



AgriTech Solutions: Innovating VET for Sustainable Agriculture
AgriTech Solutions: Иновативно COO за одрживу пољопривреду
AgriTech Solutions: Иновативно COO за одржливо земјоделство
2024-1-RS01-KA210-VET-000244168

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REPORT

On the implementation of activities for the needs of the project

Review of available literature and materials on sustainable agricultural practices, precision agriculture, organic agriculture, renewable energy sources, and the use of technology in agriculture

Engaged teachers:

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Location:

Kumanovo, Sveti Nikole, Skopje, Strumica, Kavadarci

Short Description

Modern agriculture is facing increasing challenges: climate change, soil degradation, water scarcity, and growing food demand. In this context, scientific and professional literature increasingly focuses on concepts such as “Sustainable Agriculture”, “Precision Agriculture”, “Organic Production”, “Renewable Energy Sources”, and the “Integration of New Technologies”.

This report provides an overview of the main sources, research papers, and trends in each of these areas.

Sustainable Agricultural Practices

Literature Review:



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- FAO (2014) – “*Building a common vision for sustainable food and agriculture*”
 - OECD (2021) – “*Sustainable Agriculture and Food Systems*”
 - Pretty, J. (2008) – “*Agricultural sustainability: concepts, principles and evidence*”

Key Topics:

- Crop rotation and agroecological approaches
- Protection of biodiversity and natural resources
- Reduction of chemical inputs

<https://www.fao.org/sustainability/en/>

Precision Agriculture

Literature Review:

- Zhang et al. (2002) – “*Precision Agriculture: A Worldwide Overview*”
- Mulla (2013) – “*Remote sensing in precision agriculture*”
- FAO (2019) – “*Digital technologies in agriculture*”

Key Technologies:

- GPS/GIS, sensors, drones, IoT
- Yield mapping and variable fertilization
- Artificial intelligence for decision-making

<https://www.fao.org/3/ca4887en/CA4887EN.pdf>

Organic Agriculture

Literature Review:

- IFOAM (2023) – “*Principles of Organic Agriculture*”
- FiBL & IFOAM (2024) – “*The World of Organic Agriculture*”
- Barański et al. (2014) – “*Nutritional differences in organic crops*”



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Key Principles:

- No use of synthetic fertilizers and pesticides
- Natural protection methods and certification
- Biodiversity and soil health

<https://www.organic-world.net/>

Renewable Energy Sources in Agriculture

Literature Review:

- IRENA (2015) – “*Renewable Energy in Agriculture*”
- FAO (2017) – “*Energy-Smart Food for People and Climate*”
- World Bank (2020) – “*Solar Pumps for Irrigation*”

Key Technologies:

- Solar panels for pumps and dryers
- Biogas from organic waste
- Geothermal and wind energy for farms

<https://www.irena.org/publications/2015/Jun/Renewable-Energy-in-the-Water-Energy-Food-Nexus>

Use of Technology in Agriculture

Literature Review:

- USAID (2021) – “*Digitalization in Agriculture: North Macedonia*”
- GIZ (2022) – “*Smart Farming Opportunities in the Western Balkans*”
- IGI Global (2020) – “*Smart Farming Technologies for Sustainable Agriculture*”

Key Technologies:

- Mobile applications for agronomic advice



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2024-1-RS01-KA210-VET-000244168

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- Sensors for moisture and nutrient monitoring
 - Market platforms and product traceability systems

<https://www.usaid.gov/north-macedonia/factsheets/digital-agriculture>

Conclusion

The literature review shows a clear convergence between **sustainable agricultural practices and digital technologies**. Precision agriculture and the use of renewable energy represent important tools for achieving sustainable production, particularly under conditions of climate change.

Organic agriculture, although more demanding in terms of certification, offers healthy and environmentally friendly products. Finally, **digitalization acts as a key catalyst for agricultural development**, especially in developing countries such as North Macedonia.

There is a need for integration of these areas through:

- supportive policies
- development of education and agri-innovation
- public and private investment in technology
- regional cooperation and knowledge exchange

The literature review on the application of good agricultural practices and digitalization prepared for this project will support the development of **manuals, new curricula, and training programmes** for agricultural and veterinary schools. These resources will help current and future generations of students acquire knowledge and practical skills related to sustainable agriculture.

Through the implementation of the above-mentioned practices, students will be better prepared for the labour market and capable of applying their theoretical and practical knowledge in **family farms, agricultural enterprises, and future professional careers**.



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