Hort4EUGreen

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CHEMICAL PESTICIDE-FREE HORTICULTURE

European legal framework for ‘non-chemical methods’ in plant protection and crop pest management

Volume 1

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Module 1. European legal framework for ‘non-chemical methods’ in plant protection and crop pest management

Summary

This module provides an in-depth analysis of the development of European Union regulations concerning ‘non-chemical methods’ for plant protection, in the context of increased concerns of utilization of chemical pesticides. It covers the historical context, key legislative milestones, implementation challenges, and future directions of EU policies in this area. The module combines theoretical knowledge with presentation of case studies Beside the introduction to EU regulatory framework, the module presents the most important EU Directives sustainable plant protection, as Directive 2009/128/EC (Sustainable Use Directive), National Action Plans and their role in implementing non-chemical strategies, the EU Organic Regulation (EU) 2018/848, and an overview of current research and innovation in non-chemical plant protection, with examples of EU funding and support for research in sustainable agriculture and non-chemical pest management.

Learning outcome descriptors

By the end of the module, the trainees should be able to prove they acquired both general and transferable skills and knowledge, understanding and professional skills.

General and transferable skills

1	Gain insight into the role of the European Union in addressing global environmental issues through legal frameworks.
2	Understand and interpret legal language and its implications for non-chemical plant protection strategies
3	Gain proficiency in examining and understanding EU policies, particularly in the context of sustainable agriculture and environmental protection
4	Enhance abilities in conducting thorough and systematic research.
5	Develop the skill to communicate legal implications to a non-legal audience, such as scientists, farmers, and policymakers
6	Strengthen critical thinking abilities in evaluating the effectiveness and compliance of various pest management approaches.

Learning outcome descriptors

Knowledge, understanding and professional skills

1	In-depth knowledge of EU regulations, directives, and policies relevant to plant protection and pesticide use.
2	Familiarity with EU policies and strategies promoting sustainable agriculture, such as the EU Green Deal and the Farm to Fork Strategy.
3	Grasp the dynamic relationship between legal frameworks, scientific research in plant protection, and policy development.
4	Understand the implications of legal decisions on scientific practices and vice versa.
5	Recognizing the challenges faced by member states in implementing EU directives and regulations at the national level.
6	Understanding professional ethics in plant protection, including considerations for environmental stewardship and public health.

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Unit 1.1 Legal framework. Review

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1.1.1 Introduction

Introduction on the importance of sustainable agriculture and legal framework related to non-chemical methods

Sustainable agriculture represents a comprehensive approach prioritizing environmental health, economic profitability, and social and economic equity (Pretty, 2008). It is defined by its ability to meet current food and textile needs without compromising the ability of future generations to meet their needs. This approach is critical in addressing the challenges posed by a growing global population and the ensuing increase in food demand (Godfray et al., 2010).

For years, increasing the agriculture productivity was the main goal, and this included the use of chemicals to secure the productions. The extensive use of chemical pesticides in conventional agriculture has led to significant environmental and health concerns. These concerns include the contamination of water bodies, soil degradation, and adverse effects on non-target organisms, including beneficial insects (Pimentel & Burgess, 2014). The potential for bioaccumulation of these chemicals in the human food chain poses

direct health risks, leading to various illnesses and disorders (Mostafalou & Abdollahi, 2013). On the other hand, sustainable agriculture emphasizes preserving biodiversity and ecosystem services. Biodiversity in agricultural landscapes enhances ecosystem services like soil fertility, pest and disease control, and pollination, contributing to overall ecosystem resilience and productivity (Tscharntke et al., 2005). The role of biodiversity in sustainable agricultural practices is critical in maintaining long-term agricultural productivity and environmental health (Bommarco et al., 2013)

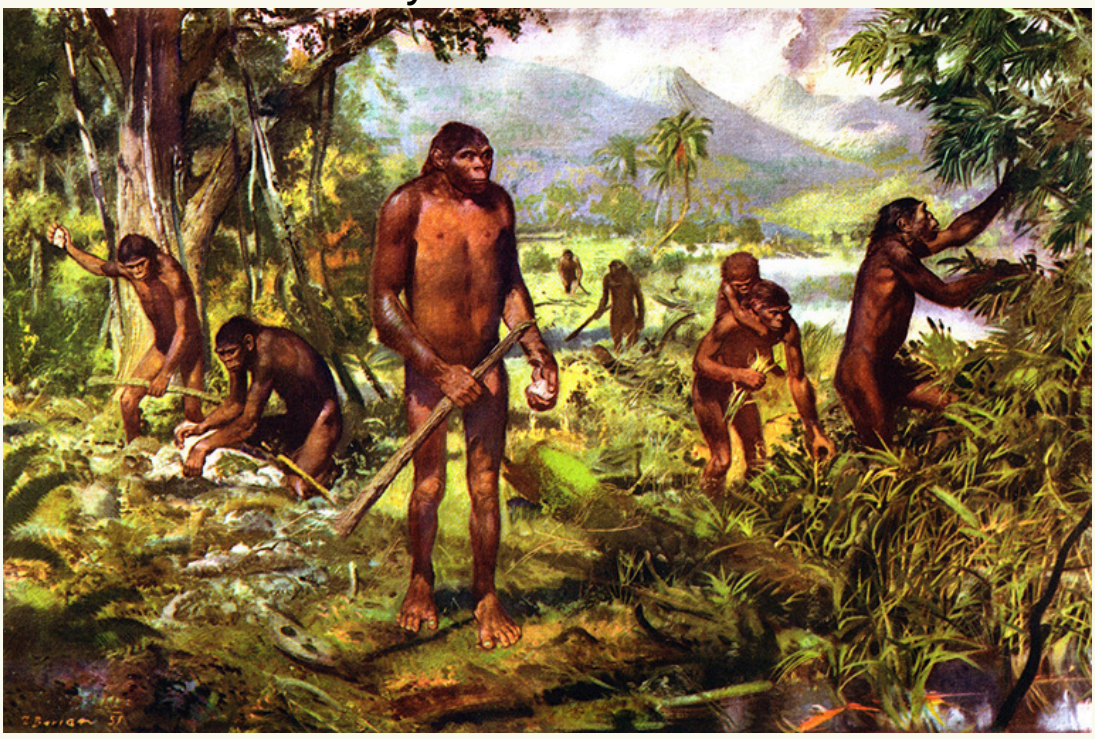
The European Union has been at the forefront of promoting sustainable agricultural practices, with a significant policy shift towards non-chemical methods in plant protection and pest management (European Commission, 2009). This shift is part of a broader strategy to reduce environmental and health risks associated with chemical pesticides and promote more sustainable practices. Therefore, the European legal framework for non-chemical methods includes a series of key legislative instruments that set the frame of the sustainable use agricultural production, including the Integrated Pest Management (IPM) and the National Action Plans. https://food.ec.europa.eu/plants/pesticides_en

In addition, EU invests substantially in research and innovation, being a significant proponent of research and innovation in sustainable agriculture, funding projects focused on effective non-chemical pest control methods. Programs like Horizon Europe and the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) have been pivotal in advancing this field (European Commission, 2020).

Source here

1.1.2 Evolution of EU policies on plant protection

The evolution of European Union (EU) policies on plant protection is a reflection of the changing understanding of the environmental, health, and economic impacts of agricultural practices. At the beginning, in Europe, the early regulatory measures were taken by the individual member states and only later developed into comprehensive EU-wide directives and regulations that exist today.



The Agricultural Revolution "Not the man domesticates the wheat, but the wheat domesticates the man

Recommended read

(Harari, 2015. Sapiens: A Brief History of Humankind. Harper - https://www.1pezeshk.com/wp-content/uploads/2019/07/Sapiens-A-Brief-History-of-Humankind.pdf)

Today, the focus is on the transformation from reliance on chemical pesticides to an integrated approach that includes non-chemical methods

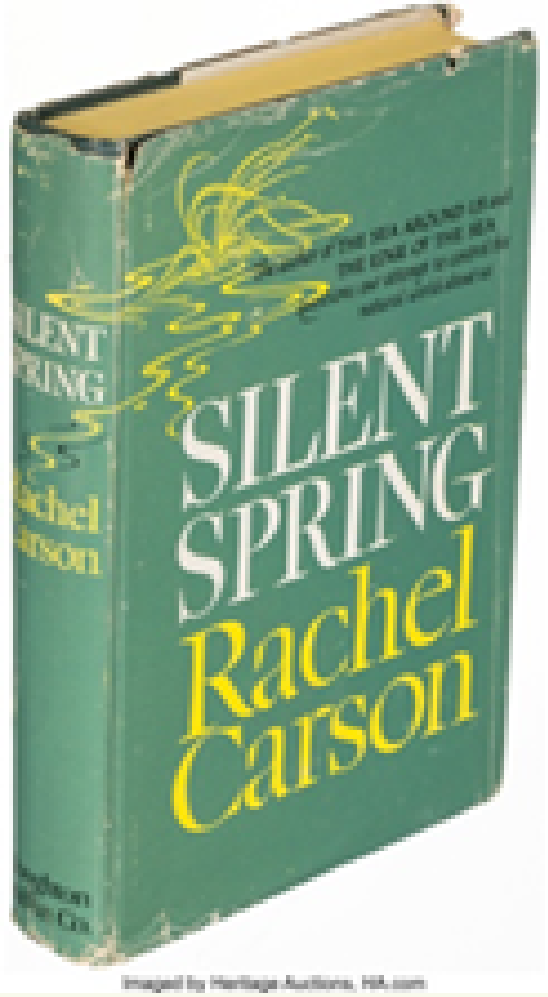
Before any regulation

FOR 2.5 MILLION YEARS HUMANS

fed themselves by gathering plants and hunting animals that lived and bred without their intervention.
And, all this changed about 10,000 years ago, when the agricultural revolution started.

Early regulatory efforts

In the post-World War II era, European countries, like much of the world, experienced significant agricultural intensification. This period saw the introduction and widespread use of synthetic chemical pesticides, a development initially hailed for its potential to increase agricultural productivity and food security (Damalas & Eleftherohorinos, 2011). However, by the 1960s and 1970s, the adverse environmental and health impacts of these chemicals began to surface. This period marks the beginning of regulatory efforts, initially at the national level, with countries like the United Kingdom, France, and Germany implementing their own regulations regarding pesticide registration and use (Freedman, 2017).



"Silent Spring," published in 1962 by biologist Rachel Carson, is a landmark publication in environmental science and a pivotal moment in the environmental movement. This book is often credited with launching the global environmental movement and played a significant role in changing public perceptions and policy approaches towards pesticides and the environment.

In 2006, Silent Spring was named one of the 25 greatest science books of all times.

The rise of environmental and health consciousness

The 1980s and 1990s were pivotal in shaping the EU's approach to plant protection. The growing environmental movement, coupled with emerging scientific evidence of the harmful impacts of pesticides, led to a more cautious approach towards their use. During this period, several key events and publications, as various scientific studies on the impacts of pesticides, played a significant role in raising public and political awareness (Cooper & Dobson, 2007).

Formation of EU-Wide Policies

The formation of the European Union and the development of its common policies provided a platform for a coordinated approach to plant protection. One of the earliest directives was the Council Directive 79/117/EEC which prohibited the marketing and use of certain dangerous substances in plant protection products. This was followed by Council Directive 91/414/EEC, which required a thorough evaluation and authorization process for pesticides (Council of the European Communities, 1991).

(https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex:31979L0117)

The sustainable use directive and integrated pest management

A landmark in EU plant protection policy was the adoption of the Sustainable Use Directive (2009/128/EC) in 2009. This directive represented a significant shift in policy focus, from reliance on chemical control to the promotion of Integrated Pest Management (IPM) and non-chemical alternatives. The directive mandated EU member states to develop National Action Plans to reduce the risks and impacts of pesticide use, and it encouraged the adoption of IPM as a key strategy in plant protection (European Parliament and Council, 2009).

The role of organic farming regulations

Concurrent with the development of policies focused on reducing pesticide use, the EU also advanced regulations promoting organic farming. Regulation (EC) No 834/2007 on

organic production and labeling of organic products, and its successor, Regulation (EU) 2018/848, played a significant role in promoting non-chemical methods in plant protection, as organic farming principles inherently prioritize such methods (European Parliament and Council, 2007; 2018).

EU Green Deal - challenges and progress

Despite these advances, the implementation of EU policies on plant protection has faced challenges. These include disparities in the adoption and enforcement of the regulations across member states, the continued reliance on chemical pesticides in certain agricultural sectors, and the need for further research and development of effective non-chemical control methods (Barzman et al., 2015). Despite the taken measures, the use of pesticide still has an positive trend.

(https://ec.europa.eu/eurostat/databrowser/explore/all/agric?lang=en&subtheme=agr.aei&display=list&sort=category)

Inside the Farm to Fork Strategy (May 2020), the European Commission announced two pesticide reduction targets: (1) a 50% reduction in the use and risk of chemical pesticides by 2030; (2) a 50% reduction in the use of more hazardous pesticides by 2030.
https://food.ec.europa.eu/plants/pesticides/sustainable-use-pesticides/farm-fork-targets-progress_en.

These targets can not be achieved without the enforcement of From the early days of unregulated pesticide use to the current emphasis on IPM and organic farming, these policies have

evolved significantly. They exemplify the EU's commitment to environmental stewardship, public health protection, and sustainable agriculture. However, the journey is ongoing, with continuous efforts required to advance and refine these policies to meet the evolving challenges of agricultural production and environmental conservation.

1.1.3 Key milestones and policy shifts towards sustainable practices

Today, the European Union (EU) has a comprehensive legal framework aimed at promoting sustainable agriculture, which includes directives and regulations regarding 'non-chemical methods' in plant protection and crop pest management. This framework reflects a growing awareness of the environmental and health impacts of chemical pesticides, and a shift towards more ecologically sound and sustainable practices in agriculture.

The main key milestones could be named as follows:

1962 The genesis: Recognizing the need for change

The publication of Rachel Carson's "Silent Spring" in 1962 was a catalyst for change, highlighting the detrimental effects of pesticides on the environment and human health (Carson, 1962).

1978 Early regulations: Setting the foundation

The first significant directive: Council Directive 79/117/EEC, which prohibited the use of certain harmful substances in plant protection products.

1991 Council Directive 91/414/EEC: A comprehensive approach

The Council Directive 91/414/EEC, adopted in 1991, marked a crucial turning point. This directive established

a rigorous evaluation and authorization process for pesticides, ensuring that only those products that are safe for human health and the environment are approved for use (Council of the European Communities, 1991).

2007 Organic farming regulations: Reinforcing sustainable practices

The EU's focus on organic farming has also significantly influenced sustainable plant protection practices. Regulation (EC) No 834/2007, followed by Regulation (EU) 2018/848, established standards for organic production, including restrictions on synthetic pesticide use, thus reinforcing the shift towards sustainable agricultural practices (European Parliament and Council, 2007, 2018).

2009 The Sustainable Use Directive (2009/128/EC): A paradigm shift

A landmark in EU plant protection policy was the adoption of the Sustainable Use Directive in 2009. This directive represented a paradigm shift from reliance on chemical control to the promotion of Integrated Pest Management (IPM) and non-chemical alternatives. It mandated EU member states to develop National Action Plans to reduce the risks and impacts of pesticide use and promote IPM as a cornerstone strategy in plant protection (European Parliament and Council, 2009).

2019 The European Green Deal: A deal for future generations

Announced in December 2019, the Green Deal represents an ambitious plan to make the EU's economy sustainable by turning climate and environmental challenges into opportunities across all policy areas. It prioritizes sustainability, biodiversity, and the reduction of chemical pesticide use, aligning with the broader objectives of achieving a climate-neutral and environmentally sustainable EU by 2050.

A must read report

https://croplifeeurope.eu/wp-content/uploads/2021/03/RISE_CP_EU_final.pdf

1.1.4 Overview of the European Union's approach towards non-chemical plant protection

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The need for ecological transition of agriculture, particularly crop protection, is well recognized at the European level. The EU regulatory Framework for 'non-chemical methods' for plant protection has been reviewed and analyzed in several reports and publications (Baghasa, 2008; van Lenteren 2012; Buckwell et al., 2020; Ecorys, 2018, ECA, 2020; Castella et al. 2022 Pollice et al., 2022, etc.)

The Good Agricultural Practices Standards related to Soil management, Fertilizer application, Irrigation, Crop protection, and Harvesting are reviewed by Baghasa (2008). Pollice et al., 2022 published a white paper presenting requirements for water reuse on the agri-food value chain. A Legal Framework for *Plant Biostimulants and Agronomic Fertiliser Additives* in the EU is reviewed by Traon et al. (2014).

The "Study supporting the REFIT Evaluation of the EU Legislation on plant protection products and pesticides

residues" (Ecorys, 2018), provides an analysis of the legislative framework for pesticides. It covers two Regulations: **Regulation (EC) No 1107/2009** on the placing of plant protection products on the market, and **Regulation (EC) No 396/2005** on pesticide residues in food and feed. The study assesses the effectiveness, efficiency, relevance, coherence, and the EU added value of these Regulations.

The focus of the report of Buckwell et al. (2020) "Crop Protection & the EU Food System. Where are they going?" is crop protection in the European Union (EU). The authors concluded that crop protection should move towards a new system with a new goal: to re-establish ecosystem functions on agricultural land, to provide nature-based solutions for pest, disease, and weed threats, and to utilize all means to eliminate the harms caused to health and environment by use of PPPs.

The report of the European Court of Auditors published in 2020 entitled: "Sustainable use of plant protection products: limited progress in measuring and reducing risks" (ECA 2020), aimed at assessing whether EU action has reduced the risk related to PPP use. The authors found that there is limited progress in measuring and reducing the risks of PPP use. They showed that EU action for the sustainable use of PPPs was off to a slow start and identified weaknesses in the current EU framework. The Union's situation and options regarding invertebrate biological control agents (IBCAs) for use in Plant Health

and Plant Protection is presented by Castella et al. (2022). The current European regulation does not cover invertebrate biological control agents for the placing into the market of PPPs (Regulation (EC) No 1107/2009).

The report of the European Court of Auditors published in 2020 entitled: “Sustainable use of plant protection products: limited progress in measuring and reducing risks” (ECA 2020), aimed at assessing whether EU action has reduced the risk related to PPP use. The authors found that there is limited progress in measuring and reducing the risks of PPP use. They showed that EU action for the sustainable use of PPPs was off to a slow start and identified weaknesses in the current EU framework. The Union’s situation and options regarding invertebrate biological control agents (IBCAs) for use in Plant Health

Still, there are several guideline-setting organizations, whose work is often informally considered in the different regulation systems developed by European Member States. These organizations are the International Plant Protection Convention IPPC (global level) and the European and Mediterranean Plant Protection Organization (EPPO) (regional level).

A comprehensive review of the current status of IPM at the EU level is presented in Farmer's Toolbox for Integrated Pest Management - Final report of the "Pilot Project – Developing a Farmers' Toolbox for Integrated Pest Management Practices from across the Union" (IPM Toolbox, 2023).

1.1.5 Key EU Legislation and Directives

The different approaches placed under the umbrella of the term “non-chemical methods” are regulated by several EU regulations. The goals of the four major regulations are as follows:
The main key milestones could be named as follows:

Regulation (EU) No 1306/2013 of the European Parliament and of the Council of 17 December 2013 on the financing, management and monitoring of the common agricultural policy and repealing Council Regulations (EEC) No 352/78, (EC) No 165/94, (EC) No 2799/98, (EC) No 814/2000, (EC) No 1290/2005 and (EC) No 485/2008

This Regulation lays down the rules on **(a)** the financing of expenditure under the Common Agricultural Policy (CAP), including expenditure on rural development; **(b)** the farm advisory system; **(c)** the management and control systems to be put in place by the Member States; **(d)** the cross-compliance system; **(e)** clearance of accounts.

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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

This regulation concerns the placing of plant protection products on the market. Its purpose is “to ensure a high level of protection of both human and animal health and the environment and at the same time to safeguard the competitiveness of Community agriculture”.

Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides

This Directive is an overall framework for crop protection in the EU. Its objectives are to reduce the risks and impacts of pesticide use on human health and the environment and to encourage the development and introduction of integrated pest management and of alternative approaches or techniques to reduce dependency on the use of pesticides.

REGULATION (EU) 2018/848 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018 on organic production and labeling of organic products and repealing Council Regulation (EC) No 834/2007

This Regulation establishes the principles of organic production and lays down the rules concerning organic production, related certification, and the use of indications referring to organic production in labeling and advertising, as well as rules on controls additional to those laid down in Regulation (EU) 2017/625

1.1.6 List of policy and legislative documents related to different approaches placed under the umbrella of the term “non-chemical methods”

A. Agronomic techniques, physical and mechanical methods for crop pests, pathogens and weeds management

Good agricultural and environmental conditions, abbreviated as GAEC, refers to a set of European Union (EU) standards (described in Annex II of Council Regulation No 1306/2013 defined at national or regional level), aiming to achieve a sustainable agriculture. Keeping land in good agricultural and environmental conditions is directly related to issues such as: minimum level of maintenance; protection and management of water; soil erosion; soil organic matter; soil structure.

European Union (Good Agricultural Practice for Protection of Waters) Regulations 2022 The purpose of these Regulations is to give effect to Ireland's Nitrates Action Programme pursuant to Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural source.

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.

European Parliament resolution of 28 April 2021 on soil protection (2021/2548(RSP)) (2021/C 506/07).

COM(2021) 699. EU Soil Strategy for 2030. Reaping the benefits of healthy soils for people, food, nature and climate.

REGULATION (EU) 2020/741 of the European Parliament and of the Council of 25 May 2020 on minimum requirements for water reuse PE/12/2020/INIT

REGULATION (EU) 2019/1009 of the European Parliament and of the Council of 5 June 2019 laying down rules on the making available on the market of EU fertilising products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC) No 2003/2003 (Text with EEA relevance).

COMMISSION IMPLEMENTING REGULATION (EU) 2021/2286 of 16 December 2021 on the data to be provided for the reference year 2023 pursuant to Regulation (EU) 2018/1091 of the European Parliament and of the Council on integrated farm statistics as regards the list of variables and their description and repealing Commission Regulation (EC) No 1200/2009 (Text with EEA relevance).

B. Biological control of crop pests, pathogens and weeds Conservation biological control

REGULATION (EU) No 1306/2013 of the European Parliament and of the Council of 17 December 2013 on the financing, management and monitoring of the common agricultural policy and repealing Council Regulations (EEC) No 352/78, (EC) No 165/94, (EC) No 2799/98, (EC) No 814/2000, (EC) No 1290/2005 and (EC) No 485/2008

C. Use of invertebrate biocontrol agents (macrobials) as non-chemical approaches to control crop pests

COUNCIL DECISION (EU) 2021/1102 of 28 June 2021, requesting the Commission to submit a study on the Union's

situation and options regarding the introduction, evaluation, production, marketing and use of invertebrate biological control agents within the territory of the Union and a proposal, if appropriate in view of the outcomes of the study.

SWD (2022). 446 final COMMISSION STAFF WORKING DOCUMENT Study on the Union's situation and options regarding the introduction, production, evaluation, marketing and use of invertebrate biocontrol agents within the territory of the Union. Brussels, 20.12.2022.

SWD (2022). 446 final COMMISSION STAFF WORKING DOCUMENT Study on the Union's situation and options regarding the introduction, production, evaluation, marketing and use of invertebrate biocontrol agents within the territory of the Union. Brussels, 20.12.2022.

European and Mediterranean Plant Protection Organization (EPPO) Standards on the safe use of biological control:

- (2008) PM 6/1(1) First import of exotic biological control agents for research under contained conditions
- (2014) PM 6/2 (3) Import and release of non-indigenous biological control agents
- (2018) PM 6/04 (1) Decision-support scheme for import and release of biological control agents of plant pests
- (2021) PM 6/3 (5) Introduction to PM 6 Standards on Safe use of biological control
- (2022) PM 6/3 (5) Biological control agents safely used in the EPPO region

D. Use of microorganisms (microbials) as non- chemical approaches to managing crop pests and pathogens

OECD 67 (2012) guidance to the environmental safety evaluation of microbial biocontrol agents Series on Pesticides No. 67, Organisation for Economic Co-operation and Development ENV/JM/MONO(2012)1

COMMISSION REGULATION (EU) 2022/1438, amending Annex II to Regulation (EC) No 1107/2009 as regards specific criteria for the approval of active substances that are micro-organisms

COMMISSION REGULATION (EU) 2022/1439, amending Regulation (EU) No 283/2013 as regards the information to be submitted for active substances and the specific data requirements for micro-organisms

COMMISSION REGULATION (EU) 2022/1440, amending Regulation (EU) No 284/2013 as regards the information to be submitted for plant protection products and the specific data requirements for plant protection products containing micro-organisms

COMMISSION REGULATION (EU) 2022/1441, amending Regulation (EU) No 546/2011 as regards specific uniform principles for evaluation and authorisation of plant protection products containing micro-organisms

E. Use of semiochemicals for control and management of crop pests

IAEA 2003. TRAPPING GUIDELINES FOR AREA-WIDE FRUIT FLY PROGRAMMES, IAEA, VIENNA, 2003 TG/FFP-2003 © IAEA, 2003

REGULATION 283/2013 - data requirements for active substances Part A (UK legislation website)

REGULATION 284/2013 - data requirements for plant protection products Part A (UK legislation website)

Guidance for Registration Requirements for Pheromones and Other Semiochemicals Used for Arthropod Pest Control' (OECD Series on Pesticides, number 12). (OECD website)

Guidance Document on Semiochemical Active Substances and Plant Protection Products Series on Pesticides No. 93.

SANTE/12815/2014. rev. 5.2, May 2016 Guidance document on semiochemical active substances and plant protection products. European Commission Health & Food Safety Directorate-General.

PP1/264(2) - Principles of efficacy evaluation for mating disruption pheromones. Bulletin OEPP/EPPO Bulletin(2019)0(0), 1–4

ISPM 26. 2006. Establishment of pest free areas for fruit flies (Tephritidae). Rome, IPPC, FAO

F. Use of natural substances for control of crop pests and pathogens

COUNCIL DIRECTIVE of 15 July 1991 concerning the placing of plant protection products on the market (91 /414 /EEC)

DIRECTIVE 2009/128/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides

REGULATION (EC) 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.

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

SANCO/11470/2012– rev. 8, 20 March 2014, GUIDANCE DOCUMENT ON BOTANICAL ACTIVE SUBSTANCES USED IN PLANT PROTECTION PRODUCTS

1.1.7. The role of European Food Safety Authority (EFSA) in regulation of non-chemical methods for plant protection and crop pest management

The European Food Safety Authority (EFSA) is deeply involved in the area of 'non-chemical methods' for plant protection and crop pest management, especially through its role in the scientific evaluation and risk assessment of plant protection products. EFSA's activities in this domain are multifaceted and very important for the implementation and regulation of sustainable pest management strategies in the European Union. EFSA's responsibilities include the dietary exposure and risk assessment of residues of plant protection products in food and feed commodities, environmental fate and behaviour assessment, ecotoxicology, as well as the ecological and environmental exposure and risk assessment of these products (EFSA, 2023). This comprehensive approach ensures that all aspects of pest control products, including non-chemical ones, are rigorously evaluated for their impact on human health, non-target organisms, and the environment.

A significant part of EFSA's work relates to the assessment and classification of microorganisms used as pesticides. In evaluating these microorganisms, EFSA follows specific exclusion criteria set by the European Commission to classify any active substance as “low risk.” For example, a substance cannot be considered low risk if it is carcinogenic, mutagenic, toxic to reproduction, or has several other hazardous properties. EFSA's evaluation also includes the assessment of secondary metabolites related to a microorganism’s survival and ecological functions. These assessments are crucial since some secondary metabolites can have adverse effects on animal, human, or environmental health (Henderson, 2022)

EFSA's work in this area aligns with the principles of Integrated Pest Management (IPM), supporting several IPM principles, particularly the preference for biological, physical, and non-chemical methods over chemical methods when they provide satisfactory pest control, and the prevention of resistance development.

EFSA does:

1. Risk Assessment and Scientific Advice
2. Evaluation of Alternative Methods
3. Guidance and Methodological Support
4. Data Collection and Analysis
5. Policy Support and Regulatory Framework
6. Stakeholder Engagement and Communication

In summary, EFSA's role encompasses the scientific evaluation of risks, the provision of scientific advice, the development of guidelines and methodologies, and the support of EU policies related to non-chemical methods in plant protection. This makes the EFSA a key player in shaping the landscape of sustainable pest management practices in Europe, directly impacting your field of expertise.

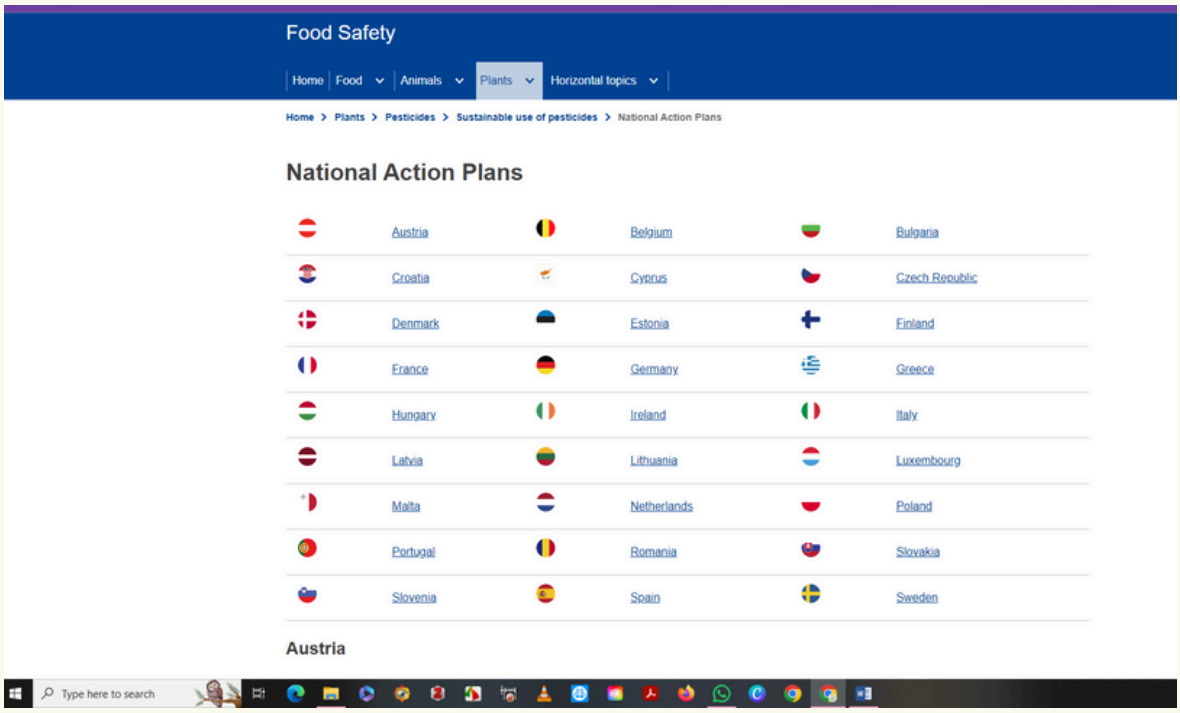
Unit 1.2 Implementation and Support Mechanisms

1.2.1 National Action Plans (NAPs)

National Action Plans (NAPs), as outlined in the European Union's Sustainable Use Directive (2009/128/EC), are the strategic frameworks developed by EU member states to reduce the risks and impacts of pesticide use on human health and the environment.

- The National Action Plan is a strategic document of each EU member state concerning the permanent improvement in the use of plant protection products and is drawn up in order to obtain a low impact on the human consumers, as well as on the aquatic and land ecosystems. It also envisages establishing an appropriate monitoring system for pesticide residues in food, drinking water and the environment.

The EU National action plans can be found at https://food.ec.europa.eu/plants/pesticides/sustainable-use-pesticides/national-action-plans_en



These Plans include quantitative objectives (targets), measures and timetables to reduce risks and impacts of plant protection product use on human health and the environment and intends to develop and implement the integrated pest management and encourages the introduction of plant protection products containing active substances of low concern, of alternative techniques in order to reduce the use of plant protection products and to optimise the control measures (Guvernul Romaniei, 2013).

Each EU member state is required to develop a National Action Plan to reduce the risks and impacts of pesticide use, to implement the EU directives, setting targets and measures to reduce the reliance on chemical pesticides.

These plans are monitored and evaluated to ensure compliance and effectiveness. At the same time, member states are required to report on the implementation of the progress made in achieving the objectives and the European Commission evaluates these reports to assess the effectiveness of the measures and the progress made towards sustainable use of pesticides.

The European legal framework for non-chemical methods in plant protection and crop pest management is comprehensive and geared towards promoting sustainable agriculture. It emphasizes the use of integrated pest management, encourages research and innovation in non-chemical methods, and requires member states to implement and monitor these practices. However, challenges remain in ensuring uniform adoption and effectiveness across the EU. Continued efforts in research, policy development, and farmer engagement are crucial to advance sustainable plant protection practices.

The main key features of the National Action Plans, under the Sustainable Use Directive are:

Risk Reduction: NAPs includes measures to protect human health, particularly of vulnerable groups like farmers and residents in agricultural areas, as well as to prevent environmental contamination.

Use Reduction: The plans might set quantitative targets for reducing the use of chemical pesticides, depending on each country scope and possibilities.

Integrated pest management (IPM): NAPs promote and implement the IPM, emphasizing the use of non-chemical methods for pest control and leaving chemical pesticides as a last resort.

Training and certification: NAPs should promote and implement proper training for professional pesticide users, distributors, and advisors, including provisions for training programs to ensure safe and sustainable pesticide use.

Public awareness and information: NAPs should include measures on raising public awareness about the risks associated with pesticide use and the benefits of IPM and other alternative approaches.

Monitoring and reporting: NAPs should include recommendations on how to collect and report data on pesticide use, for a better progress monitoring.

Adaptability and review: NAPs should be periodically reviewed and revised to adapt to new scientific findings, technological developments, or changes in pest management practices.

Case studies of NAPs from various EU member states

Examining specific case studies NAPs provides valuable insights into how different countries are implementing the EU's Sustainable Use Directive (2009/128/EC). Here are a few examples:

Bulgaria: (1) a 50-200 meter buffer zone along water courses has been established, and the size depends on the type of used fertilizer; (2) the authorities must tell bee-keepers as soon as they have been informed about aerial spraying by farmers; (3) the maximum wind speed under which aerial spraying is allowed is 2 m/second, one of the lowest in EU; (4) advisory services are free to national farmers' union members.

Hungary: (1) buffer zones of 200m for pesticides categorized as R50 (very toxic to the aquatic environment) and R50/53 (toxic to the aquatic environment); (2) pesticide producers have set up a non-profit company (www.cseber.hu) to collect pesticide waste.

Germany's NAP emphasizes IPM and the reduction of chemical pesticide use, including initiatives for rigorous training and certification programs for pesticide users and advisors, promotion of mechanical and biological control methods, and extensive public awareness campaigns about the risks of pesticide use.

French domestic agricultural policy has included goals to reduce Plant Protection Products (PPP) usage. Under the Sustainable Use of Pesticides Directive, France's National Action Plan, encompassing Ecophyto, Ecophyto II, and Ecophyto II+, aimed to cut PPP use by 50% by 2025. However, these plans have not successfully reduced overall PPP usage. These targets align with the 2014 French Law for the Future for Agriculture, Food, and Forestry, which advocates for agroecological practices. This approach is also echoed in the European Commission's European Green Deal, a broader environmental initiative (Buckwell et al., 2020).

Denmark’s NAP is notable for its use of a "pesticide load" indicator, which measures not just the quantity but also the toxicity and environmental impact of pesticide use. Their plan, including restrictions on particularly harmful pesticides, incentives for farmers using low-pesticide methods, and robust monitoring systems, has led to a reduction in the overall environmental impact of pesticides

used in agriculture, even though total usage in terms of quantity has not significantly decreased.

The Dutch NAP is focused on innovation and technological solutions for reducing pesticide dependency, including significant investments in research and development of precision agriculture technologies, positioning the Netherlands at the forefront of technological solutions in sustainable agriculture.

These case studies demonstrate the diverse strategies employed by EU member states in their National Action Plans to achieve the objectives of the Sustainable Use Directive. While the overarching goal is the same – reducing the risks and impacts of pesticides – the means of achieving these objectives vary, reflecting each country's unique agricultural landscape, challenges, and opportunities.

The EU has actively promoted research and innovation in sustainable agriculture, funding projects that explore effective non-chemical pest control methods. Initiatives like the Horizon Europe Programme and the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) play pivotal roles in advancing this field.

Unit 1.2 Implementation and Support Mechanisms

Adrian Asănică, Sorin Marin, Claudia Fabian, Roxana Ciceoi, Arzu Aydar, Yeasemin Sabahoglu

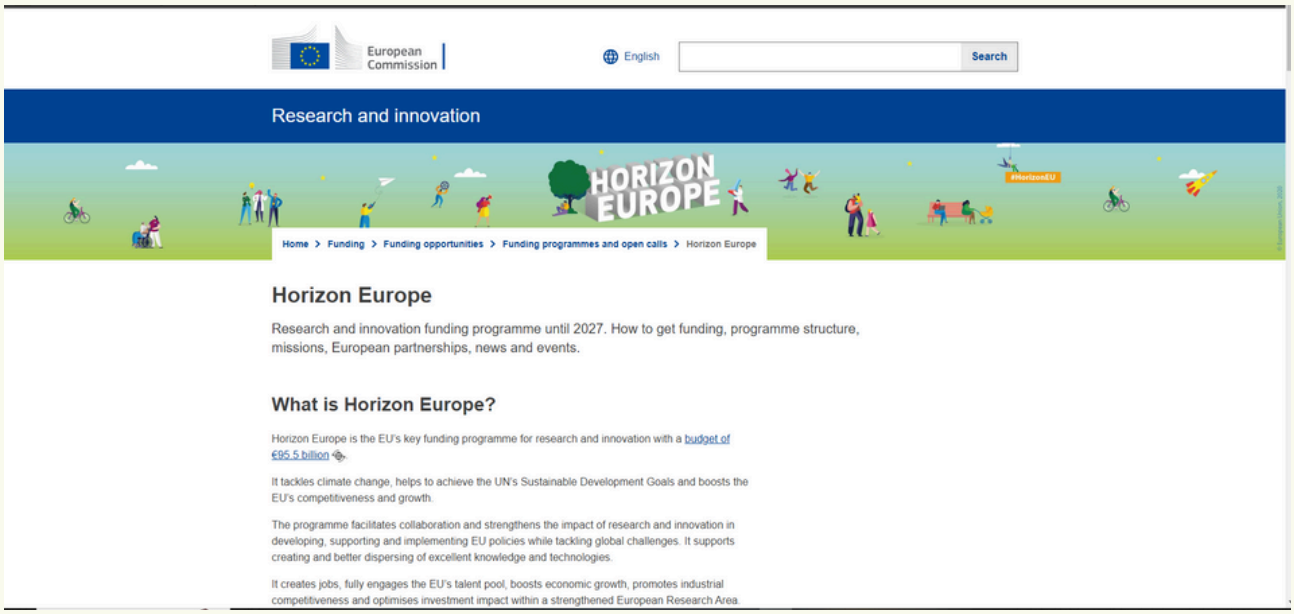
1.2.2. Horizon Europe Programme

The Horizon Europe Programme, as the European Union's key funding program for research and innovation for the 2021-2027 period, plays a significant role in supporting the development and adoption of non-chemical methods of plant protection. This support aligns with the broader EU objectives of promoting sustainable agriculture and reducing reliance on chemical pesticides. The ways in which Horizon Europe supports non-chemical methods of plant protection include:

(1) Funding research and innovation, by allocating substantial funds to research projects focused on developing and testing non-chemical methods of plant protection. This includes biological control methods (biopesticides and beneficial organisms), development of resistant crop varieties and innovative agricultural practices, integrations of the advanced technologies for precision agriculture as AI, remote sensing, and robotics;

(2) Supporting interdisciplinary research, integrating knowledge from biology, ecology, technology, and

social sciences to develop holistic and sustainable plant protection strategies;
(3) Promoting IPM, both in research and extension projects;
(4) Promote demonstration projects that showcase effective IPM techniques in real-world agricultural settings;
(5) implementing decision support systems (DSS), to help farmers make informed decisions about pest management, optimizing the use of non-chemical methods;
(6) fund educational Initiatives and training programs for farmers and agricultural professionals in non-chemical pest management methods;
(7) Fund knowledge dissemination for the transfer of research findings to end-users, including farmers, policy-makers, and other stakeholders, is a key component.



Overview of funding for sustainable agriculture research

The European Union (EU) provides extensive funding for sustainable agriculture research, recognizing its importance for environmental sustainability, economic growth, and social well-being. This funding is delivered through various programs and initiatives, each targeting different aspects of sustainable agriculture, as:

Horizon Europe (2021-2027) is the EU's key funding program for research and innovation, with a budget of around €95.5 billion, .with particular emphasis given to projects that align with the European Green Deal and the Farm to Fork Strategy.

Common Agricultural Policy (CAP) is one of the oldest and largest EU policies, with significant funding allocated to agriculture, to support to farmers adopting sustainable practices, including agri-environmental measures, organic farming, and rural development projects.

Life Programme is the EU’s funding instrument for the environment and climate action, with a budget of €5.4 billion for 2021-2027.funding projects that contribute to environmental sustainability in agriculture, including biodiversity conservation, water management, and soil health

European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) is focused on fostering innovation in agriculture, funding the development and dissemination of innovative practices and technologies in agriculture, such as sustainable pest management and resource-efficient farming practices inside operational groups.

European Regional Development Fund (ERDF) and Cohesion Fund aim at reducing regional disparities within the EU, funding rural development projects, including investments in sustainable agriculture and agri-food sector infrastructure.

Different Research and Innovation Framework Programmes, as FP7 and Horizon 2020 funded significant research in sustainable agriculture, especially in areas like crop science, sustainable land management, and agroecology.

Examples of funded projects in non-chemical pest management.

Several EU-funded projects focus on non-chemical pest management, demonstrating the European Union's commitment to sustainable agriculture and integrated pest management (IPM). Here are a few examples:

- IPMWORKS https://ipmworks.net/ is an EU-wide network coordinating groups of pioneer farmers to foster knowledge exchange and demonstrate effective IPM strategies.
- IPM Decisions https://www.ipmdecisions.net/ is a project developing Decision Support Systems (DSS) on IPM to aid farmers and advisors in implementing IPM strategies.
- C-IPM (Coordinated Integrated Pest Management in Europe) https://projects.au.dk/c-ipm// is a 7th Framework Programme (FP7) that aimed to enhance IPM implementation across Europe.
- IWMPRAISE https://iwmpraise.eu/ is a CAP supported project focusing on integrated weed management to support more sustainable cropping systems. It brings together various stakeholders including universities, research institutions, and advisory services across Europe.

Unit 1.2 Implementation and Support Mechanisms

1.2.3. EIP-AGRI

The European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) has as a main objective to foster sustainable agriculture through innovation, by supporting projects that develop and test innovative non-chemical methods for crop protection, facilitating the exchange of knowledge and best practices among farmers, researchers, and advisors. EIP-AGRI is active in the area of non-chemical pest-control methods by:

EIP-AGRI Focus Groups are temporary groups of experts concentrating on specific subjects, including plant health and Integrated Pest Management (IPM). They can have worked on various aspects related to non-chemical pest control, such as diseases and pests in viticulture, non-chemical weed management in arable cropping systems, and sustainable methods in pome and stone fruit production.

EIP-AGRI Workshops and Seminars serve as platforms for sharing knowledge and best practices in sustainable pest management.

EIP-AGRI Publications, as brochures and factsheets on topics relevant to sustainable pest management, provide valuable

information and guidelines for implementing non-chemical plant protection methods.

EIP-AGRI has financed 437 Operational Groups across the EU on issues related to sustainable use of pesticides. These groups are part of the network's efforts to promote the development and adoption of sustainable agricultural practices, including non-chemical pest control methods. In conjunction with Horizon 2020, EIP-AGRI has funded over 30 research and innovation projects with an investment of over €160 million to protect plant health and promote integrated pest management. These projects focus on developing and implementing sustainable pest management strategies.

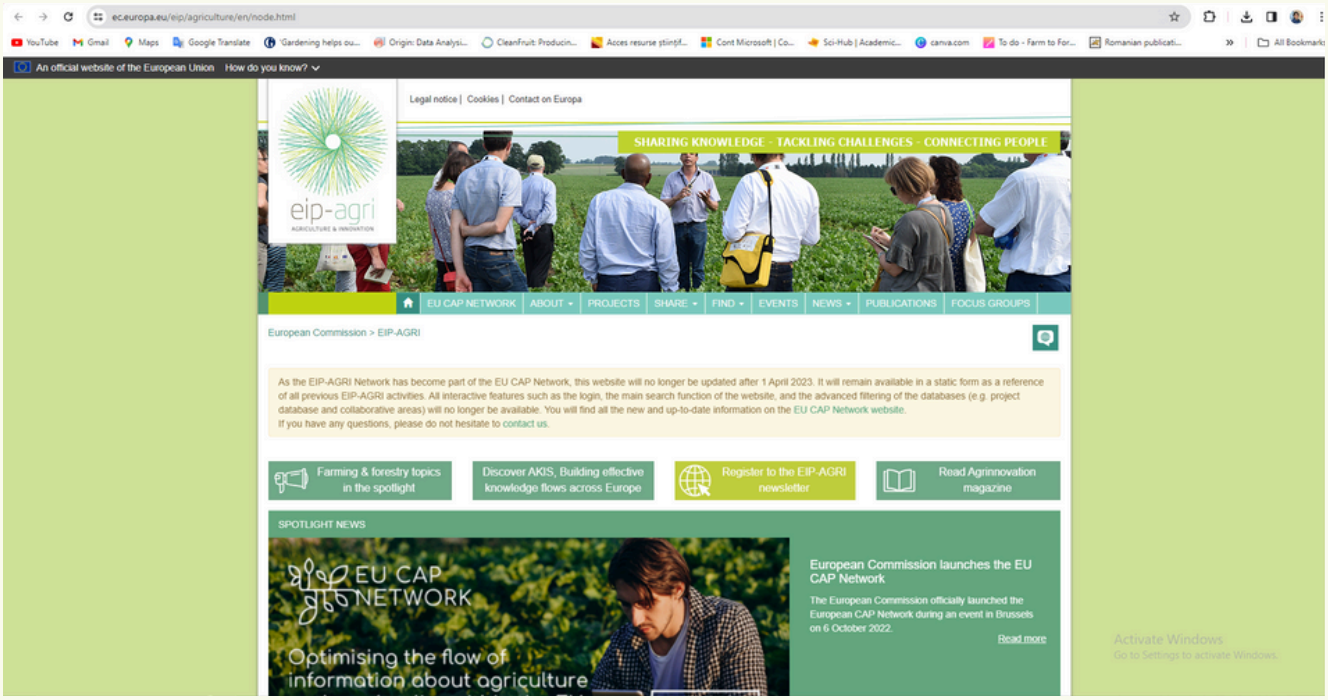
Case studies of successful EIP-AGRI projects.

SPRINT: This project developed a Global Health Risk Assessment Toolbox to assess the impact of plant protection products on ecosystem, plant, animal, and human health. It involved a cross-sectional study comparing conventional and organic farms across Europe and in Argentina, gathering data on pesticide residues and their impact.

EIP-AGRI Focus Group on Non-chemical Weed Management in Arable Cropping Systems: This group worked on identifying alternatives to chemical weed management, including redesigning cropping systems, precision non-chemical weed control, and new research into weed biology, decision-

making, and plant breeding.

Other EIP-AGRI Focus Groups: Several focus groups have concentrated on issues like diseases and pests in viticulture, IPM practices for soil-borne disease suppression in vegetables and arable crops, and sustainable methods to reduce pesticide use in pome and stone fruit production.



Unit 1.3 Glossary of terms related to non-chemical pest management

Rumen Tomov, Roxana Ciceoi

Including a glossary in a course about the European legal framework, particularly one focused on ‘non-chemical methods’ for plant protection and crop pest management, is essential for many reasons, as clarification of technical terminology, interdisciplinary communication, consistency in usage, enhancing learning experience. alignment with EU regulations, facilitating legal compliance, supporting academic rigor.

- The field of plant protection, especially within the context of European law, is replete with specialized terminology. Terms like "Integrated Pest Management (IPM)", "biocontrol agents", "phytosanitary measures", and various legal terms can be complex. A glossary helps ensure all students and all readers have a clear understanding of these terms. In the same time, as we hope to attract attracts a diverse audience, the glossary helps bridge the gap between legal jargon and scientific terminology, ensuring that concepts are accessible to all users, regardless of their background.

We intend that the glossary becomes a tool for students and professionals to reinforce their understanding of key concepts

and terms throughout the course, especially for non-native English speakers or those who are newer to the subject matter.

The glossary is based on various sources, containing definitions related to non-chemical pest management, like glossaries, EU Regulations, directives, and other sources, The glossary is not just a supplementary tool but a fundamental component of a course on the European legal framework for non-chemical plant protection because it enhances understanding, ensures clarity and consistency, supports legal compliance, and contributes to the overall academic rigor of the course.

TERM *Active substances*

DESCRIPTION Active substances are substances, including micro-organisms, which have general or specific action against harmful organisms or on plants, parts of plants or plant products.

REFERENCE EC/SANTE/12815/2014 rev. 5.2

LINK here

TERM *Agregation pheromon*

DESCRIPTION Chemical compounds synthesized and released by members of a species and which attract members of the same sex or same species to the source of the pheromone (Gordh and Headrick 2001).

REFERENCE Glossary SIT

LINK here

TERM *Agronomic techniques*

DESCRIPTION Techniques as crop rotation, use of adequate cultivation techniques (e.g. stale seedbed technique, sowing dates and densities, under-sowing, conservation tillage, pruning and direct sowing), use, where appropriate, of resistant/tolerant cultivars and standard/certified seed and planting material, use of balanced fertilisation, liming and irrigation/drainage practices, preventing the

spreading of harmful organisms by hygiene measures (e.g. by regular cleansing of machinery and equipment), protection and enhancement of important beneficial organisms, e.g. by adequate plant protection measures or the utilisation of ecological infrastructures inside and outside production sites)

REFERENCE DIRECTIVE 2009/128/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides

LINK **here**

TERM *Allelochemicals*

DESCRIPTION Semiochemicals produced by individuals of one species that modify the behaviour of individuals of a different species (i.e. an interspecific effect). They include allomones (emitting species benefits), kairomones (receptor species benefits) and synomones (both species benefit).

REFERENCE EC SANTE/12815/2014 rev. 5.2

LINK **here**

TERM *Allomone*

DESCRIPTION A substance transmitted in chemical communication between individuals of different species that benefits the sender or both the sender and receiver (Daly et al. 1998, Jolivet

1998). A chemical substance, produced or acquired by an organism, which, when it contacts an individual of another species in the natural context, evokes in the receiver a behavioural orphysiological reaction adaptively favourable to the emitter (Coppel and Mertins 1977). An allelochemic that induces a response in an individual of another species, e.g. an insect, that is beneficial to the emitting organism. Many allomones are essentially defensive, i.e. toxic or repugnant to potential attackers. However, a scent that attracts bees and therefore facilitates pollination is also an allomone (Maxwell and Jennings 1980). See 'kairomone', 'parapheromone', 'pheromone', 'synomone', 'semiochemical'.

REFERENCE Glossary SIT
LINK **here**

TERM *Antagonist*

DESCRIPTION An organism (usually pathogen) which does no significant damage to the host but its colonisation of the host protects the host from significant subsequent damage by a pest.

REFERENCE OECD 21 (2003), van Lenteren, 2012. IOBC Internet Book of Biological Control Version 6, Spring 2012
LINK **here**

TERM *Area-wide integrated pest*

DESCRIPTION Management of the total pest population within a delimited area (Hendrichs et al. 2007).
Integrated pest management against an entire pest population within a delimited geographic area, with a minimum size large enough or protected by a buffer zone so that natural dispersal of the population occurs only within this area (Klassen, this volume). Areawide pest management is a concept of preventive suppression of a mobile insect pest species throughout its geographic range, rather than reactive field-by-field control (USDA 2006)

REFERENCE Glossary SIT

LINK **here**

TERM *Atraction*

DESCRIPTION Act or power of attracting (Collin 2001). Response of an insect in noticing, responding to or orienting/moving towards an object or chemical that is attractive to the insect. An attractant is a chemical or visual stimulus that results in movement of a pest towards the source (IAEA 2003).

REFERENCE Glossary SIT

LINK **here**

TERM *Attract and kill*

DESCRIPTION Method of pest control – selectively attracting a pest insect to a source using a chemical attractant, e.g. sex pheromone, and then killing the insect with an insecticide (APTIV 2007).

REFERENCE Glossary SIT

LINK **here**

TERM *Attractant*

DESCRIPTION A chemical or visual stimulus that results in movement of a pest towards the source.

REFERENCE IAEA (2003)

LINK **here**

TERM *Augmentative releases*

DESCRIPTION Either inundative or seasonal inoculative releases, i.e. those forms of biological control where mass-produced, biological control agents are released to reduce a pest population without necessarily leading to continuing impact or establishment of the IBCAs.

REFERENCE OECD 21 (2003)

LINK **here**

TERM *Bait*

DESCRIPTION A pesticide formulation that combines an edible and/or attractive substance with a pesticide, e.g. grasshopper bait (Pedigo 2002, Gordh and

Headrick 2001). For tsetse fly baits, refer to Van den Bossche and De Deken (2004); for fruit fly baits, refer to Nigg et al. (2004). A lure intended to attract specific organisms (Gordh and Headrick 2001).

REFERENCE Glossary SIT
LINK here

TERM *Beneficial organism*
DESCRIPTION Any organism directly or indirectly advantageous to plants or plant products, including biological control agents

REFERENCE van Lenteren, 2012. IOBC Internet Book of Biological Control Version 6, Spring 2012
LINK here

TERM *Biocontrol (or bioprotection)*
DESCRIPTION A range of tools used to control pests, diseases and weeds based on naturally occurring compounds or organisms. These include: macrobials (invertebrate control agents), microbials (e.g. bacteria), semiochemicals (e.g. pheromones) and natural substances (e.g. garlic extract). PPPs used in biocontrol must be sourced from nature or can be synthetized as long as they're nature identical and are sometimes called biopesticides.

REFERENCE Buckwell, et al. 2020

LINK here

TERM *Biological control*

DESCRIPTION Biocontrol is one of several types of pest control, in which pests are controlled using other living organisms. These biological control agents can be either macro-organisms (e.g. insects, mites) or micro-organisms (e.g. bacteria, fungi). Semiochemicals (like pheromones) are in general also considered as part of biocontrol.

REFERENCE Answer given by Mr Andriukaitis on behalf of the European Commission Question reference: E-003275/2018

LINK here

TERM *Biological control*

DESCRIPTION Pest management strategy making use of living natural enemies, antagonists or competitors and other self-replicating biotic entities.

REFERENCE OECD 21, 2003, van Lenteren, 2012. IOBC Internet Book of Biological Control Version 6, Spring 2012

LINK here

TERM *Biological control*

DESCRIPTION A living organism is reducing the population density of another living organism

REFERENCE van Lenteren, 2012. IOBC Internet Book of Biological Control Version 6, Spring 2012

LINK here

TERM *Biological control agent*

DESCRIPTION A natural enemy, antagonist or competitor, and other self-replicating

REFERENCE OECD 21, 2003, van Lenteren, 2012. IOBC Internet Book of Biological Control Version 6, Spring 2012

LINK **here**

TERM *Biological pesticide (biopesticide)*

DESCRIPTION A generic term, not specifically definable, but generally applied to a microbial control agent, usually a pathogen, formulated and applied in a manner similar to a chemical pesticide, and normally used for the rapid reduction of a pest population for short-term pest management.

REFERENCE OECD 21, 2003, van Lenteren, 2012. IOBC Internet Book of Biological Control Version 6, Spring 2012

LINK **here**

TERM *Biological Pesticides or BioPesticides including microbials*

DESCRIPTION Bacteria, algae, protozoa viruses, fungi -, pheromones and semiochemicals, macrobials /invertebrates such as insects and nematodes, and plant extracts/botanicals

REFERENCE OECD 21, 2003

LINK **here**

TERM *Biopesticides*

DESCRIPTION Biopesticide covers a wide spectrum of potential products used as plant protection products (PPP). Within the Biopesticide scheme these are divided into 4 categories: (1) products based on pheromone and other semiochemical; (2) products containing a microbial (for example bacterium, fungus, protozoa, virus, viroid); (3) products based on plant extracts; (4) other novel alternative products.

REFERENCE Health and Safety Executive

LINK **here**

TERM *Biorational control*

DESCRIPTION Biorational (biological + rational) pesticides can be defined as the use of specific and selective chemicals, often with a unique modes of action, that are compatible with natural enemies and the environment, with minimal effect on nontarget organisms.

REFERENCE Ishaaya, A. R. Horowitz 2009 Biorational Control of Arthropod Pests e-ISBN 978-90-481-2316-2

LINK **here**

TERM *Botanical*

DESCRIPTION A substance, used either as a food or a medicine, derived from plants, fungi, algae or lichens.

REFERENCE EEFSA

LINK **here**

TERM *Botanical active substance*

DESCRIPTION A 'botanical active substance' is consists of one or more components found in plants and obtained by subjecting plants or parts of plants of the same species to a process such as pressing, milling, crushing, distillation and/or extractions. The process may include further concentration, purification and/or blending, provided that the chemical nature of the components is not intentionally modified/altered by chemical and/or microbial processes.

REFERENCE EUROPEAN COMMISSION

LINK **here**

TERM *Classical biological control*

DESCRIPTION Biorational (biological + rational) pesticides can be defined as the use of specific and selective chemicals, often with a unique modes of action, that are compatible with natural enemies and the environment, with minimal effect on nontarget organisms.

REFERENCE OECD 21 (2003)

LINK **here**

TERM *Conservation Agriculture*

DESCRIPTION An approach to managing agro-ecosystems for improved and sustained productivity, increased profits and food security while preserving and

enhancing the resource base and the environment' (Friedrich et al., 2012)

REFERENCE CAB International 2014. Conservation Agriculture: Global Prospects and Challenges

LINK **here**

TERM *Control (of a pest)*

DESCRIPTION Suppression, containment or eradication of a pest population

REFERENCE IPPC Secretariat. 2023.

LINK **here**

TERM *Crop protection toolbox*

DESCRIPTION Includes agronomic practices and landscape management tools, physical crop protection tools, biocontrol and chemical pest control in addition to monitoring, forecasting and the use of warning systems.

REFERENCE Buckwell,et al. 2020

LINK **here**

TERM *Cultural control*

DESCRIPTION A pest management strategy that involves the use of production practices, such as crop spacing, crop rotation, planting and harvest dates, clean culture, irrigation, pruning and tillage operations, individually or in combination, to disrupt a pest's life cycle (Gordh and

Headrick 2001, USDA 1993). Purposeful manipulation of a cropping environment to reduce rates of pest increase and damage (Pedigo 2002).

REFERENCE Glossary SIT
LINK **here**

TERM *Cultural controls*
DESCRIPTION Practices that reduce pest establishment, reproduction, dispersal, and survival.
REFERENCE Department of Primary Industries and Reginal Developmnt of Australia
LINK **here**

TERM *Delimiting Survey*
DESCRIPTION Survey conducted to establish the boundaries of an area considered to be infested by or free from a pest
REFERENCE IPPC Secretariat. 2023., ISPM 26
LINK **here**

TERM *Detection Survey*
DESCRIPTION Survey conducted in an area to determine if pests are present
REFERENCE IPPC Secretariat. 2023.. ISPM 26
LINK **here**

TERM *Dispenser*

DESCRIPTION A device able to release semiochemicals at controlled release rates.

REFERENCE EUROPEAN COMMISSION SANTE/12815/2014 rev. 5.2

LINK here

TERM *Dispenser*

DESCRIPTION Dispenser is a device able to release semiochemicals at controlled release rates.

REFERENCE EUROPEAN COMMISSION SANTE/12815/2014 rev. 5.2

LINK here

TERM *Eradication*

DESCRIPTION Application of phytosanitary measures to eliminate a pest from an area

REFERENCE IPPC Secretariat. 2023.

LINK here

TERM *Exclusion (of a pest)*

DESCRIPTION Application of phytosanitary measures to prevent the entry or establishment of a pest into an area

REFERENCE IPPC Secretariat. 2023.

LINK here

TERM *Genetically modified organism*

DESCRIPTION An organism which contains genetic material that has been deliberately altered and which does not occur naturally through breeding or selection.

REFERENCE EEFSA

LINK here

TERM *Genetically modified organisms*

DESCRIPTION Organisms in which the genetic material has been altered within the meaning of Article 2(2) of Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the deliberate release into the environment of genetically modified organisms (1); Regulation (EC) No 1107/2009

REFERENCE Regulation (EC) No 1107/2009

LINK here

TERM *Good plant protection practice*

DESCRIPTION A practice whereby the treatments with plant protection products applied to given plants or plant products, in conformity with the conditions of their authorised uses, are selected, dosed and timed to ensure acceptable efficacy with the minimum quantity necessary, taking due account of local conditions and of the possibilities for cultural and biological control;

REFERENCE Regulation (EC) No 1107/2009

LINK here

TERM *Integrated control*

DESCRIPTION 'The rational application of a combination of biological, biotechnological, chemical, cultural or plant-breeding measures whereby the use of chemical plant protection products is limited to the strict minimum necessary to maintain the

pest population at levels below those causing economically unacceptable damage or loss.

REFERENCE COUNCIL DIRECTIVE of 15 July 1991 concerning the placing of plant protection products on the market (91 /414 /EEC)

LINK **here**

TERM *Integrated pest management*

DESCRIPTION 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. 'Integrated pest management' emphasises the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms; DIRECTIVE 2009/128/EC

REFERENCE DIRECTIVE 2009/128/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides

LINK **here**

TERM *Integrated pest management*

DESCRIPTION The part of Integrated Production focusing on pests, pathogens and weeds.

REFERENCE IOBC – WPRS, 2018

LINK **here**

TERM *Integrated Production*

DESCRIPTION A concept of sustainable agriculture based on agro-ecology and a system approach that aims at contributing to sustainable, resilient, profitable and robust farming systems.

REFERENCE IOBC – WPRS, 2018

LINK here

TERM *Inundative release*

DESCRIPTION The release of very large numbers of a mass-produced biological control agent with the expectation of achieving a rapid reduction of a pest population without necessarily achieving continuing impact or establishment of the IBCA.

REFERENCE OECD 21 (2003)

LINK here

TERM *Invertebrate Biocontrol Agents (macrobials)*

DESCRIPTION Invertebrate Biocontrol Agents (also called macrobials) are natural enemies such as insect, mite and nematode species providing control of pest populations through predation or parasitism.

REFERENCE IBMA, 2023. DEFINITION

LINK here

TERM *Irradiation*

DESCRIPTION Treatment with any type of ionizing radiation

REFERENCE IPPC Secretariat. 2023.

LINK here

TERM *Kairomones*

DESCRIPTION Kairomones are allelochemicals that evoke a behavioral (releaser effect) or physiological response (primer effect) in the receiver of the signal that is adaptively favorable to the receiver but not the emitter.

REFERENCE Kost C, in Encyclopedia of Ecology, 2008

LINK here

TERM *Living modified organism*

DESCRIPTION Any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology.

REFERENCE Cartagena , Protocol on Biosafety to the Convention on Biological Diversity (CBD, 2000)

LINK here

TERM *Low risk active substance*

DESCRIPTION Distinct from non-low risk active substances. Substances are not considered low risk if they are classified in one of the following categories according to Regulation (EC) 1272/2008: carcinogenic, mutagenic, toxic to reproduction, sensitising chemicals, very toxic or toxic, explosive, or corrosive. And also if 'they are persistent (half-life in soil is more than 60 days), their bioconcentration factor is higher than 100, they are deemed to be an endocrine disrupter or they have neurotoxic or immunotoxic effects'

REFERENCE Regulation (EC) 1107/2009). (Buckwell,et al. 2020)

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TERM *Kairomones*

DESCRIPTION Kairomones are allelochemicals that evoke a behavioral (releaser effect) or physiological response (primer effect) in the receiver of the signal that is adaptively favorable to the receiver but not the emitter.

REFERENCE Kost C, in Encyclopedia of Ecology, 2008

LINK here

TERM *Lure*

DESCRIPTION A chemical, food or colour that attracts insects; for the purpose of monitoring or control (Coombs and Hall 1998). Refer to IAEA (2003). In general, 'lure' is defined as a thing that attracts or lures an animal to do something (Oxford 2008), or anything that serves as an enticement (Webster 2008).

REFERENCE Glossary SIT

LINK here

TERM *Lure and kill*

DESCRIPTION A technique to control insects by attracting them to a lure or bait (usually in a trap) which is associated with something, e.g. insecticide, that kills the attracted insects.

REFERENCE Glossary SIT

LINK here

TERM *Male Annihilation Technique*

DESCRIPTION The male annihilation technique involves the use of a high density of bait stations consisting of a male lure combined with an insecticide.

An insect pest control method that reduces pest populations by employing mass trapping to lure and kill male insects before they have a chance to mate. Often used to control fruit flies (USDA 1993).

REFERENCE Glossary SIT
LINK here

TERM *Management or control of a pest*

DESCRIPTION Suppression, containment or eradication of a pest population.

REFERENCE OECD 21 (2003)
LINK here

TERM *Mass trapping*

DESCRIPTION The use of traps, baited with pheromones or other attractants, to control insect pests. Chemical pesticides or biopesticides can be used in conjunction with the pheromones to kill target insects (Coombs and Hall 1998).

REFERENCE Glossary SIT
LINK here

TERM *Mating disruption*

DESCRIPTION The controlled release of large amounts of pheromones to confuse the females or males of an insect pest population, thus limiting their potential to mate (Coombs and Hall 1998). Use of pheromones to interfere with mating for pest control (Daly et al. 1998). The application of a

formulated pheromone to a crop in order to interfere with mate finding by a pest insect (Resh and Cardé 2003)

REFERENCE Glossary SIT
LINK here

TERM *Mechanical and physical controls*

DESCRIPTION Kill a pest directly or make the environment unsuitable for it

REFERENCE Department of Primary Industries and Reginal Developmnt of Australia
LINK here

TERM *Mechanical control*

DESCRIPTION The control of pests by mechanical methods (Schmutterer 1969). The control of pests by the use of physical barriers, e.g. tree banding, screens, row covers, etc. rather than chemical or biological methods (Coombs and Hall 1998, Weeden et al. 2000, Pfadt 1962).

REFERENCE Glossary SIT
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TERM *Microbial control*

DESCRIPTION The use of micro-organisms (including viruses) as biological control agents.

REFERENCE OECD 21 (2003)
LINK here

TERM *Microbials*

DESCRIPTION Microbials are based on microorganisms, including but not limited to bacteria, fungi, protozoans,

viruses, viroids, mycoplasmas, and may include entire microorganisms, living and dead cells, any associated microbial metabolites, fermentation materials and cell fragments.

REFERENCE IBMA, 2023. DEFINITION Bioprotection as the global term for all biocontrol technologies

LINK here

TERM *Micro-organisms*

DESCRIPTION Any microbiological entity, including lower fungi and viruses, cellular or non-cellular, capable of replication or of transferring genetic material

REFERENCE Regulation (EC) No 1107/2009

LINK here

TERM *Micro-organisms used in plant protection products*

DESCRIPTION Micro-organisms such as bacteria, fungi, viruses, and protozoa can be used to protect plants, as some of them are parasites or pathogens of insects or other organisms that are pests or cause disease in plants.

REFERENCE EUROPEAN COMMISION

LINK here

TERM *Monitoring Survey*

DESCRIPTION Ongoing survey to verify the characteristics of a pest population

REFERENCE IPPC Secretariat. 2023.

LINK here

TERM *Natural enemy*

DESCRIPTION An organism which lives at the expense of another organism in its area of origin and which may help to limit the population of that organism. This includes parasitoids, parasites, predators, phytophagous organisms and pathogens [ISPM 3, 1995; revised ISPM 3, 2005]

REFERENCE IPPC Secretariat. 2023.

LINK **here**

TERM *Natural substances*

DESCRIPTION Natural substances consist of one or more components that originate from nature, including but not limited to: plants, algae/micro algae, animals, minerals, bacteria, fungi, protozoans, viruses, viroids and mycoplasmas. They can either be sourced from nature or are nature identical if synthetised. This definition excludes semiochemicals and microbials.

REFERENCE IBMA, 2023. DEFINITION Bioprotection as the global term for all biocontrol technologies

LINK **here**

TERM *Non-chemical methods*

DESCRIPTION Alternative methods to chemical pesticides for plant protection and pest management, based on agronomic techniques such as (crop rotation, use of adequate cultivation techniques (e.g. stale seedbed technique, sowing dates and densities, under-sowing, conservation tillage, pruning and

direct sowing), use, where appropriate, of resistant/tolerant cultivars and standard/certified seed and planting material, use of balanced fertilisation, liming and irrigation/drainage practices, preventing the spreading of harmful organisms by hygiene measures (e.g. by regular cleansing of machinery and equipment), protection and enhancement of important beneficial organisms, e.g. by adequate plant protection measures or the utilisation of ecological infrastructures inside and outside production sites), or physical, mechanical or biological pest control methods.

REFERENCE DIRECTIVE 2009/128/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides

LINK here

TERM *Non-chemical pest management*

DESCRIPTION Pest management practices which include preventive measures such as crop design and layout, cultural practices, management of natural enemies, and mechanical methods. Curative measures include pest-controlling plants, physical methods, the use of other substances such as soap, and other methods which include a diversity of types of methods not forming a particular category.

REFERENCE OISAT, 2022

LINK here

TERM *Non-chemical practices and products*

DESCRIPTION Which exclude synthetic chemical pesticides and genetically altered substances or compounds. Non-chemical products, as they are used in the OISAT context, may be processed on the farm but also manufactured commercially. The non-chemical commercial products, which are not excluded, are biopesticides, which are permitted in organic agriculture.

REFERENCE OISAT

LINK here

TERM *Organic production*

DESCRIPTION The use, including during the conversion period referred to in Article 10, of production methods that comply with this Regulation at all stages of production, preparation and distribution

REFERENCE Regulation (EC) 2018/848

LINK here

TERM *Parapheromone*

DESCRIPTION Specific chemical compounds produced by plants and which mimic the effect of insect pheromones. Parapheromones may be synthesized and used to detect, monitor, mass-trap or disrupt the mating of target insect species (Gordh and Headrick 2001, IAEA 2003).

REFERENCE Glossary SIT

LINK here

TERM *Parasite*

DESCRIPTION An organism which lives on or in a larger organism, feeding upon it [ISPM 3, 1995]

REFERENCE IPPC Secretariat. 2023.

LINK **here**

TERM *Parasitoid*

DESCRIPTION An insect parasitic only in its immature stages, killing its host in the process of its development, and free living as an adult

REFERENCE IPPC Secretariat. 2023.

LINK **here**

TERM *Pathogen*

DESCRIPTION Micro-organism causing disease.

REFERENCE IPPC Secretariat. 2023.

LINK **here**

TERM *Pest*

DESCRIPTION An insect, rodent, nematode, fungus, weed, or other form of terrestrial or aquatic plant or animal life, or virus, bacterial, or micro-organism that is injurious to health or the environment (USDA 1993, Bijlmakers 2008). An organism causing damage to humans, livestock, crops and possessions (Hill, 1997; Resh and Cardé, 2003). A species or organism that interferes with human health, activities or property, or is objectionable (Gordh and Headrick 2001). Plant pest = Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products (FAO 2006).

REFERENCE Glossary SIT

LINK **here**

TERM *Pest*

DESCRIPTION Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products. Note: In the IPPC, “plant pest” is sometimes used for the term “pest” [FAO, 1990; revised ISPM 2, 1995; IPPC, 1997; CPM, 2012]

REFERENCE IPPC Secretariat. 2023.

LINK **here**

TERM *Pest control*

DESCRIPTION Suppression, containment or eradication of a pest population (FAO 2006; IAEA 2003; FAO/IAEA/USDA 2003; Hendrichs et al., this volume). To reduce damage or pest density to a level at which damage is insignificant, by physical, chemical or
biological means (Hill 1997). The application of technology, in the context of biological knowledge, to achieve satisfactory
reduction of pest numbers or effects (Pedigo 2002).

REFERENCE Glossary SIT

LINK **here**

TERM *Pest management*

DESCRIPTION Synonym for ”integrated pest management (IPM)”

REFERENCE Glossary SIT

LINK **here**

TERM *Pesticide*

DESCRIPTION (a) a plant protection product as defined in Regulation (EC) No 1107/2009; (b) a biocidal product as defined in Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 concerning the placing on the market of biocidal products

REFERENCE DIRECTIVE 2009/128/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides

LINK **here**

TERM *Pesticide*

DESCRIPTION Something that prevents, destroys, or controls a harmful organism ('pest') or disease, or protects plants or plant products during production, storage and transport. The term includes, amongst others: herbicides, fungicides, insecticides, acaricides, nematicides, molluscicides, growth regulators, repellents, rodenticides and biocides.

REFERENCE EUROPEAN COMMISSION

LINK **here**

TERM *Pesticide*

DESCRIPTION The term is used to designate both plant protection products and biocides. In everyday use this word is often a synonym for plant protection products, but it´s not the case in this report.

REFERENCE Buckwell,et al. 2020

LINK **here**

TERM *Pheromones*

DESCRIPTION Semiochemicals produced by individuals of a species that modify the behaviour of other individuals of the same species (i.e. an intraspecific effect).

REFERENCE EUROPEAN COMMISSION SANTE/12815/2014 rev. 5.2

LINK here

TERM *Physical barriers*

DESCRIPTION Any living or nonliving material used to restrict movements or to delineate a space

REFERENCE Vincent et al. 2003

LINK here

TERM *Physical control = Physical actions*

DESCRIPTION (e.g. fruit stripping, host destruction, hand-picking, heat, cold, light, electricity, sound waves, radiation) taken to control a pest (USDA 1993, Pfadt 1962, Coombs and Hall 1998). Refer to Mangan (this volume).

REFERENCE Glossary SIT

LINK here

TERM *Plant protection products*

DESCRIPTION Products, in the form in which they are supplied to the user, consisting of or containing active substances, safeners or synergists, and intended for one of the following uses: (a) protecting plants or plant products against all harmful organisms or preventing the action of such organisms, unless the main purpose of these products is considered

to be for reasons of hygiene rather than for the protection of plants or plant products; (b) influencing the life processes of plants, such as substances influencing their growth, other than as a nutrient; (c) preserving plant products, in so far as such substances or products are not subject to special Community provisions on preservatives; (d) destroying undesired plants or parts of plants, except algae unless the products are applied on soil or water to protect plants; (e) checking or preventing undesired growth of plants, except algae unless the products are applied on soil or water to protect plants

REFERENCE Regulation (EC) No 1107/2009
LINK **here**

TERM *Polyphagous*

DESCRIPTION Feeding on a wide variety of hosts (Grimaldi and Engel 2005). Adapted to the use of a wide variety of plant or animal species as hosts or prey (Coppel and Mertins 1977).

REFERENCE Glossary SIT
LINK **here**

TERM *Predation*

DESCRIPTION The killing of animals (prey) by other animals (carnivores) for food (Hill 1997).

REFERENCE Glossary SIT
LINK **here**

TERM *Predator*

DESCRIPTION A natural enemy that preys and feeds on other animal organisms, more than one of which are killed during its lifetime

REFERENCE IPPC Secretariat. 2023.

LINK **here**

TERM *Physical barriers*

DESCRIPTION Any living or nonliving material used to restrict movements or to delineate a space

REFERENCE Vincent et al. 2003

LINK **here**

TERM *Prevention*

DESCRIPTION Application of phytosanitary measures in and/or around a pest free area to avoid the introduction of a pest (Hendrichs et al., this volume). A pest control measure applied in anticipation of a pest attack (Hill 1997). _Prevention' is the preferred termrather than _exclusion'.

REFERENCE Glossary SIT

LINK **here**

TERM *Preventive measures*

DESCRIPTION measures that easures that are to be taken by operators at every stage of production, preparation and distribution in order to ensure the preservation of biodiversity and soil quality, measures for the prevention and control of pests and diseases and measures that are to be taken to avoid negative effects on the environment, animal health and plant health;

REFERENCE Regulation (EC) 2018/848
LINK here

TERM *Release*
DESCRIPTION Intentional liberation of an organism into the environment (FAO 2006).
REFERENCE Glossary SIT
LINK here

TERM *Repellent*
DESCRIPTION Chemical which has the property of inducing avoidance by a particular pest due to unpleasant odour, colour, taste or mechanical effect (Bijlmakers 2008, Hill 1997). Chemical that causes insects to orient their movements away from a source (Pedigo 2002).
REFERENCE Glossary SIT
LINK here

TERM *Sanitation*
DESCRIPTION Field sanitation involves removing crop residues and the food/habitat of insect pests as a method of pest control (Daly et al. 1998).
REFERENCE Glossary SIT
LINK here

TERM *Semiochemicals*
DESCRIPTION Semiochemicals are substances or mixtures of substances emitted by plants, animals, and other organisms that evoke a behavioural or physiological response in individuals of the same or other species.
REFERENCE EUROPEAN COMMISSION SANTE/12815/2014 rev. 5.2
LINK here

TERM *SIT*

DESCRIPTION Sterile insect technique

REFERENCE IPPC Secretariat. 2023.

LINK here

TERM *Stale seedbed*

DESCRIPTION A stale seedbed is a seedbed where the nondormant weeds in the germination zone (shallow soil layers from which weeds can emerge) are killed before crop planting.

REFERENCE BOYD et al., 2006

LINK here

TERM *Sterile insect*

DESCRIPTION An insect that, as a result of a specific treatment, is unable to reproduce

REFERENCE IPPC Secretariat. 2023.

LINK here

TERM *Sterile insect technique*

DESCRIPTION Method of pest control using area-wide inundative release of sterile insects to reduce reproduction in a field population of the same species

REFERENCE IPPC Secretariat. 2023.

LINK here

TERM *Sticky trap*

DESCRIPTION Insect trap where a surface inside the trap is covered with a sticky glue to catch and hold insects attracted or lured to the trap.

REFERENCE Glossary SIT

LINK here

TERM *Sustainable agriculture*

DESCRIPTION agricultural systems that preserve and restore natural ecosystem functioning; both within agricultural soils and in aboveground crop systems working from the field to the landscape scale and integrating semi-natural elements. Focus is placed on restoring soil fertility and thus soil function. This is achieved by extending and widening crop rotations, mixing plant and animal agriculture where possible, providing nutrients by making more use of legumes, manures, composted material and digestates, cover and companion crops and legumes and introducing greater diversity in fields and around them. The essence is to restore soil and above ground biodiversity to maximise natural and circular processes for plant nutrition, health, resistance to pests and disease thereby increasing the resilience of the production system. In these systems, the use of synthetic plant protection products as well as mineral fertilizers is greatly reduced or not allowed.

REFERENCE Buckwell,et al. 2020

LINK here

TERM *Trap*

DESCRIPTION A baited device used for catching animals (IAEA 2003).

REFERENCE Glossary SIT

LINK here

Useful links

Study on the Union's situation and options regarding invertebrate...

The European Commission commissioned a study on the Union's situation and options regarding the introduction,...

op.europa.eu

Plants

The European Commission takes actively part in the setting of international phytosanitary and quality standards for plants and plant products.

Pesticides

A 'pesticide' is something that prevents, destroys, or controls a harmful organism or disease, or protects plants or plant products.

Biological pesticides

The programme (or BioPesticides including microbials - bacteria, algae, protozoa viruses, fungi -, pheromones and semiochemicals, macrobials/invertebrates such as insects and nematodes, and plant...

oecd.org

Global, International Organisation for Biological Control

IOBC promotes environmentally safe methods of pest control by encouraging collabroation, fostering research and practical application, dissemination of information and training of personnel.

iobc-global.org

Home Page IBMA-GLOBAL International Biocontrol Manufacturers

IBMA-GLOBAL, the International Biocontrol Manufacturers Association represents the biocontr...

IBMA-GLOBAL /

Biocontrol

What Is Biocontrol? Biological control, or Biocontrol for short, is the practice of rearing and releasing natural enemies (predators and parasites) that seek out and destroy other insects and mites that are...

ANBP

Integrated Pest Management (IPM) | Pest and Pesticide Management | Food and Agriculture Organization of the...

Integrated Pest Management (IPM) was developed in response to steadily increasing pesticide use that resulted in pest control crises (outbreaks of secondary pests and pest resurgence following development of pesticid...

fao.org

EPPO activities on plant protection products

EPPO

eppo.int

https://www.efsa.europa.eu/en/search?s=plant+protecion+products

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