

weeding MAPs



Book of abstracts

"What about EU agricultural policies in European countries?"

September 18th - 19th 2025.

CEKOM 3LJ / Trilj - Croatia



Program

September 18th 2025 – Day 1 (closed to the public)

Hotel Alkar, Vrlička ul. 50, 21230, Sinj

15:45 - 16:00 Registration

16:00 – 16:15 **Jelena Ružić**, CEKOM 3LJ Institution - *Welcome speech*

Part I - Selected presentations from different European countries

16:15 – 16:30 **Dr. sci. Amra Bratovčić**, University of Tuzla, Faculty of Technology, Bosnia and Herzegovina - *Development Strategy of Bosnia and Herzegovina Through the Lens of Medicinal Herbs: Economic Potentials and Geographical Distribution*

16:30 -16:45 **Dr. sc. Vítor Martinho**, Polytechnic Institute of Viseu, Portugal – *video presentation of EU Agricultural Policy in Portugal*

16:45 – 17:00 **Pawel Sobczyk**, PRO CIVIS Foundation, Poland - *Polish formal and operational regulations in the substantive area of non-chemical weed management for medicinal and aromatic plants*

17:00 – 17:15 **Prof. Sava Vrbničanin**, University of Belgrade, Faculty of Agriculture, Serbia - *Strengths and Weaknesses of Non-chemical Weed Management in Medicinal and Aromatic Plant Production*

17:15 – 17:30 **Dr. sc. Vlatka Paštar**, CEKOM 3LJ Institution, Croatia – *The role of the CEKOM 3LJ Institution in the development of rural areas of the Dalmatian hinterland*

17:30 - 18:00 *Coffee break*

Part II - Selected presentations from different European countries

18:00 – 18:15 **Prof. Serghei Sprincean**, Moldova State University, Moldova - *online presentation The specific of implementation in the Republic of Moldova of the European legislation and strategies of NCWM*

18:15 – 18:30 **Dr. sc. Oyebanji Alagbo**, Obafemi Awolowo University, Ile-Ife, Nigeria – *Online presentation: Exploring non-chemical weed management strategies among growers of selected spices (ginger, tumeric) in Nigeria*

- 18:30 -18:45 **Prof. dr. Dragana Božić**, University of Belgrade, Faculty of Agriculture, Serbia - *Status and perspectives of the adoption of non-chemical weed control strategies (NCWM) in the production of MAPs in Serbia*
- 18:45 – 19:00 **Doc. Dr. Menekşe Bulut & Prof. Ramazan Erenler**, Iğdir University, Turkey - *Insecticidal Activity of essential oils and silver nanoparticles from *Lavandula stoechas**
- 19:00 – 19:15 **Prof. Arben Mehmeti**, Faculty of Agriculture and Veterinary, University of Prishtina, Kosovë - *The National Organic Action Plan of Kosovo-Analyses*
- 19:15 – 19:30 **Ivana Kavain**, CEKOM 3LJ Institution, Croatia – *Application of supercritical CO₂ extract of medicinal plants in the food, cosmetic and pharmaceutical industries*
- 20:00 - 22:00 *Dinner*

September 19th 2025 – Day 2 (open to the public)

CEKOM 3LJ, Ugljane 115c, 21240, Trilj

- 8:30 - 9:00 Registration
- 9:00 – 9:30 **Tugomir Majdak**, State Secretary, Envoy of the Prime Minister of the Republic of Croatia, Mr. Andrej Plenković - *Welcome speech*
- Ivan Bugarin**, Member of Parliament and Mayor of the City of Trilj - *Welcome speech*
- Jozo Sarač**, Director of the J.U. RERA SD, Envoy of the Prefect of the Split-Dalmatia County Mr. Blaženko Boban - *Welcome speech*
- Jelena Ružić**, CEKOM 3LJ Institution - *Conference opening*

Part I - Agricultural policies, scientific and technological achievements, examples of good practice

- 9:30 – 9:45 **Pawel Sobczyk**, PRO CIVIS Foundation, Poland - *Presentation of the project CA23123 weeding MAPs and conclusions of the first day of the event*
- 9:45 – 10:00 **Ivica Delić**, Ministry of Agriculture, Forestry and Fishery, Directorate for Agricultural Land, Plant Production and Market, Croatia - *Croatian national policy within the framework of the European Green Deal and sustainable use of pesticides*

- 10:00 – 10:15 **Martin Bućan**, Split-Dalmatia County, Administrative Department for Economy, EU Funds and Agriculture, Croatia - *Programs and measures for the development of agriculture*
- 10:15 – 10:30 **Dr. sc. Dragan Solić**, Croatian Agency for Agriculture and Food (HAPIH) - *The role of the Croatian Agency for Agriculture and Food in the agricultural sector of the Republic of Croatia*
- 10:30 – 10:45 **Andrija Polić**, Stella Mediterranea d.o.o., Croatia – *Stella Croatica as a European model of integrated rural development: sustainability, heritage, and innovation in service of the Green deal*
- 10:45 – 11:00 **Zorica Radunić**, Kaštela Olive Growers' Association "Mastrinka", Croatia – *NGO Presentation of work, cooperation with agricultural producers and small and medium-sized entrepreneurs*

11:00 - 11:15 *Coffee Break*

Part II - Agricultural policies, scientific and technological achievements, examples of good practice

- 11:15 – 11:30 **Assoc. Prof. Dr. Sc. Mario Bjeliš**, University of Split, Agromediterranean faculty, Croatia - *Application of scientific and technological achievements in the context of sustainable use of pesticides; Results of the national Action plan for the suppression of the Mediterranean fruit fly pest in Neretva river valley of Croatia*
- 11:30 – 11:45 **Ass. Prof. Ivana Carev, PhD**, University of Split, Faculty of Chemical Technology, Croatia - *Aromatic herbs and sustainable development goals - Croatian perspective within EU agricultural policies*
- 11:45 – 12:00 **Dr. sc. Juliana Navarro Rocha**, Agri-Food Research and Technology Centre of Aragon (CITA), Spain - *Differential phytotoxicity of essential oils from Lamiaceae family and their major constituents against common sowthistle (Sonchus oleraceus)*
- 12:00 – 12:15 **Assoc. Prof. Dr. Sc. Jurica Primorac**, Faculty of Agronomy and Food Technology, University of Mostar, Bosnia and Herzegovina - *The Role of Higher Education in the Digital Transition and Rural Development through EU Projects – Experiences from APTF SUM*
- 12:15 – 12:30 **Igor Frljužec**, Agrigentum d.o.o., Croatia – *Digital Agro – Examples of good practice and use of digital technologies in Agriculture*
- 12:30 – 12:45 **Dr. sc. Milica Aćimović**, Institute of Field and Vegetable Crops, Serbia - *Nothing Goes to Waste: Circular Solutions for Medicinal and Aromatic Plant Chains*

12:45 – 13:00 **Mate Paštar**, J.U. RERA SDŽ, Department for the Preparation of Programs and EU Projects, Croatia – *Financial Support and International Aspect of Projects in the Agricultural Sector*

13:00 - 14:00 *Lunch break at the premises of CEKOM 3LJ*

Part III - Agricultural policies, scientific and technological achievements, examples of good practice

14:00 – 14:15 **Doc. Dr. Koray Kaçan**, Muğla Sıtkı Koçman University, Turkey – *online presentation Barriers to national adoption of NCWM strategies in Turkey*

14:15 – 14:30 **Denis Rubić**, DALMACONSULT d.o.o., Croatia – *Terra Marascae project - examples of good practice, use of EU funds, sustainable practices, biodiversity, digital technologies, rural tourism*

14:30 – 14:45 **Hrvoje Bota**, Održivo d.o.o., Croatia – *Development of regenerative agriculture in the Republic of Croatia and the EU*

14:45 – 15:00 **Marijana Franičević**, CEKOM 3LJ Institution, Croatia – *Tour: Inspiration Plant – a meeting place for agriculture and high technology*

15:00 – 15:15 **Juraj Ivanković**, Dodir prirode d.o.o., Croatia – *A tour of the organic almond and pistachio plantation and a tour of the processing plant*

15:15 - *Closing of the conference / Coffee on the green roof*

NOTE: The Poster session will be organized during Day 2 of the conference at CEKOM 3LJ premises.

How to reduce strategic dependencies and strengthen European food security

Marijana Petir, Chairperson of Croatian Parliament's Committee on Agriculture

Trilj, September 18th, 2025

Reducing strategic dependency, strengthening European food availability and security, while also preserving the quality of agricultural and food products that the European Union has spent years building and investing considerable financial resources, both through subsidies for farmers, as well as investment cycles – cannot be achieved without responsibility. This responsibility, due to geopolitical relations, challenges of war, political developments in Europe, surrounding countries and globally, cannot and must not be placed solely on the farmers' shoulders, but it instead requires synergistic action at all levels of government, us politicians, the economy, finance, environment and energy sector, as well as internal and external trade actions, at the national and European level.

The European Commission recognised this and in December of last year, the European Board on Agriculture and Food (EBAF) was established. The board should tackle the relations within the agri-food value chain, support farmers and create a more resilient, competitive and sustainable agri-food system, but also encourage understanding and exchange of experience, as well as coherences and synergies in the Union's policies. This office will, as Christophe Hansen, the Commissioner for Agriculture and Food, himself has said, embody a new culture of cooperation and dialogue, not only among stakeholders, but also towards the European Commission and with it.

While at that, specifics and starting points of Member States must be considered, since not all Member States have used European funds for an equal length of time, and thus have not had an equal opportunity for growth in agricultural productivity and competitiveness, so it isn't fair to impose the same obligations on all states.

We are concerned by the high green ambition imposing the same goals and obligations on all Member States, which is unacceptable. We believe that it is necessary to take into consideration the real state in each member country, since not all countries produce the same environmental pressure with their production, nor do they have the same capacity to combat climate change. For example, Croatian farmers already use half the pesticides and antimicrobial agents as the EU average, we are a GMO-free country with a ban on sowing GMO seeds, even for experimental purposes. We have called for caution and the need for additional complete information for citizens and consumers, and it's just as important to remind that we have considerable objections on the Unions proposal on new genomic techniques, since satisfactory solutions to a range of open questions are still not available, questions important from the aspect health, environment and agriculture protection, and of fundamental interest to the wider public and community. I would like to remind you also that Croatia has the greatest reduction in greenhouse gas emissions originating from agriculture in the Union, but this was also contributed by a sharp decline in livestock production, so new requirements for additional emission reduction, coupled with the fact that we already have almost 50% of our territory under NATURA 2000 and various national nature protection categories, could lead to undermined production.

We are also worried by debates on the new Multiannual Financial Framework because we believe it's important to keep the stability in financing the Common Agricultural Policy as a separate policy based on two pillars – direct payments and rural development, with, of course, a redefining of priorities so that they reflect farmers' actual needs. Farmers should be asked about their needs for food production and rural inhabitants should be asked about their needs to keep living in rural areas, because the precondition for ensuring security is their continued presence in these areas. But, money alone won't be motivation enough if farmers don't realise we are doing everything necessary to enable them to farm and earn a decent living.

That is why we need additional funding sources for rural development, but also reordering rural development priorities and encouraging activities that enable access to new services, such as improving roads the farmers must use to access fields or rural residents take to get to work. We must think of the role agriculture has in preserving rural areas and communities, but also that farmers must earn a decent income to keep producing food for us because the fundamental role of agriculture should be food production, and not carbon sequestration.

It's also important to reduce bureaucracy, not only within state and European administration, but primarily towards farmers because farmers are lost in the infinite paperwork instead of producing food. We also need to ensure tools for agriculture's digital transformation, an important EU priority, while also considering the large number of small agricultural producers in Croatia and their advanced age.

Young farmers are more open to using new, modern and more sustainable techniques and technologies in agricultural production, they are the focus of the new CAP programme period, but money itself won't be enough if we do not interest them in agricultural production and if we don't encourage older holders in the EU to transfer agricultural holdings to younger farmers. Investing in advisers' knowledge and enhancing capacities of advisory services, which will be used as a key tool for enhancing European agriculture's competitiveness and attractiveness, can also contribute to this generational transition, as well as the overall transition of agriculture towards sustainability.

One of the greatest challenges facing the agri-food sector is unfair trading practices and the different standards applied to European products compared to those from third countries. In that sense, the question of quality of European products has not been adequately recognized nor has it been, unfortunately, adequately regulated, and when placing food on the market the main measure is health safety, which cannot be compared to food quality. In addition to protected designations of quality, we must invest more in promoting European products and encourage Europeans to buy domestic products more, and more often, and thusly strengthening European farmers' competitiveness. Likewise, we must give more attention to product traceability, strengthen controls and monitor market trends because these may be first indicators of future crisis situations.

Our committee has proposed and asked for stricter legislation considering combating unfair trading practices and greater fairness and transparency when margin setting and transfer price control. A shift in EU approach to trade agreements is needed, as our

farmers cannot tackle unfair competition. Strategic directions are more than important here, where bilateral and multilateral trade agreements provide more protection for European production, create new export opportunities and lower export dependency. In other words, the expected agri-food sector transformation would greatly benefit from a transformation in market relations in the food supply chain, something that is, unfortunately, rarely spoken of.

The COVID crisis demonstrated that European supply chains are more than vulnerable to disruptions, but also that the fastest and most concrete response to that challenge came from short supply chains, confirming their role in food supply security. The fact that strengthening short food supply chains encourages rural residents engaged in agriculture to remain living in the area and take care of production resources, the community, environment and biodiversity is no less important. It should not be forgotten, in these complex security times, that every fourth European lives in a rural area, so their role in safeguarding rural areas as well as potential security challenges, should not be disregarded.

Indeed, agriculture and food become the main topic in crisis, only then do we suddenly realize and start asking questions on self-sufficiency in food production and start buying food from local farmers. But, as soon as things are stable, it's all forgotten and we continue with old habits, not caring overmuch about those who feed us and keep the rural area.

It's unclear how it's possible that the question of food production, as the basic resource needed for human life, in European policies and European reality, still hasn't assumed the key place, despite the CAP being one of European oldest policies, until recently the policy with the biggest funding, which is not the case anymore.

That is why I wish to give warning, farmers cannot battle climate change, increased green ambition, supply chain disruptions, disloyal competition, unfair trade practice and other problems the sector faces, with less money. We need food for life, so farmers should get a stronger support.

The question of sustainability and better and more efficient food system management has become an important theme in European policies addressing healthy and sustainable consumers' eating habits and a more sustainable food system management. But, it's still being debated what food systems regulation should exactly encompass and which segments of the food chain should be included and how. This raises concern that additional obligations could be created for the agricultural sector, it remains unclear which added value food system policy would bring compared to the Common Agricultural Policy, and no concrete applicable solutions have been proposed. Still, raising awareness among European consumers and deciding to buy domestic/European products based on informed choice and/or promotion as a potential strong incentive for European farmers, needs to be considered. Issues concerning food waste and loss throughout the food chain should be mentioned and the importance of activities to address minimising food waste as much as possible.

The potential to reduce Europe's strategic food dependency and to strengthen European food security depends on all of the before mentioned, and lately, due to geopolitical shifts, this is complicated by challenges connected to security circumstances. There can be no

European and national security without defence and food security. That is why it's important to ensure self-sufficiency in food production to supply the populace with quality and domestic food. Synergistic action is a precondition for this, integrating measures to guarantee food and security in food supply chains, and to ensure fast and efficient possible crisis management in food systems. In addition to these, we need alliances, cooperation and strategic partnerships – not only to resolve issues of dependency on agricultural inputs, but to ensure, through a more integrated internal European market, that it is fully functional and accessible to all European farmers.

The situation is not great, if we put aside the security challenges and reflect only on European market liberalization and agreements with third countries, European farmers are faced with many challenges, while at the same time being demanded achieving high standards in food production. That is why it is important to ensure support and offer alternative solutions to farmers that are supposed to strengthen European food safety and decrease strategic dependence.

Agriculture is an ally in resolving climate challenges because it is capable of sequestering carbon in soil, preserving biodiversity, running smart environmental practices and producing energy from renewable sources. And this contribution should be recognized and valued because farmers are not the problem, but the solution.

Development Strategy of Bosnia and Herzegovina through the Lens of Medicinal Herbs: Economic Potentials and Geographical Distribution

Amra Bratovic¹

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This study analyzes the structural, economic, and institutional dimensions of agriculture in Bosnia and Herzegovina (BiH), with emphasis on the medicinal and industrial plant sector. Trade data from 2019-2024 show that exports of medicinal plants and related products increased from 2.1 million BAM in 2019 to over 7.6 million BAM in 2022, while imports rose from 1.7 million to 6.3 million BAM in the same period. Exports of industrial and medicinal herbs reached 10.9 million BAM in 2024, though imports remain disproportionately higher (56.7 million BAM). The sector maintains strong international orientation, with exports covering 246% of imports in 2019 and reaching 397% for essential oils in 2020, with the EU absorbing 83% of total exports. However, the trade structure remains unfavorable, as BiH largely exports raw herbs (93%) while importing processed and packaged products. Medicinal and aromatic plants (MAPs) are collected and cultivated by 250-300 mostly family-run enterprises, involving around 50,000 households. Annual wild collection ranges from 1,500 to 9,000 tons, complemented by growing plantation production of species such as immortelle, lemon balm, mint, and chamomile on 200-300 hectares. Exports of essential oils, valued at 4.5 million BAM in 2019/2020, have declined in price and volume, reflecting competitiveness challenges. Within the broader agricultural context, BiH farms are small-scale and fragmented: in the Federation of BiH (FBiH) the average holding size is 1.45 ha, with 67% of farms below 1 ha. Approximately 406,000 ha of arable land are recorded, yet nearly half remains uncultivated. Cereals dominate sown areas, though industrial crops such as sunflower, soybean, and oilseed rape have expanded modestly. Despite incremental legislative alignment with EU standards, structural weaknesses in farm size, mechanization, and value chain integration limit competitiveness. Strengthening infrastructure, expanding processing capacity, and better utilizing EU instruments such as IPARD remain key to unlocking the sector's potential and advancing BiH's agricultural integration into EU markets.

Acknowledgements: Cost project CA23123 Non-chemical weed management in medicinal and aromatic plants (MAPs) (weedingMAPs)

Literature:

1. Strategija poljoprivrede i ruralnog razvoja Federacije Bosne i Hercegovine 2021. – 2027. godina, Sarajevo, Feb. 2024. <https://fzzpr.gov.ba/files/Strategije/HR-%20Strategija%20PRR%20FBiH%20-%202029.%201.%202024.pdf>
2. INFOKOM – broj 78 – juli/srpanj 2020
3. Stat_Ljekovito bilje 2022
4. INFOKOM – broj 90 – august/kolovoz 2024.

EU Agricultural Policy in Portugal

Martinho, VJPD¹

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The European Union's agricultural policy, known as the Common Agricultural Policy (CAP), has impact on farmers' decisions in the various member states. The CAP has a set of instruments designed to support farmers' incomes (Pillar 1 of the CAP) and encourage investment in agricultural holdings (Pillar 2 of the CAP). The various measures provided for in these two pillars have changed since the CAP was conceived at the beginning of the construction of the European Union in the 1950s and 1960s (at the time known as the European Economic Community). These changes have become known as CAP reforms. Several changes have been made to the CAP's policy instruments over the years, completely decoupling financial aid from production and activities. However, it is known that CAP measures influence farmers' choices, leading them to opt for activities that have greater financial support and this has advantages and disadvantages, depending on the context of each country/region. In view of the above, the aim of this study is to analyze, based on the information available in the literature, how the CAP has been implemented in Portugal and the consequent impacts of its measures. The results show that for a country that joined the European Economic Community in the 1980s and with an agricultural sector that was significantly behind other member states, the CAP has brought benefits but has also created new challenges.

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Polish formal and operational regulations in the substantive area of non-chemical weed management for medicinal and aromatic plants.

Paweł S¹, Artur S²

Foundation of Education and Social Dialogue „PRO CIVIS”

This presentation explores how non-chemical weed management (NCWM) for medicinal and aromatic plants is addressed within the European Union and Poland's national framework. Three key policy layers are considered: Directive 2009/128/EC, the European Green Deal, and the Common Agricultural Policy 2023–2027. The Directive establishes the foundation for sustainable pesticide use by promoting training, data collection, and non-chemical alternatives. The Green Deal, through the Biodiversity Strategy and Farm to Fork Strategy, sets ambitious targets to expand organic farming and restore ecosystems, making NCWM an integral element. At the national level, Poland's National Action Plan and CAP Strategic Plan provide concrete tools such as certified training, eco-scheme payments, advisory services, and targeted support for organic MAP cultivation. Together, these frameworks demonstrate strong alignment between EU ambitions and national action, ensuring that NCWM contributes to biodiversity protection, farmer resilience, and the sustainable development of medicinal and aromatic plant production.

1) 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 (Text with EEA relevance)

2) MONITOR POLSKI DZIENNIK URZĘDOWY RZECZYPOSPOLITEJ POLSKIEJ
OBWIESZCZENIE MINISTRA ROLNICTWA I ROZWOJU WSI z dnia 7 czerwca 2023 r.
w sprawie krajowego planu działania na rzecz ograniczenia ryzyka związanego ze
stosowaniem środków ochrony roślin na lata 2023–2027

3) <https://www.consilium.europa.eu/pl/policies/biodiversity/#2030>

4) <https://www.consilium.europa.eu/pl/policies/from-farm-to-fork/>

5) Plan Strategiczny dla Wspólnej Polityki Rolnej na lata 2023-2027 - wersja skrócona

6) COMMON AGRICULTURAL POLICY FOR 2023-2027 28 CAP STRATEGIC PLANS
AT A GLANCE

7) At a glance: POLAND'S CAP STRATEGIC PLAN

8) SPRAWOZDANIE Z REALIZACJI W 2023 r. KRAJOWEGO PLANU DZIAŁANIA NA
RZECZ OGRANICZENIA RYZYKA ZWIĄZANEGO ZE STOSOWANIEM ŚRODKÓW
OCHRONY ROŚLIN NA LATA 2023–2027 Warszawa, Grudzień 2024 r. Departament
Hodowli i Ochrony Roślin w Ministerstwie Rolnictwa i Rozwoju Wsi

9) <https://www.gov.pl/web/rolnictwo/wskazniki-ryzyka>

Strengths and Weaknesses of Non-chemical Weed Management in Medicinal and Aromatic Plant Production

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Weeds are a major problem in obtaining the desired yield and profit in the production of medicinal and aromatic plants (MAPs). Weed control methods may vary depending on the type and abundance of weeds, crop type, season, and production goals. In this study, the strengths and weaknesses of non-chemical weed control strategies in MAPs were analyzed. Mechanical and cultural methods including mulching, hand weeding, tillage, and grazing are mainly used to manage the weed infestation in the MAPs. Mulching with natural and synthetic mulches was the main method used on MAPs plantation. In addition, a few conventional methods such as hand weeding and tillage were applied to reduce the problem. Although the methods were effective and affordable, the effect was not highly effective on plots with high weed abundance. Since one method is not enough to weed control, an integrated system is needed to reduce the possibility of failure in weed management. Along with the existing strategies, planting cover crops, applying organic herbicides and using flame are recommended. Through the education of farmers and the higher education of future managers, it is possible to improve the weed control strategy in MAPs production.

Key words: medicinal plants, weeds, management.

The role of the CEKOM 3LJ Institution in the development of rural areas of the Dalmatian hinterland

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Based on research and analysis of developmental potentials to stimulate economic growth and harness the development opportunities of the Trilj region, the City of Trilj, in accordance with its Strategic Development Program, established in 2015 the Institution for Research and Knowledge Development of Nutrition and Health CEKOM 3LJ. The goal was to create a framework to support capacity-building of the business sector, particularly small and medium-sized enterprises interested in developing new agricultural products, in line with the Smart Specialization Strategy of the Republic of Croatia. The CEKOM 3LJ Institution serves farmers through a wide range of laboratory analyses, including wine analysis, soil analysis, and analyses of extracts and essential oils. Within the institution's facilities, it is possible to extract medicinal and aromatic plants by supercritical CO₂ extractor, use a chamber dryer for drying fruits, vegetables, and mushrooms, produce wine vinegar in a generator, make apple chips, as well as blanch or vacuum-pack appropriate food products.

This comprehensive scope of activities allows CEKOM 3LJ to serve as a crucial linkage between science, industry, and entrepreneurship focused on sustainable development and innovation in the Trilj area and beyond.

The mission of the CEKOM 3LJ Institution is to stimulate the economic growth of the Dalmatian hinterland and the broader region through scientific research and development, connecting the science and industry sectors, as well as providing support and encouraging the development of innovative entrepreneurship through research programs that address the needs in agriculture and food technology. CEKOM 3LJ, as a teaching base in cooperation with the academic community, offers a structured platform for practical training and professional development of students and actively contributes to the popularization and promotion of science.

The vision of the CEKOM 3LJ Institution is to become the leading regional center for development and innovation in agriculture and the food industry, significantly contributing to the economic growth of Dalmatia hinterland. The institution aims to be a place of excellent collaboration between the academic community and the economy, enabling knowledge transfer, finalization of innovative products and technologies, and strengthening the competitiveness of small and medium-sized enterprises within the sector. This synergy of knowledge and experience stimulates the development and commercialization of new solutions, contributing to the sustainable development of the region.

Exploring non-chemical weed management strategies among growers of selected spices (ginger, turmeric) in Nigeria

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²*Department of Agricultural Economics and Agribusiness, University of Ghana, Legon, Accra, Ghana.*

³*Department of Agricultural Education, Kaduna State College of Education, Gidan Waya. Kaduna State, Nigeria.*

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Weed management remains a critical challenge in the cultivation of spices such as ginger (*Zingiber officinale*), and turmeric (*Curcuma longa*) in Nigeria. Reliance on chemical herbicides raises concerns related to environmental sustainability, health risks, and input costs. As a result, there is a growing interest in exploring non-chemical weed control methods suitable for smallholder and medium-scale spice farmers. This proposed study, aims to investigate the non-chemical weed management strategies, currently practiced or potentially adoptable among growers in key spice-producing regions of Nigeria. The study will adopt a mixed-method approach, combining surveys, focus group discussions, and key informant interviews (KIIs) to identify: commonly used techniques (such as manual weeding, mulching, crop rotation, intercropping, and cover cropping), and assess farmers' perceptions of effectiveness, and barriers to adoption of non-chemical weed control. The study also aim to review the state-of-the-art knowledge in non-chemical weed control practices in ginger and turmeric production. The findings are expected to inform sustainable agricultural practices and reduce chemical dependency in spice production. Ultimately, the study seeks to provide practical recommendations for stakeholders (private sectors, development partners, policymakers, extension agents, and farmers) to enhance eco-friendly weed management strategies tailored to local agro-ecological and socio-economic contexts.

Status and perspectives of the adoption of non-chemical weed control strategies (NCWM) in the production of MAPs in Serbia

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²*Institute for Medicinal Plant Research "Dr Josif Pančić", Belgrade*

The production of medicinal and aromatic plants (MAP) in Serbia has a long tradition and significant potential for development, both on the domestic and foreign markets. With the growing demands for organic and sustainable products, there is an increasing need to apply non-chemical weed control methods (NCWM) in this sector. This presentation aims to: 1) analyzes obstacles and incentives for the implementation of NCWM in Serbia, 2) shows the current level of compliance of national policies with relevant European directives and strategies, and 3) propose specific measures to accelerate the application of NCWM methods in MAP production.

Serbia has significant potential for the development and application of NCWM methods in the production of MAPs. It is necessary to strengthen financial and institutional support in order to make the transition realistic and sustainable for agricultural holdings. It is necessary to increase awareness and knowledge through education and practical examples. Regional and European cooperation can accelerate the process through the exchange of experiences and good practices.

Keywords: adoption medicinal and aromatic plant, non-chemical weed control, Serbia.

THE NATIONAL ORGANIC ACTION PLAN OF KOSOVO – ANALYSES

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Abstract

The National Organic Action Plan of the Republic of Kosovo (NOAP) for the period 2023-2026 outlines comprehensive support for the development of organic agriculture. The sector of organic agriculture is increasing in Kosovo, particularly the cultivation of Medicinal Aromatic Plants (MAP) and the collection of Non-Wood Forestry Products (NWFP). In this direction significant financial support is provided subventions for production and certification from the Ministry of Agriculture, Forestry, and Rural Development (MAFRD) and support from other donors. MAFRD is working continuously for the update of legislation and implementation of the NOAP. The implementation of the NOAP, addresses most of the key aspects like the processing and production, market growth, legislation, certification and policies, as well as research, education, training, and extension services. These activities are likely to play a key role in the development of organic agriculture, bringing about economic, environmental, and social benefits. As a result, several of the activities in the NOAP have already implemented, and MAFRD, the Organika association, as well as other experts, is monitoring closely the development and implementation of the NOAP.

Keywords: organic agriculture, NOAP, Kosovë

Application of Supercritical CO₂ Extracts of Medicinal Plants in the Food, Cosmetic, and Pharmaceutical Industries

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Supercritical carbon dioxide (SC-CO₂) extraction is an innovative and environmentally friendly method for obtaining high-quality plant extracts rich in bioactive compounds. This technology enables selective isolation of essential oils, flavonoids, phenolic compounds, and other valuable constituents from various medicinal plant species, without the use of harmful organic solvents. Due to its low operating temperatures and adjustable pressures, SC-CO₂ extracts maintain stability and biological activity, making them suitable for applications in food products, cosmetics, and pharmaceutical preparations.

In the food industry, SC-CO₂ extracts are used to obtain natural flavors, antioxidants, and nutraceutical compounds, preserving sensory qualities without toxic residues. In cosmetics, these extracts deliver potent antioxidant and anti-inflammatory agents with pure, natural fragrances, enhancing skin and hair care products. Pharmaceutical industries benefit from SC-CO₂ extraction by obtaining high-purity bioactive compounds for natural remedies, drug delivery systems, and active pharmaceutical ingredients, ensuring solvent-free and stable formulations.

In conclusion, SC-CO₂ extraction offers a sustainable and efficient alternative to conventional extraction methods, supporting the development of innovative, high-value products with added value across these industries.

Survey Results Overview

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Analysis focused on survey results collected from respondents across 31 countries, representing a wide range of academic, research, agricultural, and advisory organizations. The network included universities, research institutes, NGOs, farmers, processors, and policy advisors active in the agri-food sector. The analysis revealed that while sustainable agriculture, biodiversity protection, innovation, rural development, and food security are recognized as strategic EU priorities, awareness and understanding of specific policy details remain limited. Respondents highlighted a gap between policy design and practical implementation, pointing out challenges such as excessive bureaucracy, poor communication, limited support, and insufficient involvement of farmers in decision-making. They emphasized the need for increased education and awareness, simplified procedures, realigned subsidies, and policies focused more on practical support and innovation rather than paperwork and formalities. Overall, the analysis underscores the need for more effective, transparent, and grassroots-oriented agricultural policies.

Croatian national policy within the framework of the European Green Deal and sustainable use of pesticides

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The European Green Deal aims to create a cleaner, healthier and climate-neutral Europe by transforming the way we produce and consume. Also, it establishes a long-term vision of climate neutrality, biodiversity protection, and sustainable food production across the European Union.

The vision of the European Green Deal is to make the EU the first climate-neutral area in the world by 2050, to cut pollution and restore a healthy balance in nature and ecosystems.

Within this framework, the Farm to Fork Strategy and the Biodiversity Strategy 2030 set specific objectives, including reducing the use of and risk from chemical pesticides and more hazardous pesticides by 50% but also increasing organic farming to 25% of agricultural land by 2030.

Croatia, as an EU member state, has integrated these commitments into its national agricultural and environmental policies, seeking to balance productivity with ecological sustainability.

At the EU level, 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 (SUD) is in force. The provisions of SUD have been transposed into national legislation by the Act on the Sustainable Use of Pesticides (Official Gazette No. 46/2022).

Also, at the national level, the Ordinance on Integrated Pest Management was adopted. Integrated pest management (IPM) means 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 minimize risks to human health and the environment. At the national level, the development of a new National Action Plan (NAP) for the sustainable use of pesticides is underway.

Although efforts are being made at the national level to contribute as much as possible to the achievement of the common EU goals, the Republic of Croatia is faced with several challenges.

<https://www.consilium.europa.eu/en/policies/european-green-deal/>

MEASURES TO SUPPORT THE DEVELOPMENT OF AGRICULTURE IN THE SPLIT-DALMATIA COUNTY

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Cilj ovih mjera je omogućiti uspješan i ravnopravan razvitak poljoprivrede na području Županije potičući komparativne prednosti pojedinih krajeva (zaleđe, priobalje i otoci) te stvoriti uvjete za konkurentnost Obiteljskog poljoprivrednog gospodarstva (OPG).

Županijska Skupština donijela je Program potpore poljoprivredi i ruralnom na području Splitsko-dalmatinske županije (2021.-2027.) kojeg je Ministarstvo poljoprivrede odobrilo, odnosno Mjere koje će se provoditi u periodu 2021.-2027. godina i to: okrupnjavanja poljoprivrednog posjeda i uređenje poljoprivrednog zemljišta; primjene stajskog gnojiva i provedba nitratne direktive; posebne mjere pomoći za sektor stočarstva; potpora izgradnji jednostavnih akumulacija u poljoprivredi; potpora za osiguranje u poljoprivredi; potpora radu poljoprivrednih udruga i lokalno akcijskih grupa; potpora za uređenje zapuštenih poljskih putova u zagori, priobalju i otocima u SDŽ, potpora razvoja konkurentnosti poljoprivredne proizvodnje kroz marketinšku pripremu proizvoda, uvođenje i održavanje EU standarda, izradu projektne dokumentacije za poljoprivredno-proizvodne objekte, ekološku proizvodnju, te potpora za sufinanciranje nabave sadnog materijala u Splitsko-dalmatinskoj županiji.

The aim of these measures is to enable the successful and equitable development of agriculture in the County by encouraging the comparative advantages of individual regions (hinterland, coastal areas and islands) and to create conditions for the competitiveness of the Family Farm (FH).

The County Assembly adopted the Program for Support to Agriculture and Rural Affairs in the Split-Dalmatia County (2021-2027), which was approved by the Ministry of Agriculture, namely the measures that will be implemented in the period 2021-2027, namely: consolidation of agricultural holdings and development of agricultural land; application of manure and implementation of the Nitrates Directive; special aid measures for the livestock sector; support for the construction of simple reservoirs in agriculture; support for insurance in agriculture; support for the work of agricultural associations and local action groups; support for the improvement of neglected field paths in the hinterland, coastal areas and islands in the Split-Dalmatia County, support for the development of the competitiveness of agricultural production through marketing preparation of products, introduction and maintenance of EU standards, preparation of project documentation for agricultural production facilities, organic production, and support for co-financing the purchase of planting material in the Split-Dalmatia County

The role of the Croatian Agency for Agriculture and Food in the agricultural sector of the Republic of Croatia

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The Agency's activities have been prescribed by the Act on the Croatian Agency for Agriculture and Food and other special regulations (more than 19 different acts, more than 200 different rules, ordinances and instructions); the activities include research in the field of agronomy and related fields, plant protection, seed and seedling production, viticulture, winemaking, oil production, fruit growing, vegetable growing, agricultural land, cattle breeding, quality control of fresh raw milk, honey and feed, as well as food safety. The Agency carries out programmes that are of strategic interest to the Republic of Croatia and establishes an infrastructure in cooperation with scientific institutions that is of interest to the entire agricultural system of the Republic of Croatia.

The Agency's experts also provide technical and scientific support to the Ministry of Agriculture, primarily in the drafting of legislation, expert opinions and technical bases, as well as by conducting laboratory analyses of samples collected in phytosanitary, agricultural and winery inspection.

The activities are conducted in the entire territory of the Republic of Croatia due to their specific nature.

Our vision is to enable the functioning of agricultural production on the basis of sustainable agriculture with observation of high standards of environmental protection by carrying out activities regulated by legal acts. Fulfilling the Agency's vision includes creating human and infrastructure capacities.

Our goal is to become the leading development institution in the field of agriculture in the Pannonian region of the European Union within the next 10 years.

Presentation of work, cooperation with agricultural producers and small and medium-sized entrepreneurs

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Kaštela Olive Growers' Association "Mastrinka", NGO, Kaštela, Croatia

Kaštela Olive Growers' Association "Mastrinka", a non-profit association based in the Split-Dalmatia Region of Croatia, is one of the largest Dalmatian olive-growing associations representing over 100 olive producers. It shapes its activities according to the needs of the olive growers and the society in which it resides. It actively participates in projects of socially useful activities, climate change adaptation, and nurtures international cooperation. The goal of the association is to become a central place for educating and informing olive growers, promoting olive oil and olive products as well as connecting agricultural producers and other related organizations.



Mastrinka



KAŠTELA OLIVE GROWERS ASSOCIATION

Application of scientific and technological achievements in the context of sustainable use of pesticides; Results of the national Action plan for the suppression of the Mediterranean fruit fly pest in Neretva river valley of Croatia.

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Mediterranean fruit fly of Medfly (*Ceratitidis capitata*) Wiedemann (Diptera, Tephritidae) is a pest of high economic importance for mandarin (*Citrus reticulata*) B. production in Neretva river valley. If not combat, this pest cause fruit infestation through larvae feeding inside fruit pulp. Suppression of Medfly in area-wide suppression programs include different non-pesticide methods world-wide that are implemented as a part of integrated pest management (IPM) in Neretva valley. Sterile Insect Technique (SIT) is a selective and species-specific method that is used widely for medfly suppression. This method includes mass rearing of Medfly males that are sterilised through production phase in the laboratory and released in wild Medfly population. Released sterile males copulate with wild males resulting no progeny (so called birth control). SIT has been applied successfully more than ten years in Neretva river valley over 4000 ha of the production area. Sterile Medfly males have been purchased either from Spain or Israel in the past in pupal stage and deliver to emergence facility in the city of Opuzen where they emerge to adults and mature before release. Sterile males are released on a weekly base from early April to end of November using ground release machines mounted on a back pack of the vehicle, by paper bags and boats. SIT is part of the overall IPM Action plans world-wide that has been proved as effective method of control in Europe, Central America, South Africa etc.

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Differential phytotoxicity of essential oils from Lamiaceae family and their major constituents against common sow thistle (*Sonchus oleraceus*)

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Some species of the genus *Sonchus*, such as the annual *S. oleraceus* (common sow thistle), are widespread weeds with high colonization capacity due to their genetic diversity, invasive potential, and ecological adaptations (Aizpuru et al., 1999; Khalsa et al., 2021; Ruiz-Rocamora et al., 2025). While they provide certain ecosystem services, in cultivated areas *S. oleraceus* is a problematic weed because of its strong competition with crops and its increasing herbicide resistance (Khalsa et al., 2021; Ruiz-Rocamora et al., 2025). These challenges highlight the need for integrated management and alternatives to chemical control. Essential oil fractionation enables the identification of bioactive components, which may explain their phytotoxic effects. This study aimed to evaluate the phytotoxic potential of different essential oils (EOs) from the Lamiaceae family and some of their fractions during *in vitro* germination of *S. oleraceus* seeds. Essential oils (EO) were fractionated by HPLC (Pure C-850, Büchi Iberica S.L.U, Spain), yielding a variable number of fractions (FR) depending on the EO. Fractions were vacuum-dried and, together with pure EO, redissolved in ethanol 3% and polysorbate 0.05% at 500, 250 and 100 ppm for *in vitro* germination assays. Disinfected *S. oleraceus* seeds were placed (10 per Petri dish, three replicates) on moistened filter paper, with controls (water, ethanol 3% and polysorbate 0.05%). Plates were incubated in a climatic chamber (30/20 °C, 16 h/8 h photoperiod), and germination (radicle > 2 mm) was recorded every two days. Both EO and FR delayed radicle emergence, extending the lag phase. Fractions from *Artemisia absinthium* (FR2, FR3, FR5), *Salvia rosmarinus* (FR3, FR4, FR5), *Lavandula × intermedia* (FR1, FR3, FR4) and *Thymus vulgaris* (FR2, FR4, FR6, FR7) showed comparable effectiveness to the corresponding EO across all concentrations. On the other hand, the essential oils (EO) of *Mentha rotundifolia* (MR), *Origanum vulgare* (OV), and *Satureja montana* (SM) strongly inhibited *S. oleraceus* germination at 500 and 250 ppm, although their effectiveness decreased at 100 ppm. However, specific fractions—FR2 of MR and OV, and FR3 and FR5 of SM—significantly ($p < 0.05$) inhibited *in vitro* germination at 100 ppm, reducing the number of viable seedlings compared with controls. These findings suggest that, if the study is extended to *in vivo* trials, careful fractionation could enhance the understanding of dose–response relationships and structure–activity effects, thereby improving the potential of EO in herbicidal applications.

The Role of Higher Education in the Digital Transition and Rural Development through EU Projects – Experiences from APTF SUM

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The Faculty of Agriculture and Food Technology at the University of Mostar (APTF SUM) works in a region where agriculture is more than just a business; it is part of the identity and culture. With this in mind, the Faculty aims to tackle the challenges of the EU's Common Agricultural Policy (2023–2027). It focuses on digital transition, sustainability, and getting youth involved in rural development.

For more than ten years, APTF SUM is an active partner in INTERREG/IPA EU programs. These programs have allowed for knowledge sharing and initial pilot projects in precision agriculture. Some of these projects include digital monitoring of vineyards and olives, sensor-based greenhouse systems, and farmer training through project academies. We hope to expand these efforts with upcoming projects currently under review. This will further enhance the Faculty's role in promoting innovation and sustainability in rural areas.

Understanding that digital agriculture is essential, the Faculty plans to improve its curriculum by including precision farming, GIS, remote sensing, and other smart implementations. In the near future, we expect to work closely with start-ups and innovators. This partnership aims to bring smart irrigation, drones, and AI-based soil analysis into teaching and research. These initiatives will help provide students with practical experience through international projects.

Beyond technical skills, APTF SUM also wants to build students' project management abilities. This will equip them to design and manage EU-funded projects. We also plan to set up a Centre for Rural Development and Digital Transition as a key step forward.

Bosnia and Herzegovina faces challenges like limited EU integration and rural youth migration. However, EU policies offer guidance and opportunities. By promoting cooperation, digital innovation, and project-based learning, APTF SUM aims to show how higher education can support sustainable and inclusive rural development in Southeast Europe.

Nothing Goes to Waste: Circular Solutions for Medicinal and Aromatic Plant Chains

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Essential oil production yields a small amount of oil but generates large quantities of waste, including hydrolate, wastewater, and solid residues. Solid residues, in particular, represent the majority of the waste generated and are approximately equal to the amount of input raw material, since essential oil comprises only 0.3 to 3.0 percent of the raw material. This highlights the need for sustainable waste management strategies. A review of the literature reveals a wide range of possible applications for post-distillation solid waste. These include the recovery of phenolic compounds for the pharmaceutical, food, and cosmetic industries; use as a substrate for composting and soil amendments; energy production such as biogas, biofuel, and pellets; biosorbent and biochar production; incorporation as a bio-additive in building materials; use as an additive in animal feed; formulation of biopesticides; and as lignocellulosic feedstock for mycelial biomaterial production. However, what is often overlooked is the preparation of solid waste for these applications, as well as the facilities required for such processing. This paper therefore focuses on the pretreatment of plant material, which is carried out on the farm where the essential oil is distilled, and its subsequent distribution to anaerobic digestion facilities, biochar production plants, lignocellulosic feedstock facilities, or to further processes such as phenolic compound re-extraction, animal feed production, or building material manufacturing. This also requires the development of technologies in the raw material sector, where post-distillation solid waste serves as the main input. It is therefore essential to educate farmers on the proper handling of post-distillation solid waste, as it can become a significant source of additional income in the future while also helping to reduce environmental pollution caused by waste generation on farms.

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Future of regenerative agriculture in Croatia and the EU

Hrvoje Bota dipl.ing.arch. social enetrprise Održivo d.o.o. members of EARA
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Abstract

Humanity's 4th agriculture revolution is in full swing in Europe and the world. Farmers are leading the world's regeneration movement. EARA is at the front of the development and scaling of an outcome based regenerative farming system in EU. The lecture presents principles and techniques of regenerative farming. New scientific study on productivity of regenerative farms in EU is presented. Examples of successful regenerative farms in Europe and pioneers of regenerative agriculture in Croatia are the living result. Održivo will present current design of regenerative farms in Dalmatia, and Lika regions. A living model of a small family size biointensive organic market garden farm in Bisko, Trilj will be presented. The micro farm produces organic vegetables, herbs, flowers and fruits. Its built from wood and hempcrete and has a self-sufficient energy system. On the farm Mikrofarma Mrvica we organize workshops, tours and gastro events.



održivo



Prospects for the Use of Medicinal Plant Resources of the Flora of Azerbaijan

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One of the main tasks and priority areas of botanical resource science is the scientific substantiation of practical activities to preserve biodiversity and effectively use useful plant resources. This is especially important when solving issues related to medicinal and aromatic plants. Therefore, scientific research at the intersection of resource science with pharmacognosy, as well as aromatherapy, cosmetology and perfumery, is most in demand. In this regard, the flora of Azerbaijan has great potential and broad prospects. Of the approximately 5,000 plant species growing in the flora of Azerbaijan [1], more than 1,600 have medicinal and about 700 have aromatic properties. Of the total number of medicinal plants included in the Pharmacopoeias of different countries of the world, 274 species grow in the flora of Azerbaijan [2]. However, today the medicinal and aromatic flora of Azerbaijan, its biodiversity and resource potential are experiencing a strong negative impact of various anthropogenic factors. As a result, the areas of traditional growth of these plants are shrinking and the places of their loss are being lost, the number of species on the verge of extinction is increasing. At the same time, there is hope that understanding the seriousness of the tasks and the measures taken at the state level will help stabilize the situation, ensure the preservation of biodiversity and the efficient use of plant resources. More than 200 species of medicinal and aromatic plants are widespread and have significant reserves in the flora of Azerbaijan. Over the past 10 years, we have studied the stocks of more than 70 species. All of the above species contain biologically active substances (flavonoids, alkaloids, essential and fatty oils, coumarins, vitamins, tannins, saponins, phenolic acids, steroids, etc.), which determine their medicinal properties. Studies have shown that the greatest number of species have diuretic (species of the genera *Galium*, *Viola*, *Equisetum*, *Asplenium* et al.), laxative (*Euphorbia*, *Viola*, *Rumex* et al.), hemostatic (*Geranium*, *Rumex*, *Potentilla*, *Salix* et al.), diaphoretic (*Papaver*, *Inula*, *Betula*, *Ribes*, *Tilia*, *Viola* et al.), sedative (*Valeriana*, *Teucrium*, *Orobancha*, *Usnea* et al.), hypotensive (*Crataegus*, *Stachys*, *Fumaria* et al.) and choleric effects (*Achillea*, *Helichrysum*, *Berberis*, *Fragaria* et al.), antibacterial activity (*Centaurea*, *Salvia*, *Allium*, *Inula* et al.), as well as wound healing (*Salvia*, *Tulipa*, *Galium*, *Usnea* et al.), anti-inflammatory (*Stachys*, *Viola*, *Euphrasia* et al.), anthelmintic (*Artemisia*, *Allium*, *Pyrethrum*, *Dryopteris* et al.), astringent (*Geranium*, *Salix*, *Rumex*, *Rosa* et al.), expectorant (*Viola*, *Primula*, *Verbascum* et al.), antitumor (*Artemisia*, *Alcea*, *Usnea* et al.) and antiseptic (*Thymus*, *Rumex*, *Juniperus*, *Usnea* et al.) properties.

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Comprehensive Evaluation of Morphological and Biochemical Parameters in Seven *Ocimum basilicum* L. Genotypes with a Focus on Light Utilization Efficiency

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The choice of basil (*Ocimum basilicum* L.) genotypes determines key attributes such as yield, flavor, and adaptability, contributing significantly to the overall success and sustainability of basil cultivation practices. As the primary aim of this study, seven basil accessions were characterized for both their growth performance and biochemical profile of volatile compounds, enabling the differentiation among distinct chemotypes. As secondary objectives, growth performance and production were evaluated under natural solar radiation conditions (SR100) and with a 30% reduction in solar radiation using a net (SR70). Light use efficiency (LUE) determination revealed the plants' biomass production capability under different solar radiation (SR) conditions. Genotypes A, B, C, and G were characterized by a high levels of linalool, which is typically associated with the "pesto" sauce smell. Lemon basil D exhibited a different chemotype due to the presence of neral and geranial. E and F displayed a different chemotype due to the higher concentration of α -bergamotene. The total fresh harvested biomass was significantly higher in SR70 than SR100 conditions. The second harvest in both SR conditions was the most productive one, while genotype E under SR70 displayed the highest yield. The landraces D and E showed the highest LUE values, indicating their capability in converting the solar radiation into fresh biomass. Plants grown in SR70 conditions registered significantly higher values of plant height, number of branches, and leaf weight. This work aimed to provide valuable insights into the selection of basil genotypes suitable for sustainable agriculture. Conversely, it lays the basis for cultivation aspects pertaining to the crop's adaptability in peri-urban, marginal lands, which are characterized by limited solar radiation.

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Mild abiotic stresses for improving qualitative traits of Mediterranean Medicinal and Aromatic Plants

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The Mediterranean basin hosts an outstanding diversity of Medicinal and Aromatic Plants (MAPs) that have evolved under distinctive climate and soil conditions. Spanning families such as Lamiaceae, Apiaceae, Asteraceae, Abietaceae, Cupressaceae, Lauraceae, Myrtaceae, and Rutaceae, these species are industrial crops valued for their sensory, biological, and pharmacological properties. Their bioactive profile, dominated by terpenes, alkaloids, and phenolic compounds, enhances analgesic, anticancer, anti-inflammatory, and muscle-relaxant activities and supports applications across cosmetics, pharmaceuticals, fragrances, cleaning products, functional foods, and biocontrols (Napoli et al., 2020).

The biosynthesis of these compounds emerges from a complex metabolic network represented by plant-environment interactions. Temperature, salinity, air humidity, soil water content, heavy metals, and nutrient availability modulate the direction of secondary metabolism, with effects that can be positive or negative depending on species and context. Among secondary metabolites, essential oils (EOs), volatile blends of terpenes, terpenoids, phenylpropanoids, and other low-molecular-weight constituents, are especially demanded by industry. Their production often peaks before flowering, with subsequent relocation to flowers and fresh leaves. In these organs, EOs serve ecological functions as chemical defenses against pests and predators or as attractants for pollinators, aligning plant fitness with traits of direct industrial relevance.

Because climate is a primary external driver, ongoing climate change is expected to influence EO quantity and composition via its effects on plant metabolism (Patni et al., 2022). Against this backdrop, an innovative strategy has gained prominence: the deliberate application of mild abiotic stress at specific phenological phases to enhance EO synthesis without materially impairing growth. In this context, an innovative strategy is gaining ground: applying mild abiotic stresses at specific phenological stages to boost essential oil synthesis without compromising plant growth (Yeshi et al., 2022). Physiologically, mild stress sits in a “sub-threshold” zone where the plant’s self-regulation remains active. By contrast, severe stress breaks this balance, disrupts metabolic control, and leads the plant to reduce energy-intensive processes such as growth and reproduction. It is therefore crucial to identify and respect the boundary between mild and severe stress (Göçer et al., 2021).

In Mediterranean marginal areas, carefully applied mild abiotic stress, brief, controlled drought, heat, salinity, or light, can act as a cue rather than a setback. If kept below damaging levels and timed to the right growth stage, plants keep core functions running while boosting essential-oil pathways. Oil concentration may rise with a small drop in fresh leaves or flowers, but many MAPs achieve a good balance when intensity and timing are tuned. Used this way, mild stress becomes a low-input tool to maintain growth and obtain high-value essential oils under a changing climate.

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Biomass yields, morphometric features and volatile/non volatile specialized metabolite performance of six Sicilian Accessions of *Salvia officinalis* L. and *Salvia triloba* L. during a triennial growing cycle in a Mediterranean environment

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Sage (*Salvia* spp.) is an officinal plant renowned for its distinctive aroma and use. In this study, we characterized seven populations of sage (six accessions of *S. officinalis* L. and one of *S. triloba* L.) for their morphometric and biochemical traits by a triennial growing cycle. The field was established during the 2020 at the experimental farm of the University of Catania (Sicily) where we transplanted 80 plantlets for each genotype by three replicates. The plantlets were transplanted along single rows 1,00 m far each other and 0,40 cm along the rows each others. The experimental design was factorial with the first experimental factor represented by the genotype and the secondary one by the year of harvest. Plant yields were measured, both as TYI (total yield) and component yield (fresh leaves, stems, and leaf dry weight). Genotypes were also analyzed for leaf morphometric traits. Significant interactions between genotype and year of harvest affected the percentage of leaves and stems. Pearson's correlation revealed a robust positive correlation among leaf area, length, and width, while TYI was negatively correlated with leaf dry weight. PCA grouped the different genotypes on the basis of their morphometric traits and biomass production, with unique clusters except for genotypes D and E, which grouped together due to high stem percentage. A significant interaction between genotype and year of harvest was observed for all specialized metabolites. Non-volatile specialized metabolites accumulation was monitored along the three year of growing cycle; rosmarinic acid was the most representative non-volatile compound, peaking in genotype F during the first year and showing the lowest value in genotype B during the second year. Flavonoids (scutellarein, hispidulin, cirsimaritin, genkwanin, salvigenin) and diterpenes (carnosol, carnosic acid, and methyl carnosate) showed different accumulation trends. Genotypes were distinctly categorized into three chemotypes based on their volatile compounds profiles; one with higher monoterpene hydrocarbons (A, D, F, G), another with elevated diterpenes (E, C), and the third one with remarkable amounts of oxygenated monoterpenes (B) all along the whole observation period (77.91%, 79.36%, and 77.70%). From these data, it was possible to select a particularly valuable sage genotype both in terms of biomass yield, morphology and content of specialized metabolites suitable for large scale cultivation in this particular area.

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From Field to Laboratory: Strengthening MAPs Research through COST Action weeding MAPs STSM at the University of Catania

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As part of the COST Action weeding MAPs, two two-week Short-Term Scientific Mission (STSM) were conducted in summer 2025, at the University of Catania (Di3A), hosted by Prof. Ferdinando Branca's team. The mission focused on strengthening knowledge and skills in morphological and biochemical phenotyping of medicinal and aromatic plants (MAPs) in the context of developing non-chemical weed management (NCWM) strategies.

Field work across different Sicilian agroecosystems included sampling wild and cultivated MAP populations of *Salvia officinalis*, *Origanum vulgare var. hirtum*, *Thymus capitatus*, observing sustainable cropping systems (oregano, hazelnut, pistachio), and tomato trials under non-chemical biofumigation. In the laboratory, the practical experience in essential oil extraction and sample preparation for GC-MS analysis was gained.

The STSM successfully met its objectives by generating material for chemotyping, enhancing interdisciplinary collaboration, and fostering capacity building in MAP research, particularly relevant for inclusiveness of target countries. Planned follow-up includes joint publications, COST dissemination activities, Erasmus exchange agreements, and co-organisation of the 2026 Summer School in Catania.

This mission contributes directly to COST action, on weeding MAPs, deliverables by supporting innovation, training, and cross-border knowledge exchange for sustainable MAPs production.

Comparative Analysis of Volatile Compounds in Dry *Satureja montana* L. from the Dalmatian Hinterland and its Supercritical CO₂ Extract

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Satureja montana L. (mountain savory) is an aromatic medicinal plant native to the Mediterranean. It inhabits arid, sunny and rocky habitats along the Adriatic coast, including the Dalmatian Hinterland. It's traditionally used in folk medicine, for treating various ailments. Numerous studies have confirmed it's antimicrobial, antioxidative, antiproliferative and anti-inflammatory properties^{1, 2, 3}. Conventional extraction methods have been used to obtain natural product extracts, but with drawbacks (low selectivity, high energy costs, loss of volatile compounds, etc.). Extraction of plant oils using supercritical CO₂ extraction has received much attention as an alternative method with a wide range of applications. Supercritical CO₂ extraction allows for processing plant material at low temperatures, thus limiting thermal degradation and avoiding the use of toxic solvents⁴. This study aimed to characterize and compare volatile compounds in headspaces of dry mountain savory from the Dalmatian Hinterland and its supercritical CO₂ extract, using solid-phase microextraction (SPME) coupled with gas chromatography – mass spectrometry (GCMS). The results revealed a higher number of volatile compounds identified in the CO₂ extract compared to the dry plant material. The dry mountain savory volatile profile was dominated by carvacrol, followed by caryophyllene and γ -terpinene, while the supercritical extract had a more balanced volatile profile, with *o*-cymene, thymol and thymol methyl ether as well as caryophyllene. The analysis successfully differentiated between dry and supercritical extract of *S. montana* L., suggesting possible applications for the extract within the food, cosmetic and pharmaceutical industries.

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Bridging Environmental Technology and Policy: Socio-Technical Drivers for Non-Chemical Weed Management in Medicinal and Aromatic Plant Cultivation

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Abstract:

Non-chemical weed management (NCWM) strategies are gaining importance as sustainable alternatives to conventional pesticide use, particularly in the cultivation of medicinal and aromatic plants (MAPs). This study explores the intersection of environmental technologies and agricultural policy frameworks to identify barriers and drivers for NCWM adoption in EU countries, with a specific focus on Türkiye. Drawing on interdisciplinary expertise in chemical engineering and public administration, the research evaluates how national implementations of the Common Agricultural Policy (CAP) 2023–2027, the Directive on Sustainable Use of Pesticides (2009/128/EC), and the EU's Farm-to-Fork and Biodiversity strategies influence sustainable weed control practices.

In addition to technical solutions, such as the use of biomass-derived activated carbon for mitigating agrochemical residues, this work emphasizes socio-political factors shaping farmer behavior. Key considerations include financial incentives, decision-making processes at the farm level, stakeholder collaboration, knowledge transfer, and youth engagement in agricultural education. By linking environmental remediation technologies with socio-economic and policy analysis, this study offers integrated recommendations to accelerate the adoption of NCWM strategies across diverse farming contexts.

Keywords: Non-Chemical Weed Management (NCWM), Medicinal and Aromatic Plants (MAPs), Common Agricultural Policy (CAP), Sustainable Agriculture, Socio-Technical Integration
