under the SUR targets. As these substances are already approved, Member States could swiftly authorise products containing them to a much larger extent than they currently do, to increase the range of uses.

It is also worth noting that new biological control solutions will be coming to the market: 65 applications for first time approval of active substances are currently under evaluation (ca. 30 fall into the category of biocontrol as defined under the SUR proposal). Depending on progress with the evaluations by Member States and EFSA, these could be approved in the course of the coming months or years.

Furthermore, according to information received from 26 companies<sup>84</sup> of the International Biocontrol Manufacturers Association (IBMA), new applications for approval of 79 new biocontrol active substances (as defined under the SUR) and 54 extensions of uses of existing substances are expected before 2028. These will have significant potential to replace chemical pesticides in a range of crops, including in field crops such as cereals and oilseed. According to the crops/pests targeted by these innovations, the size of the agricultural surfaces that could potentially be treated would be around 30 million ha (ca. 20% of the total), out of which 23 million ha would be used for arable crops.

In addition to changing the regulatory framework further steps are being taken to facilitate the approval process for micro-organisms and products containing them:

1. **Simplification of dossier-preparation by applicants.** Two communications have been endorsed by the Standing Committee on Plants, Animals, Food and Feed on 22-23 March and several explanatory notes are expected to be endorsed before the end of 2023. These documents will facilitate and harmonise the dossier-preparation in line with the aforementioned implementing Regulations on micro-organisms.

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<sup>84</sup> 26 companies representing 15% of the 160 companies actively developing biocontrol substances

2. **Capacity building for Member States.** As part of the Commission ‘*Better Training for Safer Food*’ (BTSF) initiative<sup>85</sup>, training opportunities are available to Member State experts to build expertise in conducting risk assessments of micro-organisms used as pesticides (8 sessions with 152 participants so far) and further training under this initiative is foreseen after 2024. In addition, the Commission has also launched a call for proposals under the Single Market Programme for **financial grants** to Member States (EUR 10 million over 5 years) to boost their expertise and capacity for conducting assessments of active substances and plant protection products – with particular emphasis on micro-organisms in order to reduce delays in the access to the market of alternatives to chemical pesticides.
- (b) Development and dissemination of sustainable agricultural practices such as organic farming, biological control and IPM
1. **Support to Organic Farming.** The European Commission Farm to Fork strategy sets a target of ‘at least 25% of the EU’s agricultural land under organic farming’ to be achieved by 2030. As demonstrated in section 2.5 ‘Organic farming’ of Chapter 1, this significant increase in the area under organic farming will significantly contribute to achieving the targets of the SUR proposal and offers alternatives to the use of chemical pesticides and a framework of financial support under the CAP. In April 2021, the Commission put forward an Action Plan on Organic Farming, which the Commission is implementing to help the organics sector reach its full potential. Moreover, under the CAP Strategic Plans, Member States have included support for the conversion and maintenance of organic farming.
  2. **Development and dissemination of Integrated Pest Management (IPM) practices.** IPM is seen as one of the cornerstones of the SUR proposal and one of the key actions to contribute to the reduction in pesticide use and risk. IPM requires farmers to have a range of tools available, and be informed of these, to facilitate making decisions that will ensure chemical pesticides are only used as a last resort. The European Commission has recently published a [database presenting an overview of the IPM methods currently available, including the “crop-specific guidelines” developed by Member States in the implementation of the SUD, accompanied by a study assessing their effectiveness and prospects for their further uptake.](#) This overview of practices, established following a two year project [Pilot Project ‘IPM Toolbox for farmers’](#)<sup>86</sup>, shows that there is a great variety in the uptake and implementation options for IPM across EU countries. This toolbox is intended to inspire national authorities, farm advisors, etc. to develop and implement IPM approaches after adapting them to local/regional farm and agro-climatic conditions. The database, hosted on the [JRC’s Data-Modelling platform of resource economics](#), will be updated with additional examples on a regular basis.
  3. **Development of IPM crop-specific rules.** The Commission intends launching a project under the [LIFE](#) Programme to support Member States in developing crop-specific rules which are proposed to be required by the Commission SUR proposal. The call for proposals was published on 18 April 2023, envisaging the project start in early 2024. The Horizon

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<sup>85</sup> BTSF ACADEMY online training platform: <https://better-training-for-safer-food.ec.europa.eu/training/?redirect=0>

<sup>86</sup> [https://agriculture.ec.europa.eu/news/using-less-chemical-pesticides-european-commission-publishes-toolbox-good-practices-2023-02-28\\_en](https://agriculture.ec.europa.eu/news/using-less-chemical-pesticides-european-commission-publishes-toolbox-good-practices-2023-02-28_en)

Europe project [SUPPORT](#) will also contribute to the development of an inventory of IPM tools and co-create strategies to apply IPM, working together with the entire agrifood-chain.

4. **IPM training.** Several specific training sessions on IPM (20 sessions with 545 participants) under the Better Training for Safer Food (BTSF) initiative have been organised since 2018 and will be running until the end of 2023. (An extension beyond 2023 is currently being considered). This training programme, targeted at national officials and agricultural advisors, helps improve IPM implementation at farm level and assists controls by competent authorities. In addition, BTSF training on the testing of pesticide application equipment has been running since 2019 and will be ongoing until 2025. So far, 5 sessions were organised with a total of 96 participants attending. BTSF training is built on the cascade principle to train the trainers. Participants commit to disseminating the knowledge gained as part of their engagement in the programme. This results in a substantially larger number of trained persons than the headline figures.
5. **Dissemination and networking of sustainable practices** is of utmost importance to help farmers, advisors and other stakeholders in the transition towards a greater uptake of non-chemical plant protection methods. The Horizon 2020 project [IPM Works](#) has set an EU-wide network of farmers to demonstrate and promote the benefits of IPM practices. Moreover, through the Innovation and Knowledge Exchange/agricultural European Innovation Partnership (EIP-AGRI) strand of the [EU CAP Network](#) (previously EIP-AGRI Network), the Commission provides support and promotes, through the organisation of workshop, seminars and focus groups, the exchange and dissemination of best practices among Member States and other stakeholders. Several [EIP-AGRI](#) networking activities were organised over the past years helping farmers to produce with a reduced use of chemical pesticides. In this regard, a special newsletter focusing on pesticide reduction was issued in September 2022<sup>87</sup>.

The following are some examples of EIP-AGRI focus groups whose activities were summarised in reports containing several good practices and recommendations to facilitate the transition towards a reduced use of pesticides<sup>88</sup>:

- [Integrated Pest Management \(IPM\) - Focus on Brassica species.](#) This group focused on winter oilseed rape and the three most important Brassica vegetables, cauliflower, broccoli and white cabbage. In its final report (January 2016), it was concluded that although effective non-pesticidal approaches were still limited in number for these species, and IPM strategies such as biocontrol products, natural enemies of pests, and general pest resistance were deemed to need further exploration, the use of proper preventive IPM measures could contribute to better management of problems in Oilseed rape and Brassica vegetables. Efforts were suggested to focus on a few growers which would be leaders in the IPM strategy implementation. Their success would push other growers to follow their example.
- [Non-chemical weed management in arable cropping systems:](#) the Focus Group, in its final Report (March 2020), identified various good practices in relation to redesigning the cropping system, through a proper use of crop rotation and cover crops, including intercropping, crop sowing patterns, sowing time adjustments and fertilisation and a

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<sup>87</sup> Newsletter 106, [EN FR DE SK](#)

<sup>88</sup> A more comprehensive list of activities can be found on a dedicated [site](#).

choice of weed-suppressive and tolerant varieties of crops. This is recommended as using the competitiveness of a crop either for being weed-suppressive or weed-tolerant is a relevant way to reduce the need for more invasive type of weed management.

- [Optimising profitability of crop production through Ecological Focus Areas](#). In its report (March 2016) this Focus Group studied how landscape features contribute to the profitability of arable crop production. In the report landscape features were considered to comprise the following: i) ‘field margins’, the spontaneously established strips of herbaceous plants at the edge of fields; ii) ‘hedgerows’, composed of one or two rows of planted or naturally established shrubs and/or trees, and; iii) ‘grassy or flower strips’, intentionally sown.
- [Organic farming – Optimising arable yields](#). This group analysed the issue of yield gaps in organic farming and in its final report (May 2014) included several proposals for further discussions in operational groups, recommendations for further research and practical solutions which have already implemented in some areas of Europe. The latter include, among others: farming systems co-design; information and decision support systems; how to increase soil microbial activity and biodiversity by farming techniques; fine-tuning of composting techniques, structuring of joint purchase and use of machinery; selection of locally appropriate robust varieties; development of innovative tillage techniques; fostering the use of companion planting and cover crops.
- [IPM practices for soil-borne diseases suppression in vegetables and arable crops](#). From November 2014 until September 2015, the Group evaluated the current state of the art on soil-borne diseases and brought together existing knowledge on innovative techniques to control soil-borne diseases caused by fungi and nematodes. In its final report (October 2015) it was concluded that the absence of an integrated approach to soil health and soil quality in general is the main cause of problems regarding soil-borne diseases. A lack of awareness and knowledge along the production chain, resulting in a lack of knowledge-based planning, monitoring and a lack of preventive measures leads to a reactive approach. The guiding principle should be to enhance soil health on a constant basis rather than a reactive approach where incidents are only managed a soil-disease develops. IPM of soil-borne diseases is knowledge-intensive, so effective knowledge exchange is crucial and, in this respect, it is important to communicate about ‘permanent success stories’.
- [Sustainable ways to reduce the use of pesticides in pome and stone fruit production | EIP-AGRI \(europa.eu\)](#).
- As part of this dissemination strategy, the EU CAP Network workshop “[Innovative arable crop protection – using pesticides sustainably](#)”, taking place from 19 to 21 April 2023, will focus on exchanging knowledge and sharing innovative, inspirational practices that support farmers, advisors and other stakeholders to ensure a greater uptake of non-chemical plant protection methods in arable crops by using economically and ecologically sustainable approaches.

(c) Research, innovation and knowledge exchange

Priority is given to research actions supporting the Green Deal objectives. Specifically, the EU has supported R&I and knowledge exchange in the area of plant health and plant protection through various instruments and these are summarised as follows:

1. **Horizon 2020<sup>89</sup> and Horizon Europe<sup>90</sup>**: The EU Research and Innovation (R&I) funding Framework Programmes, Horizon 2020 and Horizon Europe, support actions to develop a wide range of tools for prevention, early detection, monitoring, control and management of plant pests and diseases, along with promoting breeding of plant varieties with improved characteristics like pest resistance, and crop management strategies. It also financed a project focused on organic farming: [RELACS](#) (replacements of contentious inputs in organic farming systems) in which a significant reduction of one of the few pesticides used in organics was further reduced. Horizon 2020 has financed 30 projects with + EUR 160 million euros to protect plant health and promote integrated pest management. Over EUR 60 million were dedicated to plant health and plant protection in the first two years of Horizon Europe to finance 10 projects. Several projects implement the “[multi-actor approach](#)” to develop solutions which are more ready to be applied in practice, accelerating the transition and reaching end-users. Innovative solutions and practical knowledge are also made available to advisors and farmers through Thematic Networks<sup>91</sup> funded by EU R&I programmes. A non-exhaustive list of financed R&I projects is included in Annex 1.
2. **European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI)**: Innovation and knowledge exchange are supported through the EIP-AGRI Operational Groups funded under the Common Agricultural Policy. EIP-AGRI Operational Groups are project-based and support the development of innovations seeking solutions to a certain (practical) problem by groups of relevant actors in a bottom-up manner. From over 2788 Operational Groups, 475<sup>92</sup> are working on finding solutions for the sustainable use of pesticides. Examples of EIP-AGRI Operational Groups are accessible on the EU CAP Network website and found at the following links:
  - a [vineyard app for plant protection](#); the project (APPVID) ran between 2016 and 2018 in Spain, bringing together different types of organisations as partners, representing research and practice. In the first phase of the project, meteorological stations were installed on 9 experimental vineyard plots. In the second phase, disease data for mildew, powdery mildew and botrytis diseases were collected. In parallel, the different components for the mobile application were developed. Finally, the [mobile application was developed and made available](#).
  - [weed control with non-chemical alternatives](#); this Operational Group (HortInf), is trying to find non-chemical alternatives to conventional weed management that could be used by Portuguese farmers. It is one of 23 Operational Groups working on weed management.
  - [certification of pesticide residue free fruit & vegetables](#): AGroTrend, the Polish operational Group is developing a zero-residue certification system providing more detailed information to the consumer about the quality of the product they are buying while encouraging further uptake of farming techniques to protect the environment.
  - [alternatives for stone fruit, berries and table grapes](#): this Spanish Operational Group ‘FruitCare’ was created in 2020 and is aimed at establishing pesticide substitution programmes for fruit producers. The study considered the socio-economic impact of the

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<sup>89</sup> 2014-2020

<sup>90</sup> 2021-2027

<sup>91</sup> Examples of relevant Thematic Networks: [Innoseta](#), [Oper8](#), [SmartProtect](#).

<sup>92</sup> Data at 04.04.2023

strategies, allowing them to determine the real consequences of the suppression of active substances, as well as the suitability of the alternative strategies proposed, in each crop. Based on the outcomes of the project, the partners have designed and created 'Dissemination cards' for each of the pesticides illustrating which alternative processes or methods can be used instead of the pesticide.

- [controlling wireworms in potato production](#). This Austrian Operational Group has been carrying out trials to find alternative control measures for wireworm control in potatoes without using synthetic pesticides. The results seem encouraging as a reduction in the wireworm population can be achieved through the use of site-specific, multi-annual strategies using a combination of various measures. For example, through the use of attractive plants, wireworms gather in specific areas of the field and they can be dealt with in a targeted manner. The project has contributed to the development of forecast models to support the decision-making for the application of the different measures to control wireworm damage. These models have been widely shared amongst farmers and farm advisors in Austria.
3. **Digital Europe programme:** Specific financial support for new technologies and precision farming tools is also part of the [Digital Europe Programme](#) which is a new EU funding programme focused on bringing digital technology to businesses, citizens and public administrations. The Digital Europe Programme is implemented by means of multiannual work programmes in 2023-2024, with a total budget of EUR 909,5 million. Actions under the Work programme 2023-2024 will boost the number of education and training opportunities for "users of advanced digital technologies", such as farm advisors exploiting the potential of precision farming technologies or software experts with specific automotive expertise.

## 2. Possible additional actions for accelerating access to the market of new biological control solutions

Looking forward to the need for additional action in the time period of the 2030 reduction targets, consideration needs to be given to the fact that authorisation and approval requires actions from a number of players. The following summary suggests actions that need to be taken by each of these to accelerate bringing alternatives to the market:

### (a) By applicants:

- Actively seek pre-submission meetings with Member States when preparing application dossiers to agree on the appropriate content (considering all possibilities for adaptation of data requirements) and agree on submission schedules
- Prepare high-quality dossiers with the content agreed with Member States in pre-submission meetings and submit at the foreseen points in time
- Once an active substance is approved, submit applications for product authorisation in all or the maximum number of Member States covering all relevant crops to increase availability

(b) By Member States:

- As mentioned under point Ia, Member States could authorise more plant protection products containing ‘natural means of biological origin or substances identical to them’ already approved at EU level and for a wider range of uses than they currently do.
- Increase capacity in human resources (number of staff and expertise) to assess applications for biocontrol solutions so that more Member States than today can act as rapporteur Member States for approval or as reference Member State for zonal authorisation of products. This would then mean that approvals would be spread across more Member States and would reduce difficulties caused by only one or two Member States conducting the assessment.
- Further exploit the existing provision under Regulation 1107/2009 for mutual recognition of authorisations granted by neighbouring countries (as is done for example by Ireland and Luxembourg) and/or of authorisations granted by any other Member State in the respective zone for biocontrol products.
- Further use provisions under Art 40 (2) of Regulation (EC) No 1107/2009 to recognise authorisations from other Member States on application of third parties (such as farmers associations) or by authorities/public bodies
- Reduce fees for certain products to increase attractiveness for applications for authorisation – in particular for biocontrol products.
- Fully exploit the possibilities under Article 51 of Regulation (EC) No 1107/2009 to extend authorisations granted for major crops to minor crops on their own initiative.
- Agree to pre-submission meeting requests from applicants – and involve EFSA to avoid discrepancies later on. Examine all possibilities for adaptation of data requirements as foreseen in point 1.5 of the introduction to the Annexes to Regulations (EU) No 283/2013<sup>93</sup> and 284/2013<sup>94</sup>, respectively.
- Systematically prioritise applications for approval/authorisation of biological control solutions and deliver draft assessment reports (for approval) in 6 months instead of 1 year as foreseen in Article 11(1) of Regulation (EC) No 1107/2009 and within 120 days for product authorisations. The establishment of separate approval streams is one example of a practice that can be adopted by Member States to assist in this.
- Provide incentives for submission of applications for authorisation of biological solutions (e.g. lower fees – or payment of fees in instalments, fast decisions on applications for mutual recognition of products already authorised by another Member State).

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<sup>93</sup> 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 (OJ L 93, 3.4.2013, p. 1).

<sup>94</sup> Commission Regulation (EU) No 284/2013 of 1 March 2013 setting out the data requirements for plant protection products, 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 (OJ L 93, 3.4.2013, p. 85).

(c) By EFSA:

- Increase expertise to assess applications for biocontrol solutions.
- Participate in pre-submission meetings between Member States and applicants on dossier composition to identify data gaps at an early stage rather than them being discovered after delivery of the draft assessment reports.

(d) By the Commission:

- Continue providing capacity building for Member States (if so desired by them) through ‘*Better Training for Safer Food*’ (BTSF) to build expertise in conducting risk assessments for biocontrol solutions.
- Consider simplifying data requirements and assessment methodologies for more biocontrol substance categories. Similarly to what has been done on micro-organisms, targeted amendments of Regulations (EU) 283/2013 and 284/2013 (data requirements) and Regulation (EC) 547/2011 (uniform principles) could simplify and speed up the system of approval for semiochemicals (pheromones), plant extracts or other biocontrol active substances (such as peptides/proteins). This would benefit the swifter access of such biocontrol products to the market following fit-for-purpose risk assessment while keeping the level of protection of human health and the environment high. Amendments, if found necessary, could be based on the experience gained with the application of the existing guidance documents and/or the experience gained by rapporteur Member States having conducted assessments.
- Set up a meeting with smaller Member States who cite problems with availability of (biocontrol) plant protection products to explain how the existing provisions in Regulation (EC) No 1107/2009 can be better utilised for mutual recognition of authorisations granted by other Member States and sharing best practices from Member States with positive experience.

(e) By the European Parliament and the Council:

In the context of the inter-institutional negotiations of the SUR proposal the Council and Parliament could consider making targeted amendment of Regulation (EC) No 1107/2009, as Articles of the existing SUR text, in order to:

- **Set shorter timelines** for Member States in Article 11(1) of the Regulation to deliver draft assessment reports for new biocontrol active substances (e.g. 6 months), which would reduce the time to market for new biocontrol active substances and products containing them.
- **Allow provisional authorisations for biocontrol products** as formerly foreseen in Article 30 of the Regulation: if the Rapporteur Member State establishes that a new biocontrol active substance meets the approval criteria, all Member States could grant provisional authorisations for products containing it until the approval process is completed and regular authorisations granted, which would mean that biocontrol products could be placed on the market and used significantly faster and well before a regular authorisations would be granted.

- **Unlimited approvals for biocontrol active substances.** Approvals of biocontrol active substances could be made unlimited in time by modifying Article 5, as is already the case for basic substances. This would immediately free resources in companies to invest in the development of new active substances, and in Member State authorities for the evaluation of new applications.

(f) Facilitating new plant varieties:

Plant breeding and the availability of suitable cultivars with traits of resistance to certain pests is one of the tools that enables decisions to be made in applying IPM that reduces later the need for pesticide application. There are two considerations of action to support this:

- **Plant Breeding.** The Commission is revising the legislation on plant and forest reproductive material, with the aim to modernise it and to better align it with the goals of the European Green Deal and the Farm to Fork, ensuring a sustainable agri-food production. A proposal on plant and forest reproductive material is expected to be adopted in June 2023 and it intends, among others, to introduce sustainability criteria in the variety registration for plant reproductive material and approval of basic material (forest reproductive material) and to simplify procedures, harmonise the official controls, and improve coherence with the plant health and the organic regulations.
- **New Genomic Techniques.** New Genomic Techniques (NGT) appear to have the potential to reduce the development time and costs of new varieties and, more importantly, to enable the introduction of multiple resistance genes into plant varieties. This could allow for significant reductions of pesticides, e.g. fungicides by 80 to 90 percent, without affecting yields (Haverkort et al., 2016; Kessel et al., 2018). The Commission plans to bring forward a legal proposal on their use during 2023, based on the outcome of the impact assessment and considering the views of all stakeholders including conventional and organic farmers.

(g) Research and innovation:

1. **Horizon Europe.** Under its work programme 2023-2024, Horizon Europe provides several funding opportunities for the development of alternatives, including breeding, farming and management practices, supporting the transition to sustainable and biodiversity-friendly farming systems. The following topics for proposals are of particular relevance and selected projects will start indicatively from the fourth quarter of 2023, will last between three to five years and are expected to deliver throughout their lifetime:

- [Innovations in plant protection: alternatives to reduce the use of pesticides focusing on candidates for substitution:](#) (EC indicative budget EUR 10 million) Projects are expected to contribute to i) increased availability of widely accessible and cost-efficient alternatives for prevention and (bio)control of plant pest with improved environmental performance (e.g. reduced effects on non-target organisms, natural resources, humans and the environment); ii) reduced reliance on hazardous plant protection products and favour low risk plant protection solutions, to sustain crop productivity and food security while contributing to sustainable agriculture and/or forestry; and iii) minimized pesticides impact on human and animal health, terrestrial and aquatic ecosystems, drinking water, soils and the food chain.

- [Developing EU advisory networks to reduce the use of pesticides](#) (EC indicative budget EUR 4 million) The project will connect advisors possessing a broad and extensive network of farmers across all EU Member States in an EU advisory network dedicated to pesticide use and risk reduction, including farming techniques which support pesticide use and risk reduction, with a view to sharing experiences on how to best tackle the issues, building on the outcomes of the EIP-AGRI Focus Groups and Workshops as well as the Horizon 2020 Thematic networks related to pesticide use and risks reduction;
- [Biodiversity friendly practices in agriculture – breeding for Integrated Pest Management \(IPM\)](#) (EC indicative budget EUR 10 million) aims to boost the development of plant varieties with tolerance of, or resistance to, relevant pests and diseases, with the goal of reducing reliance on chemical pesticides.
- [Increasing the availability and use of harmless inputs in organic farming](#) (EC indicative budget EUR 12 million) aims to develop, test and put in the place alternative products and solutions for harmful substances such as copper fungicides in use in organic crop production.

In addition, under Horizon Europe, a co-funded partnership with EU Member States on [Agroecology](#) called “Accelerating Farming Systems Transition: Agroecology Living Labs and Research Infrastructures” is expected to be launched at the end of 2023 or beginning of 2024, with a total indicative EC contribution of EUR 150 million. The overall aim of the partnership will be to enhance the knowledge base and deliver solutions and tools that will underpin the agroecology transition in Europe. The partnership will tap into the potential of agroecology to reduce and phase out the use of pesticides and mineral fertilisers and close nutrient cycles, while preserving natural resources.

### 3. Actions described in the SUR proposal:

It should be noted that various aspects of the existing SUR proposal are designed to incentivize, support and encourage the bringing to the market of alternatives, and to facilitate their availability to the professional user. In addition, various measures are suggested above for amendments to the proposal that would further accelerate this process.

- Art 3 23) For the first time the SUR proposal provides a definition of Biological Control. This is a broad and inclusive definition and is designed to provide clarity on what is biological control and to allow inclusion of a broad range of substances, some of which are relatively new to the market (such as peptides). This is of further importance because the following Articles deal with a reduction target for reduction of chemical pesticides and thus any biocontrol substances are not included in the target.

- Art 4 Union Reduction Targets and Article 5 Member State Reduction Targets. The establishment of legally binding targets for 2030 is intended to incentivise the transition from more hazardous to less hazardous substances and setting the target for only chemical pesticide reduction is intended to result in biological control being prioritised.

- Art 8 National Action Plans transfer these targets to relevant Member State specific action. Art 8 specifies that the plans should contain information on Member State measures for encouraging the use of non-chemical methods, and measures to support innovation and development in this area. Art 9 further requires the setting of national reduction targets which include a target for increasing the non-chemical methods for the main crops and pests specific to the Member State situation in its efforts to achieve the reduction targets under Art 5, and for a national target for increasing the percentage of overall sales of pesticides that are not chemical pesticides.

Chapter 5 covers provisions for Integrated Pest Management and enforces the principle of a hierarchy of measures with Chemical Interventions as a last resort. The addition of record keeping and of crop specific rules is intended, along with the support measures described in this paper, to increase the uptake, implementation, and official controls of this crucial requirement.

The system of independent advice on IPM (Article 26) and information at the point of sale (Art 24) additionally provide a framework for relevant information to be made available to the professional user to assist in making decisions on use of biocontrol or alternative control methods

#### **4. Conclusion**

The provision of alternatives and making them public and well-known by all actors, in first row farmers and advisors, is key to providing an array of tools to facilitate decision making in the framework of applying Integrated Pest Management. Just as important is the dissemination of knowledge and tools available to facilitate decision making. Several actions to increase the knowledge and the spreading of holistic IPM principles and relevant tools are already underway, strongly supported by research and innovation, together with important legislative initiatives aimed at increasing the number of low risk and biocontrol substances available on the market in the medium term. The bringing of new products to the market requires actions to be taken by the Commission in the context of the legislative framework, but also by industry and Member States in submitting and approving pesticides within the legislative timelines. The Commission has a number of actions underway that already establish a legal framework for accelerated approvals of low risk and biocontrol substances and is taking steps to expand this further. The SUR proposal is already designed to increase the availability of these through encouraging biological controls and establishing targets, and additional amendments could go further by amending some of the requirements of the existing Regulation 1107/2009. With this framework and with actions being taken by industry, Member State authorities as well as the Commission current information indicates that sufficient tools will be available generally within the timeframe of the 2030 targets to provide the reduction in chemical pesticide use and risk required.

## Annex 1

### EU funded R&I activities for healthy crops with a reduced use of chemical pesticides<sup>95</sup>

<p>Integrated Pest Management (IPM) and alternative solutions to reduce the use of chemical pesticides, including agroecological approaches</p>	<p><a href="#"><u>IPM DECISIONS</u></a> creates an online platform that is easy to use to monitor and manage pests supporting Integrated Pest Management. This project will give farmers and advisers access to an extensive range of existing Decision Support Systems adapted to regional conditions.</p> <p><a href="#"><u>IPM Works</u></a> with 31 partners has set up an EU-wide network of farmers to promote cost-effective IPM strategies. The project aims to demonstrate to other farmers that holistic IPM “works” and allows reducing the reliance on pesticides with better pest control, reduced costs and enhanced profitability.</p> <p><a href="#"><u>SuperPests</u></a> seeks innovative tools to control the most difficult-to-manage pests (super pests).</p> <p><a href="#"><u>OPTIMA</u></a> developed an optimised Integrated Pest Management to precisely detect and control plant diseases in perennial crops and open-field vegetables.</p> <p><a href="#"><u>NOVATERRA</u></a> investigates novel ways to reduce the use of pesticides in grapevines and olives.</p> <p>Alternatives to chemical pesticides are being developed by the projects <a href="#"><u>WELASER</u></a>, <a href="#"><u>BIOSCHAMP</u></a>, <a href="#"><u>NOVLGRAIN</u></a>, and <a href="#"><u>VIROPLANT</u></a>.</p> <p><a href="#"><u>PESTNU</u></a> deploys solutions and innovations like robotic traps, mobile robots for pesticide monitoring and 3D spot spraying to reduce the use of pesticides and fertilisers.</p> <p><a href="#"><u>SoildiverAgro</u></a> develops and deploys management practices that enhance soil biodiversity reducing the use of external inputs, like pesticides.</p> <p><a href="#"><u>IWMPRAISE</u></a> developed and optimised novel alternative weed control methods and create a ‘tool box’ of validated IWM methods and made results available to end users. Three additional upcoming Horizon Europe projects will continue to investigate the potential of agroecological practices for sustainable weed management.</p> <p><a href="#"><u>SUPPORT</u></a> aims to support the uptake of IPM and low-risk pesticide use.</p> <p><a href="#"><u>RELACS</u></a> and <a href="#"><u>Organic-PLUS</u></a> have investigated and developed alternatives to the use of contentious inputs in organic farming systems.</p>
<p>Plant Pests</p>	<p>Several projects tackle pest-crop-specific challenges:</p> <ul style="list-style-type: none"> <li>The projects <a href="#"><u>PONTE</u></a>, <a href="#"><u>XF ACTORS</u></a>, <a href="#"><u>PRE-HLB</u></a>, <a href="#"><u>FF-IPM</u></a>, <a href="#"><u>IPM-Popillia</u></a>, <a href="#"><u>REACT</u></a>, <a href="#"><u>PURPEST</u></a> and <a href="#"><u>BeXyl</u></a> provide tools for prevention, monitoring, control and management of pests and diseases affecting important crops in</li> </ul>

<sup>95</sup> Non-exhaustive list of Horizon 2020 Societal Challenge 2 and Horizon Europe Cluster 6 projects.

	<p>Europe.</p> <ul style="list-style-type: none"> <li>• <a href="#"><b>RUSTWATCH</b></a> established a stakeholder driven early-warning system to improve preparedness and resilience to emerging rust diseases on wheat.</li> <li>• <a href="#"><b>MUSA</b></a> developed sustainable alternatives for protecting banana crops.</li> <li>• <a href="#"><b>EMPHASIS</b></a> addressed native and alien pest threats for a range of both natural ecosystems and farming systems.</li> <li>• <a href="#"><b>HOMED</b></a> developed practical solutions for managing emerging native and non-native pests and pathogens (PnPs) threatening European forests.</li> </ul> <p>Early diagnosis and rapid response are crucial to reduce the risk of entry and spread of plant pests and, ultimately their impacts. <a href="#"><b>VALITEST</b></a> worked on the validation of diagnostic tests to support plant health.</p>
<p>Knowledge, Training and Advising</p>	<p><a href="#"><b>INNOSETA</b></a> established a thematic network on spraying equipment, training and advising to close the gap between the available new high-end crop protection solutions and European farmers.</p> <p><a href="#"><b>WINETWORK</b></a> built a network for the exchange and transfer of innovative knowledge between European wine-growing regions to control and fight against diseases that jeopardise the future production potential of the EU.</p> <p><a href="#"><b>SmartProtect</b></a> creates an e-platform to gather, share, manage and distribute knowledge on IPM for vegetable production in open fields and greenhouses.</p> <p><a href="#"><b>Oper8</b></a> aims to co-create, showcase and evaluate non-chemical weed control.</p>
<p>Risk assessment and One Health approach</p>	<p>The <a href="#"><b>SPRINT</b></a> project aims to develop a Global Health Risk Assessment Toolbox to assess the impacts of Plant Protection Products (PPPs) on environment and human health and propose several transition pathways.</p> <p><a href="#"><b>RATION</b></a> aims to develop a novel risk assessment scheme, supported by the necessary guidance on methods and tools, tailored to the specific characteristics of established and emerging low risk pesticides solutions.</p>

## Chapter 4 – Sensitive areas

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## Summary

In Article 1(1)(f) of Council Decision (EU) 2022/2572, the Council requested the Commission to provide a quantification of the impact of banning the use of plant protection products in sensitive areas as defined in Article 3(16) of the proposal, especially in areas used by the general public and in human settlements (public and urban areas). This additional input focuses on the impacts of sensitive areas in line with the more limited definition set out in the non-paper that was transmitted to the European Parliament and to the Council on 15 November 2022. This non paper provides for use of biocontrol and low risk substances in all sensitive areas, and for all but more hazardous substances in agriculture within ecologically sensitive areas, including all substances authorised for use in organic farming.

The impacts of sensitive areas are assessed against a baseline of the current Sustainable Use Directive, characterised by varied levels of implementation and a wide variety of approaches, both between Member States and even between regions or cities within some Member States.

The purpose of proposing restrictions on the use of pesticides in sensitive areas is to protect human health and the environment. Public and urban areas are protected because of the higher possibility of human exposure. Areas protected under environmental legislation for habitat or water protection reasons are prioritised because of their ecological importance.

As noted in section 2.1 of Chapter 1 – Economic issues, pesticide use restrictions in urban and public areas have no impact on agricultural production. A transition towards pesticide-free management may require a change in aesthetics and to the overall approach to weed management, which can be done without affecting the overall budget balance and with positive effects on the environment. There are particular challenges, especially in cemeteries and sports grounds, but many technical solutions are available.

Pesticides are already generally prohibited in non-productive areas as part of GAEC (Good Agricultural and Environmental Condition) standard 8. The SUR also proposes an additional requirement to use only low-risk pesticides or biological control in a 3-metre buffer zone, which could contribute in a modest way to that biodiversity function. In practice, the buffer zone will only affect farms larger than 10 hectares where the increase of the non-productive area due to the buffer zone will be less relative to the overall size than it would be for a smaller farm.

Allowing only biological control and low-risk pesticides in urban areas covered by watercourse or water feature, recreational/ bathing water and areas designated for the protection of economically significant aquatic species is expected to have a limited impact on agriculture. Given the environmental importance of surface water and the negative medium-term outlook for water quality, it appears prudent to provide for such a restriction.

The non-paper includes various options for the protection of drinking water resources. In addition to the aims of protecting human health and the good status of water bodies, there is also a high economic cost (borne by the consumer) that arises from the need to treated water polluted by pesticides, thus there are strong economic reasons to address the contamination at source.

The inclusion of Natura 2000 and areas protected under national legislation and reported to the nationally designated protected areas inventory (Common Database on Designated Areas (CDDA)) will help to protect rare and threatened species and rare natural habitat types and to maintain, enhance, or restore the integrity, connectivity and resilience of all ecosystems.

Although the non-paper highlights for the co-legislators a possible option that the protection of pollinators threatened with extinction should be addressed as part of discussions on the Nature Restoration Law rather than under the SUR, the likely extent of these areas and their importance are briefly addressed.

In Article 1(1)(e), the Council requested the Commission to address the availability of alternatives to plant protection products (which is discussed in detail in a separate Note on alternatives for chemical pesticides) and the potential increased risk of introduction and spread of harmful organisms in the Union due to the limited availability of alternative means of mitigating that risk. This chapter briefly addresses the second part of that question.

In Article 1(1)(g), the Council requested the Commission to provide a quantification of the impacts of the proposed restriction concerning the use of plant protection products on forest stands and forest dependent biodiversity. The Commission does not possess data at EU level on pesticide use in forest stands, though research shows that such use is rare compared to agriculture. As pesticide restrictions in forest stands are part of wider restrictions on pesticide use in sensitive areas, the Commission has chosen to address forest stands in this chapter.

In conclusion the protection of sensitive areas is very important for human health and biodiversity. It is possible to successfully implement pesticide restrictions in urban and public areas without increasing the overall costs. An EU-wide harmonised approach would also facilitate knowledge-sharing networks between municipalities and communication to the public as well as simplifying administration for national authorities. The impact on agriculture will be minimized and in some cases we even expect short- or medium-term economic benefits.

## Impacts of pesticide restrictions in sensitive areas

### 1. Introduction

The Council has requested that the Commission provide a quantification of the impact of banning the use of plant protection products in the sensitive areas as defined in Article 3(16) of the proposal, especially in areas used by the general public and in human settlements.<sup>96</sup>

The Commission understands the concerns of Member States that a total ban on the use of all pesticides in sensitive areas as set out in Article 3(16) of the proposal could have an impact on some types of agriculture. Member States and stakeholders highlighted that agriculture can be part of the solution that contributes to meeting biodiversity objectives, and in some cases the sensitive organisms to be protected are dependent on the maintenance of the agricultural habitat or crop.

The Commission has listened to these concerns and for this reason, transmitted a non-paper on sensitive areas to the Council and the European Parliament on 15 November 2022.<sup>97</sup> This set out options for possible Council changes to the proposal taking account of key Member State concerns in relation to sensitive areas.

The impact assessment already explored the impacts of provisions on sensitive areas as set out in the proposal. A further detailed assessment of the initial proposal beyond what was already set out in the impact assessment would therefore serve no purpose. The non-paper now makes a clear distinction between urban sensitive areas and agriculture in ecological sensitive areas. In the latter it is proposed to allow use of all but the more hazardous pesticides, and allow pesticides used in organic agriculture. Because of this and because of the scope of the council request this paper focusses on urban areas.

The Council has requested that the Commission assess the potential increased risk of introduction and spread of harmful organisms and include a quantification of the impacts of the proposed restriction concerning the use of plant protection products on forest stands and forest dependent biodiversity.<sup>98</sup> The SUR does not have any provisions dealing specifically with pesticide use in forest stands. However, the vast majority are included in the sensitive area definition as they are open to the public or are found in ecologically sensitive areas.<sup>99</sup> Some input on forest stands is therefore provided in this chapter.

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<sup>96</sup> See Article 1(1)(f) of Council Decision (EU) 2022/2572.

<sup>97</sup> Commission *Non-Paper on the Definition and Scope of Provisions on Sensitive Areas in the Proposal for a Regulation on the Sustainable Use of Plant Protection Products (SUR)*, transmitted by the Commission to the Council and the European Parliament on 15 November 2022.

<sup>98</sup> See Article 1(1)(g) of Council Decision (EU) 2022/2572.

<sup>99</sup> Under the non-paper, these would be Natura 2000 and CDDA areas and “catchment areas for abstraction points”, to be designated by Member States by 2027 under Directive (EU) 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption (recast) (OJ L 435, 23.12.2020, p. 1). See European Commission, *Non-Paper on the Definition and Scope of Provisions on Sensitive Areas in the Proposal for a regulation on the Sustainable Use of Plant Protection Products (SUR)*, [https://food.ec.europa.eu/document/download/98add16-a88a-4e9e-a654-db84e21c0da8\\_en?filename=pesticides\\_sud\\_sur-non-paper\\_en.pdf](https://food.ec.europa.eu/document/download/98add16-a88a-4e9e-a654-db84e21c0da8_en?filename=pesticides_sud_sur-non-paper_en.pdf), p. 4. See also further section 3.5 below.

## 2. Sensitive areas under the Commission non-paper

The Commission non-paper on sensitive areas provides options for the co-legislators to consider that greatly reduce the impact of SUR sensitive areas on agriculture. It would limit the total area covered by the definition so that Member States could focus on those areas deemed most relevant to pesticide use restrictions. To promote agriculture in protected areas, all but the more hazardous pesticides would be allowed in conventional agriculture in areas protected under the Birds and Habitats Directives (Natura 2000) or reported to the nationally designated protected areas inventory (CDDA), excluding also emergency authorisations for products containing non-approved active substances. To support organic agriculture in protected areas, all pesticides used in organics would be allowed. In line with the aim of promoting the use of pesticides with good risk profiles (safer for farmers, the environment, pesticide users and citizens), the non-paper provides an option for the co-legislators to consider allowing biological control and low-risk pesticides in all sensitive areas. Finally, the scope of derogations has been widened.

The non-paper also maintains a high level of ambition in relation to the protection of human health and the environment.

## 3. Impacts of sensitive areas options under the non-paper

### 3.1 Areas used by the general public/vulnerable groups/human settlements

#### 3.1.1 Protection aim:

The non-paper identifies for the co-legislators a possible option that only low-risk pesticides or biological control would be permitted in these areas and within a 3-metre buffer zone surrounding them. Public and urban areas and areas used by vulnerable groups are included with the aim of protecting public health.<sup>100</sup> Analysis of academic and scientific literature points to similar and recurring conclusions on the risks and possible impacts and strongly presumed links for several exposure-disease combinations.<sup>101</sup> There is a high standard of protection of human health in approvals of active substances used in pesticides in the European Union. An active substance must be shown not to have “any harmful effects” on human health, including that of vulnerable groups, or animal health, taking into account known cumulative and synergistic effects where accepted scientific methods to assess such effects are available.<sup>102</sup>

However, although the assessment of effects on human health is a stringent one, it is based on a system of assessing each active substance individually. Furthermore, the methodology of assessment is dependent on the availability of accepted scientific methods to assess

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<sup>100</sup> The non-paper includes a possible option for the co-legislators to consider excluding the agricultural element of discontinuous urban fabric from the definition of urban areas (‘human settlements’) and to have a closed definition of ‘vulnerable groups’ as defined to include pregnant and nursing women, the unborn, infants, children and the elderly.

<sup>101</sup> Inserm (2021). Arnold, T. Tilton, L. Pesticides and effects and health; New data, doi: 10.5749/j.ctvg251hk.27. For further details, see Annex 5 of *Commission Staff Working Document Impact Assessment Report Accompanying the document Proposal for a Regulation of the European Parliament and of the Council on the sustainable use of plant protection products and amending Regulation (EU) 2021/2115*, pp. 146-149.

<sup>102</sup> See Article 4(2) of Regulation (EC) No 1107/2009.

synergistic or ‘cocktail’ effects, which are not available. There is a concern about the effects of simultaneous exposure to two or more chemical substances, which occurs in real-life conditions and may have synergistic effects.<sup>103</sup> The current limits on allowed maximum pesticide residues on food are set for single substances and the current measures to protect human health do not adequately address potential for mixture effects. EFSA has concluded that cumulative dietary exposure is, with various degrees of uncertainty, below the threshold that triggers regulatory action for all population groups.<sup>104</sup>

Pesticide residues have also been detected in human breast milk samples, and there are concerns about prenatal exposure and health effects in children.<sup>105</sup> However, in its latest report on maximum residue levels, EFSA concluded that dietary exposure to pesticides for which health-based guidance values were available is unlikely to pose a risk to EU consumer health. In the rare cases where dietary exposure for a specific pesticide/product combination was calculated to exceed the health-based guidance value, and for those pesticides for which no health-based guidance value could be established, the competent authorities took appropriate and proportionate corrective measures to address potential risks to consumers.<sup>106</sup>

Most epidemiological studies point to statistical associations between pesticide exposure and health impacts. However, so far regulatory risk assessment approaches, including some on mixtures, point to low risk. This is a significant scientific challenge which makes it difficult to conclude on the causality of observed links (or statistical associations) and the potentially differing conclusions of risk assessment methodologies and epidemiological studies. However, if confirmed as causal relationships, the observed links carry major societal and health costs which support the case for reducing exposure and risk. It has been shown that combinations of chemicals present at even low levels may contribute to the overall risk of adverse health effects such as cancer and reproductive toxicity and most epidemiological studies point to several statistically significant associations or presumed links.<sup>107</sup>

Another benefit of restrictions in urban or public areas is to reduce risks to human health associated with incorrect use. For example, the German Federal Agency for Nature Protection (UBA) has advocated for a complete ban on herbicides in gardens and allotments, given the repeated occurrence of inputs of herbicides into public sewers and wastewater treatment system, in many cases likely due to inappropriate application by private users.<sup>108</sup>

In addition to the benefits for human health of restricting pesticide use in urban and public areas, there are benefits for biodiversity. Pesticides are among the pollutants that contribute to environmental degradation and ecosystem service losses and pesticide use is listed as among

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<sup>103</sup> Polyxeni Nicolopoulou-Stamati, Sotirios Maipas, Chrysanthi Kotampasi, Panagiotis Stamatis, Luc Hens, Chemical Pesticides and Human Health: The Urgent Need for a New Concept in Agriculture, *Front Public Health*. 2016; 4: 148. Published online 2016 Jul 18. doi: 10.3389/fpubh.2016.00148, PMC4947579.

<sup>104</sup> *Commission Staff Working Document Impact Assessment Report Accompanying the document Proposal for a Regulation of the European Parliament and of the Council on the sustainable use of plant protection products and amending Regulation (EU) 2021/2115*, p. 44.

<sup>105</sup> Polyxeni Nicolopoulou-Stamati, Sotirios Maipas, Chrysanthi Kotampasi, Panagiotis Stamatis, Luc Hens, Chemical Pesticides and Human Health: The Urgent Need for a New Concept in Agriculture, *Front Public Health*. 2016; 4: 148. Published online 2016 Jul 18. doi: 10.3389/fpubh.2016.00148, PMC4947579.

<sup>106</sup> <https://www.efsa.europa.eu/en/efsajournal/pub/7215>

<sup>107</sup> *Commission Staff Working Document Impact Assessment Report Accompanying the document Proposal for a Regulation of the European Parliament and of the Council on the sustainable use of plant protection products and amending Regulation (EU) 2021/2115*, p. 44.

<sup>108</sup> Frishche et al., ‘5-point programme for sustainable plant protection’, *Environmental Sciences Europe*, <https://enveurope.springeropen.com/articles/10.1186/s12302-018-0136-2>. p. 8.

the key drivers for pollinator decline.<sup>109</sup> As was noted by Professor Dave Goulson in a keynote address to the European Parliament, urban spaces can be turned into a network of insect reserves, making a positive contribution to biodiversity.<sup>110</sup>

### **3.1.2: Available data**

The Commission possesses data on the total territory in each Member State to be categorised as ‘human settlements’ as defined in Article 3(16)(c) of the SUR.<sup>111</sup> This is defined by reference to the CORINE (Coordination of information on the Environment) system maintained by the EEA Land Cover Level 1 classification (Artificial Surfaces) and covers 1.1 and 1.4 of that classification system, which encompasses:

- 1.1.1 Continuous urban fabric
- 1.1.2 Discontinuous urban fabric
- 1.4.1 Green urban areas
- 1.4.2 Sport and leisure facilities

Annex 1 provides the total territory (rounded to the nearest percentage) affected in each Member State.<sup>112</sup> The category of discontinuous urban fabric includes private gardens, which will therefore also be covered in the following subsections. The non-paper includes the option of removing agricultural parts of ‘discontinuous urban fabric’ (which are described in CORINE as ‘complex cultivation patterns’) from the sensitive area definition.

### **3.1.3 Examples of Member State, regional and municipal initiatives to restrict pesticides in urban and public areas**

In addition to legislation providing for general conditions of use in pesticide authorisations, many Member States, regions and cities have provided for restrictions on pesticide use in urban and public areas specifically.<sup>113</sup> Pesticides are restricted in public areas, including parks, sports grounds, cemeteries and urban green spaces, as well as in private gardens and

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<sup>109</sup> For further details, please see section 3.1 of Chapter 1 – Economic issues and section 3.6.1 of this chapter.

<sup>110</sup> <https://www.europarl.europa.eu/streaming/?event=20220928-1800-SPECIAL-OTHER> and [https://www.pesticide-free-towns.info/sites/pesticide-free-towns.info/files/field/attachment/pan\\_brussels\\_10\\_minute\\_talk.pdf](https://www.pesticide-free-towns.info/sites/pesticide-free-towns.info/files/field/attachment/pan_brussels_10_minute_talk.pdf). See also slide 10 of a presentation given at a 2022 conference organised by the “Pesticide Free municipalities” initiative [https://www.umweltbundesamt.de/sites/default/files/medien/3521/dokumente/vortrag\\_insektenschutz\\_kommune\\_kuemmerlen.pdf](https://www.umweltbundesamt.de/sites/default/files/medien/3521/dokumente/vortrag_insektenschutz_kommune_kuemmerlen.pdf)

<sup>111</sup> This has been calculated using the official CORINE Land Cover dataset and the EUROSTAT GISCO database for MS boundaries (Countries 2020, scale 1:1). This encompasses urban areas used by the general public and by vulnerable groups. However, the Commission does not have specific data on the territories covered by areas used by the general public or vulnerable groups outside urban areas.

<sup>112</sup> Table 1A in Annex 1 provides the total territory (rounded to the nearest percentage) affected in each Member State. Table 1B in Annex 1 provides a breakdown of the affected territories for continuous and discontinuous urban fabric. Table 1C in Annex 1 provides a breakdown of the affected territories for green urban areas and sports and leisure facilities. It should be noted that in this and all tables, the 3-metre buffer zone is not included in the calculations.

<sup>113</sup> See Annex 2 for further details.

sports clubs. There are also restrictions in areas used by vulnerable groups such as healthcare facilities, schools and childcare facilities. Restrictions to permit only low-risk pesticides in public areas exist in some Member States. Limited exemptions are also provided for, mainly concerning control of harmful organisms or alien invasive species, in line with the derogation in the SUR proposal.

Many Member States have extensive experience of successful pesticide-free management of urban areas. For example, in Germany, through a network of “Pesticide Free municipalities” (*Pestizidfreie Kommunen*)<sup>114</sup>, more than 550 German municipalities and local communities have committed themselves to avoiding the use of chemical plant protection products either completely or as far as possible. Cities such as Münster and Saarbrücken have practiced pesticide-free management for twenty years.<sup>115</sup> By the end of 2015, 40% of Luxembourgish municipalities had voluntarily renounced chemical pesticides and many others had seen a significant reduction, which resulted in national legislation making almost the entire public space in Luxembourg pesticide-free.<sup>116</sup> Authorities in the Netherlands have also concluded that in general, the quality level sought by site managers can be achieved through non-chemical methods.<sup>117</sup>

Tallinn has adopted a city strategy “Tallinn 2035” in which the municipal authorities consider all green areas in terms of planning, designing, construction and importantly, maintenance. Incorporation of integrated plant protection considerations into each of these phases is considered absolutely necessary to achieve the goals of the strategy. With this planning in place, the authorities were sufficiently confident to invite green area maintenance tenders from companies, using only non-chemical methods. Tallinn no longer spends public money from the municipal budget on pesticides. There are other city initiatives such as publicity campaigns encouraging private garden owners to use integrates pest management and guidance documents on maintenance of these spaces.

In Paris, first reflections about chemical pesticides started in 1990 by stopping the use of the most toxic and dangerous products (such as atrazine) and starting using insect larvae to control harmful insects in greenhouses. Differentiated management began in urban parks and gardens in the 2000s. Since 2009, gardens (454 ha) are managed without any chemical pesticides. In addition, 422 hectares of Parisian cemeteries (inside and outside Paris territory) have been managed without any chemical pesticides since 2015. Over 90% of green spaces have the EcoJardin label, which goes beyond national legislation (which permits low-risk pesticides, biological control and products used in organic farming) and bans all products classified as hazardous to human health or the environment. Urban agriculture is encouraged through the Parisculteurs scheme and there is a “Green fingers” scheme for eco-friendly community gardens.

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<sup>114</sup> <https://www.bund.net/umweltgifte/pestizide/pestizidfreie-kommune/>

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[https://www.bund.net/fileadmin/user\\_upload\\_bund/\\_migrated/publications/130411\\_bund\\_chemie\\_broschuere\\_estizidfreie\\_kommunen.pdf](https://www.bund.net/fileadmin/user_upload_bund/_migrated/publications/130411_bund_chemie_broschuere_estizidfreie_kommunen.pdf)

<sup>116</sup>

[http://www.ounipestiziden.lu/uploads/2/2/4/8/22480338/merkbl%C3%A4tter\\_kampagne\\_ouni\\_pestiziden\\_einf%C3%BChrung\\_\\_unternehmen\\_.pdf](http://www.ounipestiziden.lu/uploads/2/2/4/8/22480338/merkbl%C3%A4tter_kampagne_ouni_pestiziden_einf%C3%BChrung__unternehmen_.pdf)

<sup>117</sup> See explanatory memorandum accompanying the Decree of 9 March 2016 amending the Decree on plant protection products and biocides as regards the non-authorisation of plant protection products outside agriculture, <https://zoek.officielebekendmakingen.nl/stb-2016-112.html>, pp. 17-18. The application of non-chemical methods to paved and unhardened surfaces was seen as technically feasible, subject to a few exceptions.

There are certain current and emerging phytosanitary challenges in Paris. For example, there are some limited biological treatments for the box-tree moth in Paris, which is an invasive alien species. The strategy is to allow restricted treatments on box-tree moth of heritage interest (for example plant sculptures) in sites that can be closed to the public at night with an EcoJardin compatible biological solution (*Bacillus thuringiensis*) and close the area to the public for 12 hours after treatment. For other types of box-trees or box-trees in other types of sites, the solution is to replace the plants gradually with other plants or landscaping solutions (such as a metallic barrier or wooden edges).

The Swedish city of Malmö has a 20-year history of severely restricting pesticide use in public spaces. In effect, use of pesticides is prohibited in species such as school and kindergarten playgrounds, parks, gardens and public recreational areas, land for residential buildings, private gardens and a plethora of other areas, as well as gravel and highly permeable surfaces. Since 2021, gaining from the experience Malmö authorities, national rules in Sweden now reflect the rules that Malmö already had in place for nearly 20 years. While public areas such as parks and cemeteries are considered pesticide-free, permission can be granted to use pesticides in these areas where certain invasive and alien species occur. The city's pesticide-free policies are linked to other initiatives to improve biodiversity such as reduced cutting of roadside grass, planting mixed seeds and allowing higher grasses on roundabouts etc.

### ***3.1.4: Impacts of pesticide use restrictions in urban and public areas***

The impacts of pesticide use restrictions in urban and public areas are explored in more detail in Annex 4. This subsection provides an overview of the main issues. As a preliminary point, it should be noted that the 3-metre buffer zone applying to urban and public areas is included to provide additional protection for public health in urban areas through minimizing the risks from simultaneous exposure or incorrect applications explored above.<sup>118</sup> It is estimated that the impact of this restriction on agriculture is likely to be minimal and it will benefit human health and biodiversity as well as having a positive impact on tourism, environmental education, recreation or general well-being.<sup>119</sup> For example, a recent study estimating the amount of agricultural land close to residential buildings in France estimated that only 0.2% of crops are within 10 metres of urban areas and about half of those crops are not treated with pesticides (e.g. grasslands and pastures).<sup>120</sup>

#### ***3.1.4.1: Costs and tools for the transition***

The experience in many Member States (for example in France, Germany, Luxembourg and the Netherlands) is that implementation of differentiated management and a change in

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<sup>118</sup> See section 3.1.1 above.

<sup>119</sup> See section 3.1.4 below.

<sup>120</sup> Guilpart, Bertin, Valantin-Morison and Barbu, 'How much agricultural land is there close to residential areas? An assessment at the national scale in France', *Building and Environment*, Vol. 226, December 2022, 109662, p. 7.

citizens' aesthetic expectations can help make pesticide-free management of municipalities possible from a cost perspective.<sup>121</sup>

Research in France has shown that a transition to zero pesticides is not a matter of pure technical substitution which would lead to an increase in management costs. Instead, there is a need for an overall change in space management and a daily optimisation of resources under budgetary constraints.<sup>122</sup> A transition usually leads to a temporary increase in costs while managers change their maintenance objectives through mulching, landscape adjustments and above all, acceptance of spontaneous flora.<sup>123</sup>

Similarly, a cost study by the Dutch Ministry of Infrastructure and the Environment found that higher costs do not automatically mean higher maintenance budgets. While there are municipalities that gradually increase the budget for weed control, there are also municipalities that 'shift within the budget' or accept a slightly lower level of quality. Chemical-free weed control has been assessed as about four times more expensive, with a slightly decreasing trend, but as the total budget for public space management in Dutch municipalities was found to be in the region of 0.3% to 3.6%, budgetary adjustments were feasible.<sup>124</sup>

“Tallinn 2035” being a new initiative, is still transitioning away from the use of chemicals in the maintenance of public spaces and so it is still too early to assess the real impacts on budgetary costs. Adding to the difficulty in assessing the financial impacts, there was also a change in the way in which the authorities request the maintenance to be carried out, switching a quantitative method (e.g., cut grass 5 times) to a more qualitative method (e.g., keep grass to Xcm). Actual figures should become available after a few years of operation.

Experience gained from “Pesticide Free municipalities” in Germany shows that a number of tools can help, including choice of design and construction materials in paved areas, soil cover to suppress the growth of unwanted plants and differentiated management.<sup>125</sup> The German Federal Environment Agency (UBA) reports that urban pesticide restrictions can best be implemented with an overall sustainability concept. Once initial difficulties have been overcome, such as the proper conservation of green areas (financial hurdles: acquisition of suitable equipment; management plan: mowing and flowering; acceptance by citizens of the measures), pesticide-free policies bring many benefits. Information events are also important for networking between the municipalities and are a quick and effective way of sharing knowledge.

Knowledge-sharing between municipalities has been identified as an important tool in many Member States and existing networks such as the European Green Cities Network and the European Pesticide Free Towns Network bring many benefits. There will be a much stronger framework for such knowledge sharing and support with an EU-wide harmonised approach.

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<sup>121</sup> For further details, see Annex 3, section 1.

<sup>122</sup> Plante & Cité, Center for Landscape and Urban Horticulture, Conditions Techno-Economiques Du Passage Au “Zero-Phyto [Synthèse]” [Technical requirements for the transition to “zero phyto” [Synthesis], summary.

<sup>123</sup> Plante & Cité, Center for Landscape and Urban Horticulture, Conditions Techno-Economiques Du Passage Au “Zero-Phyto [Synthèse]” [Technical requirements for the transition to “zero phyto” [Synthesis], summary, sections 1.2.1 and Plante & Cité, Passer Au “Zéro Phyto” Dans Votre Commune: Les réponses à (certaines) questions que vous vous posez, factsheet 8.

<sup>124</sup> Inventarisatie onkruidbestrijding op verhardingen, <https://zoek.officielebekendmakingen.nl/blg-225182.pdf>, p. 12.

<sup>125</sup>

[https://www.bund.net/fileadmin/user\\_upload\\_bund/migrated/publications/130411\\_bund\\_chemie\\_broschuere\\_p\\_estizidfreie\\_kommunen.pdf](https://www.bund.net/fileadmin/user_upload_bund/migrated/publications/130411_bund_chemie_broschuere_p_estizidfreie_kommunen.pdf)

French research on pesticide-free practices in municipalities also demonstrates the multitude of available tools, such as city charters, eco-management labels and management plans for differentiated management, weed control or site redevelopment. Other useful tools include participatory governance, experience-sharing, financial aid for the purchase of equipment, training, communication with users and awareness-raising measures on nature in cities. Public communication and engagement is also very important, for example through participatory workshops, information posters or public consultation.<sup>126</sup> The increased number of tools now available make it easier for managers to have a shorter transition.<sup>127</sup>

In relation to public engagement, research has shown that citizens have a strong preference for a natural visual appearance, which suggests that the costly control of the vegetation is not always desirable. It also found that fauna abundance and the improvement in the recreational opportunities available in urban green spaces are valued by a large majority of respondents. Overall, the transition is more likely to be accepted by making sure that recreational opportunities are not restricted and workers' conditions do not deteriorate.<sup>128</sup>

Again, an EU-wide harmonised approach will help facilitate clear messages to the public on pesticide-free policies. Finally, pesticide restrictions in urban areas will be a lot easier to administer when they are more harmonised. This will reduce the complexity for national administrations by reducing the variations between municipalities.

#### ***3.1.4.2 Specific challenges: cemeteries and sports grounds:***

The transition to zero pesticide use is easier to make in public parks and gardens than it is in cemeteries and sports grounds. There can be specific cultural challenges in cemeteries (for example in France and Belgium) as families can view toleration of spontaneous flora as disrespectful and a failure on the part of the municipality to maintain the cemetery. Greater acceptance can be facilitated through measures such as keeping spontaneous flora to an acceptable height or mixing spontaneous flora with horticultural plants.<sup>129</sup> In Italy, the City of Venezia banned the use of synthetic pesticides in cemeteries in 2023, but is keeping its policy under review due to increased costs from challenges such as in relation to limiting spontaneous grass in gravel fields.<sup>130</sup> Despite these challenges, pesticide restrictions in cemeteries exist in many Member States, such as Belgium, Denmark, France, Germany, Luxembourg, Sweden and The Netherlands.<sup>131</sup> While other Member States may not have explicit prohibitions in place, the actual use is considered negligible such as in the Estonian capital city, Tallinn. Pesticide use in cemeteries in Malmö is only permitted in case of occurrence of invasive weed species such as Japanese knotweed or Giant hogweed, as these species can cause structural damage to headstones etc.

Sports grounds also pose technical and aesthetic challenges linked to the maintenance requirements of clubs. These are greater in the case of sports fields for high-level

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<sup>126</sup> Plante & Cité, Conditions Techno-Economiques., section 2.3.

<sup>127</sup> Plante & Cité, Conditions Techno-Economiques., section 3.4.2.

<sup>128</sup> Lefebvre et al., 'Alternative adaptation scenarios towards pesticide-free urban green spaces: welfare implications for French citizens', Environmental Science and Policy, 2022, 136, pp. 46-55. 10.1016/j.envsci.2022.05.014. hal-03694169.

<sup>129</sup> See Annex 3, section 2 for further details.

<sup>130</sup> Citta' di Venezia, Allegato a Relazione Istruttoria – Nuova Poposta di Adeguamento Degli Standard Previsti per la Gestione del Verde Cimiteriale Da Parte di Veritas S.P.A. See also

<sup>131</sup> See Annex 2, section 1 for further details.

competitions, racetracks and golf courses. Nevertheless, Member States such as Belgium, France, Germany, Portugal, Slovenia, Spain, Sweden and The Netherlands have pesticide restrictions in sports grounds. Many strategies support this, such as the use of design and maintenance tools, close surveillance of relevant symptoms and pests, monitoring tools such as checklists, support and training for maintenance teams and tailored and motivational communication to raise awareness among users.<sup>132</sup>

Support for municipalities is important, including general information, exchange of good practice, knowledge sharing and a roadmap for environmentally friendly work. In the Netherlands, three quarters of the municipalities surveyed expressed a need for such supports. In response to that, an Integrated Sports Management Manual was published in the Netherlands in 2023 within the framework of Sports Sustainability Roadmap. In the longer term, developments in precision agriculture will facilitate a preventive and ultimately cost-effective approach.<sup>133</sup>

In Tallinn, pesticide use on the sports grounds included in the cities maintenance contracts is prohibited. This can be challenging in some situations, but it's all about making the transition and developing new maintenance strategies.

The use of pesticides in sports grounds in Malmö is generally prohibited but on occasion, if a situation develops which requires intervention using chemical pesticides, a permit can be sought from the Environmental Department who will determine if the pesticide can be applied, or not.

In conclusion, while certain areas are more challenging in relation to implementation of pesticide-free policies, there are many tools available to support municipalities. Changes in design and aesthetic expectations allow a transition and need to be facilitated by knowledge sharing and exchange of good practice among staff and managers as well as effective communication to the public in relation to the approach taken and the reasons for it.

#### ***3.1.4.3 Environmental, public health and other benefits of pesticide use restrictions in urban and public areas***

As noted in section 3.1.1, public and urban areas and areas used by vulnerable groups are included with the aim of protecting public health given concerns about the effects of simultaneous exposure to combinations of pesticides and risks from incorrect application of pesticides. It is therefore appropriate to restrict the use of pesticides in areas where there is a greater risk of human exposure.

There are also clear environmental benefits to restricting pesticide use in urban and public areas given the effects of pesticides on environmental degradation and pollinator decline.<sup>134</sup> For example, on a Commission field trip to Paris to understand its pesticide-free policy, it was noted that there is an abundance of bees in Paris due to the approach taken in the city and that there are more fish in the river Seine (an increase from 3 species in the 1980s to 32 species currently) due to environmental policies in the city and that citizens are generally positive about the increase of biodiversity as they value nature living in a large city. Another positive side-effect of restrictions was that it inspired more research and experimentation to

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<sup>132</sup> See Annex 3, section 2 for further details.

<sup>133</sup> See Annex 3, section 2 for further details.

<sup>134</sup> See section 3.1.1 above.

find new solutions in horticulture, bringing educational as well as environmental benefits. The French organisation Plante & Cité also confirmed that French pesticide policies have helped to incentivise the biocontrol industry to bring more products to the market in France.

During the visit to Paris, it was mentioned that citizens are generally positive about the increase of biodiversity as they value nature living in a large city. Another positive side-effect of restrictions was that it inspired more research and experimentation to find new solutions in horticulture, bringing educational as well as environmental benefits.

An analysis carried out in the Netherlands on behalf of the Ministry of Infrastructure and Water in 2018 of measurement data of plant protection products in surface water to understand the effectiveness of the ban on professional pesticide use outside agriculture found that a decrease in glyphosate concentrations and standard exceedances compared to other groups of monitoring points is demonstrable at drinking water intake points and that there was a plausible link to the prohibition.<sup>135</sup> In 2018, the Central Statistics Office in the Netherlands reported that Dutch public authorities were using about 82% less pesticides than 5 years earlier. Most of the pesticides used (69%) were used to keep railway tracks and marshalling yards free of weeds.<sup>136</sup>

Finally, some wider benefits have been noted. The German Federal Environment Agency (UBA) informed the Commission that pesticide-free communities in Germany report clear effects from their policies that have a positive impact on tourism, environmental education, recreation or general well-being. They also report more tolerance of spontaneous flora, increased greening and biodiversity in the settlement areas and a greater recognition of the value and importance of urban nature.

### 3.1.5 Conclusion

As is evident from the overview of initiatives in this section, it is possible to successfully implement pesticide restrictions in urban and public areas. Many such initiatives have been in place for several years and include restrictions similar to those identified in the non-paper (permission to use only low-risk pesticides and biological control) as well as more stringent restrictions (zero pesticide approach, with limited derogations).

Even in the case of restrictions that are more stringent it is possible to implement them without increasing the overall costs of managing green spaces through adjusting maintenance objectives and employing a differentiated management approach. Certain areas, such as cemeteries and sports grounds, have particular technical, aesthetic or cultural challenges but pesticide restrictions have been successfully implemented in those areas also. It is also evident that it is possible to make a quick transition and that this has become easier due to the number of tools now available and the possibility of drawing from experiences of other municipalities in relation to issues such as alternative weed control or public communication and engagement.<sup>137</sup>

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<sup>135</sup> *Effecten van het gebruiksverbod gewasbeschermingsmiddelen buiten de landbouw op oppervlaktewater*, 2018, p. 17.

<sup>136</sup> <https://www.cbs.nl/nl-nl/nieuws/2019/35/gebruik-bestrijdingsmiddelen-overheden-fors-gedaald>;  
<https://www.clo.nl/indicatoren/nl0048-bestrijdingsmiddelengebruik-door-de-overheid>.

<sup>137</sup> See section 3.1.4.1 above.

A change in aesthetic objectives and greater acceptance of spontaneous flora are key to allowing a transition to be made in a cost-neutral manner. Furthermore, there is evidence from France that rather than this being a trade-off, citizens have a strong preference for a natural visual appearance and greatly value fauna abundance and the improvement in recreational opportunities in urban green spaces from such an approach.<sup>138</sup> Such preferences may also pertain in other Member States. Even if there is a more challenging trade-off between cultural or aesthetic values on the one hand and the protection of human health and the environment on the other in some Member States, tools such as differentiated management and public information campaigns can help to ease the transition.

Given that pesticide restrictions in urban and public areas do not impact on agriculture, there is less of a need to balance the benefits for biodiversity against disadvantages in relation to food production.<sup>139</sup> This point was also noted by many Member States in Council and is reflected in the Commission's non paper. Similarly, the German Federal Agency for Nature Protection (UBA) notes that the use of pesticides in public areas "cannot be justified with any existential necessity"<sup>140</sup>. In contrast to farming, UBA argues that the economic benefits are usually negligible. Giving preference to non-chemical alternatives in these cases is, therefore, both practicable and reasonable.<sup>141</sup>

There is a need to harmonise controls both from the point of view of equality between European citizens and because the threat to biodiversity and ecosystems linked to the use of pesticides crosses boundaries and necessitates a strong and EU-level action.<sup>142</sup> An EU-wide harmonised approach would also facilitate knowledge-sharing networks between municipalities and communication to the public as well as simplifying administration for national authorities.

## 3.2 Forest stands

### 3.2.1 Protection aim:

As noted in the introduction, the SUR does not have any provisions dealing specifically with pesticide use in forest stands. However, the vast majority of forest stands across the Union are open to the general public and are therefore included in the sensitive area definition. Forests are also found in ecologically sensitive areas. Given that the SUR does not address forests specifically, there is no distinction drawn between commercial forests and other forests that are rich in biodiversity.

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<sup>138</sup> For further details on this research, see section 3.1.4.1 above.

<sup>139</sup> On this issue, see also the discussion in section 2.1 of Chapter 1 – Economic issues.

<sup>140</sup> See German Federal Agency for Nature Protection (UBA), Scientific Opinion Paper October 2022, Towards sustainable plant protection: evaluation of the draft regulation on the sustainable use of plant protection products 2022/0196 (COD) with a focus on environmental protection, page 28.

<sup>141</sup> Frishche et al., '5-point programme for sustainable plant protection', Environmental Sciences Europe, <https://enveurope.springeropen.com/articles/10.1186/s12302-018-0136-2>, p. 8.

<sup>142</sup> See further Commission Staff Working Document, Subsidiarity Grid accompanying the document Proposal for a Regulation of the European Parliament and of the Council for a Regulation on the sustainable use of plant protection products and amending Regulation (EU) 2021/2115.

As noted above, forests and other wooded land cover over 43.5 % of the EU's land space.<sup>143</sup> Their rich biodiversity and unique natural system are home and habitat for most species found on land around the world. Forests are a place to connect with nature, thus helping us to strengthen our physical and mental health, and are central to preserving lively and prosperous rural areas. Forests play a crucial role in reducing greenhouse gas emissions and have a hugely important role in our economy and society, creating jobs and providing food, medicines, materials and clean water. Forests are a natural ally in adapting to and fighting against climate change and will play a vital role in making Europe the first climate neutral continent by 2050. Protecting forest ecosystems also lessens the risk of zoonotic diseases and global pandemics.<sup>144</sup>

Despite this imperative, European forests are under increasing strain – partly as a result of natural processes but also because of increased human activity and pressures. While forest area has become bigger in the last decades thanks to natural processes, afforestation, sustainable management and active restoration, and while this has resulted in several trends moving upwards, forest conservation status should be considerably improved, including in the 27% of the EU forest area that is protected and should be the healthiest.<sup>145</sup>

Among many measures the Commission is taking to ensure sustainable forest management under the New EU Forest Strategy for 2030, the Commission, working with the Member States, will monitor the situation of tree health in the EU, including the impact of invasive alien species, diseases and pests such as bark beetles, and encourage the necessary preventive actions for early detection and eradication. These include pest management strategies to identify areas most at risk, exchange of best practices, support and cooperation on phytosanitary controls, as well as the development of innovative and sustainable plant protection tools in respect of ecological principles favourable to biodiversity.<sup>146</sup>

### 3.2.2 Available data:

The Commission does not have EU-level data submitted by Member States on the level of pesticide use in forest stands, although research indicates it is very low compared to agriculture.<sup>147</sup> Across EU Member States, pesticide use in forestry is usually less than one

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<sup>143</sup> See section 3.2.1 above.

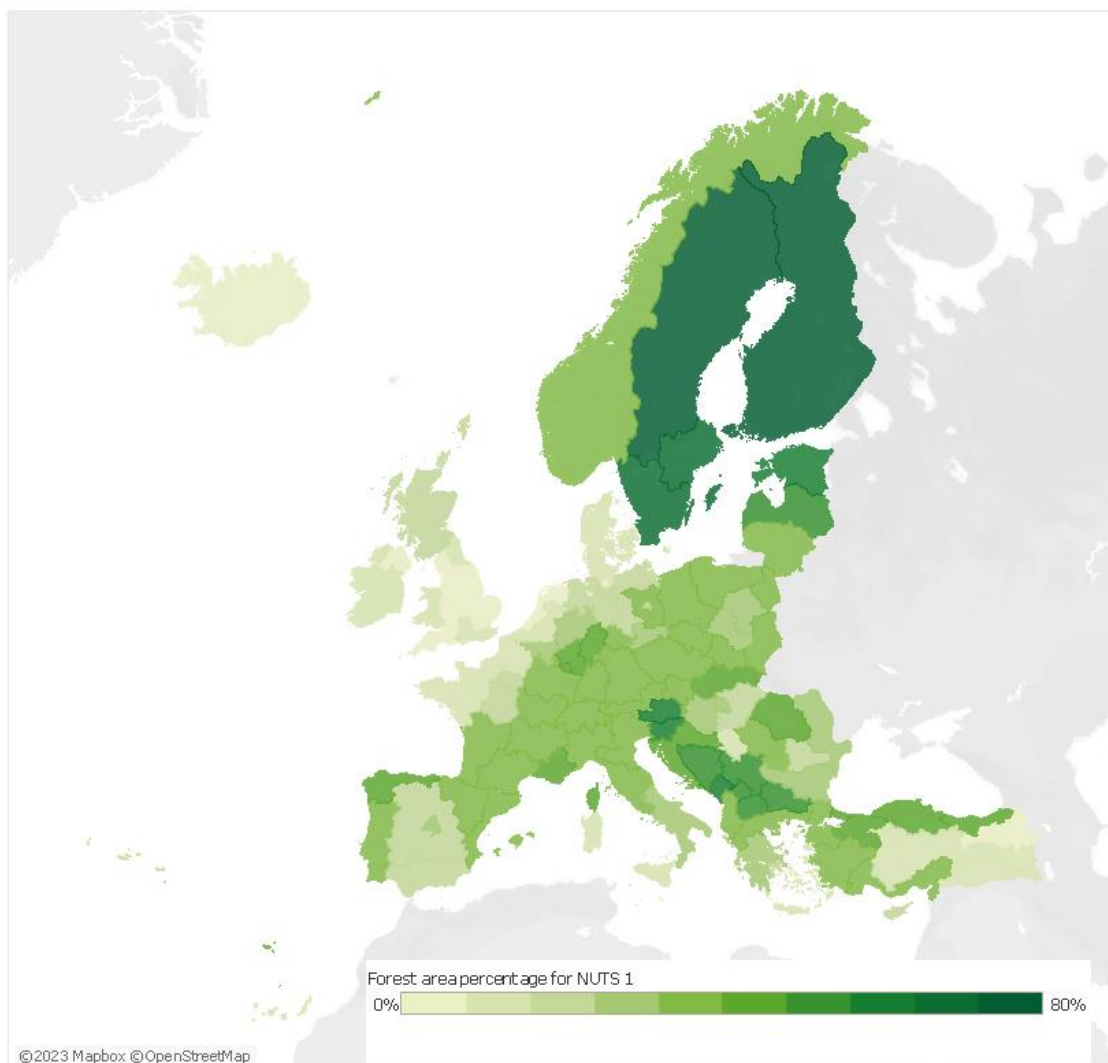
<sup>144</sup> *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – New EU Forest Strategy for 2030*, COM(2021) 572 final, 16.7.2021, <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021DC0572&from=EN>, Introduction.

<sup>145</sup> *Ibid.* Forest habitats listed in Annex I of the Habitats Directive cover about 27% of all forested area in the EU.

<sup>146</sup> *Ibid.*, section 3.2.

<sup>147</sup> I. Willoughby, Philippe Balandier, N.S Bentsen, N. MacCarthy, J. Claridge. Forest vegetation management in Europe: current practice and future requirements. European co-operation in science and technology (COST) Office, 156 p., 2009 ([hal-00468013](https://hal.archives-ouvertes.fr/hal-00468013)).

percent of agriculture on an annual basis.<sup>148</sup> Forest coverage is highly variable across Member States. The following chart shows an overview of forest area coverage across the EU:



The Commission asked Member States to provide data on pesticide use in forests.<sup>149</sup> Member States generally do not have detailed statistics on pesticide use in forests but provided information on the restrictions that are on place.

As noted above, forests and other wooded land cover over 43.5 % of the EU's land space.<sup>150</sup> The range of forest cover is substantial, with some Member States such as Finland, Sweden and Slovenia having over 60% forest cover, while Member States such as Cyprus, Denmark and Ireland have less than 20% forest cover and Malta has about 1%. A large cohort of Member States have forest covers of between 30-40%.

<sup>148</sup> <https://hal.science/hal-00468013/document>.

<sup>149</sup> Request for contributions in WK 4195 2023 INIT.

<sup>150</sup> See section 3.2.1 above.

While the majority of Member States do not currently have comprehensive statistics on pesticide use in forestry scenarios, it is generally considered that pesticide use in forestry situations accounts for quite a small proportion of overall pesticide use. Nonetheless, while in an overall context the pesticide use is not considered significant, it is still considered quite important in most Member States. Some Member States do not have pesticides specifically authorised for use in forestry and others do not allow pesticide use at all in forest plantations and the majority allow pesticide use in such areas but only in exceptional circumstances.

In the Member States that actually use pesticides in forest stands, it tends to be concentrated in the establishment phase of the forest stand or in commercial growing of for example Christmas trees. In some Member States during the 1 to 2 year establishment period, some use of pesticides are considered necessary to ensure that newly planted areas can establish in a viable way and become resilient and stable stands. In other Member States pesticide treatment of stumps after harvesting is considered necessary to protect the next forest plantation, either with chemical substances or biocontrol. In addition, a small number of Member States experience pest outbreaks in mature forests where treatment is deemed necessary to save the affected stand but also to protect the surrounding forest plantations.

In summary, there is no routine annual application of pesticides to forestry plantations, and some Member States manage their forests effectively without chemical pesticide use, and overall pesticide use is very low. Where pesticide treatments are applied to forest plantations, Member States are using both biological and/or chemical pesticides depending on the pest encountered. Newly established plantations may receive pesticide applications in the establishment period of 1-2 years, but generally do not receive further treatment for the life of the plantation (40-60 years for faster maturing species). Very occasionally, pest outbreaks require the treatment of more mature forest plantations. Treatment of the more mature plantations is sometime carried out by aerial application under derogation (Article 9 of Directive 2009/128/EC).

A brief summary of submissions Member States have made is available in annex 3.

### **3.2.3 Analysis:**

The SUR includes a possibility to derogate from restrictions on pesticide use in sensitive areas in cases where there is a proven serious and exceptional risk of the spread of quarantine pests or invasive alien species and no technically feasible lower risk alternative control technique. Furthermore, as is explained in more detail below in section 3.8, a possible option for the co-legislators to consider would be to amend the proposal to provide for a more general derogation to allow use of specified pesticides within demarcated areas without the need for individual applications. The Commission believes that these derogation possibilities, coupled with the possibility of using low-risk pesticides or biological control, more than suffice to ensure the protection of forest stands and forest-dependent biodiversity. Indeed, forest stands survived for millennia in the absence of pesticides and will normally regenerate in an area affected by an outbreak.<sup>151</sup> However, it is acknowledged that in some circumstances pesticide use maybe necessary, especially during the establishment of a new

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<sup>151</sup> Zeppenfeld, Svoboda, DeRose, Heurich, Müller, Čížková, Starý, Bače and Donato, 'Response of mountain *Picea abies* forests to stand-replacing bark beetle outbreaks: neighbourhood effects lead to self-replacement', *Journal of Applied Ecology*, Vol. 52, No. 5 (October 2015), pp. 1402-1411.

plantation, in cultivation of Christmas trees or in the production of pest free planting material in forest nurseries. A clarification that forest nurseries and specific cultivation of stands for Christmas tree use could be classified as agriculture would be one way to address this issue. It would allow a greater range of pesticides to be used where such private forest nurseries or Christmas tree stands were located in ecologically sensitive areas. Furthermore, where Member States wish to establish a new plantation, the area of sapling trees could be demarcated from public access.

While precise economic impacts of limiting pesticides to low-risk and biological control, as well as those needed to control quarantine pests or invasive alien species, cannot be provided in the absence of pesticide use data at Union or Member State level, it is clear that many Member States successfully implement pesticide use bans or significant restrictions in forest stands.

### **3.3 Non-productive areas under GAEC 8**

#### **3.3.1 Protection aim:**

The non-paper refers to a possible option for the co-legislators to consider allowing only low-risk pesticides or biological control in these areas and within a 3-metre buffer zone surrounding them. The framework of standards of good agricultural and environmental conditions of land (GAEC standards) aims to contribute, among other things, to the protection and quality of soil and the protection and quality of biodiversity. GAEC 8 relates to improving on-farm biodiversity amongst other aims through a requirement to devote a minimum share of arable land to non-productive features or areas and is aimed *inter alia* at biodiversity protection. The main objective of this obligation is the maintenance of non-productive features and areas to improve farmland biodiversity, including birds and pollinators.<sup>152</sup>

A possible option is identified of a minimum buffer zone for all sensitive areas as a matter of prudence given the ecological and human health importance of the sensitive areas. This restriction will mainly affect the 3-metre buffer zone as many of these areas and features should not be treated with pesticides anyway. Thus, the protection aim for GAEC 8 areas really relates primarily to the buffer zone rather than the non-productive areas themselves. Legislation on placing of pesticides on the market can provide for much greater buffer zones, either as part of the approval process for the relevant active substance or as part of the pesticide authorisation process.<sup>153</sup>

#### **3.3.2 Available data:**

GAEC 8 provides for a requirement to devote a minimum share of arable land to non-productive features or areas. Member States have the possibility to derogate from the obligation to devote 4% of arable land in accordance with certain conditions set out in the

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<sup>152</sup> See Ares(2021)7125284 - Working document Conditionality : fact sheets GAEC (Annex III of Regulation (EU) No 2021/2115), November 2021, Expert group direct payments, p. 18.

<sup>153</sup> See Articles 4(3)(e)(i), 6 and 31(4)(a) of Regulation (EC) No 1107/2009.

CAP Strategic Plans Regulation.<sup>154</sup> There is an obligation to report on the number of hectares that will be subject to this obligation.<sup>155</sup> This reporting will only start in 2025<sup>156</sup> and therefore the Commission does not yet possess data on the extent of non-productive areas covered in each Member States. However, many of the areas and features that may be included in non-productive areas should not be treated with pesticides anyway, irrespective of the pesticide restriction on sensitive areas. Depending on the Member State definition, non-productive areas and features can include:

- *land lying fallow, especially the most valuable land lying fallow with natural or planted green cover (e.g. melliferous plants, wildflowers etc.)*
- *woody features such as hedgerows, individual or groups of trees, rows of trees*
- *field margins, field patches (“islands of biodiversity”), buffer strips, ditches, streams, small ponds, small wetlands, stonewalls, cairns, terraces, cultural features, and other<sup>157</sup>*

The term “non-productive” means that cultivated areas are excluded, reducing the likelihood of plant protection products being applied in these areas, leading to higher biodiversity benefits compared with the current EFA elements.<sup>158</sup>

As many of these areas and features should not be treated with pesticides anyway, irrespective of the pesticide restriction on sensitive areas, the inclusion of such non-productive areas in the SUR ‘sensitive area’ definition has a very minimal additional impact. The only additional requirement is to use only low-risk pesticides or biological control in the 3-metre buffer zone around the non-productive area.

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<sup>154</sup> See the description of GAEC 8 in Annex III to Regulation (EU) 2021/2115 of the European Parliament and of the Council of 2 December 2021 establishing rules on support for strategic plans to be drawn up by Member States under the common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulations (EU) No 1305/2013 and (EU) No 1307/2013.

<sup>155</sup> Annex IV of Commission Implementing Regulation (EU) 2022/1475 of 6 September 2022 laying down detailed rules for implementation of Regulation (EU) 2021/2115 of the European Parliament and of the Council as regards the evaluation of the CAP Strategic Plans and the provision of information for monitoring and evaluation.

<sup>156</sup> See Article 15 of Commission Implementing Regulation (EU) 2022/1475 of 6 September 2022 laying down detailed rules for implementation of Regulation (EU) 2021/2115 of the European Parliament and of the Council as regards the evaluation of the CAP Strategic Plans and the provision of information for monitoring and evaluation (OJ L 232, 7.9.2022, p. 8).

<sup>157</sup> This is not included in Regulation (EU) 2021/2115 but rather builds on the previous CAP legislation. Member States have to fill in a form (in the SFC IT tool) which provides a structure for the Strategic Plans. These categories are already included in the tool, and Member States tick the corresponding boxes. They may also add additional features. So, Member States are given free choice about the type of landscape features that can be counted. However, this is set out in the CAP Strategic Plan and is therefore also subject to approval. See section 3.1 of Annex I of Commission Implementing Regulation (EU) 2021/2289 of 21 December 2021 laying down rules for the application of Regulation (EU) 2021/2115 of the European Parliament and of the Council on the presentation of the content of the CAP Strategic Plans and on the electronic system for the secure exchange of information.

<sup>158</sup> See Ares(2021)7125284 - Working document Conditionality : fact sheets GAEC (Annex III of Regulation (EU) No 2021/2115), November 2021, Expert group direct payments, p. 19.

### 3.3.3 Analysis

The three-meter 'buffer zone' could increase the total area on which pesticide use would be restricted. However, given that under CAP legislation one of the reasons for exempting farmers from an obligation to set aside non-productive land under GAEC 8 is the size of the farm (with exemptions permitted for farms up to 10 hectares of arable land), the 3-meter buffer zone is more likely to apply in larger farms where the increase of the non-productive area due to the buffer zone will be less relative to the overall size of the farm than it would be for a smaller farm.

A three-meter buffer zone is proposed in order to help to reduce the risk of spray drift of pesticides or of contact of animals with pesticides when these animals temporarily leave the protected area. This could contribute in a modest way to the biodiversity function of these non-productive areas. The main objective of GAEC 8 is maintenance of non-productive features and areas to improve the on-farm biodiversity. Landscape features also provide a number of important environmental benefits for soils, water quality and climate change with a major role in the supply of ecosystem services such as pest control and erosion prevention. These elements also provide broader connectivity corridors and contribute to building "green infrastructure" in agricultural areas.<sup>159</sup>

Agricultural production would still be possible in the buffer zone, unlike in the non-productive areas under GAEC 8. As noted above, many of the areas and features that are currently GAEC 8 non-productive areas should already not be treated with any pesticides under other legislation. However, this applies only to the non-productive areas themselves and not to the buffer zones. Production in the buffer zones would only be constrained by the requirement to use only low-risk pesticides or biocontrol (or not spraying if the farmer decides so). This is likely not to lead to significant yield losses in these buffer zones since the rest of the parcel will be managed without restriction and the overall pressure of pests and diseases will therefore remain under the farmer's control.

## **3.4 Urban areas covered by watercourse or water feature, recreational/ bathing water and areas designated for the protection of economically significant aquatic species**

### **3.4.1 Protection Aim:**

The non-paper mentions a possible option for the co-legislators to consider allowing only low-risk pesticides or biological control on these water bodies and within 3-metre buffer zone surrounding them.<sup>160</sup> The aim of protection of these waters is the protection of human health

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<sup>159</sup> See Ares(2021)7125284 - Working document Conditionality : fact sheets GAEC (Annex III of Regulation (EU) No 2021/2115), November 2021, Expert group direct payments, p. 18.

<sup>160</sup> The non-paper cites an option for the co-legislators to consider of excluding nutrient-sensitive areas, including areas designated as vulnerable zones, and areas designated as sensitive for urban waste-water treatment protected under the Water Framework Directive in order to focus on the areas most relevant for pesticide use restrictions.

and of the aquatic environment.<sup>161</sup> The Water Framework Directive<sup>162</sup> and the Groundwater Directive<sup>163</sup> both set out rules to halt deterioration in the status of EU water bodies and achieve good status for Europe's rivers, lakes and groundwater.<sup>164</sup>

In line with this Article 6 and Annex IV of the Water Framework Directive oblige Member States to designate protected areas, which are to be included in (national) registers of protected areas. These protected areas are included in the SUR 'sensitive area' definition and include areas designated for the protection of economically significant aquatic species and bodies of water designated as recreational waters, including areas designated as bathing waters under Directive 76/160/EEC.<sup>165</sup> In addition, the SUR proposes to protect urban areas covered by a watercourse or water feature. These waters correspond to 'surface waters' under the Water Framework Directive and are proposed to be given additional protection because they are found in urban areas.<sup>166</sup>

The protection of surface water is important as it is particularly at risk from the use of pesticides and the area of surface waters that are at risk due to the use of pesticides is continuously increasing. As has been explained by the German Federal Agency for Nature Protection (UBA):

“This particularly applies to small water bodies in vicinity of agricultural areas. They represent the major part of total flow length and are of particular importance for the natural balance. Pesticides enter natural water bodies mainly intermittently in a dissolved or by a sediment-bound form from adjacent fields through surface runoff after rain events (Neumann 2002, Moschet 2014). According to estimations by Röttele (2013), 35 % of pesticides enter water bodies diffusely via surface runoff and only 5% via drift. A recently published Germany-wide study (Liess et al., 2021) shows that the concentrations of pesticides are beyond ecologically acceptable thresholds in more than 80 % of the small water bodies within agricultural landscapes after rain events in Germany. Similarly, more than 80 % of the investigated water bodies show a reduced proportion of sensitive aquatic organisms such as dragonflies and caddisflies. Thus, pesticides are a crucial stress factor for insects in small water bodies in agricultural landscapes.”<sup>167</sup>

The European Environment Agency has reported that Europe is not on track to meet policy objectives on water quality. It predicted a 'red light' warning in its outlook to 2030 based on

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<sup>161</sup> See recitals 23 and 24 and Article 19 of the SUR. Article 19 of the SUR also prohibits the use of pesticides on all surface waters and within 3 metres of such waters. The reason for inclusion of certain surface water bodies also under Article 18 is that the Water Framework Directive has two systems for designating water bodies. Under one of those systems, water bodies under a certain size don't need to be designated, so there was a need to capture those smaller water bodies in the 'sensitive area' definition also. In addition, areas designated for the protection of economically significant aquatic species are wider than the water bodies themselves.

<sup>162</sup> Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1).

<sup>163</sup> Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration (OJ L 372, 27.12.2006), p. 19.

<sup>164</sup> For further details, see [https://environment.ec.europa.eu/topics/water/water-framework-directive\\_en](https://environment.ec.europa.eu/topics/water/water-framework-directive_en) and Article 1 and Annex IV of Directive 2000/60/EC.

<sup>165</sup> Article 3(16)(f)(i) of the SUR, which refers to any protected area under the Water Framework Directive, Annex IV of which includes such areas and bodies of water as protected areas.

<sup>166</sup> For further details on the protection aim in relation to protecting urban areas, see section 3.1.1 above.

<sup>167</sup> See German Federal Agency for Nature Protection (UBA), Scientific Opinion Paper October 2022, Towards sustainable plant protection: evaluation of the draft regulation on the sustainable use of plant protection products 2022/0196 (COD) with a focus on environmental protection, page 27.

continuing progress to restrict pesticide use. Regulatory monitoring for European surface water between 2007 and 2017 records exceedances of quality standards of 5–15% by herbicides, 3–8% by insecticides, and negligible exceedances for fungicides. Whereas for groundwater, the exceedances of quality standards were about 7% for herbicides and below 1% for insecticides, whilst also being negligible for fungicides.<sup>168</sup> Aquatic biodiversity is a vital resource and there is an important feedback loop between terrestrial and aquatic ecosystems. Many terrestrial species that directly improve food production also rely on riparian zones (uncropped areas around water bodies).<sup>169</sup>

The European Environment Agency database on pesticides in groundwater and on surface waters shows the following important statistics:

- 1) between **4 and 11% of ground waters** are above the limit values of the Ground water Directive (**threshold value i.e. 0,1 µg/l** for each individual pesticide);
- 2) Between **10 to 25% of the surface waters** are above the Environmental Quality Standards Directive standards and surface water watch list values (and in the absence of those, national regulatory standards).<sup>170</sup>

Some pesticides can remain in the environment for years and accumulate in soils and water (Akanksha Sharma et al., 2020). Since many synthetic pesticides degrade slowly in the environment, they can lead to contamination of ground-water. These are also responsible for polluting nearby water bodies via rainwater and pesticide run-off.<sup>171</sup> Studies have shown that pesticide residues are found in surface water and groundwater. Contamination of water by pesticides is widespread.<sup>172</sup>

The protection of economically significant aquatic species, including freshwater fish and shellfish, was included among the areas protected under the Water Framework Directive in order to protect the aquatic environment and for economic reasons. Pesticides can adversely affect non-target organisms, including fish. A 2000-2019 literature review identified several blood cell and biochemical effects of various herbicides, insecticides, and fungicides in fish. It also noted an adverse effect of pesticides on the immune systems of fish and possible immunosuppression. Pathophysiological changes in fish induced by pesticides depend on many factors, such as active compound and its concentration, exposure duration, fish species, and environmental conditions.<sup>173</sup>

A recent study of concentrations and toxicities of 148 pesticide active substances across the EU estimates that individual substances are generally below no observed effect

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<sup>168</sup> EEA. (2020).ETC/ICM Report 1/2020: Pesticides in European Rivers, Lakes and Groundwaters - Data Assessment. <https://www.eionet.europa.eu/etcs/etc-icm/products/etc-icm-report-1-2020-pesticides-in-european-rivers-lakes-andgroundwaters-data-assessment>. See also Ramboll, *Study Supporting the Evaluation of Directive 2009/128/EC on the Sustainable Use of Pesticides and Impact Assessment of its Possible Revision – Final Impact Assessment Report*, p. 73.

<sup>169</sup> Ramboll, *Study Supporting the Evaluation of Directive 2009/128/EC on the Sustainable Use of Pesticides and Impact Assessment of its Possible Revision – Final Impact Assessment Report*, p. 74.

<sup>170</sup> <https://www.eea.europa.eu/data-and-maps/figures/percentage-of-reported-monitoring-sites-2/>

<sup>171</sup> Ibid., section 5.4.

<sup>172</sup> Aktar, W., Sengupta, D., & Chowdhury, A. (2009). Impact of pesticides use in agriculture: their benefits and hazards. *Interdisciplinary Toxicology*, 2(1), 1–12 , p. 5. <https://doi.org/10.2478/v10102-009-0001-7>

<sup>173</sup> Bojarski and Witeska, ‘Blood biomarkers of herbicide, insecticide, and fungicide toxicity to fish – a review’, *Environ Sci Pollut Res Into*. 2020 June;27(16):19236-19250, <https://pubmed.ncbi.nlm.nih.gov/32248419/>

concentrations (NOEC) for aquatic organisms. However, the cumulative mixture toxicity (calculated by adding individual active substance concentrations divided by the respective NOEC) can exceed 0.1 toxic units for more than 27% of the length of the EU's stream network, and 1 toxic unit for more than 4%. This suggests a relatively widespread risk due to pesticide pollution.<sup>174</sup>

Pesticide use restrictions for recreational and bathing water and urban areas covered by a watercourse or water feature are primarily aimed at protecting human health but also serves to protect the aquatic environment. Reducing pesticide use, in particular of key insecticides and herbicides is found to reduce risks to aquatic ecosystems, such as freshwater or marine water ecosystems, and species which are particularly vulnerable to toxic chemicals.<sup>175</sup> Studies have shown that insecticides may be responsible for more than half, and herbicides for more than one-quarter, of acute risks to aquatic life in the EU.<sup>176</sup>

### 3.4.2 Available data:

Member States are obliged to include identification and mapping of protected areas in their River Basin Management Plans.<sup>177</sup> Table 2 in Annex 1 shows the data the Commission has in relation to areas designated for the protection of economically significant aquatic species and bodies of water designated as recreational waters. Data on bathing water is in the form of points and most of the data on economically significant aquatic species (provided by 9 Member States) is in the form of lines representing length in kilometres rather than total area affected so cannot be converted to a percentage of total territory. In the case of the four Member States that have provided data in the form of the percentage of total territory affected by protection of economically significant aquatic species, the territory affected (rounded to the nearest percentage) is 0% or 1%.

Table 3 provides the total territory affected by 'urban area covered by a watercourse or water feature' in each Member State (rounded up to the nearest percentage). The terms 'watercourse or water feature' refer to 'surface water' as defined under the Water Framework Directive. Rounded to the nearest percentage, it affects 0% of total territory in 22 Member States, 1% in 2 Member States and 2% in 2 Member States. The Member State most affected is the Netherlands, with 7% of its territory affected.

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<sup>174</sup> Pistocchi, Dorati, Galimberti, Udias, Bopp, D'Andriomnt, Catarino and Schaefer, 'A screening study of the spatial distribution of agricultural pesticides in Europe's waters based on available data', [Frontiers | A screening study of the spatial distribution of agricultural pesticides in Europe's waters based on available data \(frontiersin.org\)](https://doi.org/10.3389/fenv.2023.106479), published on 30 March 2023.

<sup>175</sup> *Commission Staff Working Document Impact Assessment Report Accompanying the document Proposal for a Regulation of the European Parliament and of the Council on the sustainable use of plant protection products and amending Regulation (EU) 2021/2115*, p. 47; Ramboll, *Study Supporting the Evaluation of Directive 2009/128/EC on the Sustainable Use of Pesticides and Impact Assessment of its Possible Revision – Final Impact Assessment Report*, p. 73.

<sup>176</sup> Wolfram J, Stehle S, Bub S, Petschick LL, Schulz R. (2021). Water quality and ecological risks in European surface waters– Monitoring improves while water quality decreases. *Environment International*. 2021 Jul 1;152:106479.

<sup>177</sup> Under point 3 of Annex VII of Directive 2000/60/EC, River Basin Management Plans must include "identification and mapping of protected areas as required by Article 6 and Annex IV".

On 27 March 2023, the Commission received representations from the Dutch Organisation for Greenhouse Horticulture that the buffer zone of 3 metres is problematic as some greenhouses in the Netherlands are closer than 3 metres to surface water. As certain greenhouses are closed systems with close to zero risk of run-off, Member States might wish to consider providing for an exemption in relation to such closed production systems.

### 3.4.3 Analysis

The protection of bathing water points and of urban areas covered by a watercourse or water feature covers surface water and a 3-metre buffer zone around it. While there may be some overlap between agricultural areas and the 3-metre buffer zone (for example in the case of a large lake that is designated as a bathing water point), this should have a limited impact. Bathing water points and urban areas covered by a watercourse or water feature will often not coincide with agriculture<sup>178</sup> and data on the latter shows a very low percentage of coverage in most Member States. Even where they do coincide with agriculture, pesticide restrictions will be limited to the three-metre buffer zones. This is in line with the GAEC 4 standard, which provides that as a general rule, buffer strips along water courses shall respect a minimum width of 3 meters.

Areas designated for the protection of economically significant aquatic species might in theory have a greater impact on agriculture since a Member State might choose to designate much larger areas than the water bodies themselves. The Commission only possesses data from 9 Member States in relation to these areas and 5 of those are in the form of number of lines and overall length of lines, from which it is not possible to gauge the percentage of total Member States territory affected. In the case of the 4 Member States that have provided data on the percentage of territory affected by the designation of these areas, the territory affected, rounded to the nearest whole percentage, amounts to 0% or 1% of the total Member State territory.<sup>179</sup> If this type of coverage is replicated in other Member States, the likely impact on agriculture would be also minimal.

Member States that have identified and mapped the protected areas in relation to economically significant aquatic species in the form of numbers of lines and length of lines may wish to verify the percentage of territory that may be affected by this designation. Member States that have not yet carried out an identification or mapping of such protected areas in line with their obligations under the Water Framework Directive, or that have designated them in the past but wish to amend that designation in updated River Basin Management Plans, might wish to take into account possible pesticide use restrictions that might arise from options presented for the co-legislators to consider in the non-paper and potential impacts on agriculture, as well as the need to ensure adequate protection of economically significant aquatic species.

In addition, the protection of surface water is of great environmental importance. As noted above, there is evidence that concentrations of pesticides are beyond ecologically acceptable

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<sup>178</sup> The non-paper identifies a possible option for the co-legislators to consider of removing the agricultural element from the ‘discontinuous urban fabric’ part of human settlements. However, this does not necessarily apply to urban areas covered by a watercourse or water feature, where the term ‘urban’ can be taken to mean ‘local administrative units’ (LAU) classified as “cities” and “towns and suburbs”, according to the Degree of Urbanization (Eurostat, 2018). Therefore there might be some limited overlap between urban areas covered by a watercourse or water feature and agriculture.

<sup>179</sup> See Table 2 in Annex 1.

thresholds in between 10% and 25% of surface water bodies and the European Environmental Agency has predicted a ‘red light’ warning in its outlook to 2030 based on continuing progress to restrict pesticide use.<sup>180</sup> Given the high level of concern in relation to water quality in the medium terms and the relatively minor likely impact on agriculture of protecting these areas, it appears prudent to restrict the use of pesticides in these areas to biocontrol and low-risk pesticides.

Finally, it should be noted that the minimal 3-metre buffer zone proposed under the SUR would help address the issues of point source contamination and drift or surface run-off from use of pesticides in close proximity to water (under 3 metres) but would not address drift or surface run-off issues from pesticides requiring greater buffer zone distances. However, as noted above, legislation on placing of pesticides on the market can provide for much greater buffer zones to avoid contamination of surface water from point source contamination, drift or surface run-off, either as part of the approval process for the relevant active substance or as part of the pesticide authorisation process.<sup>181</sup>

### **3.5 Drinking water protection areas**

#### **3.5.1 Protection aim**

The non-paper includes an option for the co-legislators to consider that only low-risk pesticides or biological control would be permitted in these areas and within a 3-metre buffer zone surrounding them. The Water Framework Directive and the Groundwater Directive contain provisions for extra protection of surface- and groundwater bodies used for the abstraction of drinking water. Those are aimed at avoiding a deterioration of quality and at reducing the level of purification treatment required for the production of drinking water. In addition to the general need to protect surface water and aquatic life as set out in section 3.3, there is a specific need to protect drinking water, which can be sourced from groundwater and freshwater surface bodies. Persistent and bio-accumulative substances can be found decades after their ban or end of use. Some substances and many metabolites can last for decades in some large water tables because there is no degradation below the surface of the ground.<sup>182</sup>

Moreover, there is a high economic cost to the current widespread presence of pesticides and their metabolites in drinking water resources. Many water suppliers must take costly measures to comply with the parametric values of Directive 2020/2184. These costs are passed on to the water consumer.

Water industry case studies refer to examples of additional activated carbon filtration and ozonation due to pesticides in drinking water resources costing a water processing company EUR 50 M in the period 2018-2020.<sup>183</sup> Another case study examined the case of a UK water operator which found the pesticide metaldehyde in its treated drinking water and failed to meet the drinking water Directive limit value for the indicated pesticide threshold. Treating

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<sup>180</sup> For further details, see section 3.4.1.

<sup>181</sup> See section 3.3.1 above.

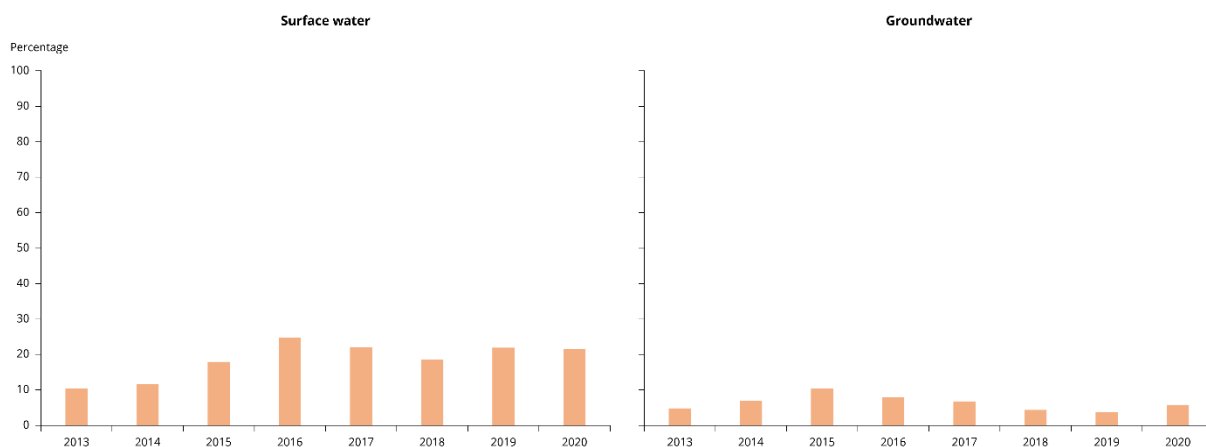
<sup>182</sup> Eureau, the European Federation of National Associations of Water Services, Sustainable Use of PPP Regulation Additional EurEau Input on PPP and Drinking Water Resources, October 2022.

<sup>183</sup> *Commission Staff Working Document Impact Assessment Report Accompanying the document Proposal for a Regulation of the European Parliament and of the Council on the sustainable use of plant protection products and amending Regulation (EU) 2021/2115*, p. 14.

the water for metaldehyde would have cost €612.4M, entailing a 21% increase in consumer water bills. As an alternative to treating the water, the company used financial incentives to address the cost barriers to farmers to use an alternative to metaldehyde. This alternative cost €16.6M, 3% of the alternative cost of treating the water. A recent paper claims that various infrastructural, institutional and behavioural “pesticide lock-ins” hamper more effective actions being taken in this area.<sup>184</sup>

Eureau, the European Federation of National Associations of Water Services, has estimated that it could cost several hundred million euro throughout the EU each year to test and clean water from pesticides to achieve concentrations below the maximum residue levels. Despite this, there is currently little transparency on how much is spent or even how many samples are analysed each year in the EU by government authorities and private companies. By way of examples, they note that most tested pesticide, atrazine, which was banned in the EU since 2004, would cost over €25 million per year, that one large private water supplier in Lower Saxony (Germany) spends about €0.8 million a year and there are tens of thousands of water suppliers in the European Union. In France, a total of €360 million is spent every year on the removal of pesticides from drinking water, and consumers spend €137 million per year on bottled water to avoid drinking tap water with pesticide residues.<sup>185</sup>

*Figure 1 shows the percentage of reported monitoring sites with pesticides exceeding thresholds in a) surface waters and b) groundwater in Europe, weighted by country area (courtesy of the European Environment Agency)<sup>186</sup>*



In France, the percentage of the population that was exposed to pesticides that exceeded the limits under the Drinking Water Directive increased from 2,6% (2020) to 6,6% (2021) as regards occasional exceedances and from 3,3% (2020) to 10,8% (2021) as regards recurrent exceedances.<sup>187</sup> In Denmark, it is estimated that the proportion of Danish households

<sup>184</sup> *Ibid.*

<sup>185</sup> Eureau, the European Federation of National Associations of Water Services, Sustainable Use of PPP Regulation Additional EurEau Input on PPP and Drinking Water Resources, October 2022.

<sup>186</sup> <https://www.eea.europa.eu/data-and-maps/figures/percentage-of-reported-monitoring-sites-2/>

<sup>187</sup> Bilan de la qualité de l’eau au Robinet du consommateur vis-à-vis des pesticides en France en 2021“, Ministère de la Santé et de la Prévention, December 2022, [https://sante.gouv.fr/IMG/pdf/2021\\_bilan\\_pesticides.pdf](https://sante.gouv.fr/IMG/pdf/2021_bilan_pesticides.pdf), p. 9.

potentially exposed at least once to pesticides above the maximum allowed concentration under the Drinking Water Directive was 19% for 2002-2019 and 11% for 2015-2019.<sup>188</sup>

In the Czech Republic, of nearly 200 pesticides monitored in 2017, more than 80% were detected at least once at levels above the limits of quantification. It can therefore be assumed that hundreds of pesticides can be present in drinking water, even if only rarely. Based on the routine monitoring data, 96% of findings were below the limit of quantification. A recent study suggests this can be considered over-monitoring as a result of non-targeted monitoring. Public feedback suggested the situation had undermined consumer confidence in drinking water quality.<sup>189</sup>

In the Netherlands, a prohibition of professional use outside agriculture (with limited exceptions) was justified in the explanatory memorandum accompanying the legislation by reference to reports of the Environmental Planning Bureau showing that banning specific active substances, sustainable weed management measures and legal obligations to minimise pesticides had had limited positive impact on the quality of the aquatic environment and that pesticide use restrictions were therefore necessary.<sup>190</sup>

From both the economic and health perspective, the solution is not to provide most water treatment plants with pesticide removal technologies as it does not address the cause of the problem, it contradicts the polluter-pays principle, and moreover, the existing technologies are not equally effective against all pesticides or may have negative side effects. It is necessary to adopt effective regulation, direct or indirect, over the use of the most problematic pesticides in the environment in regard to their impact on water sources.

In conclusion, additional treatment appears to be needed for drinking water. This clearly demonstrates the need for pesticide restrictions in water catchment areas, in line with the requirement for preventive measures under Article 8 of the Drinking Water Directive.

### 3.5.2 Available data:

The SUR 'sensitive area' definition includes areas designated for the abstraction of water intended for human consumption.<sup>191</sup> The Commission only possesses data in relation to the percentage of territory affected in nine Member States – most Member States do not disclose the data for reasons of confidentiality. In some cases, areas currently designated for abstraction of drinking water under the Water Framework Directive cover up to a 100% of a Member State's territory. However, as explained below, under the recast Drinking Water Directive, Member States are required to define catchment areas for the protection of drinking water abstraction points. This exercise will allow the Member States to designate areas to be protected from pesticides more precisely.

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<sup>188</sup> Voutchkova, Schullehner, Skaarup, Wodschow, Ersbøll, Hansen, 'Estimating pesticides in public drinking water at the household level in Denmark', 2021: GEUS Bulletin 47. 6090, <https://doi.org/10.34194/geusb.v47.6090>.

<sup>189</sup> Kotal, Kožišek, Jelíková, Vavrouš, Mayerová, Gari and Moulisová, 'Monitoring of pesticides in drinking water: finding the right balance between under- and over-monitoring – experience from the Czech Republic', *Environ. Sci.: Process Impacts*, 2021, 23, 311.

<sup>190</sup> See explanatory memorandum accompanying the Decree of 9 March 2016 amending the Decree on plant protection products and biocides as regards the non-authorisation of plant protection products outside agriculture, <https://zoek.officielebekendmakingen.nl/stb-2016-112.html>, pp. 10-11.

<sup>191</sup> Article 3(16)(f)(i) of the SUR, which refers to any protected area under the Water Framework Directive, Annex IV of which includes such areas as protected areas.

### 3.5.3 Analysis

Given that in some cases, Member States have designated 100% of their territory as areas designated for abstraction of drinking water under the Water Framework Directive, pesticide use restrictions on such a large extent of territory would have a severe economic impact on agriculture. On that basis, the non-paper notes the following possible options in relation to drinking water<sup>192</sup>:

- 1) restricting pesticide use in “catchment areas for abstraction points” to be designated by 2027 under the Drinking Water Directive<sup>193</sup> rather than in areas designated for the abstraction of drinking water. Exemptions could be permitted under specific technical conditions;
- 2) Member States could delineate specific sub-sections of the catchment area for abstraction points after carrying out the risk monitoring of the catchment area for abstraction points that they are obliged to carry out under the Drinking Water Directive and could identify the relevant areas where risk monitoring demonstrates that a particular risk warrants a restriction on use of pesticides;
- 3) Deletion of the reference to protection of drinking water under the SUR on the basis that it is adequately covered by the Drinking Water Directive and legislation on placing pesticides on the market.<sup>194</sup>

Under Option 1, Member States would have control over the extent of designated territory and would designate that territory in the knowledge that the area would be subject to pesticide use restrictions. Such pesticide use restrictions would be to allow for biocontrol and low-risk pesticides in the overall catchment area for abstraction points. There would also be the possibility to provide for specific exemptions, as outlined in the non-paper, where certain technical conditions are met.

The advantage of this option is that it would provide for an approach whereby all parts of catchment areas for abstraction points would be treated in a consistent manner. The clear technical conditions described above would be set in the catchment areas, which would be the same across all Member States, thus introducing more harmonisation.

In addition, there would be a requirement to prove that there are no risks to human health before pesticides other than low-risk pesticides or biological control could be used in such areas. Thus, sufficient proof would be required before such pesticides could be used. Furthermore, the technical conditions for exceptions would be tailored in an objective manner to national and even local situations enabling the competent authorities to take targeted measures. It appears that only a few pesticides may account for most of the risk to aquatic life and these pesticides would thus be avoided.<sup>195</sup>

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<sup>192</sup> See European Commission, *Non-Paper on the Definition and Scope of Provisions on Sensitive Areas in the Proposal for a regulation on the Sustainable Use of Plant Protection Products (SUR)*, [https://food.ec.europa.eu/document/download/98add16-a88a-4e9e-a654-db84e21c0da8\\_en?filename=pesticides\\_sud\\_sur-non-paper\\_en.pdf](https://food.ec.europa.eu/document/download/98add16-a88a-4e9e-a654-db84e21c0da8_en?filename=pesticides_sud_sur-non-paper_en.pdf), p. 4.

<sup>193</sup> Article 7(4) of Directive (EU) 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption.

<sup>194</sup> Regulation (EC) No 1107/2009.

<sup>195</sup> Underwood, E and Mole, N (2016). Effective policy options for reducing environmental risks from pesticides in the UK. Institute of European Environmental Policy; Van Klink R, Bowler DE, Gongalsky KB, Swengel AB, Gentile A, Chase JM. (2020). Meta-analysis reveals declines in terrestrial but increases in freshwater insect abundances. *Science*. 368(6489):417-20; van Eerd M, Spruijt J, van der Wal E, van Zeijts H, Tiktak A.

The occurrence of pesticides and their metabolites can vary a lot from Member State to Member State and even within the regions of a Member State. Therefore a (local) risk assessment of the catchment area is a good tool to identify the local human health risks due to the local use of specific pesticides. In option 1, pesticides can be used provided they are not identified as a risk to human health. Under the recast DWD, as a part of the risk assessment, Member States shall ensure that appropriate monitoring is carried out in the catchment areas. The use of these monitoring data (measuring what pesticides/metabolites are actually present in the water sources) in the assessment of the health risk is an advantage of option 1 with a view to protect human health.

Under Option 2, Member States could delineate specific sub-sections of the catchment area for abstraction points after carrying out risk monitoring, as required under the Drinking Water Directive.<sup>196</sup> Member States could identify the relevant areas where risk monitoring demonstrates that a particular risk warrants a restriction on the use of pesticides.

An advantage of Option 2 is that it would allow Member States to apply stricter pesticide use restrictions in the areas where they determine there is a greater risk of pollution of surface waters or of groundwater. They would have greater flexibility to pinpoint the precise areas where the greatest risk exists. In addition, there would be less administrative burden for competent authorities in relation to assessing whether the exceptions under Option 1 apply.

A possible disadvantage of Option 2 is that pesticide use restrictions could only apply after specific problems had been identified. The Commission has received representations from Eureau, the European Federation of National Associations of Water Services, that risk assessments will document pollution that has already occurred with no power to enforce source control measures. They argue that this is even more problematic, as it can take up to 10 years for pesticides and their metabolites to arrive in groundwater bodies.<sup>197</sup> As against this, it should be noted that monitoring under the revised Drinking Water Directive will immediately show where past use of pesticides in the last decade or longer have created the most problems. The properties of soil do not normally change quickly so this should give an accurate picture of where the greatest risks of run-off area. However, it is also true that once problems have been identified and pesticide use restricted in a given area, it may take many years for the soil and water to recover.

Under Option 3, Member States might consider sufficient for the purposes of pesticide use restrictions the obligations under the Drinking Water Directive to define risk management measures. The references in the Drinking Water Directive to “preventive measures” and “mitigation measures” could be interpreted to include such pesticide use restrictions.<sup>198</sup>

A disadvantage of this approach is that it may not lead to adequate protection. In practice, Member States have difficulties to reach the limit values of the Drinking Water Directive for pesticides. Under Option 3, there would be no explicit obligation to provide for pesticide use restrictions and no scope to provide parameters for a more harmonised approach.

Protection of drinking water from pesticides is important for human health and for protecting the good status of water bodies given that persistent and bio-accumulative substances can be

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(2014). Costs and effectiveness of on-farm measures to reduce aquatic risks from pesticides in the Netherlands. *Pest management science*. 70(12):1840-9.

<sup>196</sup> Articles 7 and 8 of Directive 2021/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption (OJ L 435, 23.12.2020, p. 1).

<sup>197</sup> Eureau letter to Commissioner Kyriakides, 15 December 2022.

<sup>198</sup> See Article 8 of Directive (EU) 2020/2184.

found decades after their ban or end of use. There is also a high economic cost that arises from the need to treat water polluted by pesticides. Water supplies have to take costly measures, with the cost being passed on to the consumer. The cost of treating drinking water has been estimated at several hundred million euro throughout the EU. This suggests a need for proportionate action to reduce contamination at source.

### 3.6 Other ecologically sensitive areas: Natura 2000 and CDDA

#### 3.6.1 Protection aim

The aim of protecting Natura 2000 and CDDA areas is the preservation of biodiversity. Natura 2000 is a network of core reproductive and resting sites for rare and threatened species. Natura 2000 also protects a wide range of natural and semi-natural habitat types, including grasslands, wetlands, dunes, heathlands, forests, lakes and rivers. Its aim is to ensure the long-term survival of Europe's most valuable and threatened species and habitats, listed under the Birds and Habitats Directives.<sup>199</sup>

The Natura 2000 network is complemented by protected areas for nature conservation at national and regional level, which are reported by Member States to the Nationally designated protected areas inventory (CDDA), the official source of protected area information for the World Database of Protected Areas (WDPA).<sup>200</sup> Jointly, all protected areas make up a network required for nature protection, and for reaching the targets of the Kunming-Montreal Global Biodiversity Framework,<sup>201</sup> in particular to maintain, enhance, or restore the integrity, connectivity and resilience of all ecosystems.

The non-paper identifies for the co-legislators a possible option that outside agriculture, only low-risk pesticides or biological control would be permitted in these areas and within a 3-metre buffer zone surrounding them. In agriculture within these areas, Member States may envisage allowing the use of biocontrol, low-risk and other approved substances as well as all pesticides allowed in organic agriculture while not allowing the use of emergency authorisations of pesticides containing non-approved substances or the use of more hazardous pesticides that are not used in organic agriculture.<sup>202</sup>

There is ample scientific evidence for negative impacts of current pesticide use on biodiversity.<sup>203</sup> While the task and function of protected areas is to protect rare and endangered species and their communities from harmful influences outside the protected

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<sup>199</sup> For further details, see [https://ec.europa.eu/environment/nature/natura2000/index\\_en.htm](https://ec.europa.eu/environment/nature/natura2000/index_en.htm)

<sup>200</sup> For further details, see <https://www.eea.europa.eu/data-and-maps/data/nationally-designated-areas-national-cdda-17>

<sup>201</sup> The Kunming-Montreal Global Biodiversity Framework was agreed at the 15th meeting of the Conference of Parties to the UN Convention on Biological Diversity in 2022. <https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222>

<sup>202</sup> In addition, the non-paper cites a possible option for the co-legislators to consider of explicitly removing roads, railways, ports and airports from all parts of the sensitive area definition. Such areas are explicitly excluded from human settlements but are not explicitly excluded from Natura 2000 and CDDA areas under the SUR proposal.

<sup>203</sup> See for example the EEA briefing, 'How pesticides impact human health and ecosystems in Europe', 26 April 2023, pp. 10-11.

areas, many scientific studies show a rapid decline of species even in protected areas.<sup>204</sup> At the same time, populations of valuable species in protected areas are often in an unfavourable conservation status and thus highly vulnerable to additional anthropogenic stress.<sup>205</sup>

Insect decline is a global phenomenon<sup>206</sup> and pesticide use is listed among the key drivers for pollinator decline, even inside protected areas.<sup>207</sup> In some EU Member States, pesticide application on agricultural land is frequent within Natura 2000 areas, which is expected to impact the environment not only on the applied farmland, but also on adjacent natural habitats. While isolation distances vary greatly, for certain insecticides, isolation distances of several hundred meters are required. There are no reports that such isolation distances are systematically applied, which means that negative impacts on the fauna in nature reserves are likely to be significant in terms of driving the invertebrate declines in Natura 2000 sites and other protected areas in the EU.

### 3.6.2 Available data

#### *Natura 2000 areas*

Table 4A in Annex 1 provides data on the percentage of territory in Natura 2000 areas in each Member State. This shows that between 9 and 39% of total Member States territory is in Natura 2000. Table 4B in Annex 1 provides data on the percentage of arable land, permanent crops<sup>208</sup>, pastures and heterogeneous agriculture<sup>209</sup> affected. Of arable land, which is the most economically significant, between 1% and 25% of arable land is affected.

#### *Nationally designated protected areas inventory (CDDA):*

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<sup>204</sup> See German Federal Agency for Nature Protection (UBA), Scientific Opinion Paper October 2022, Towards sustainable plant protection: evaluation of the draft regulation on the sustainable use of plant protection products 2022/0196 (COD) with a focus on environmental protection, page 24.

<sup>205</sup> Ibid.

<sup>206</sup> Zattara & Aizen, 2021, 'Worldwide occurrence records suggest a global decline in bee species richness', *One Earth* 4, 114–123 January 22, 2021 <https://doi.org/10.1016/j.oneear.2020.12.005>; Wagner, Grames and Forrester, 'Insect decline in the Anthropocene: Death by a thousand cuts', <https://www.pnas.org/doi/10.1073/pnas.2023989118>; Goulson, 'Insect declines and why they matter', [https://www.somersetwildlife.org/sites/default/files/2019-11/FULL%20AFI%20REPORT%20WEB1\\_1.pdf](https://www.somersetwildlife.org/sites/default/files/2019-11/FULL%20AFI%20REPORT%20WEB1_1.pdf).

<sup>207</sup> IPBES (2016). The assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production. S.G. Potts, V. L. Imperatriz-Fonseca, and H. T. Ngo (eds). Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany. 552 pages. <https://doi.org/10.5281/zenodo.3402856>; Hallmann et al., 'More than 75 percent decline over 27 years in total flying insect biomass in protected areas', 18 October 2017, <https://doi.org/10.1371/journal.pone.0185809>.

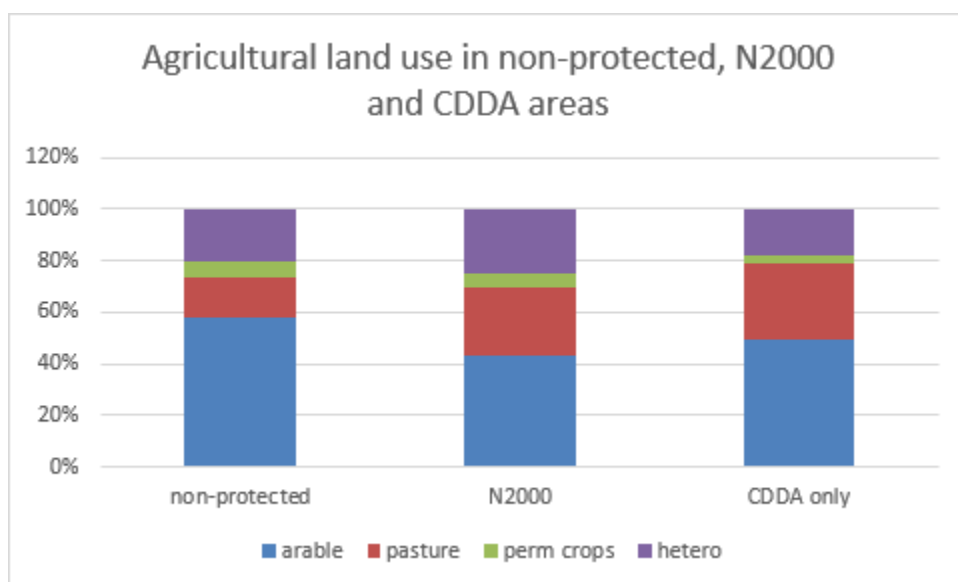
<sup>208</sup> Permanent crops are all fruit trees, all citrus fruit trees, all nut trees, all berry plantations, all vineyards, all olive trees and all other permanent crops used for human consumption (e.g. tea) and for other purposes (e.g. Christmas trees). For further information, see [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Permanent\\_crops#:~:text=Permanent%20crops%20are%20usually%20lignous,more%20than%20five%20consecutive%20years](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Permanent_crops#:~:text=Permanent%20crops%20are%20usually%20lignous,more%20than%20five%20consecutive%20years).

<sup>209</sup> The phrase 'heterogeneous agricultural areas' refers to areas of annual crops associated with permanent crops on the same parcel, annual crops cultivated under forest trees, areas of annual crops, meadows and/or permanent crops which are juxtaposed, landscapes in which crops and pastures are intimately mixed with natural vegetation or natural areas. See <https://land.copernicus.eu/user-corner/technical-library/corine-land-cover-nomenclature-guidelines/html>

The Commission also possesses data on territories in each Member States affected by the Nationally designated protected areas inventory (CDDA). Table 5A in Annex 1 provides data on the percentage of territory in CDDA areas in each Member State. This shows that between 1% and 60% of Member State national territory is affected. Table 5B in Annex 1 provides on the percentage of arable land, permanent crops<sup>210</sup>, pastures and heterogeneous agriculture affected. Of arable land, which is the most economically significant, between 1% and 56% is affected.

While this data is still useful information in understanding the effects of inclusion of the CDDA, it is less directly relevant than the data on Natura 2000, given that the non-paper describes various options for the co-legislators to consider for limiting or removing the CDDA areas that would be relevant to pesticide use restrictions.

Another point of relevance is that the proportion of land that is arable, and consequently more economically productive, is lower in Natura 2000 and CDDA areas than in areas that are not under protection, as the following graph shows:



Data:

	non-protected	N2000	CDDA only
Arable	58%	43%	49%
Pasture	15%	27%	29%
perm crops	7%	5%	3%
Hetero	20%	25%	18%

<sup>210</sup> Permanent crops are all fruit trees, all citrus fruit trees, all nut trees, all berry plantations, all vineyards, all olive trees and all other permanent crops used for human consumption (e.g. tea) and for other purposes (e.g. Christmas trees). For further information, see [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Permanent\\_crops#:~:text=Permanent%20crops%20are%20usually%20lignous,more%20than%20five\)%20consecutive%20years.](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Permanent_crops#:~:text=Permanent%20crops%20are%20usually%20lignous,more%20than%20five)%20consecutive%20years.)

(“N2000” includes “N2000 only” and “CDDA land that is also categorised as N2000”).

### 3.6.3 Promotion of agriculture in Natura 2000 and CDDA areas

The application of pesticides on agricultural land within areas designated for nature protection obviously limits the value of this land for biodiversity conservation, and this also affects adjacent non-agricultural land in these protected areas (see review of pesticide impact in section 3.3). Nevertheless, the continuation of agricultural use in areas protected for habitats and biodiversity in Natura 2000 and CDDA areas is a major concern for some Member States and stakeholders. Several argued that agriculture is part of the management policy that contributes to the meeting of biodiversity objectives, and in some cases the sensitive organisms to be protected are dependent on the maintenance of the agricultural habitat or crop. Feedback further suggested that significant agricultural areas would be affected and showed a preference for prohibiting only the more hazardous pesticides in such areas. Some Member States, including Germany, Austria and Slovenia indicated they had prioritised and promoted organic farming in these areas.

At the same time, there is a balance to be struck between the immediate and longer-term needs of agriculture. The Organisation for Economic Cooperation and Development has highlighted the need to “weigh the risk that measures may be difficult to rescind and may provide limited or marginal assistance with the current pressures, while carrying important longer term environmental costs, in particular for biodiversity”.<sup>211</sup> It is also important to weigh the benefits of food production against externalised costs of agriculture. For example, a recent study from November 2022 in France found that the social costs attributable to synthetic pesticide use in France amounted to 372 million euros, more than 10% of the annual budget in 2017 of the French Ministry of Agriculture and Food.<sup>212</sup> Thus, the Commission has tried to strike a balance by identifying for the co-legislators a possible option that more hazardous pesticides would be prohibited in agriculture in Natura 2000 and CDDA areas.

The non-paper envisages allowing the use of biocontrol, low-risk and other approved substances as well as all plant protection products allowed in organic agriculture while not allowing the use of emergency authorisations of pesticides containing non-approved substances<sup>213</sup> or the use of more hazardous pesticides that are not used in organic agriculture. Prohibition of both these classes of substances in agriculture in Natura 2000 and CDDA areas

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<sup>212</sup> Alliot, McAdams-Marin, Borniotto and Baret, The Social Costs of Pesticide Use in France, *Frontiers in Sustainable Food Systems*, 17 November 2022, <https://www.frontiersin.org/articles/10.3389/fsufs.2022.1027583/full>, p. 1.

<sup>213</sup> Emergency authorisations of pesticides containing approved and non-approved active substances are provided for under Article 53 of Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC (OJ L 309, 24.11.2009, p. 1). These substances have the highest hazard weighting within the existing SUD harmonised risk indicator 1 as they have either lost approval due to their hazard properties or no application has been submitted for approval or renewal of approval, which means that their effects on the environment have not been assessed under the latest environmental risk assessment methodology as having no unacceptable effect on the environment. In 2019-2021, the average percentage of emergency authorisations of non-approved active substances accounted for 18% of the relevant emergency authorisations. This is based on COM analysis of the emergency authorisations notified to it, counting any emergency authorisation of use of an active substance that was non-approved at the time the authorisation was granted.

would therefore remove those pesticides considered to be most damaging to biodiversity in the longer term. It is considered that this approach, coupled with a more effective application of the IPM provisions as set out in the proposal, could still lead to a more progressive move to chemical pesticides as a last resort. This approach could also better consider the current availability of effective alternatives for agricultural needs. However, under this approach, protected areas will continue to be exposed to a range of pesticides, which may have impacts on biodiversity within these areas.<sup>214</sup>

Copper compounds are the only ‘more hazardous’ pesticides that are authorised for use in organic agriculture. Research initiatives supported by Horizon Europe are ongoing and have already yielded substantial reductions in the level of copper use by using expert systems to rely on climate and humidity to predict when copper is not needed, by developing resistant cultivars and by developing biological controls. In addition, the quantity of copper permitted in both conventional and organic farming has been reduced to 28kg per hectare over a seven-year period.<sup>215</sup>

### **3.6.4 Options in relation to the CDDA**

The CDDA accounts for around the same amount of territory across the Union as Natura 2000 areas. It also includes a great deal of agriculture and a higher share of arable land (which is of most economic significance for agriculture) than Natura 2000 areas. As with drinking water protection and Natura 2000 areas, the consequence under the options set out in the non-paper of including certain CDDA areas within ‘sensitive areas’ would be to allow only low-risk pesticides or biological control in non-agricultural parts of those areas. This would be of benefit to the protection of biodiversity in ways that are not sufficiently covered by Natura 2000 alone.

As agreed at international level in Kunming-Montreal Global Biodiversity Framework<sup>216</sup>, there is a need to dedicate by 2030 at least 30 per cent of terrestrial and other areas for biodiversity and ecosystem functions and services through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures. The EU Biodiversity Strategy for 2030 sets out a commitment to legally protect a minimum of 30 % of the land (including inland waters, and 30 % of the sea in the Union), of which at least one third should be under strict protection, including all remaining primary and old-growth forests. The Natura 2000 network in its present form alone will not suffice to meet this goal as it covers only 18% of the EU land area.<sup>217</sup> In line with other ecologically sensitive areas, a different balance would be struck in agricultural parts of the CDDA in order also to allow for the continuation of agriculture in such areas, as outlined above in section 3.5.3.

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<sup>215</sup> Member States should supervise the use of copper in organic farming during annual inspections for certification of organic farming and in related sampling in order to ensure that its use is minimised in line with emerging research and reduction techniques.

<sup>216</sup> <https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222>

<sup>217</sup> [https://tableau-public.discomap.eea.europa.eu/views/Protected\\_Area\\_with\\_CLS18/DashboardCLC2018andPA2022byEU27?%3AisGuestRedirectFromVizportal=y&%3Adisplay\\_count=n&%3AshowAppBanner=false&%3Aorigin=viz\\_share\\_link&%3AshowVizHome=n&%3Aembed=y](https://tableau-public.discomap.eea.europa.eu/views/Protected_Area_with_CLS18/DashboardCLC2018andPA2022byEU27?%3AisGuestRedirectFromVizportal=y&%3Adisplay_count=n&%3AshowAppBanner=false&%3Aorigin=viz_share_link&%3AshowVizHome=n&%3Aembed=y)

Several Member States have reported areas to the CDDA database that are not primarily protected for biodiversity conservation, for example areas of cultural value. These areas are reported by Member States and the classification criteria are not harmonised at EU level. On that basis, the non-paper provides options for the co-legislators to consider to limit the extent of CDDA territory affected. The non-paper sets out the following options in relation to the CDDA:

1. Member States might remove areas not directly relevant for biodiversity from the CDDA designation, modifying their CDDA notification on that basis.
2. To make SUR-related reporting a specific reporting field in future CDDA reporting (which is done annually). This would mean that Member States would then be responsible for designating areas relevant for SUR purposes under the CDDA (e.g. areas considered by the Member State as more vulnerable to pesticide use). Those areas that are designated as relevant for SUR purposes would be subject to a restriction on pesticide use (using only low-risk pesticides or biological control, or a greater range of pesticides in agriculture within those areas – see section 3.5.3). Member States would have more flexibility within their existing reporting, but subject to criteria relevant for designating SUR relevant areas for the protection of biodiversity that are not separately covered by the Birds and Habitats Directives.
3. Exclusion of the CDDA from the sensitive area definition.

The advantage of Option 1 is that it would ensure the widest area of protection of biodiversity through pesticide use restrictions. At the same time, it would avoid restrictions in areas where there is no particular biodiversity-related reason for restriction (such as areas of cultural value). If Member States removed irrelevant areas, Option 1 could provide a wider protection of biodiversity in a harmonised manner.

The advantage of Option 2 is that it would allow Member States a greater degree of control in specifying the areas of the CDDA of most relevance to the SUR pesticide restrictions. Areas that are protected both by the CDDA and by Natura 2000 would have the Natura 2000 default of biological control and low-risk pesticides, with a greater range permitted in agriculture.<sup>218</sup>

The advantage of Option 3 is that it would involve less administrative burden for Member States. The disadvantage is that it would remove from protection certain areas necessary for the protection of biodiversity. As noted above<sup>219</sup>, the Natura 2000 network in its present form alone will not suffice to meet this goal as it covers only 18% of the EU land area. Thus, this option would fall behind the requirements to effectively implement the aspirational commitments set out in the EU Biodiversity Strategy and the Kunming-Montreal Global Biodiversity Framework to ensure that a share of 30% of the land area is protected for biodiversity.

### 3.6.5 Conclusion

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<sup>218</sup> See further section 3.5.3 above.

<sup>219</sup> See above the first paragraph of this section 3.6.4.

Placing stricter restrictions on pesticide use in sensitive areas will allow the overall pesticide reduction targets to be met in a way that maximizes the environmental benefits. A ban on all but low-risk pesticides and biological control will help to protect essential habitats and biodiversity. Permitting use of a greater range of pesticides in agriculture in those areas will promote agriculture in those areas while also preventing use of the more hazardous pesticides. In CDDA areas a balance needs to be struck between striving to promote further biodiversity in areas not covered by the birds and habitats directives, whilst not imposing unnecessary restrictions on CDDA areas not relevant to biodiversity protection.

### **3.7 Areas that sustain European red listed pollinators threatened with extinction**

The non-paper mentions for the co-legislators a possible option that the protection of pollinators threatened with extinction should be addressed as part of discussions on the Nature Restoration Law rather than under the SUR given that Member States have raised concerns that the areas to be designated in future under the Natural Restoration Law are not yet known. None the less, given the importance of this issue and the emphasis in the non-paper on maintaining ambition in relation to pollinators, this topic is briefly addressed here.

The protection of pollinators is essential to biodiversity and food security and has multiple economic benefits. Pollinators are required for at least 35 percent of global human food supply and provide vital ecosystem services to crops and wild plants. Over half of global GDP depends on nature and services provided by pollination. At EU-level, only the pollination services provided by bees has been estimated to account for 21 percent of the total yield value of pollination dependent crops or 10 billion euro – while this figure does not quantify most of the essential benefits that pollinators provide, such as their contribution to nutrition security and health, or to maintaining ecosystem health and resilience by pollinating wild plants. A diverse community of pollinators, including wild species, generally provides more effective and stable crop pollination than any single species. It is well-established that pesticides contribute to the decline of pollinators.<sup>220</sup>

As is explained in the technical clarifications provided in Annex 5, areas sustaining persistent populations are likely to be small and to not coincide with agriculture, particularly intensive agriculture. Threatened pollinators have very specific habitat requirements to meet essential needs and most wild pollinator species move across rather limited ranges. Annex 5 also includes maps showing georeferenced data of recorded sightings of threatened bee species compared to sightings of a common wild bee species. The Commission therefore suggests to continue discussion of this subject in the context of the monitoring that will take place under the Nature Restoration Law.

### **3.8 Potential increased risk of introduction and spread of harmful organisms**

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<sup>220</sup> For further details, see section 3.3.

Article 1(1)(e) of the Council Decision requested the Commission to address the availability of alternatives to plant protection products and the potential increased risk of introduction and spread of harmful organisms in the Union due to the limited availability of alternative means of mitigating that risk. The issue of the availability of alternatives has already been discussed in detail in section 7. This subsection briefly addresses the second part of the question – the potential increased risk of introduction and spread of harmful organisms in the Union due to the limited availability of alternative means of mitigating that risk.

### **3.8.1 Risk of the introduction and spread of harmful organisms**

In principle, the limited availability of alternatives does not influence the introduction of harmful organisms into the Union but is of relevance in relation to the potential increased risk of spread of harmful organisms. Since the green revolution, the agricultural system has moved to an approach to manage pests based on the use of chemical pesticides. The standardization of farming systems with less biodiversity at farm level (monocropping, few rotations) and landscape level (larger plots, removal of hedges, etc.) increase the risk of pests, leads to the development of pests' resistance to chemicals and finally is leading to a constant increase in pesticides use, often described as the pesticide treadmill (Hedlund et al. 2020).

As is noted in the 'Agroecology' subsection of 'Tools for the transition to low pesticide-input food systems' in the separate paper entitled *Additional Scientific Support for the Sustainable Use of Plant Protection Products Regulation*, it has long been recognized that the landscape configuration and composition is closely related to pest spread and therefore also the impact (Bonato et al., 2023; Epanchin-Niell et al., 2010, 2012; Topping et al., 2015). The strong reliance on chemical control, through selective pressure, results in the development of pests' resistance to the applied chemicals; which may lead to an increase in pesticides use or a shift to different active ingredients with the associated mixture effects on the environment (Tang & Maggi, 2021).<sup>221</sup>

While the severity of the impacts is expected to increase, also the availability of alternative solutions to widespread chemical plant protection products is also expected to widen.<sup>222</sup> As is described in detail in the separate Note on alternatives for chemical pesticides, a wide of array of Commission policies, including the SUR, are aimed at increasing the availability of alternatives to chemical pesticides. This will help to address the contribution of pesticide dependency and biodiversity loss to increased spread of pests within the Union.

Over 11 000 invasive species have already spread into Europe with the average annual rate of establishment progressively increasing over the last century (Hulme et al. 2009). Estimates by the European Commission suggest that these species already cost taxpayers 12.5 billion Euro annually. Considering that for almost 90 percent of invasive species information on impact in Europe is missing, this arguably represents a rather conservative estimate (Vila et al. 2010).

For Europe, the maximum potential impact of 28 union quarantine pests in terms of the maximum production lost has been quantified. The cumulative impact of these pests only may reach over EUR 25 billion for annual crops, representing around 20% of the total EU

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<sup>221</sup> See section 4.4 of the *Additional Scientific Support for the Sustainable Use of Plant Protection Products Regulation*.

<sup>222</sup> Commission Staff Working Document, *Drivers of food security*, 4 January 2023, pages 45-46.

production value. There are also non-economic impacts such as reduced food availability (a maximum of 3% of total caloric intake) or impact on trees in streets and city parks.<sup>223</sup>

### 3.8.2 Impact of the SUR

While the causes of the risk of increased introduction and spread of harmful organisms are much wider than the limited availability of alternatives to chemical pesticides and biodiversity loss, the SUR will help to address these issues. The SUR includes targets for decreasing the use and risk of chemical pesticides, measures to promote low-risk and biological control in national action plans and measures to strengthen the implementation of integrated pest management. These will contribute to addressing the risk of spread of harmful organisms in ways that avoid a vicious circle through the ‘pesticide treadmill’ mentioned in this section.

The Farm to Fork Strategy aims to increase the availability of alternatives to sustain the tool-box to control harmful organisms as is set out in the separate Note on alternatives for chemical pesticides. As has also been explained in the separate paper entitled *Additional Scientific Support for the Sustainable Use of Plant Protection Products Regulation*, the targets are designed to allow for flexibility in how they are achieved and allow for adequate pest control where needed as a last resort.

Ports, airports and industrial areas are excluded from the SUR sensitive area definition (types of ‘artificial surfaces’ under ‘human settlements’) specifically because of industrial treatments including post-harvest pesticide treatment that removes pests in fruits/ grain that is being imported or indeed exported. The non-paper also clarifies that ports and airports are to be excluded from all parts of the definition.

It is clear that there are biological control solutions, coupled with other strategies, for treating certain harmful organisms, such as the box-tree moth in Paris.<sup>224</sup> Where this is not possible, the SUR includes a possibility to derogate from the restrictions on use of pesticides in sensitive areas where there is a proven serious and exceptional risk of the spread of quarantine pests or invasive alien species and no technically feasible lower risk alternative control technique. Under the non-paper, a possible option is cited for the co-legislators to consider of allowing the period of each derogation to last for a full growing season or for 120 days, whichever is the longer. In addition, Member States could allow the possibility to apply for a derogation in relation to pests for which an application for classification as quarantine pests or invasive alien species is pending decision. If an application for classification as quarantine pests or invasive alien species were to fail, the derogation would lapse automatically.

One issue that has been raised by Member States is the compatibility of the SUR proposal with obligations under the Plant Health Law to act promptly to eradicate or contain certain prescribed pests in specifically designated areas.<sup>225</sup> The concern is that the SUR derogations

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<sup>223</sup> Commission Staff Working Document, *Drivers of food security*, 4 January 2023, pages 43-44.

<sup>224</sup> See section 3.1.3 above.

<sup>225</sup> See Articles 18(1) and 28(2) and Annex II of Regulation (EU) 2016/2031 of the European Parliament and of the Council of 26 October 2016 on protective measures against pests of plants, amending Regulations (EU) No 228/2013, (EU) No 652/2014 and (EU) No 1143/2014 of the European Parliament and of the Council and repealing Council Directives 69/464/EEC, 74/647/EEC, 93/85/EEC, 98/57/EC, 2000/29/EC, 2006/91/EC and 2007/33/EC (OJ L 317 23.11.2016, p. 4).

for these purposes would be too slow to facilitate this process and furthermore each derogation would have to be applied for to authorities by each individual farmer, which could create a huge administrative burden.

The Commission is fully aware of the issue and has been examining at technical level how best to resolve it. One possible option for the co-legislators to consider would be to amend the proposal to provide for a more general derogation to allow use of specified pesticides within demarcated areas without individual applications by farmers to reduce the administrative burden of the derogation procedure.

The provision on sensitive areas (Article 18 of the SUR) could be amended to provide for a second derogation possibility in cases where a demarcated area is established for eradication or containment in accordance with Article 18(1) or Article 28(2) of the Plant Health Law. In such cases, a competent authority under the Plant Health Law might issue a general derogation permitting professional users to apply plant protection products for the purposes of the eradication or containment of any relevant Union quarantine pests, protected zone quarantine pests or pests that are not included in the list of Union quarantine pests but that the Commission considers may fulfil the conditions for inclusion in that list<sup>226</sup> or their vectors within the demarcated area for the duration of the demarcation without the need to apply for an individual permit.

This amendment would resolve any possible differences between the SUR and the Plant Health Law.

### **3.8.3 Conclusion**

In addition to related policies under the Farm to Fork Strategy, the SUR will help to address biodiversity loss and the limited availability of alternatives to chemical pesticides, both of which are among the causes of the risk of increased introduction and spread of harmful organisms.

Ports, airports and industrial areas are excluded from the SUR sensitive area definition specifically because of industrial treatments including post-harvest pesticide treatment that removes pests in fruits/ grain that is being imported or indeed exported. Where low-risk or biological control solutions are not possible in sensitive areas, the SUR includes a possibility to derogate from sensitive area restrictions in order to tackle the risk of the spread of quarantine pests or invasive alien species. This might be further expanded to allow for general derogations in cases where a demarcated area is established for eradication or containment under the Plant Health Law, which would resolve any possible differences between the SUR and the Plant Health Law.

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<sup>226</sup> See Article 30 of Regulation (EU) 2016/2031.

## ANNEX 1: DATA ON SENSITIVE AREA COVERAGE IN MEMBER STATES

It should be noted that in all tables, the 3-metre buffer zone is not included in the calculations

**Table 1A: human settlements**

<b>Member State</b>	<b>% of MS area as human settlements</b>
<b>Austria</b>	5
<b>Belgium</b>	18
<b>Bulgaria</b>	4
<b>Croatia</b>	3
<b>Cyprus</b>	7
<b>Czechia</b>	5
<b>Denmark</b>	7
<b>Estonia</b>	1
<b>Finland</b>	1
<b>France</b>	4
<b>Germany</b>	7
<b>Greece</b>	2
<b>Hungary</b>	5
<b>Ireland</b>	2
<b>Italy</b>	4
<b>Latvia</b>	1
<b>Lithuania</b>	3
<b>Luxembourg</b>	8
<b>Malta</b>	24
<b>Netherlands</b>	11
<b>Poland</b>	5
<b>Portugal</b>	3
<b>Romania</b>	5
<b>Slovakia</b>	5
<b>Slovenia</b>	3
<b>Spain</b>	2
<b>Sweden</b>	1

**Table 1B: Continuous and discontinuous urban fabric**

<b>Member State</b>	<b>% of MS area as continuous urban fabric</b>	<b>% of MS area as discontinuous urban fabric</b>
<b>Austria</b>	0	5
<b>Belgium</b>	0	17
<b>Bulgaria</b>	0	3
<b>Croatia</b>	0	3
<b>Cyprus</b>	0	6
<b>Czechia</b>	0	5
<b>Denmark</b>	0	5
<b>Estonia</b>	0	1
<b>Finland</b>	0	1
<b>France</b>	0	4
<b>Germany</b>	0	7
<b>Greece</b>	0	2
<b>Hungary</b>	0	5
<b>Ireland</b>	0	2
<b>Italy</b>	1	3
<b>Latvia</b>	0	1
<b>Lithuania</b>	0	2
<b>Luxembourg</b>	0	8
<b>Malta</b>	1	21
<b>Netherlands</b>	0	9
<b>Poland</b>	0	5
<b>Portugal</b>	0	2
<b>Romania</b>	0	5
<b>Slovakia</b>	0	5
<b>Slovenia</b>	0	2
<b>Spain</b>	0	1
<b>Sweden</b>	0	1

**Table 1C: Green urban areas and sports and leisure facilities**

<b>Member State</b>	<b>% of MS area as green urban areas</b>	<b>% of MS area as sports and leisure facilities</b>
<b>Austria</b>	0	0
<b>Belgium</b>	0	1
<b>Bulgaria</b>	0	0
<b>Croatia</b>	0	0
<b>Cyprus</b>	0	1
<b>Czechia</b>	0	0
<b>Denmark</b>	0	2
<b>Estonia</b>	0	0
<b>Finland</b>	0	0
<b>France</b>	0	0
<b>Germany</b>	0	0
<b>Greece</b>	0	0
<b>Hungary</b>	0	0
<b>Ireland</b>	0	0
<b>Italy</b>	0	0
<b>Latvia</b>	0	0
<b>Lithuania</b>	0	0
<b>Luxembourg</b>	0	0
<b>Malta</b>	1	1
<b>Netherlands</b>	0	1
<b>Poland</b>	0	0
<b>Portugal</b>	0	0
<b>Romania</b>	0	0
<b>Slovakia</b>	0	0
<b>Slovenia</b>	0	0
<b>Spain</b>	0	0
<b>Sweden</b>	0	0

**Table 2: bathing water points and economically significant aquatic species**

<b>.Member State</b>	<b>Bathing water points</b>	<b>Economically significant aquatic species (freshwater fish) - % of total territory</b>	<b>Economically significant aquatic species (freshwater fish) -number of lines</b>	<b>Economically significant aquatic species (freshwater fish) -length of lines (km, rounded to nearest km)</b>
<b>Austria</b>	256			
<b>Belgium</b>	78			
<b>Bulgaria</b>	61	1	94	3368
<b>Croatia</b>	74	0	33	1896
<b>Cyprus</b>	73			
<b>Czechia</b>	155			
<b>Denmark</b>	530			
<b>Estonia</b>	35		111	2297
<b>Finland</b>	222			
<b>France</b>	2253			
<b>Germany</b>	2148		168	4318
<b>Greece</b>	1683		13	205
<b>Hungary</b>	199		7	236
<b>Ireland</b>	24		34	1210
<b>Italy</b>	1290	0	266	3426
<b>Latvia</b>	33	1	100	4431
<b>Lithuania</b>	108			
<b>Luxembourg</b>	17			
<b>Malta</b>	52			
<b>Netherlands</b>	653			
<b>Poland</b>	601			
<b>Portugal</b>	359			
<b>Romania</b>	22			
<b>Slovakia</b>	32			
<b>Slovenia</b>	23			
<b>Spain</b>	1271			
<b>Sweden</b>	254			

**Table 3: urban areas covered by a watercourse or water feature**

The SUR includes urban areas covered by a watercourse or water feature in the ‘sensitive area’ definition.<sup>227</sup> For these purposes, the term ‘urban’ can be taken to mean ‘local administrative units’ (LAU) classified as “cities” and “towns and suburbs”, according to the Degree of Urbanization (Eurostat, 2018). The terms ‘watercourse or water feature’ refer to ‘surface water’ as defined under the Water Framework Directive.<sup>228</sup>

<b>Member State</b>	<b>% of MS area as urban area covered by watercourse/ water feature</b>
<b>Austria</b>	0
<b>Belgium</b>	1
<b>Bulgaria</b>	0
<b>Croatia</b>	0
<b>Cyprus</b>	0
<b>Czechia</b>	0
<b>Denmark</b>	0
<b>Estonia</b>	0
<b>Finland</b>	2
<b>France</b>	0
<b>Germany</b>	0
<b>Greece</b>	0
<b>Hungary</b>	1
<b>Ireland</b>	0
<b>Italy</b>	0
<b>Latvia</b>	0
<b>Lithuania</b>	0
<b>Luxembourg</b>	0
<b>Malta</b>	0
<b>Netherlands</b>	7
<b>Poland</b>	0
<b>Portugal</b>	0
<b>Romania</b>	0
<b>Slovakia</b>	0
<b>Slovenia</b>	0
<b>Spain</b>	0
<b>Sweden</b>	2

<sup>227</sup> Article 3(16)(d) of the SUR.

<sup>228</sup> Article 2(1) of Directive 2000/60/EC defines ‘surface water’ as inland waters, except groundwater; transitional waters and coastal waters, except in respect of chemical status for which it shall also include territorial waters.

**Table 4A: percentage of territory in Natura 2000 areas in each Member State**

For calculation of total % of territory, the European Environment Agency uses the indicator on terrestrial protected areas. These values are aligned with the official Natura 2000 coverage in percentage by MS as published in the Natura 2000 barometer.

<b>Member State</b>	<b>% of MS in Nat 2000</b>
<b>Austria</b>	16
<b>Belgium</b>	15
<b>Bulgaria</b>	36
<b>Croatia</b>	38
<b>Cyprus</b>	18
<b>Czechia</b>	15
<b>Denmark</b>	9
<b>Estonia</b>	19
<b>Finland</b>	13
<b>France</b>	14
<b>Germany</b>	16
<b>Greece</b>	28
<b>Hungary</b>	23
<b>Ireland</b>	15
<b>Italy</b>	20
<b>Latvia</b>	12
<b>Lithuania</b>	13
<b>Luxembourg</b>	27
<b>Malta</b>	14
<b>Netherlands</b>	15
<b>Poland</b>	20
<b>Portugal</b>	21
<b>Romania</b>	24
<b>Slovakia</b>	31
<b>Slovenia</b>	39
<b>Spain</b>	28
<b>Sweden</b>	14

**Table 4B: percentage of arable land, permanent crops, pastures and heterogeneous agriculture affected by Natura 2000 in each Member State**

<b>Member State</b>	<b>% of arable land affected by Natura 2000</b>	<b>% of permanent crops affected by Natura 2000</b>	<b>% of pastures affected by Natura 2000</b>	<b>% of Hetero Agri affected by Natura 2000</b>
<b>Austria</b>	10	32	6	13
<b>Belgium</b>	4	3	14	11
<b>Bulgaria</b>	15	17	35	33
<b>Croatia</b>	12	36	41	24
<b>Cyprus</b>	4	9	9	9
<b>Czechia</b>	2	8	16	13
<b>Denmark</b>	4	3	35	8
<b>Estonia</b>	1	0	6	10
<b>Finland</b>	1	0	47	1
<b>France</b>	6	8	12	8
<b>Germany</b>	7	14	18	15
<b>Greece</b>	17	9	23	15
<b>Hungary</b>	10	8	39	11
<b>Ireland</b>	2	0	4	13
<b>Italy</b>	8	5	18	9
<b>Latvia</b>	3	15	11	9
<b>Lithuania</b>	3	2	10	8
<b>Luxembourg</b>	11	13	29	27
<b>Malta</b>	0	0	0	9
<b>Netherlands</b>	1	0	5	2
<b>Poland</b>	7	2	31	13
<b>Portugal</b>	25	12	20	16
<b>Romania</b>	9	6	24	13
<b>Slovakia</b>	14	9	29	20
<b>Slovenia</b>	16	14	29	24
<b>Spain</b>	14	8	20	20
<b>Sweden</b>	1	0	17	3

**Table 5A: percentage of territory in the CDDA in each Member State**

For calculation of total % of territory, the European Environment Agency uses the indicator on terrestrial protected areas. These values are aligned with the official Natura 2000 coverage in percentage by MS as published in the Natura 2000 barometer.

<b>Member State</b>	<b>% of MS in CDDA</b>
<b>Austria</b>	26
<b>Belgium</b>	6
<b>Bulgaria</b>	15
<b>Croatia</b>	13
<b>Cyprus</b>	35
<b>Czechia</b>	18
<b>Denmark</b>	19
<b>Estonia</b>	23
<b>Finland</b>	11
<b>France</b>	20
<b>Germany</b>	33
<b>Greece</b>	18
<b>Hungary</b>	9
<b>Ireland</b>	1
<b>Italy</b>	10
<b>Latvia</b>	19
<b>Lithuania</b>	16
<b>Luxembourg</b>	60
<b>Malta</b>	35
<b>Netherlands</b>	33
<b>Poland</b>	33
<b>Portugal</b>	9
<b>Romania</b>	5
<b>Slovakia</b>	24
<b>Slovenia</b>	41
<b>Spain</b>	15
<b>Sweden</b>	17

**Table 5B: percentage of arable land, permanent crops, pastures and heterogeneous agriculture affected by the CDDA in each Member State**

<b>Member State</b>	<b>% of arable land affected by CDDA</b>	<b>% of permanent crops affected by CDDA</b>	<b>% of pastures affected by CDDA</b>	<b>% of Hetero Agri affected by CDDA</b>
<b>Austria</b>	6	26	18	13
<b>Belgium</b>	2	2	4	6
<b>Bulgaria</b>	12	11	11	9
<b>Croatia</b>	4	4	10	6
<b>Cyprus</b>	7	42	27	40
<b>Czechia</b>	5	12	22	18
<b>Denmark</b>	10	8	60	38
<b>Estonia</b>	3	0	7	12
<b>Finland</b>	0	0	34	1
<b>France</b>	9	14	20	15
<b>Germany</b>	21	31	38	40
<b>Greece</b>	14	4	13	11
<b>Hungary</b>	2	4	6	4
<b>Ireland</b>	0	0	0	0
<b>Italy</b>	3	4	9	4
<b>Latvia</b>	11	24	15	14
<b>Lithuania</b>	5	6	13	13
<b>Luxembourg</b>	56	19	60	60
<b>Malta</b>	12	40	0	30
<b>Netherlands</b>	10	7	19	26
<b>Poland</b>	20	20	36	35
<b>Portugal</b>	7	6	8	6
<b>Romania</b>	1	1	4	3
<b>Slovakia</b>	4	3	28	17
<b>Slovenia</b>	17	23	30	26
<b>Spain</b>	3	5	12	11
<b>Sweden</b>	2	0	22	6

## **ANNEX 2: EXAMPLES OF MEMBER STATE INITIATIVES TO RESTRICT PESTICIDES IN URBAN AND PUBLIC AREAS AT NATIONAL AND REGIONAL LEVEL**

### **Section 1: Examples of Member State restrictions on pesticide use in urban and public areas**

#### **Austria:**

Control on the use of pesticides is the responsibility of individual federal states and is regulated accordingly. Carinthia allow only low risk pesticides in outdoor areas around hospitals, nursing homes, schools, nurseries, kindergartens, children's playgrounds, publicly accessible parks/gardens and publicly accessible sports/leisure grounds. There are some exceptions allowed. Tyrol have in place a complete prohibition of pesticide use around hospitals and convalescent homes, nursing homes, health care facilities, schools, nursery schools and kindergartens as well as other facilities for the care of children and publicly accessible playgrounds. In addition a 2-5m buffer around such areas with the use of drift mitigation measure also required in instances with exceptions possible. Burgenland have a general prohibition on glyphosate use. Vienna allows certain pesticides to be used as per principles of integrated pest management in grounds of kindergartens, hospitals and areas open to the public. Such pesticide use should be notified to the authorities within 5 days of the use, accompanied by some details of location, user and the pesticide being used. There is a general prohibition in pesticide use in Vorarlberg in a range of areas including areas accessible to the public, children's playgrounds, parks, gardens and sports facilities, grounds of hospitals, care facilities, schools, kindergartens, and other facilities for the care of children. Exceptions are possible.

#### **Belgium:**

Conditions linked to the sale and use of pesticides are at federal level in Belgium. In Flanders, public services have been prohibited from using pesticides since 1 January 2015 except under strict conditions. Areas subject to the prohibition include schools, hospitals, childcare and healthcare institutions. In private sports and recreational areas, there are obligations to decrease pesticides, use non-chemical alternatives where possible and take pesticide-free management into account in the design of sites. Since June 2019, it has been prohibited to use pesticides in public spaces in Wallonia. The prohibition applies to managers of public spaces, parks and pavements, cemeteries, etc. In the Brussels Capital region, the use of pesticides by the public services in public spaces has been banned since **1st January 2019 and pesticides have been banned in places where vulnerable groups are hosted (e.g. schools, hospital and nursing homes) since 1 March 2014. Special exemptions are available for reasons of public health and safety.**

#### **Bulgaria**

There is a general prohibition in place regarding the use of professional use pesticides in areas used by general public or vulnerable groups, such as public parks and gardens, sports

grounds, children's playgrounds and health or medical facilities. However, if an absolute need arises to treat such an area, it is possible to use a pesticide for non-professional use or a pesticide which is low risk or biological in nature.

## **Croatia**

A new Act on Sustainable Use of Pesticides came into force in 2022 which places some restrictions on pesticide use in certain specific. Consequently, only low risk pesticides after conducting a risk assessment, may be used in areas including public green areas, public gardens and parks, sports and recreational fields, school and children's playgrounds, areas in the immediate vicinity of health facilities, Natura 2000 areas, special reserves and national parks. However, other pesticides may be used to control invasive or alien species in these areas. Regarding pesticide use in agricultural crops, pesticides classified as dangerous to bees are prohibited during the flowering period.

## **Cyprus**

The National Action Plan (NAP) sets out restrictions relating to the use pesticides in areas used by the general public and in urban settings at the national and more local level.

Pesticides classified as toxic, very toxic, carcinogenic, mutagenic or toxic for reproduction cannot be used areas used by the public or by vulnerable groups (e.g. public parks, gardens, picnic/camping areas, recreational facilities, schools, playgrounds). Use of low risk pesticides, biological pesticides and non chemical alternatives can be use din these areas. If there is a need to apply other pesticides ( but not toxic or very toxic etc..) in these areas, this can only be done with written and signed opinion of a certified advisor, who must also propose risk mitigation measures to protect human health. Access to the treated area should be restricted in accordance with any required safety interval.

## **Czech Republic**

Czech law restricts the use of pesticides in certain areas and establishes specific measures for the protection of the aquatic environment and drinking water). It is also includes measures to protect bees, game, aquatic organisms and other non-target organisms when using pesticides. Restrictions placed on certain pesticides come directly from the risk assessments performed during the pesticide authorisation process and it is on this basis a decision is made on whether the specific pesticide can be used in areas visited by the general public. Protective set back distances and buffer zones are also assigned during this process.

## **Denmark**

The use of pesticides is limited in certain areas and on certain surfaces used by the general public. On grass areas accessible to the public, only low-risk pesticides authorized specifically for those areas are allowed. Similarly, only pesticides specifically authorized for use on golf courses are allowed on golf courses. Pesticide use on hard surfaces and very permeable surfaces is restricted to pesticides that degrade quickly. Exemptions are allowed for, on or around airports, railways, highways using certain crash barriers, and protected cultural heritage sites. The use of toxic and very toxic pesticides may not be used in private

gardens, on outside areas with public access or for treatment of plants situated on the boundary of private gardens or public roads.

There are strict laws relating to possession, use and sale of pesticides which are not allowed for use on certain areas.

### **Estonia**

The use of pesticides in public places and in areas used by the vulnerable groups is allowed by professional users only. Low risk substances and biological control methods should be preferred and the users must follow the principles of Integrated Pest Management. At municipal level Tallinn is a member of the European Pesticide Free Towns Network and there now exists the Tallinn Pesticide Reduction Action Plan. In addition, the second biggest city of Estonia, Tartu, is prescribing in the current landscape management procurement, mechanical weed control should be used and any chemical treatment requires a special permit.

### **Finland**

Restrictions on pesticide use are prescribed in the individual pesticide authorisation. However, the use of glyphosate is prohibited in paved areas, children's playgrounds or in school or day-care settings. When applying the pesticides in public areas, the safety of humans and animals is considered paramount. Glyphosate use in forestry is restricted in areas with wild berries or mushrooms. In such areas, the treated area must be marked with tape with signs stating the treatment date, name of pesticide applied, the contact information of the person responsible for the spraying and also sign with the following text "Berry and mushroom picking is prohibited from the date of treatment until the end of the year". Also, in areas with wild raspberry, treatment can only occur before ripening phase of the fruit. For other pesticides there is a requirement to designate the treated area with varying product specific requirements.

### **France:**

The "LABBE" law came into force in 2017 and regulates the use of pesticides in certain specific areas. Only biocontrol, low risk pesticides or pesticides used in organic production can be used in the maintenance of green spaces, forests, walks and roads accessible or open to the public (except for safety reasons). From July 2022 these areas have been extended to other living areas such as private/public parks and gardens, vegetated areas, hotel grounds, campsites, cemeteries, educational and health establishments, sports facilities and a whole plethora of other areas. There are areas excluded such as railways, airports and roads not open to the public but also these provisions do not apply where the control of a quarantine or invasive pest are concerned, or where the survival of historical or heritage areas is at risk. Pesticides marketing authorisations contain provisions on "no treatment zones" around areas used by vulnerable people, residential areas etc.. and these can extend up to 20m.

## **Germany:**

In Germany, the application of pesticides is prohibited a) on paved areas (e.g. roadsides, pavements, paved squares) and b) on all open areas not used for agriculture, forestry or horticulture/gardening). The competent authority may allow derogations. In addition, for areas used by the general public, only low-risk pesticides for which the suitability for application on these areas within the scope of the authorisation has been assessed are permitted. Areas intended for the general public include public parks and gardens, green spaces in publicly accessible buildings, publicly accessible sports grounds including golf courses, school and kindergarten grounds, playgrounds, cemeteries and areas in the immediate neighbourhood of health care facilities. Only competent users may use plant protection products on areas that are intended for the general public. These include, for example, publicly accessible parks and gardens, cemeteries, sports, school and kindergarten grounds, outdoor swimming pools or golf courses.

## **Greece**

Measures to reduce the use or risk of pesticides areas used by vulnerable groups of the population are in place and involve using biological control measures and low risk plant protection products as a priority, and establishing minimum set back distances from spraying area. Protected areas designated in Directive 2000/60/EC and special areas designated in Directives 79/409/EEC and 92/43/EEC require a specific plant protection plan to be drawn up by the competent regional authorities before measures can be carried out.

## **Hungary:**

Only pesticides belonging to category II or III may be used in accordance with the permit document in public areas, in built-up areas, in recreation areas, including railway tracks passing through it, in areas serving community purposes (e.g., educational, health, social and religious institutions), in home gardens and in public areas. Highways, driveways, major roads and sections of railways outside built-up areas may be treated with pesticides of any category.

A pesticide authorised for use in public spaces and in areas serving Community purposes may be applied under the direction of a specialist manager who is a member of the Hungarian Chamber of Plant Protection Engineers and Plant Medicine.

Pesticides which are classified as dangerous to aquatic organisms and which are not to be used in water may not be applied or prepared in the vicinity of watercourses with safe distances being set by the pesticide authorisation process. Storage of pesticides is prohibited within one kilometre of selected lakes and waters designated for bathing and within one kilometre of protected natural areas, as well as within the protection areas of waterworks, sinkholes, reservoirs etc.. (does not apply to retail outlets or users with quantities below 25 kg)

Pesticide use in areas around water is subject to the provisions of specific legislation on the protection of watercourses and facilities for the supply of drinking water.

Pesticides with the exception of those approved for use in living waters - may not be used within a safety distance of 5 m in the vicinity of waters, streams, or lakes created during surface mining of mineral raw materials.

In the case of aerial spraying, a protective distance around inhabited area and nature conservation area of at least 100 meters applies unless otherwise stated in the permit document. This may be increased to 300m depending on wind direction and strength. Aerial application closer to these areas may be possible depending on the specific terms in the permit.

### **Ireland:**

National legislation provides for restricted use of pesticides in certain designated areas. These areas include areas used by the general public or vulnerable groups (public parks, hospitals, public schools, public playgrounds etc.), areas designated as “Special Protection Areas” under the wild birds directive and areas designated as “Special Areas of Conservation” under the habitats directive. Pesticides can only be used in these areas under strictly controlled conditions and only where deemed absolutely necessary and requires a full risk assessment to be carried out before using pesticides in any of the listed areas. Guidance documents on “Best Practice” and “Responsible Pesticide Use” in all public areas have been produced on the government website.

### **Italy:**

The National Action Plan forms the basis for all the measures related to pesticide use in areas used by the general public. The NAP allows the Regions and Autonomous Provinces to prepare guidelines on the use of pesticides in urban green areas and/or areas for use by the public.

Areas used by the general public or by vulnerable groups include urban green areas, public use areas, public parks and gardens, sports fields, recreational areas, yards and green areas within and next to schools, children's playgrounds, areas next to healthcare facilities, cycling paths, heritage and landscape attractions and associated grounds, archaeological sites and cemeteries.

If pesticide application must take place in such areas, the general public must be notified by signs indicating, the active substance used, the spraying date and the re-entry restrictions. Where no re-entry period is indicated in areas used by vulnerable groups the re-entry period shall not be less than 48 hours. The pesticides used must not have re-entry periods of more than 48 hours. Access to these areas are prevented and where possible, applications are made at times of the day when inconvenience for the public is minimised.

Certain pesticides with particular classifications may not be applied to agricultural land within 30 m of the above recreational and public areas.

A revised NAP, yet to be adopted, allows for more defined distances of between 15m and 50m depending on the classification of the pesticide concerned and the risk posed.

### **Luxembourg:**

Luxembourg has had a ban on using pesticides in public spaces since 2016 under Article 11(3) of the national law on plant protection products. Public spaces, as defined by Article 1(10) of the same law, include public paths, roads, sidewalks, as well as spaces accessible to

the general public such as public parks, playgrounds, schools or cemeteries. Derogations are possible but none have been granted so far.

### **Malta:**

In general pesticide use is prohibited or severely restricted in areas used by the general public or by vulnerable groups, such as public parks and gardens, sports and recreation grounds, school grounds, playgrounds, paved areas in civil areas, cemeteries, child-care centres and in the close vicinity of healthcare facilities. In addition, protected areas, defined in the Water Policy Framework Regulations and other areas identified in the Conservation of Wild Birds Regulations, the Flora, Fauna and Natural Habitats Protection Regulations and the Trees and Woodlands Protection Regulations, as well as recently treated areas accessible to agricultural workers.

### **The Netherlands:**

In the Netherlands, professional use of pesticides outside agriculture is not permitted. However, exemptions are possible if it can be demonstrated that use of pesticides is necessary a) to combat quarantine organisms, invasive alien species, or plants or their products that are a threat for human health b) for a safe exploitation of corporate activities and establishments c) for the practice of sports in areas that cannot be exploited and maintained otherwise. In 2018, the Central Statistics Office in the Netherlands reported that Dutch public authorities were using about 82% less pesticides than 5 years earlier. Most of the pesticides used (69%) were used to keep railway tracks and marshalling yards free of weeds.

Both municipalities and companies must comply with the ban. Site management is usually carried out by contractors, on behalf of municipalities or companies. Contractors prefer to use one technique, rather than using both chemical and non-chemical techniques. Because most municipalities ask for non-chemical management, contractors prefer to manage all areas with non-chemical techniques.

The explanatory memorandum that accompanied the initial publication of the prohibition in the State Journal explained that the reason for this change is the protection of human health and the quality of surface water against avoidable use of pesticides. The exceptions are kept under review. For example, an evaluation in 2019 of the specific exceptions as regards use of pesticides necessary for the protection of human health, animals and the environment found that 14 exceptions (species) could be dealt with in a chemically free manner and should therefore be removed from the list of exceptions. It further recommended that further practical investigations be carried out for the remaining species in order to decide whether to maintain or include them on the list of exceptions.

### **Poland:**

There is a general prohibition in using pesticides classified as hazardous to human health in areas such as playgrounds, nurseries, kindergartens, primary schools, hospitals, or spa protection areas, however, a provincial inspector may authorise the use of other pesticides if certain situations arise, e.g., occurrence of a quarantine pest or for nature conservation reasons etc. Use of pesticides in Natura 2000 areas can only take place if it is in support of

the conservation objectives of the area. Minimum, buffer zones and setback distances are established for different pesticide application techniques and situations.

### **Portugal:**

In Portugal national legal provisions allow for additional risk reduction measures for the protection of vulnerable groups of the population from exposure to pesticides used in non-agricultural areas such as public parks, gardens, recreation/ sports grounds, public paths and close to public schools, health care and elderly care institutions (hospitals, day care centres). Use of plant protection products in these settings is not permitted except under derogation in special circumstances. i.e., emergency measures due to plant health or quarantine pest issues, or where no alternative control methods are available and where it is possible to minimize the exposure from the application. Derogations are subject to authorization from the Competent Authority.

### **Romania:**

The use of pesticides in certain specific areas is prohibited or minimized, taking into account the necessary public hygiene and health requirements, and considering the results of relevant risk assessments. These areas include areas used by the public or vulnerable groups such as parks, public gardens, sports and recreation grounds, school yards, playgrounds, the immediate vicinity of public health institutions, protected natural areas and areas used or accessible to agricultural workers. Risk management measures include prioritising the use of low-risk and biological active substances.

### **Slovenia:**

Only non-chemical methods shall be used for pest or weed control in public areas. However, the conditional use of pesticides on some public areas (not school or children's playgrounds) may be allowed. In such cases, the provision of information (name of pesticide, method of application, date and estimated time and area of treatment) to the public about the intended pesticide treatment is compulsory at least 24 hours in advance. In addition, the public are prevented from accessing such areas, signs are put in place and the more appropriate time for treatment is chosen. Buffer zones around the treatment location and facilities where the pesticide use is not allowed are also used. Pesticides may not be used for weed control on public areas and such areas include golf courses, sports fields and roads. However, limited treatment along railways and highways may occur.

### **Spain:**

The use of pesticides in non-agricultural areas is restricted to pesticides with a favourable toxicological and environmental profile and use in certain areas requires prior authorisation. Professional users treating non-agricultural areas are required to prevent access by the general public both during and for a period after the treatment and during a period when public access is less likely. Where such an area is used by "vulnerable" groups, the person in charge of that area is allowed 48 hours' notice where they can propose an alternative date or time. Only pesticides authorised for the particular use can be used.

**Sweden:**

In Sweden, there has been a ban since 1 October 2021 on the use of pesticides in schoolyards, courtyards of preschools or in playgrounds to which the public has access, in recreational areas, primarily intended for recreation, such as parks and gardens, in allotment garden areas or in greenhouses used for non-professional purposes, on land for residential buildings and in private gardens and on plants indoors, except in production premises, warehouses and similar places. The Swedish Chemicals Agency may decide on exemptions from the ban and has exempted low-risk pesticides and substances that are considered to pose only limited risk to human health and the environment.

## Section 2: Non-exhaustive examples of restrictions on pesticide use in urban and public areas at regional or municipal level

### Austria:

In Austria, federal states (Länder) can provide for restrictions on the use of pesticides in specific areas.<sup>229</sup> The federal state of Kärnten, also called Carinthia, has a general ban on pesticides in Carinthian schools, recreational areas, playgrounds and public parks.<sup>230</sup>

### Germany:

Many German towns and local community in the initiative “Pesticide Free Communities” (*Pestizidfreie Kommunen*) have committed themselves to avoiding the use of chemical pesticides either completely or to the greatest extent possible.<sup>231</sup> More than 550 German cities and municipalities have so far decided to manage their urban greenery partially or completely without pesticides. These include large cities such as Hanover, Leipzig, Dresden and Munich, but also whole rural districts. Some municipalities are phasing out a specific active ingredient or group of active ingredients. Other municipalities have already completely cut the use of pesticides. Some cities, such as Saarbrücken, Celle, Bielefeld and Tübingen, have been managing their green areas without pesticides for more than 20 years.<sup>232, 233</sup>

### Italy:

In the City of Venezia, the city management has not used synthetic pesticides in the maintenance of public surfaces for last 3 years, with exception of cemeteries. In relation to management of weeds on public land, 5 operations are carried out annually, of which 3 are carried out with acetic acid and 2 are carried out using mechanical measures, mainly scraping and cutting off. Starting from 2023, the use of synthetic pesticides is prohibited also on cemeteries.

### Spain:

In Spain, the autonomous community of La Rioja enacted legislation on 31 January 2023 providing that the treatment of green areas, urban trees and tree pits by local entities or any other public Administration of La Rioja must be carried out in priority way avoiding phytosanitary products and herbicides of chemical and industrial origin and prohibiting the use of glyphosate in the treatment of urban green infrastructure.<sup>234</sup>

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<sup>229</sup> *Nationaler Aktionsplan über die nachhaltige Verwendung von Pflanzenschutzmitteln*, Österreich 2022-2026, p. 29. <https://www.ktn.gv.at/Verwaltung/Amt-der-Kaerntner-Landesregierung/Abteilung-10/Publikationen/Nationaler%20Aktionsplan%20Pflanzenschutzmittel%202022-2026>

<sup>230</sup> [https://www.oekonews.at/?mdoc\\_id=1122343](https://www.oekonews.at/?mdoc_id=1122343)

<sup>231</sup> Frishche et al., ‘5-point programme for sustainable plant protection’, Environmental Sciences Europe, <https://enveurope.springeropen.com/articles/10.1186/s12302-018-0136-2>, p. 8.

<sup>232</sup> <https://eu.boell.org/en/2022/10/18/pesticide-free-regions-good-examples>

<sup>233</sup> <https://www.umweltbundesamt.de/themen/chemikalien/pflanzenschutzmittel/pestizidfreie-kommune>

<sup>234</sup> Article 14(2) of Ley 2/2023, de 31 de enero, de biodiversidad y patrimonio natural de La Rioja, <https://web.larioja.org/bor-portada/boranuncio?n=23742931-6-HTML-551465-X>

### Section 3: Case studies of pesticide use restrictions in specific cities

#### Paris:

In 2022, the Department of Green Spaces and Environment in Paris managed a large amount of green spaces, includes 531 gardens and green parks (454 hectares), 20 cemeteries, 2 large woods (around 2,000 hectares), green roofs and green walls (131 hectares) and urban agriculture (33 hectares). There are 7 sectors in the Paris green spaces “zéro phyto” strategy: green parks and gardens, vines, cemeteries, a horticultural school, woods, trees and orchards, a botanical garden and horticultural production centres. These sectors operate with an annual work plan that consolidates the experiences of each sector and includes continuous on-site visits and experience sharing.<sup>235</sup>

The objectives of the strategy in Paris are to assert a strong environmentally-friendly approach, anticipate national legislation and work towards “total” zero pesticides, including non-chemical pesticides. A number of measures taken in the city pre-dated the national legislation (the “Labbé Law”). For example, there have been herbicide-free cemeteries since 2015. The first insect larvae releases instead of insecticides occurred in City of Paris greenhouses in the 1990s. From the 2000s, differentiated management in urban parks and gardens began. This allowed for a different type of management depending on the areas and the access to the public within each park. In addition to creating safe havens for beneficial insects and birds, this also led to a reduced need for pesticides.<sup>236</sup>

Prior to the start of the “Zero Phyto Paris” strategy in 2014, the city of Paris had relied on ISO certification processes and labels as benchmarks for its work. For example, it created its own “eco-friendly management” label (“Gestion Ecologique”) unique to the city of Paris to promote green space sustainable management with no use of chemical pesticides. In 2012, the national EcoJardin label was applied to Parisian green spaces. Currently, over 90% of the City of Paris green spaces have the EcoJardin Label, which goes beyond national requirements as it bans all products classified as hazardous (for the environment, for health, etc.).<sup>237</sup>

The city of Paris uses a number of alternatives to herbicides for weed control: mulching, ground-covers, greened cobblestones, hand weeding, mechanical weeding, thermal weeding, grazing. 422 hectares of Parisian cemeteries (inside and outside Paris territory) have been managed without any chemical pesticides since 2015. This was a particularly sensitive change as there was public unease with the change of aesthetics. Therefore the city employed an awareness-raising campaign, for example with a photo exhibition on biodiversity found in cemeteries. The city also manages orchards without the use of pesticides and has planted 1,702 fruit trees in 214 Parisian schools under the 2014-2020 mandate “an orchard in my school”.<sup>238</sup>

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<sup>235</sup> City of Paris - Green Spaces and Environment - Plant and Soil Expertise Division, Paris’ Zero Phytosanitary product Strategy “Zero Phyto Paris” or “Phyto free Paris”, presentation made to Commission staff in Paris on 1 January 2023.

<sup>236</sup> Ibid.

<sup>237</sup> Ibid.

<sup>238</sup> Ibid.

Urban agriculture is also encouraged through the Parisculteurs scheme, which is managed without the use of chemical pesticides. Since 2016, there have been over 70 projects within and outside Paris, covering 15 hectares. Finally, there is a “Green fingers” scheme for community gardens, with eco-friendly management of over 150 community gardens. More than 7,000 people have participated in the scheme and they receive free expertise and technical advice from the municipality. Nearly 3,000 permits have been delivered by the city of Paris to citizens who wish to engage in eco-friendly planting in public spaces (such as around public trees). Communication with the public is a key part of the strategy, for example through public events, online tutorials, poster campaigns and other educational activities.<sup>239</sup>

There are certain current and emerging phytosanitary challenges in Paris. For example, there are some limited biological treatments for the box-tree moth in Paris, which is an invasive alien species. The strategy is to allow restricted treatments on box-tree moth of heritage interest (for example plant sculptures) in sites that can be closed to the public at night with an EcoJardin compatible biological solution (*Bacillus thuringiensis*) and close the area to the public for 12 hours after treatment. For other types of box-trees or box-trees in other types of sites, the solution is to replace the plants gradually with other plants or landscaping solutions (such as a metallic barrier or wooden edges).<sup>240</sup>

The Paris Horticultural Production Centre (4 production sites around Paris including greenhouses and field production, with over 83 hectares) are not subject to the pesticide restrictions under the national Labbé Law. Therefore chemical pesticides are still permitted. However, there is a strong engagement on sustainable practices – for example they are fully herbicide free. They employ a number of alternative practices to limit the use of pesticides such as insect larvae release instead of insecticides and plant pot mulching or mechanical weeding instead of herbicides. Employees are trained on pest and disease awareness and pesticides are only used as a last resort if all else fails. There are specific phytosanitary challenges in greenhouses, such as fungal diseases or certain insect pests. Where available, biocontrol solutions or organic agriculture compatible treatments are used.<sup>241</sup>

As regards the management of invasive alien species in Paris, no pesticides are used. Instead of herbicides, there is management with cultural practices (such as pruning, grubbing up or sheeting). In relation to Japanese knotweed management, depending on where it is found it can be left to develop freely, with programmes to mow and remove at some point, mowed up to 6 times a year, excavated with an excavator or buried under a tarp.

Other phytosanitary challenges in Paris do not justify use of pesticides at the moment, for example processionary caterpillars. Processionary caterpillars are dealt with by removal of the nests or installation of traps around pine tree trunks as the only efficient product (Bt) would kill many other species of butterflies.<sup>242</sup>

## Malmö

The city of Malmö has historically had a more ambitious policy than under national restrictions. The city has had a restrictive stance on pesticides for approximately 20 years and this has tightened over time, linked to a municipal target on increased ecosystem services for

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<sup>239</sup> Ibid.

<sup>240</sup> Ibid.

<sup>241</sup> Ibid.

<sup>242</sup> Ibid.

2030.<sup>243</sup> It now operates under national restrictions that were adopted in Sweden in 2021.<sup>244</sup> As noted above, these provide for a ban on the use of pesticides in a large number of public areas as well as on land for residential buildings and in private gardens, with limited exemptions in relation to low-risk pesticides and substances as determined by the Swedish Chemicals Agency.<sup>245</sup>

A total ban on professional use of pesticides applies in schoolyards, kindergarten yards or playgrounds, parks, gardens and public recreational areas, land for residential buildings, private gardens and on indoor plants except in production rooms or warehouses. In the case of areas, including road areas as well as gravel and other highly permeable surfaces, a person who wishes to use pesticides professionally must report this in writing four weeks before the start of operations to the environmental administration. The Environmental Administration inspects the site and checks that the notified product has been approved by the Swedish Chemicals Agency. Permission to use chemical pesticides is only given if there are no other alternatives.<sup>246</sup>

Public land such as parks and cemeteries are generally pesticide-free. Permission is granted to use pesticides even in banned areas in the case of certain invasive alien species, which are not very common (tree of heaven, Japanese knotweed and giant hogweed).<sup>247</sup> Public parks and cemeteries are generally pesticide-free.

When the municipality authorities want to use pesticides, they also have to apply to the Environmental Department for a permit. Generally, the reasons for such applications are that fire or hot water cannot be used because the area is too close to wood panels that might start a fire. The Environmental Department then normally has a dialogue with the person seeking the permit to ask whether it is really necessary to use a pesticide or whether ascetic acid could be used instead. Occasionally there is a fungus on the grass in golf courses that leads to pesticide applications, but the sports managers really try to use as little as possible and then only on the parts that really need it. So they try to maintain their grasses in other ways.<sup>248</sup>

The experience within the municipality is that it is simpler to apply the new legislation (in force since 2021) as many more areas have a ban in place (except in the case of invasive alien species) but there are no restrictions on low-risk substances such as ascetic acid, so that the process of granting permits has been simplified.<sup>249</sup>

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<sup>243</sup> Information from a response by a staff member of the municipality of Malmö submitted to a PAN Europe questionnaire that was shared with the Commission.

<sup>244</sup> Information gained from a meeting with an environmental inspector working in the municipality of Malmö on 12 April 2023.

<sup>245</sup> <https://www.kemi.se/en/pesticides-and-biocides/plant-protection-products/current-topics-on-plant-protection-products/ban-on-use-of-plant-protection-products-in-certain-areas>. For further details, see section 1 of this Annex.

<sup>246</sup> <https://malmo.se/For-foretag-och-verksamheter/Miljo--och-halsoskydd/Kemikaliehantering/Kemiska-bekampningsmedel.html>.

<sup>247</sup> For further details, see <https://www.naturvardsverket.se/amnesomraden/invasiva-frammande-arter/Arter/eu-listade-etablerade-arter/gudatrad/>; <https://www.naturvardsverket.se/amnesomraden/invasiva-frammande-arter/Arter/arter-som-nej-omfattas-av-regler/parkslide> and <https://www.naturvardsverket.se/amnesomraden/invasiva-frammande-arter/Arter/eu-listade-etablerade-arter/jatteloka/>.

<sup>248</sup> Information gained from a meeting with an environmental inspector working in the municipality of Malmö on 12 April 2023

<sup>249</sup> Information gained from a meeting with an environmental inspector working in the municipality of Malmö on 12 April 2023.

The city's pesticide-free policies are linked to wider initiatives to improve biodiversity such as less frequent cutting of roadside grass, planting mixed seeds and allowing higher grasses on roundabouts and putting big pots with trees in them on certain streets (summer streets) and prohibiting driving on them during a couple of months.<sup>250</sup>

There was an issue with particular trees in schoolyards where the roots would spread under asphalt and stones and pop up elsewhere

The Commission has received details from Pesticide Action Network Europe in relation to the pesticide free policies in Malmö. The city has had a restrictive stance on pesticides since at least 2004 and have since tightened it over time. This is linked to a municipal target on increased ecosystem services for 2030. The city has historically been more ambitious than national legislation. It encounters particular challenges regarding invasive species and weeds in gutter surfaces. It is also more costly to carry out the work without pesticides and increases the risk of greater use of carbon di-oxide. The city uses a lot of mechanical weeding, steam and hot water, flaming for weeding. The contact person in the administration also mentioned that requests from companies come to sell tools, services and products as alternatives.<sup>251</sup>

## Tallinn

At a conference organised in the European Parliament in September of last year, the Deputy Mayor of Tallinn presented its pesticide-free policies. The city no longer spends public money from the municipal budget on pesticides. It also issues guidelines to private citizens and landowners as to how to avoid pesticide.<sup>252</sup> PAN Europe has confirmed with contacts in Tallinn that in the maintenance contracts with its partners Tallinn city sets as a requirement that no pesticides are used for the maintenance of public areas.<sup>253</sup>

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<sup>250</sup> Information gained from a meeting with an environmental inspector working in the municipality of Malmö on 12 April 2023.

<sup>251</sup> Email from PAN Europe, 14/03/23.

<sup>252</sup> <https://www.europarl.europa.eu/streaming/?event=20220928-1800-SPECIAL-OTHER>

<sup>253</sup> Email from PAN Europe, 15/03/23.

### **ANNEX 3: SUMMARY OF INFORMATION FROM MEMBER STATES ON PESTICIDE USE IN FORESTRY**

#### **Austria**

In broad terms, only certain pesticides, when used in accordance with the principles of good plant protection practice and the principles of integrated plant protection are allowed in forests. Use in forest situations may be further restricted or prohibited at provincial level by decree, where areas are protected by water or nature conservation law. While there is currently no statistical data on actual pesticide usage in forests, use is quite low. Pesticide use tends to be dominated by prevention of damage by wild game, bark beetles and other pests including the control of invasive and alien weed species. Pesticide use tends to be infrequent, but the regulations (Forest Act 1975) also covers Christmas trees, forest nurseries and short rotation coppices and pesticide use can be more frequent on these niche forest types. Sometimes forest owner are required by law to protect their plantations, particularly from cloven-hoofed game.

#### **Belgium:**

No pesticides are used in forestry in the Brussels region. In the region of Wallonie, limited use of pesticides allowed in forest sector, e.g., herbicide use against invasive or alien species, or in new plantations/in forest nurseries and insecticides or fungicides for particular pest problems.

#### **Bulgaria:**

Pesticides can be used in the forest areas in Bulgaria. Pesticides authorised for aerial application only include EU approved active substances. Where pesticide treatment by aerial application takes place under derogation, just two active substances are allowed, *Bacillus thuringiensis var. Kurstaki* and spinosad. Whereas the number of active substances which can be used by non aerial means is considerably more (16) and includes herbicides, insecticides, fungicides and rodenticides.

#### **Croatia:**

Forestry accounts for about 47% of the continental part Croatia, with a very small fraction being treated with pesticides. Generally, if pesticide treatment occurs, it is in the nursery or after re-establishing a plantation. Forestry in karst areas are almost never treated, but where they are, it is usually with biological insecticides and this accounts for about 400 ha per annum. Oak powdery mildew *Microsphaera alphitoides* is the most important forestry disease and young plantations and nurseries are protected, accounting for about 5000 ha per annum. Pesticides are used for this purpose, however, in recent years experimental ecological treatments have been tested but have not been found effective. Other forest pests include Lepidoptera (butterflies): scaly beetle, large and small frost beetle, goldenrod, oak beetle which occur periodically. The Oak net bug *Coritchucha arcuata* is an invasive pest species which is particularly challenging and currently there are no pesticides identified that can control this pest. Currently, about 9-10 million saplings are planted annually and the

protection of these plants for the early part of their life is seen as being critical. Croatia's use of pesticides in forestry is not high but it is considered critically important.

### **Cyprus:**

Main issues around pesticide use in forest stands focus on control of Pine processionary moth mostly by biological pesticides mostly by aerial application but also by ground application with other pesticides all coordinated by the Department of Forests and their action plan. Control of alien invasive pest species including weed species is also an issue of continued concern. Use of fungicides and insecticides on both century old trees and in forest nurseries is also practiced. However, public spaces within forests (mostly controlled by the Department of Forests) are subject to a prohibition of all pesticides except where the entire health of the forest stand could be compromised.

### **Czech Republic:**

About 35% of the land mass of the Czech Republic comprises of forest areas. The restoration, establishment and maintenance of high-quality forest stands is supported by society and this is ever more important since recent pest problems caused by bark beetles and extreme weather events. To ensure progress on replanting of forest stands there are nurseries (about 2000 ha) devoted to producing sapling trees for planting. In volume terms there is negligible pesticide use in forestry and the bulk of pesticide use comes from use of game repellents to protect newly planted forest stands. Pesticide use is generally by individuals. There is also some herbicide use, again mostly in newly planted forest sites and occasional use of pheromones and insecticides to protect against various pests when saplings are at their most vulnerable stage but also for use on felled tree trunks.

A shortage of pesticides before and after planting would mean increased costs for protecting small saplings from weed infestation as labour shortages leave manual weeding expensive. Where other pests cause the death of planted areas, replanting is then required which again is expensive.

### **Denmark:**

Data from 2015 show that there about 640,835 ha of forestry in Denmark with state owned forestry accounting for about 190,000 ha. Data from 2020 show that 21,711 ha of farmland were devoted to the production of Christmas trees. Moreover, pesticide use data in forestry shows that the bulk of such use is related to Christmas tree production but also in the establishment of new forestry plantations (generally at 60 year intervals), with an fairly equal distribution of insecticide and herbicide use. Pesticide use in Christmas trees can occur throughout the lifetime of the tree and it is estimated that only 2% of Christmas trees are grown organically.

The impact of banning pesticides in forestry areas has not been quantified, however a ban will have a substantial impact on the ability to uphold current production rates.

### **Estonia:**

While the use of pesticides in forests allowed in Estonia it is quite uncommon. The Estonian Forest Law specifies that pesticides can only be used in forests in cases specified by the forest management regulation. Information from the Environmental Board indicate that between 2019 and 2022, general advice in accordance with their forest conservation expertise, to apply pesticide, was given on only 4 occasions. Use of the biological pesticide Rotstop on harvested root stumps also took place to prevent the spread of root rot.

### **Finland:**

Pesticides are authorised in Finland for use in forestry containing 28 different active substances. These include fungicides, herbicides and insecticides, but by the far the most important active substance currently in the forestry sector is urea. Pesticides containing urea are only authorized for the control of root rot on conifers. When a plantation is harvested in certain areas and at certain times of the year, there is a legal requirement to prevent the spread of “root rot” by applying certain pesticides. Up to 75% of the total pesticides sold in Finland contain urea and are for this purpose. With this disease accounting for an estimated €50 million p.a., any restriction in pesticide use for this purpose could have significant consequences.

Other pesticides are authorised for use as herbicides to protect young trees from weed competition and while other pesticides are authorised as insecticides for the protection of some plants from Pine weevil (generally treatment is not in the plantation itself). There are also pesticides authorised for use as fungicides but are used predominantly in the tree nurseries, where annual production is about 150 million trees.

### **France**

There are about 17 million hectares of forestry and woodland in metropolitan France. Pesticide use in forestry is very limited, with cultural and preventive methods being preferred to combat forest pests. There is a question regarding the lack of economic return on such interventions but there is also a reluctance to intervene in what is considered a “balanced” natural environment. Public forests are managed by the National Forestry Office and make up about 4 million hectares. Since 2017, only low-risk pesticides, biocontrol products and pesticides that can be used in organic farming can be used in these forests. However, where invasive or quarantine pest requires controlling or if there is another unforeseen pest which threatens the overall sector, other pesticides may be considered. Some pesticide use also takes place in forest nurseries to ensure the continued production of healthy saplings for planting of new plantations. Pesticide use during the establishment phase of new plantations can be carried out, to protect new plants from weed competition and also to protect from certain insect species such as *Hylobius spp.* control in new conifer plantations. The prevention of conifer root rot *Heterobasidion annosum* is achieved usually by using a biocontrol product. Occurrence and control of other pests may arise depending on the season.

### **Germany:**

There are no pesticide regulations specific to forestry areas. Pesticides can be used in a forestry context in accordance with the individual pesticide authorisation, and subject to National Plant Protection Act. Restrictions on the use of pesticides on land accessed by the general public, include using only pesticides authorised specifically for use in areas intended for the general public.

### **Hungary:**

Aerial application of pesticides is possible after the required derogation is obtained. It is prohibited to fly aircraft with pesticide application equipment over certain areas such as populated areas, animal husbandry area, surface water, water extraction works, municipal sewage treatment plant, highly protected natural areas, forest reserves or biosphere reserves. Similar restrictions apply to unmanned aircraft used for pesticide application.

### **Ireland:**

Pesticides are specifically authorised for use in forestry. This may include use in forestry stands or forestry nurseries. Pesticides can only be used as authorised and any restrictions or mitigation measures will be included as part of the product authorisation, resulting from the risk assessment performed.

### **Italy:**

There is no specific legislation for the use of pesticides in forest areas. Currently there are no pesticides authorized for use in forestry and so if the need occurs, emergency authorisation is considered. Where necessary pesticide application by aerial spraying is authorized in accordance with Directive 2009/128/EC and provisions of the NAP.

Regional rules also apply and may require forest owner to react or act in response to a plant health problem, to minimize its spread etc.

### **Luxembourg:**

Many forest types are classified biotypes in which the use of pesticides is prohibited. Forests not covered by that prohibition include for example spruce and fir plantations. Detailed pesticide use data in forests is not currently available. In cases where pesticides are used, it tends to be insecticides against weevils and repellents to prevent damage by game in newly established plantations.

### **Malta:**

Forest cover in Malta is around 1.5% (EUROSTAT, 2020). Use of pesticides is minimised or prohibited in areas including those designated in the Trees and Woodlands Protection Regulations. If pesticide use is considered necessary, low risk and biological pesticides are considered first and foremost.

### **The Netherlands:**

There is a ban on pesticide use outside agriculture and this would also apply to forest situations. There is little forest production in the Netherlands and there is no statistical information currently available.

### **Poland:**

Poland is at the intersection of the oceanic and continental climate and can experience mass infestations of a diverse range of insect pests, some of which can be quite intense. Some pest outbreaks threaten the viability and stability of forest stands. Pesticide use can protect the area sprayed but importantly also prevents the further spread of the pest to other areas. Thus, an absence of protection in an area could result in larger areas being affected. In addition, large scale damage to forest stands can lead to an increased vulnerability to fire.

### **Portugal:**

The forest area in Portugal consists of around 3,2 million ha, representing about 36% of the national territory. While there are pesticides authorised for use in forestry there is no specific pesticide use data available for the forest sector. Chestnut tree production is considered important and covers 50,000 ha, as is the cork tree which covers about 720,000 ha. Several pesticides with different active substances are authorised to combat various insect, fungal and weeds pests etc. These pesticides include chemical active substances and non-chemical active substances. Such pesticides are used in specific National Control Plans (NCP) as part of an integrated pest management programme for the control of particular pest species.

### **Romania:**

There are pesticides specifically authorised for use in forestry.

### **Slovenia:**

Use of pesticides in forests is generally prohibited, however in exceptional circumstances and where the overall health of the forest is threatened, certain authorised pesticides can be used to protect young plants from damage by game and to control insect populations and tree diseases that cannot be achieved by other measures. Permission for such an exceptional use is issued by the Slovenian Forest Service.

### **Spain:**

There are pesticides authorised for use in forestry there is no specific pesticide use data currently collected or available. There are four integrated pest management guides produced and used in the forestry sector.

**Sweden:**

Of the 28 million ha of forest in Sweden, about 1.2 million ha are in sensitive areas designated by the SUR. Pesticide use in forest stands is quite limited and is mostly confined to use of the micro-organism *Phlebiopsis gigantea* against root rot, sheep fat and blood meal as a repellent to protect young trees from game and very limited use of insecticides, predominantly in forest nurseries and newly planted areas. Some forest areas may require prior notification to the municipality before pesticides can be used and there is also an obligation to inform the general public of any pesticide application.

## ANNEX 4: FURTHER DETAILS ON IMPACTS OF PESTICIDE USE RESTRICTIONS IN URBAN AND PUBLIC AREAS

### Section 1: Costs and tools for the transition

As noted above, in the Netherlands, professional use of pesticides outside agriculture is not permitted (with limited exceptions). In the explanatory memorandum that accompanied the initial publication of the prohibition in 2006, reference was made to the fact that according to studies of the advantages and disadvantages of various weed control techniques, the quality level sought by site managers can be achieved with all non-chemical techniques and combinations of techniques examined. The application of non-chemical methods to both paved and unhardened surfaces was regarded as technically feasible, subject to a few exceptions. According to qualitative research on non-chemical techniques and methods, these were deemed not technically feasible and financially affordable for all types of unpaved surfaces, leading to limited exceptions in certain areas such as sports grounds and certain recreational grounds.<sup>254</sup>

A detailed study of pesticide reductions in public and urban areas in French municipalities found that the transition to “zéro-phyto” (zero phytosanitary products) is not a matter of pure technical substitution which would lead to an increase in management costs, but is based on the overall change in space management, and on daily optimisation of resources, under budgetary constraints.<sup>255</sup> When moving a pesticide-free policy, the main budgetary issue is efficient management of working time.<sup>256</sup> During the transition, it takes more time to weed and manage spontaneous flora without the use of pesticides. However, this is temporary while managers change their maintenance objectives through mulching, landscape adjustments and above all, acceptance of spontaneous flora.<sup>257</sup>

This experience is mirrored in Luxembourg, where 40% of municipalities were already voluntarily pesticide-free by the end of 2015 and almost all public spaces have had a ban on the use of pesticides since 2016. Pesticide-free policies require a broad-based approach is taken to promote biodiversity and there is a change in citizens’ aesthetic expectations as well as more planning and semi-natural areas.<sup>258</sup> When switching to pesticide-free care, it is not possible to maintain the usual herb-free appearance without increasing the number of municipal staff. A change of mindset is needed in relation to tolerance of spontaneous flora.

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<sup>254</sup> See explanatory memorandum accompanying the Decree of 9 March 2016 amending the Decree on plant protection products and biocides as regards the non-authorisation of plant protection products outside agriculture, <https://zoek.officielebekendmakingen.nl/stb-2016-112.html>, pp. 17-18.

<sup>255</sup> Plante & Cité, Center for Landscape and Urban Horticulture, Conditions Techno-Economiques Du Passage Au “Zero-Phyto [Synthèse]” [Technical requirements for the transition to “zero phyto” [Synthesis], summary]. Plante & Cité is a national technical centre on green spaces and nature in cities. The study was carried out in partnership with Sypheia, a socio-economic consultancy firm specialising in nature and biodiversity projects, and was co-financed by the French Agency for Biodiversity under the Ecophyto plan. This study adopted a definition of “zéro-phyto” that corresponds to the EcoJardin label, which authorises products for use in organic farming that are not synthesized chemical pesticides dangerous for auxiliary fauna or the environment. See section 1.2.1.

<sup>256</sup> Plante & Cité, Passer Au “Zéro Phyto” Dans Votre Commune: Les réponses à (certaines) questions que vous vous posez, factsheet 5.

<sup>257</sup> Plante & Cité, Passer Au “Zéro Phyto” Dans Votre Commune: Les réponses à (certaines) questions que vous vous posez, factsheet 8.

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Municipalities are therefore advised to set a tolerance threshold, taking account of differentiated management and different aesthetic expectations for different areas.<sup>259</sup> It is also mirrored in Germany, where cities have successfully practiced pesticide-free management on the basis of planning, alternative methods and greater tolerance for grasses and wild flowers in public spaces.<sup>260</sup>

Most managers surveyed in France managed their transition without increasing their overall costs of managing green spaces.<sup>261</sup> The geographical location of a municipality had a greater influence on policies than the wealth of that municipality.<sup>262</sup>

The main wage cost item was for weed control, with variations depending on the weed control technique used: from 70 % for chemical weed control to almost 100 % for manual weeding. Investment costs in equipment, amortised over 2500 to 5000 hours, amounted to less than 10 %. Investment expenditure could be estimated to be 5 to 20 times less than the annual operating costs including the wage bill.<sup>263</sup>

As regards whether alternative techniques to pesticides are more expensive, French research suggests that everything depends on the context of the intervention, the technical knowledge of the field staff and the ability of the manager to time weeding correctly. The cost of weed control is mainly linked to the labour force and thus to the time spent on the ground, which can be optimised through training, appropriate work organisation and clear management objectives.<sup>264</sup>

For a given site, modelling shows that the overall annual cost of weed control is cheapest for chemical, with burning more expensive and mechanical most expensive. However, costs can also be controlled by changing the action thresholds (avoiding unnecessary early interventions or more labour-intensive late interventions) and by improving the effectiveness of weed control, though appropriate training and the right equipment. In two case studies, managers showed a budgetary saving linked to the cessation of treatments and the need to resort to biological control.<sup>265</sup>

In relation to costs in the Netherlands, the shift from application of plant protection products to non-chemical techniques and methods may lead to higher management costs for site managers in certain situations, but this cost was assessed in 2016 as affordable.<sup>266</sup> A survey-based cost study by the Dutch Ministry of Infrastructure and the Environment found that the desired quality level is achievable with all techniques and combinations (mechanical, thermal and chemical weed control techniques). Purely non-chemical weed control are significantly

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[https://www.bund.net/fileadmin/user\\_upload\\_bund/migrated/publications/130411\\_bund\\_chemie\\_broschuere\\_pestizidfreie\\_kommunen.pdf](https://www.bund.net/fileadmin/user_upload_bund/migrated/publications/130411_bund_chemie_broschuere_pestizidfreie_kommunen.pdf)

<sup>261</sup> Plante & Cité, Conditions Techno-Economiques., section 3.2.

<sup>262</sup> Plante & Cité, Conditions Techno-Economiques., section 3.2.

<sup>263</sup> Plante & Cité, Conditions Techno-Economiques., section 3.1.

<sup>264</sup> Plante & Cité, Conditions Techno-Economiques., section 3.3.

<sup>265</sup> Plante & Cité, Conditions Techno-Economiques., section 3.3.

<sup>266</sup> See explanatory memorandum accompanying the Decree of 9 March 2016 amending the Decree on plant protection products and biocides as regards the non-authorisation of plant protection products outside agriculture, <https://zoek.officielebekendmakingen.nl/stb-2016-112.html>, pp. 17-18.

more expensive than purely chemical weed control. However, with a good approach, non-chemical control costs can still reduce significantly.<sup>267</sup>

In similar vein to the conclusions drawn in French research, the cost study by the Dutch Ministry of Infrastructure and the Environment also found that higher costs do not automatically mean higher maintenance budgets. While there are municipalities that gradually increase the budget for weed control, there are also municipalities that 'shift within the budget' or accept a slightly lower level of quality. Among the municipalities interviewed, the budget for weed control amounted to 0.3 - 3.6% of the total budget for public space management. In half of these (15) municipalities, it was less than 1%.<sup>268</sup>

An evaluation of the ban on chemical weed control on paved areas outside agriculture in 2021, 5 years after it entered into force, confirmed the conclusions of the feasibility study from 2013: chemical-free weed control is feasible and about four times more expensive. Comparing the cost of chemical-free weed control in 2021 with chemical-free weed control in 2013, the costs appear to decrease slightly (10-15 %). This was assessed as being due to a combination of better equipment, cheaper equipment (more supply) and, above all, more efficient operation (through better management).<sup>269</sup> To put this in context, it must be remembered that the budget for weed control is a very small percentage of the total budget for public space management in Dutch municipalities, as noted above.

To avoid chemical weed control without increasing overall costs, managers studied in France employed three overall strategies: 1) limiting weed control tasks by avoiding grass growth or by planting the spaces; 2) using suitable alternative management techniques and equipment; and 3) reallocating resources and change management modes at service level.<sup>270</sup>

Despite the introduction of different strategies to limit the use of weed control, the labour requirements of “zéro-phyto” strategies often (but not always) remain higher than with use of pesticides. Case studies show that there is room for manoeuvre in terms of resource allocation for the management of green spaces to meet both budgetary requirements and environmental objectives that often go beyond the issue of pesticide reduction. Differentiated management is key to this reallocation of resources.<sup>271</sup>

Differentiated management is a tool for optimising financial, human and technical resources. Its implementation, coupled with environmentally-friendly practices, makes it possible to work in a healthier setting without generating significant costs. To this end, the spaces are divided into 3 to 6 categories according to uses and services, ranging from natural or hardy areas to horticultural or prestigious areas.<sup>272</sup> Differentiated management has been found to be useful many Member States, including Germany and Luxembourg.<sup>273</sup>

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<sup>267</sup> Inventarisatie onkruidbestrijding op verhardingen, <https://zoek.officielebekendmakingen.nl/blg-225182.pdf>, pp. 11-12.

<sup>268</sup> Inventarisatie onkruidbestrijding op verhardingen, <https://zoek.officielebekendmakingen.nl/blg-225182.pdf>, p. 12

<sup>269</sup> NVRD, Grip op Onkruid De huidige stand van zaken in Nederland, 2021, <https://nvr.nl/Downloads/Grip%20op%20onkruid.%20Stand%20van%20zaken%20onkruidbestrijding%20Nederland-DEF.pdf>, p. 33.

<sup>270</sup> Plante & Cité, Conditions Techno-Economiques., section 3.4.

<sup>271</sup> Plante & Cité, Conditions Techno-Economiques., section 3.4.2.

<sup>272</sup> Plante & Cité, Conditions Techno-Economiques., section 3.4.2.

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[https://www.bund.net/fileadmin/user\\_upload\\_bund/migrated/publications/130411\\_bund\\_chemie\\_broschuere\\_p\\_estizidfreie\\_kommunen.pdf](https://www.bund.net/fileadmin/user_upload_bund/migrated/publications/130411_bund_chemie_broschuere_p_estizidfreie_kommunen.pdf);

Experience in Germany and Luxembourg also shows the importance of design and construction materials in paved areas.<sup>274</sup> Sealing as few areas as possible is the objective of municipal planning, so only areas whose function does not allow plant cover should be completely sealed.<sup>275</sup> The importance of urban design for reduction of pesticides was also stressed in a meeting with a municipal staff member from Tallinn.<sup>276</sup>

These commonly used strategies can be adapted and complemented for each heritage, climate, economic, organisational and cultural context. The need for weed control may be limited by a change of perception favouring the acceptance of the spontaneous flora, landscape changes with or without redevelopment, grazing strategies or prevention strategies for the installation of weeds. The choice of suitable materials, the training of staff, and the planning of medium-term actions (changes in practices and alterations) are essential. Consideration of management classes (differentiated management), the suitability of flowering and the development and maintenance of shrubs and hedges make it possible to release resources that can be reallocated to grass management.<sup>277</sup>

The Plant & Cité study mentioned above found that the duration of the transition to “zéro-phyto” varies widely depending on the managers and local circumstances. Some managers instantaneously stopped the use of PP, often following a political decision. Other city managers had experimented for decades with new management practices before transitioning to “zéro-phyto”. While in most cases, managers switched to “zéro-phyto” on a gradual basis, starting with green areas and ending with cemeteries, in others, pesticide use was suddenly ceased throughout the city territory. The increased number of tools now available makes it easier for managers to have a shorter transition. Finally, even after making the transition, a number of years may be needed for profound changes in aesthetics and the introduction of new management practices, both of which are essential for a sustained approach.<sup>278</sup>

Plante & Cité have identified a number of tools that are very useful to city managers in transitioning to “zéro-phyto”. The use of city charters is a way for municipalities to receive support and formalise their commitments. It can be a driving force in the early stage or a means of communicating and endorsing existing commitments.<sup>279</sup> If the SUR is adopted with a harmonised approach to pesticide restrictions in urban areas, such charters might still be a useful for cities that want to take voluntary measures beyond the requirements of the SUR. The use of eco-management labels is another means of communicating and promoting the measures implemented. Environmental practices monitored by external audits are a goal for many municipalities. Labels promote public acceptance of new management practices. They reward gardeners for the excellence of their practices and are a management tool based on the new perspectives of their profession.<sup>280</sup>

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[https://www.bund.net/fileadmin/user\\_upload\\_bund/migrated/publications/130411\\_bund\\_chemie\\_broschuere\\_pestizidfreie\\_kommunen.pdf](https://www.bund.net/fileadmin/user_upload_bund/migrated/publications/130411_bund_chemie_broschuere_pestizidfreie_kommunen.pdf)

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<sup>276</sup> Online meeting between the Commission and a member of the municipal staff in Tallinn on 3 April 2023.

<sup>277</sup> Plante & Cité, Conditions Techno-Economiques., section 3.4.2.

<sup>278</sup> Plante & Cité, Conditions Techno-Economiques., sections 2.1 and 2.2.

<sup>279</sup> Plante & Cité, Conditions Techno-Economiques., section 2.3.1.

<sup>280</sup> Plante & Cité, Conditions Techno-Economiques., section 2.3.2.

Management plans are also essential as the transition in a constrained budgetary context cannot take place without rethinking the ways in which space is managed and maintained. These include plans for differentiated management, weed control or site redevelopment.<sup>281</sup> For land areas that must be kept entirely free of growth, non-toxic alternatives are available. Hot water-operated machines use the temperatures to kill off the parts of plants that are above ground and exposed roots. Brushes are also used to mechanically remove plant growth above ground.<sup>282</sup> In addition, several other tools are employed, including participatory governance, experience-sharing, financial aid for the purchase of equipment, training, communication with users and awareness-raising measures on nature in cities.<sup>283</sup> Each municipality can choose from a wide variety of tools as they move through necessary steps: commitment, diagnosis, training, organisation plan, operation, evaluation, with the following tools being helpful to assist with this work:

- Commitment: newsletters, charters, awareness-raising meetings
- Diagnosis: monitoring book or questionnaire, practice commitment sheet
- Training: training of staff/ elected representatives, technical days, demonstrations, guides to alternative solutions
- Decision to organise: decision-support tools for alternative weeding, specific plans for weed control, differentiated management, communication
- Operation: financial aid, time records, weeding reinforcement team, GIS installation support
- Evaluation: charter evaluation grid, monitoring indicators (e.g. working time), municipal/ territorial review<sup>284</sup>

Public communication and engagement is also very important, for example through participatory workshops, information posters or public consultation.<sup>285</sup> In Luxembourg, support is provided to municipalities that want to promote tolerance for spontaneous flora, including provision of information and publicity materials.<sup>286</sup>

A Discreet Choice Experiment<sup>287</sup> was administered in France in 2017, when a pesticide ban in all urban green spaces was implemented. The purpose of the study was to address how the transition to pesticide-free urban green spaces can be implemented so that it increases welfare for the majority of the population. The study identified the urban green space characteristics

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<sup>281</sup> Plante & Cité, Conditions Techno-Economiques., section 2.3.3.

<sup>282</sup> <https://www.umweltbundesamt.de/en/press/pressinformation/fighting-dandelions-a-brush-hot-water>. See also a link to papers as part of a conference on vegetation management on paths and squares organised by the German Federal Research Centre for Cultivated Plants, <https://www.julius-kuehn.de/a/tagungsbeitraege/>

<sup>283</sup> Plante & Cité, Conditions Techno-Economiques., section 2.3.4.

<sup>284</sup> Plante & Cité, Passer Au “Zéro Phyto” Dans Votre Commune: Les réponses à (certaines) questions que vous vous posez, fiche 4.

<sup>285</sup> Plante & Cité, Passer Au “Zéro Phyto” Dans Votre Commune: Les réponses à (certaines) questions que vous vous posez, fiche 4.

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<sup>287</sup> A discrete choice experiment is a preference elicitation technique asking respondents to make choices from two or more alternatives where at least one attribute is systematically varied and a series of choice tasks can elicit preferences.

most preferred by the users and the trade-offs they are willing to make in the context of a defined budget. The study found that citizens have a strong preference for a natural visual appearance, which suggests that the costly control of the vegetation is not always desirable. It also found that fauna abundance and the improvement in the recreational opportunities available in urban green spaces are valued by a large majority of respondents. Preferences for information campaigns were not shaped by self-declared knowledge but rather by gender, with a utility gain for female but not for male respondents.<sup>288</sup>

Managers tend to overestimate the importance of information on the pesticide ban for both citizens and workers. Moreover, managers are less willing to accept an increase in budget to have wild-looking urban green spaces with abundant fauna, despite these characteristics being valued by the majority of citizens.<sup>289</sup> Respondents also care about the working conditions of the urban green space maintenance teams: a majority prefer that their working conditions are improved, and even more numerous are those who are strongly against their deterioration. Overall, the transition is more likely to be accepted by making sure that recreational opportunities are not restricted and workers' conditions do not deteriorate. The study acknowledges certain methodological limitations, such as the ambiguity surrounding the meaning of natural visual appearance.<sup>290</sup>

Stated preference methods such as Discreet Choice Experiments could support managers in their transition by aiding them to gain a deeper understanding of public preferences and their heterogeneity, but also ways to measure the implications for public welfare of different management approaches.<sup>291</sup> Given that technical solutions for a successful transition exist, shedding light on the specific urban green space characteristics where preference diverge can help to remove the remaining barriers to a successful implementation of cosmetic pesticide bans.<sup>292</sup>

## Section 2: Specific challenges: cemeteries and sports grounds

The Plante & Cité study mentioned above found that it is possible to switch to “zéro-phyto” (zero phytosanitary products) in all municipalities, regardless of their size or geographical location.<sup>293</sup> The transition to “zéro-phyto” was the easiest to make in parks, historical gardens

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<sup>288</sup> Lefebvre et al., ‘Alternative adaptation scenarios towards pesticide-free urban green spaces: welfare implications for French citizens’, <https://hal.science/hal-03694169>, 13 June 2022, pp. 15 and 20.

<sup>289</sup> Lefebvre et al., ‘Understanding public administrators’ and citizens’ preferences for a successful transition to pesticide-free urban green spaces’, *Journal of Environmental Planning and Management*, 2022, pp. 1-25. 10.1080. 10.1080/09640568.2022.2107496. hal-03800089.

<sup>290</sup> Lefebvre et al., ‘Alternative adaptation scenarios towards pesticide-free urban green spaces: welfare implications for French citizens’, *Environmental Science and Policy*, 2022, 136, pp. 46-55. 10.1016/j.envsci.2022.05.014. hal-03694169.

<sup>291</sup> Lefebvre et al., ‘Alternative adaptation scenarios towards pesticide-free urban green spaces: welfare implications for French citizens’, *Environmental Science and Policy*, 2022, 136, pp. 46-55. 10.1016/j.envsci.2022.05.014. hal-03694169.

<sup>292</sup> Lefebvre et al., ‘Understanding public administrators’ and citizens’ preferences for a successful transition to pesticide-free urban green spaces’, *Journal of Environmental Planning and Management*, 2022, pp. 1-25. 10.1080. 10.1080/09640568.2022.2107496. hal-03800089.

<sup>293</sup> Plante & Cité, *Conditions Techno-Economiques*, conclusion.

and flowering areas. Only 1 out of 10 French municipalities still used pesticides in such areas in 2016.<sup>294</sup> Most challenging are cemeteries and sports grounds.

- **Cemeteries**

Cemeteries were the most sensitive transition to zero pesticide use in French municipalities, although in 2017 a third of them no longer used pesticides. The level of maintenance requirements and landscape expectations are high due to cultural pressure<sup>295</sup> The conversion of these spaces requires particular attention, optimising the management strategies adopted on the other spaces.<sup>296</sup> The City of Venezia has banned the use of synthetic pesticides on cemeteries, hiring more staff in order to maintain them. Particular challenges were found in relation to limiting spontaneous grass in gravel fields, requiring manual scraping or organic weed control, with reduced efficiencies. Manual weeding, biological control and scraping are employed. Due to increased costs and reduced efficiency, so the city is keeping its policy under review.<sup>297</sup>

In France, cemeteries used for walking are affected by a ban on pesticides under the Labbé Law since 1 January 2017, which permits only pesticides suitable for use in organic, low-risk and biocontrol farming. Derogations apply for roads and for regulated organisms (such as red palm weevil). A report published in 2017 found that for the majority of those cemeteries surveyed that had stopped using pesticides entirely (68%), the transition took only 3 years or less, with the more recent transitions being significantly shorter.<sup>298</sup> 76% of cemeteries surveyed found the transition to zero pesticides was accompanied by changes in work organisation. These included an increase in the need for labour, a change in work arrangements to avoid excessive overtime, training of staff and purchase of new equipment. Human health and protection of biodiversity were among the 3 main reasons cited for ceasing to use pesticides in cemeteries.<sup>299</sup>

There are specific cultural issues in France in relation to according respect to the deceased, with many families viewing the policy of tolerating spontaneous flora as disrespectful and a failure on the part of the municipality to maintain the cemetery.<sup>300</sup> This is also an issue in Belgium.<sup>301</sup> Several conditions appear to facilitate greater acceptance: if these plants are kept at an acceptable height, for example by shearing; if they have an aesthetic flowering or foliage; if they are not too numerous; if mixed with horticultural plants.<sup>302</sup> The use of grass to limit weeds may also be an aesthetically satisfactory tool and public communication through for examples signs at the entrance to cemeteries or specific exhibitions can also help public acceptance.<sup>303</sup> It should also be noted that the cultural pressure for a particular aesthetic in cemeteries may vary from Member State to Member State given the cultural specificities of

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<sup>294</sup> Plante & Cité, *Conditions Techno-Economiques*, section 2.2.

<sup>295</sup> Plante & Cité, *Conditions Techno-Economiques*, section 2.2.

<sup>296</sup> Plante & Cité, Passer Au “Zéro Phyto” Dans Votre Commune: Les réponses à (certaines) questions que vous posez, fiche 2.

<sup>297</sup> Citta’ di Venezia, Allegato a Relazione Istruttoria – Nuova Poposta di Adeguamento Degli Standard Previsti per la Gestione del Verde Cimiteriale Da Parte di Veritas S.P.A.

<sup>298</sup> Plante & Cité, *Paysage et Entretien des Cimetières*, 2017, [https://www.plante-et-cite.fr/ressource/fiche/456/paysages\\_et\\_entretien\\_des\\_cimetieres\\_guide](https://www.plante-et-cite.fr/ressource/fiche/456/paysages_et_entretien_des_cimetieres_guide), Factsheet 7.

<sup>299</sup> Plante & Cité, *Paysage et Entretien des Cimetières*, 2017, Factsheet 7.

<sup>300</sup> Plante & Cité, *Paysage et Entretien des Cimetières*, 2017, Factsheet 6.

<sup>301</sup> <https://www.adalia.be/sites/default/files/media/resources/Les%20cimetieres.pdf>.

<sup>302</sup> Plante & Cité, *Paysage et Entretien des Cimetières*, 2017, Factsheet 6.

<sup>303</sup> <https://www.adalia.be/sites/default/files/media/resources/Les%20cimetieres.pdf>.

cemeteries. Finally, it should be noted that related incentives may support the transition, such as incentives for municipalities in Wallonia to welcome more biodiversity into cemeteries.<sup>304</sup>

- **Sports grounds:**

Another area that has specific challenges associated with it is restrictions on the use of pesticides on sports grounds. Maintenance of these areas may require a certain degree of technicality and a significant investment in the introduction of suitable alternative practices (purchase of equipment, training).<sup>305</sup> The maintenance requirements of clubs using the infrastructure may also present particular challenges.<sup>306</sup> To maintain the requirements of sports grasslands in terms of quality of play and safety of players, a comprehensive agronomic approach to plant health is required.<sup>307</sup>

The requirements in terms of quality of the playing surface increase with the level of professionalism of teams and are often higher in urban settings in France.<sup>308</sup> More detailed requirements (technical and aesthetic) are required for the management of sports fields for high-level competitions and for race-tracks and golf courses.<sup>309</sup> Croplife has made representations to the Commission that it is not realistic to move towards low-risk and chemical pesticides by 2025. The European Golf Association also represented that while it embraced the transition, more time and certain exceptions will be needed. Finally, UEFA has represented in meetings with the Commission that there is a need to distinguish between elite sports grounds, where public access is limited and maintenance requirements are high, and other sports grounds.

Despite the challenges associated with pesticide restrictions in sports grounds, Member States have successfully implemented pesticide restrictions in sports grounds. For example, in the summer of 2016, two out of three French municipalities reported that they did not use plant protection products (rising to 9/10 for rural municipalities).<sup>310</sup> French legislation is moving towards abolishing the use of synthetic plant protection products for sports grounds, with two deadlines in July 2022 and then January 2025.<sup>311</sup> In The Netherlands, in 2021, more than three quarters of municipalities, which manage around 5,500 of the 7,500 grass sports grounds, did not use pesticides. This was an increase from half the municipalities in 2019.<sup>312</sup> However, the sharp decline in the use of pesticides between 2019 and 2021 appeared to diminish in 2022 as municipalities were using pesticides on sports fields at about the same

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<sup>304</sup> <http://biodiversite.wallonie.be/fr/cimetieres-nature.html?IDC=5930>; <http://ecowal.be/service/vegetalisation-des-cimetieres>.

<sup>305</sup> Plante & Cité, *Conditions Techno-Economiques*, section 2.2.

<sup>306</sup> Plant & Cité, Passer Au “Zéro Phyto” Dans Votre Commune: Les réponses à (certaines) questions que vous vous posez, fiche 2.

<sup>307</sup> Plante & Cité, Vers Le “Zéro Phyto” Des Terrains de Sport en Pelouse Naturelle: Démarche Globale et Gestion Intégrée – Guide Technique, 2021, p. 5.

<sup>308</sup> Plante & Cité, *Conditions Techno-Economiques*, section 2.2.

<sup>309</sup> Plante & Cité, Vers Le “Zéro Phyto” Des Terrains de Sport en Pelouse Naturelle: Démarche Globale et Gestion Intégrée – Guide Technique, 2021, p. 5.

<sup>310</sup> Plante & Cité, *Conditions Techno-Economiques*, section 2.2.

<sup>311</sup> Plante & Cité, Vers Le “Zéro Phyto” Des Terrains de Sport en Pelouse Naturelle: Démarche Globale et Gestion Intégrée – Guide Technique, 2021, p. 5.

<sup>312</sup> Schots et al (2022), Monitor milieuvriendelijk beheer van grassportvelden 2021, p. 21. Half of the municipalities provide support to other parties who carry out (part of) the major maintenance on municipal grass sports grounds. One out of five municipalities provide support to those who carry out major maintenance on privatised grass sports pitches.

rate as in 2021. Despite this, the majority of those municipalities that still used pesticides in 2022 intended to stop in 2023.<sup>313</sup>

In the Netherlands, pesticides are only permitted for the practice of sports in areas that cannot be exploited and maintained otherwise.<sup>314</sup> Pesticides are permitted on sports pitches for the organised practice of open-air sport, in so far as the playable part of the site includes a limited area around it necessary for the practice of sport, but excluding the parts not covered by grass cover and the specific parts marked as excluded for particular pesticides in an Annex to the relevant legislation.<sup>315</sup> A “Green Deal” was signed between the Ministry of Infrastructure and Environment with the aim of minimizing the use of pesticides on sports fields. This pledged that from 2020 no pesticides would be used on sports fields except in those situations where it is strictly necessary, that reasoned proposals be made for those situations in which the use of certain pesticides are necessary for the time being and that in those remaining situations only low-risk plant protection products are used as soon as they are available and sufficiently effective for the relevant application.<sup>316</sup>

In January 2022, the second opinion by an *ad hoc* committee of independent agronomists determining the minimum pesticide input necessary after IPM is applied was published.<sup>317</sup> The committee concluded that there are sufficient technical possibilities for chemically free management of competition, training and related fields outside stadiums. In particular in the case of municipal management of the sport fields, chemical-free management, i.e. the implementation of preventive or non-chemical weed control, should pose few problems. The use of plant protection products against weeds is not in principle necessary.<sup>318</sup>

A number of tools can be employed to assist with pesticide restrictions in sports grounds. Design and maintenance tools can help create conditions for the quality of sports grasslands and turf health. These can be adapted according to the characteristics of the sports ground and the resources available to the manager. Such measures include selection of grasses to meet agronomic and use requirements, taking account of the use and playing intensity that is appropriate to the grass and avoiding repetitive use in the same areas, preventive cleaning and disinfection measures to limit occurrence of diseases, pests or weeds, manual and mechanical weed control, ventilation operations to improve soil health, sanding operations and optimum watering to preserve plant health.<sup>319</sup>

Epidemio-surveillance is a cornerstone of integrated sports lawn management. This approach is based on knowledge, diagnosis and monitoring of the relevant symptoms and pests. Some species can provide valuable indications on the fragilities and agronomic weaknesses of the land. This knowledge also makes it possible to distinguish between spontaneous species and weeds to be checked. Knowledge of the main phytosanitary issues on sports grasslands also

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<sup>313</sup> Dalhuisen et al., *Monitor milieuvriendelijk beheer van grassportvelden 2022*, pp. 7 and 19.

<sup>314</sup> Netherlands, answers to Czech Presidency questionnaire on sensitive areas, 18 November 2022.

<sup>315</sup> See Article 8.4(1)(a) and Annex XVII of Regeling gewasbeschermingsmiddelen en biociden (Plant protection products and biocides scheme)

<sup>316</sup> <https://www.greendeals.nl/sites/default/files/downloads/GD189-samenvatting-Gebruik-van-gewasbeschermingsmiddelen-op-sportvelden.pdf>

<sup>317</sup> Noodzakelijk gebruik van gewasbeschermingsmiddelen op sportvelden met natuurgras; addendum 2022: voetbalvelden, golfterreinen en andere sportvelden met natuurgras [Necessary use of plant protection products on sports grounds with natural grass; addendum 2022: football pitches, golf courses and other sports grounds with natural grass].

<sup>318</sup> *Ibid.*, p. 8.

<sup>319</sup> Plante & Cité, *Vers Le “Zéro Phyto” Des Terrains de Sport en Pelouse Naturelle: Démarche Globale et Gestion Intégrée – Guide Technique*, 2021, chapter 3.

helps to limit the associated damage by intervening early or even preventing their development.

Finally, training and communication are essential to support pesticide restrictions. A study in France found that the buy-in of management teams and users is essential to ensure that the necessary compromises and efforts are sustained. Support for maintenance teams is essential to allow them to acquire the skills needed for new practices and to help them decide on the measures to be implemented to improve the health of sports grasslands. Training and diagnostic experiments make it possible to give meaning to the new maintenance objectives from the outset. Stopping the use of plant protection products on sports lawn can lead to visible changes or even imperfections, particularly during a transitional period. These changes can be accompanied by tailored and motivational communication in order to raise awareness among the user audiences. Awareness-raising can include onsite notice boards, dedicated webpages, press articles, public meetings and presentation of the approach to club members.<sup>320</sup>

The importance of support for municipalities was also emphasized in a 2022 study on the management of grass sports municipalities in the Netherlands. Three quarters of the municipalities surveyed indicated a need for support, including general information, exchange of good practice, knowledge sharing and a roadmap for environmentally friendly work.<sup>321</sup> 84% of those surveyed in 2022 had an understanding of the nutritional status of grass sports pitches and 67% had an understanding of the identification of the fields where weeds, diseases and pests are most likely to occur due to environmental factors. Most municipalities were in the process of monitoring, aeration, mowing or mowing to promote a robust grass and well-developed roots.<sup>322</sup> An evaluation of the Green Deal published in 2020 of the Dutch ‘Green Deal’ for sports pitches also recommended better provision to operators of sports grounds on legal requirements as regards products requiring to be authorised for sports grounds.<sup>323</sup>

The second report of the expert committee of agronomists in the Netherlands in 2022 also identified the importance of supporting sports clubs in their efforts. One specific issue that was identified was that cities ask sports clubs to organise the field maintenance themselves and clubs do not always have enough volunteers to carry out these tasks or sufficient knowledge of maintenance without the use of pesticides. It was also noted that reducing the budget at the time of transition can cause practical problems because the first years after a change have to take into account higher costs depending on the structure of the fields and the maintenance situation of the fields.<sup>324</sup>

In relation to practical incentives for site managers to design and implement their management so that pesticides are no longer used against weeds, the committee recommended the following:

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<sup>320</sup> Plante & Cité, Vers Le “Zéro Phyto” Des Terrains de Sport en Pelouse Naturelle: Démarche Globale et Gestion Intégrée – Guide Technique, 2021, chapter 7.

<sup>321</sup> Schots et al (2022), Monitor milieuvriendelijk beheer van grassportvelden 2021, p. 21; Dalhuisen et al., *Monitor milieuvriendelijk beheer van grassportvelden 2022*, p. 19.

<sup>322</sup> Dalhuisen et al., *Monitor milieuvriendelijk beheer van grassportvelden 2022*, pp. 11, 19.

<sup>323</sup> <https://www.rivm.nl/documenten/green-deal-gewasbeschermingsmiddelen-sportvelden>

<sup>324</sup> Noodzakelijk gebruik van gewasbeschermingsmiddelen op sportvelden met natuurgras; addendum 2022: voetbalvelden, golfterreinen en andere sportvelden met natuurgras [Necessary use of plant protection products on sports grounds with natural grass; addendum 2022: football pitches, golf courses and other sports grounds with natural grass].

- A transitional period of, for example, two years, because the transition to chemical-free management is possible but it takes time and can be financially challenging. A transition period also makes it clear that action is necessary.
- During the transition period, the build-up of the field should be rectified. This reduces management costs in the longer term, with exceptions. These include mechanical processing, fertiliser application, (one-off) consultancy costs of independent experts, etc.
- Some low-hanging fruit can already be effective at minimum cost, such as using competition fields for training, which is a cheap and effective weed protection measure, or allowing grass to rest in warm dry periods to save water and allow the grass to grow back stronger.
- By making the management of sport fields less to non-dependent on the use of plant protection products, the sports fields will become more robust and climate resilient, more resilient to longer dry and hot periods, but also more wet periods.
- In the longer term, the ad hoc committee noted that the development in precision agriculture will facilitate a preventive and ultimately cost-effective approach.<sup>325</sup>

The committee also recommended that an exception for unforeseen circumstances is reasonable, so that significant damage caused by diseases and pests can be made good. It also recommended differentiating between golf courses and other sports fields, arguing that zero use of pesticide on short-grass courses is technically not feasible or is difficult to achieve or financially impractical.

In discussing the trade-offs, the committee noted that if the limited exceptions allowing the use of pesticides in certain circumstances were ended, there might be a risk of unwanted effects. If fields deteriorate too quickly in quality, managers may decide to switch to artificial grass. From the point of view of sustainability, artificial grass is a much worse option than occasional use of pesticides. Moreover, the use of artificial grass may lead to not playing enough on natural fields when artificial grass fields are present, leading to avoidable presence of weeds.

Within the framework of Sports Sustainability Roadmap, an Integrated Sports Management Manual was published in the Netherlands in 2023. This manual emphasizes the need for a structured, cyclical planning approach, in which the monitoring of field quality has an important role to play. It explains the importance of monitoring, applying damage thresholds and incorporating IPM into the management cycle. It stresses the importance of making the management quality of grass fields visible as a measure for the success of IPM measures and discusses how to translate the indicative values of weeds and diseases into improvements in management. It also explains the use of field work forms for quality assessment of different types of sports fields and provides a digital bank of checklists and forms.<sup>326</sup>

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<sup>325</sup> Ibid., pp. 8-9.

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[https://sacmsmediaproduct.blob.core.windows.net/cmsmedia/assets/Handleiding\\_Geintegreerd\\_Sportgrasbeheer\\_Mrt2023\\_6da1cb7d6b.pdf](https://sacmsmediaproduct.blob.core.windows.net/cmsmedia/assets/Handleiding_Geintegreerd_Sportgrasbeheer_Mrt2023_6da1cb7d6b.pdf)

## **ANNEX 5: TECHNICAL CLARIFICATIONS IN RELATION TO AREAS FOR WHICH THE FUTURE MONITORING ESTABLISHES THAT THEY SUSTAIN ONE OR MORE POLLINATOR SPECIES THREATENED WITH EXTINCTION**

A number of Member States have raised concerns regarding areas designated for future monitoring of pollinators, as the areas to be designated in the future under the Nature Restoration Law proposal are not yet known. These technical clarifications are an attempt to address those concerns.

The methodology for the monitoring of pollinators is expected to be defined in an Implementing Act, in accordance with Article 8 (2) of the proposed Nature Restoration Regulation. The first data of the monitoring can be expected by 2025/2026.

To date, European Red Lists exist for three pollinator groups: butterflies, bees, and hoverflies<sup>327,328</sup>. Species categorised as threatened at European level typically have very specific habitat requirements to meet essential needs such as forage, shelter, breeding, nesting, and over-wintering.

Sensitive areas are to be established where at least one threatened pollinator species is sustained. This means that the species in question have a population in this area that is likely to persist over time. The existence of such population is conditioned by the existence of specific habitats that the species requires. Thus, the sensitive area should cover all relevant habitat area, and a functional buffer zone around it to mitigate drift effects.

As a direct consequence of these specific ecological requirements, the likelihood that a population of a red-listed pollinator species classified as being threatened with extinction will ever be recorded on intensively used grasslands or croplands is extremely small. Red-listed pollinator species classified as being threatened with extinction can occur in semi-natural species-rich grasslands and other unfertilised Natura 2000 grassland habitats, but are very unlikely to be detected on other agricultural lands.

### Examples:

- Most red-listed butterflies are dependent on specific habitats with host plants for the development of their caterpillars. As an example, the Apollo Butterfly (*Parnassius apollo*) is confined to fresh meadows and rocky slopes that sustain the food plants of its caterpillars, the stonecrop (*Sedum* and *Hylotelephium* species) or the houseleek (*Sempervivum* species).
- Threatened solitary bees are often specialists for a small range of wild flower species. As an example, some Pantaloon Bees (*Dasypoda* species) only collect pollen from teasel plants (*Dipsacus* species). The location of these plants can be identified and used for the designation of a sensitive area after a population of the endangered species has been located.
- Most threatened hoverfly species rely on natural or semi-natural habitats that are themselves threatened, from forest with over-mature trees to specific types of bogs, fens, marshes and semi-natural grasslands. In the Mediterranean region, many threatened hoverfly species depend on wild bulb plants that have restricted distributions.

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<sup>327</sup> <https://ec.europa.eu/environment/nature/conservation/species/redlist>

<sup>328</sup> <https://wikis.ec.europa.eu/display/EUPKH/European+Red+List+of+Hoverflies>

Most wild pollinator species move across rather limited ranges<sup>329</sup> in a local environmental context. In particular, wild bees are central place foragers that move back and forth between the food sources and a nesting site. Long flight ranges across several kilometres are observed for the managed honeybee but are rare for wild pollinator species.

Observations of individual specimens of threatened pollinator species that cannot be linked to the presence of a local population and suitable habitats should not necessarily mean this species is established in this area and that the area should be designated as sensitive.

In this Annex, geo-referenced data of recorded sightings of bee species are presented (yellow dots). The data are taken from the Global Biodiversity Information Facility (GBIF, [www.gbif.org](http://www.gbif.org)), which is a comprehensive database of recorded occurrences of wild species. The recorded occurrences are presented for two different time spans: on the left side over the entire time for which there are observations included in the GBIF database, and on the right side for the more recent period from 2000 to 2022. This indicates that the distribution ranges of species threatened species has been reduced in many cases.

***Bombus collumanus***, critically endangered

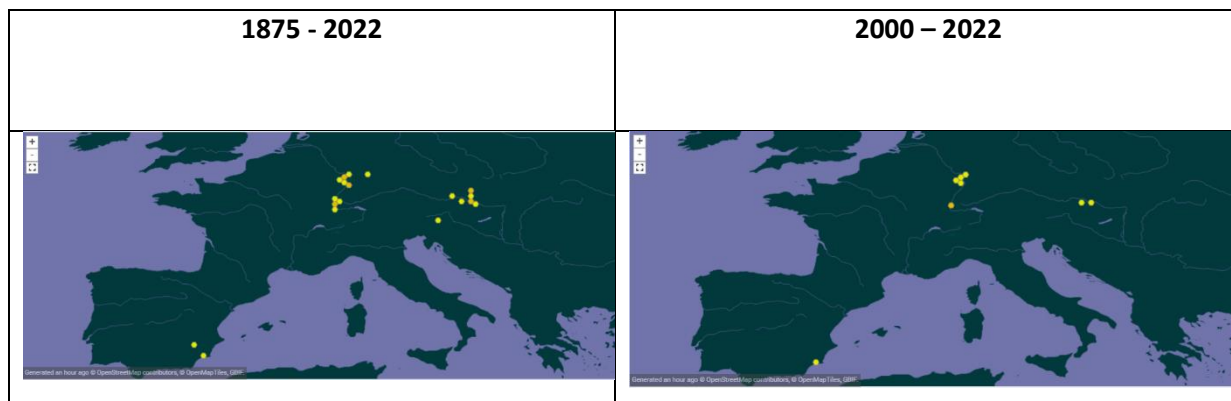


***Lasioglossum quadrisignatum***, endangered



<sup>329</sup> <https://jhr.pensoft.net/article/51182/>  
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0160333>

*Systropha planidens*, vulnerable



By means of comparison, data are also presented for a common wild bee species, *Bombus terrestris*. This species, which is not threatened by extinction, should not be taken into account for the designation of sensitive areas. These data are solely presented in order to show the reliability of the datasets currently available.

