AGRISMART CURRICULUM

A modular curriculum that can be used by VET providers as well as farmers who wish to develop their climate-smart and digital skills.

LEADER: AGROINSTITUT NITRA, SLOVAKIA

AgriSmart: Sustainability and digital skills
for the agricultural sector
2020-1-IT01-KA202-008399

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1. INTRODUCTION

This Curriculum is one of the outputs of the Erasmus Plus project "AgriSmart: Sustainability and digital skills for the agricultural sector", which is the result of a strategic partnership across 6 European countries, aiming at supporting emerging occupational needs in the agricultural sector by strengthening the climate-smart and digital agriculture skills of farmers through targeted Vocational Educational Training (VET) & Work-Based Learning (WBL) provision. The ambition of the project is to create the enabling conditions for more sustainable and efficient farming systems. The project – ending in 2023 – will pursue these goals with 5 main intermediate Outputs that, together, will shape a new training experience openly available to everyone.

The main purpose of Agrismart Curriculum is to facilitate the acquisition of climate smart and digital skills in the sector of agriculture. The AGRISMART Curriculum can be used by VET providers as well as farmers who wish to develop their climate-smart and digital skills. Additionally, this output includes the creation of a pool of resources including educational instructions, learning and assessment materials, designed to support the delivery of the AGRISMART course in VET provision.

This output develops the structure of a novel curriculum for the development of climate-smart and digital skills in the sector of agriculture, including series of up-to-date modules that can be embedded into existing VET offerings as a whole or partially, thus enriching their agricultural provision. Agrismart learning units covers the most relevant climate-smart and digital skills and competences required in the sector of agriculture.

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2. BACKGROUND OF AGRISMART CURRICULUM

According to the United Nations, digital technologies are central for the development of a smarter, resource-efficient, and more competitive agricultural sector. Nonetheless, the digital divide between urban and rural areas in Europe still persists, while in terms of initial and continuing education and training, the vast majority of farm managers rely solely on practical experience. In addition, there is a fundamental need to couple new digital skills with a practical knowledge of climate smart and sustainable agriculture practices to achieve sustainable agroecosystems. Designing targeted VET and WBL is, thus, vital for achieving the development of climate-smart and digital skills in the sector and to update the current offerings and skills portfolio of education and training institutions. AgriSmart project's mission is to adapt VET and WBL provision to existing and emerging occupational needs, and strengthen the climate-smart and digital skills of workers in the agricultural sector.

Following learning units were developed according to the findings of Learning Outcomes Report, as a result of previous project output. This report focused at the assessment of the needs for sustainability and digital skills in the agricultural sector, by means of combination of desk and "field" research that has been employed targeting different stakeholder groups, namely VET providers in the field of agriculture, field experts, and agriculture associations. As a result, **learning outcomes** have been elaborated combining the desk review results with the data obtained through the questionnaires and keeping in mind the existing VET in the different countries involved in the AgriSmart Partnership.

6 learning units were defined:

1. **Common Agricultural Policy**
2. **Sustainable Agriculture**
3. **Sustainable Water Use Management**
4. **Sustainable Weed & Pest Management**
5. **Agriculture 4.0**
6. **Data for sustainable production**

These are described in detail in **Chapter 4: LEARNING UNITS** of this document.

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3. USER GROUP SELECTION

The effort to develop the digital skills of workers and increase the sustainability of the sector needs to take into account the agriculture has a very strong practical experience component; Correspondingly, Work-Based Learning (WBL) is vital for achieving this objective. Yet, existing training offerings at post-secondary and VET level place little to none emphasis on these dimensions, as demonstrated by current curricula offered by VET providers in most EU countries. There is an increasing need to better align WBL with existing and emerging workplace requirements and realities, especially as regards environmentally sustainable and digital practices and applications. WBL schemes need to update their offerings and skills portfolio to better address learners 'climate-smart and digital skill training needs, and developing training opportunities for upskilling existing workers on the basis of such competences.

THE TARGET GROUPS AT LOCAL AND REGIONAL LEVEL, THE GROUPS AMONG WHOM WE AIM TO DISSEMINATE THE PROJECT ARE:

- Agricultural training institutions (mainly VET providers in the sector of agriculture)
- Mentors offering WBL opportunities
- Apprentices and workers to be upskilled
- Agriculture sector players (farms, agro-food companies)
- Associations and sector representatives
- VET authorities and career guidance bodies
- Local authorities- Public and private authorities (especially at local level, i.e. municipalities, agriculture associations…).

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4. LEARNING UNITS

In order to achieve a high level of interest and performance, the Agrismart learning units are prepared in compliance with the definitions for the trainees' achievements (EQF – European Qualifications Framework definitions).

EQF – European Qualifications Framework definitions

Learning outcomes	Statements of what a learner knows, understands and is able to do on completion of a learning process and which are defined in terms of knowledge, skills and competence.
Knowledge	The outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the European Qualifications Framework, knowledge is described as theoretical and/or factual.
Skills	The ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the European Qualifications Framework, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).
Competence	The proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. In the context of the European Qualifications Framework, competence is described in terms of responsibility and autonomy.

Source: www.cedefop.europa.eu

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4.1.   LEARNING UNIT 1: COMMON AGRICULTURAL POLICY

Learning outcomes	The learner has knowledge about:	• General overview of the CAP, its benefits for farmers and the EU citizens • New strategies proposed by EU Commission for the future of the new Common Agricultural Policy • Contribution of New CAP to the issues related to the climate change, biodiversity loss and management of natural resources • CAP reform and the new model of agriculture and sustainability
	The learner is able to:	• Document agricultural activities • Support the decision-making in terms of identifying Eco-Schemes most suitable in relation to the specificity of different farms • Communicate via email, chat, videoconference • Adapt the choices in relation to the needs of the territory, of the consumers and of the supply chain
	The learner is competent in:	• Solve technical problems in order to integrate several practices in a coherent way and a true redesign of the production systems • Monitor all farming processes identifying their environmental impacts • Create business networks between farms and other agri- food companies in the territorial area and in the supply chain.
EQF Level	5	
General unit contents:	• Introduction • The benefits of the CAP • The New CAP • A greener CAP • A fairer CAP • An innovation-friendly CAP • CAP reform and the new model of agriculture and sustainability • Criticisms of CAP • In defence of CAP and farmers	

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	● CAP's other novelties

Duration of the module (hours)	
Theoretical training	Practical training
40	0

Evaluation Standard		
The requirement for passing the exam is to fulfil the criteria at least to xx%.		
Evaluation criterion	**Evaluation method**	**Evaluation tool**
General description of purpose of the CAP	Oral and written assessment	Oral: main principles of CAP, financing of CAP Written: multiple-choice test
Benefits of CAP	Oral and written assessment	Oral: discuss the main benefits of CAP Written: multiple-choice test, open-text questions
The New CAP	Oral and written assessment	Oral: describe in brief the evolution of CAP; essential elements of New CAP- a greener, fairer and innovation-friendly CAP Written: multiple-choice test
New model of agriculture and sustainability	Oral and written assessment	Oral: discuss the weaknesses, strengths and opportunities of New CAP Written: multiple-choice test, open-text questions

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4.2. LEARNING UNIT 2: SUSTAINABLE AGRICULTURE

<table>
<tr>
<td rowspan="3">Learning outcomes</td>
<td>The learner has knowledge about:</td>
<td>

Sustainable agriculture.
Sustainable agriculture practices

</td>
</tr>
<tr>
<td>The learner is able to:</td>
<td>

Ensure soil fertility
Designing a versatile crop rotation
Optimize nutrient management
Shaping environmental compatibility
Promote biodiversity
Promote growth processes with natural methods

</td>
</tr>
<tr>
<td>The learner is competent in:</td>
<td>

Sustainable agricultural methods
Discribing practical sustainable methods
Discribing the advantages of sustainable agriculture

</td>
</tr>
<tr>
<td>EQF Level</td>
<td colspan="2">5</td>
</tr>
<tr>
<td>General unit contents:</td>
<td colspan="2">

What is sustainable agriculture?
Principles of sustainable agriculture
Why sustainable agriculture
Methods of sustainable agriculture
Objectives on sustainable agriculture

</td>
</tr>
</table>

Duration of the module (hours)	
Theoretical training	**Practical training**
10	

Evaluation Standard

The requirement for passing the exam is to fulfil the criteria at least to xx%.

Evaluation criterion	Evaluation method	Evaluation tool
Define the term Sustainable agriculture	Written	Written exam/ online test/ multiple choice test
Describe agriculturalpractices and give examples	Written	Written exam/ online test/ multiple choice test

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Describe sustainability assessment	Written	Written exam/ online test/ multiple choice test

4.3.   LEARNING UNIT 3: SUSTAINABLE WATER USE MANAGEMENT

Learning outcomes	The learner has knowledge about:	- Water - the main factor determining the growth and development of plants, deciding about the effects of plant production. - Agriculture, which is responsible for the highest water consumption, mainly for soil irrigation. - Water management and drought prevention plans, which must take into account the multifunctional role of agriculture and its importance for landscape services. - The cheapest way to reduce water stress on agricultural land by introducing good cultivation practices. - The need to limit the agricultural production method, which is characterized, on the one hand, by high water consumption and, on the other hand, by the pollution of water resources. - Melioration as the basis for improving the efficiency of farmland management. - Precise, water-saving irrigation. - The need to stop water evaporation by introducing trees and other solutions that retain water in the landscape, - Maintaining grassland and permanent vegetation (trees and shrubs) along water courses, also contributing to the increase in biodiversity. - How excess water in farmland increases the risk of nutrient run-off, and both soil retention and shortage can have a devastating effect on yields. - Particularly high water consumption characterizing the entire production chain in

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		industrial farming, posing a serious risk of water scarcity, both for the needs of this sector and for other sectors of agricultural production.
	The learner is able to:	1. Recognize that: • Water is a resource necessary for agricultural production and agriculture is the main user of water resources. • Renewable water resources mainly come from rainfall, the quantity and distribution of which are beyond our control. • retention, retention and slowing down the outflow of water from the catchment area is of key importance for the renewal of water resources, their quality and availability (not only for the agricultural sector). • The choice of the agricultural production model is also extremely important, because the availability of water for agriculture and other users depends on how it will contribute to retaining water for its own needs by protecting the soil, increasing its water capacity, and retaining water in the landscape.
	The learner is competent in:	1. The topic of optimizing water consumption adapted to the needs of the plant and soil species, allowing to maintain the most favorable level of humidity for a given plant, thanks to which it is possible not only to radically reduce water consumption and related costs, but also to increase the size and quality of the crop in comparison with unsustainable irrigation. 2. The issue concerning: • the integration of plant cultivation and animal husbandry departments and the pursuit of self-sufficiency of fodder, resulting in the fact that the surplus of nutrients in the soil is small and thus little of it gets into surface waters.
EQF Level		
General unit contents:		● Introduction ● Water in agriculture ● Natural retention and restoration of watercourses as a means of combating drought ● Little retention

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- Water melioration
- Irrigation
- Animal production
- Protection of water resources in agriculture - summary
- Good practices
- Key concepts
- Bibliography

Duration of the module (hours)	
Theoretical training	Practical training
5	

Evaluation Standard		
The requirement for passing the exam is to fulfil the criteria at least to xx%.		
Evaluation criterion	**Evaluation method**	**Evaluation tool**
What is the role of water in agriculture? / What does it matter?	Written assessment Written assessment	Briefly describe the problem.
How to increase water availability for crops?	Written assessment	Multiple-choice test.
What is the significance of the proper shaping of the landscape structure by introducing green infrastructure elements as a regulation of the heat and water balance of agricultural land?	Written assessment	Briefly describe the problem.
What role can farmers play in solving the problem of drought?	Written assessment	Give examples, briefly discuss the problem of drought and its prevention in agriculture. How can water be stored for agricultural purposes?
What is Smart Watering?	Written assessment	Briefly discuss the benefits.

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What is conducive to natural water retention?	Written assessment	Brief description / examples or a selection test.
What is the role of grassland as a buffer zone between cropland and water courses?	Written assessment	Brief description / examples or a selection test.
What is small retention?	Written assessment	Brief description mentioning the benefits of small retention.
For what purpose are water and agricultural melioration built? What are melioration systems made of?	Written assessment	Brief description listing the benefits of melioration systems. Additionally, a selection test.
List examples of good practices that preserve water in the soil.	Written assessment	Oral answer.
Protection of water resources in agriculture on the example of animal production.	Written assessment	Oral answer: Present the problem related to Intensive, industrial animal production - as a breeding and breeding method that contributes, on the one hand, to the highest water abstraction, and, on the other hand, to heavy water pollution.

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4.4.   LEARNING UNIT 4: SUSTAINABLE WEED & PEST MANAGEMENT

Learning outcomes	The learner has knowledge about:	• Sustainable weed mangement • Sustainable pest mangement • Integratet plant protection
	The learner is able to:	• Explain the advantages of sustainable weed and pest management • Understand the principles of sustainable weed management • Understand the principles of sustainable weed management
	The learner is competent in:	• Weeding and hoeing in Sustainable weed management • Finding alternatives to total herbicides • Reducing chemically pesticides
EQF Level	5	
General unit contents:	• What is sustainable weed management? • Advantages of hoeing and weeding • Methods of Sustainable weed mangement • What is sustainable pest management? • Principles of integrated pest management • Decision support • Curative plant protection • Organic plant protection	

Duration of the module (hours)	
Theoretical training	Practical training
20	

Evaluation Standard		
The requirement for passing the exam is to fulfil the criteria at least to xx%.		
Evaluation criterion	**Evaluation method**	**Evaluation tool**
Define the term sustainable weed management	written	online test/ multiple choice questionnaire
Describe the term sustainable pest management	written	online test/ multiple choice questionnaire

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Descibe preventive plant protection	written	online test/ multiple choice questionnaire
Describe direct plant protection	written	online test/ multiple choice questionnaire
Define oragnic pest mangement	written	online test/ multiple choice questionnaire

4.5. LEARNING UNIT 5: AGRICULTURE 4.0

Learning outcomes	The learner has knowledge about:	● Agriculture 4.0/Farming 4.0/Future Farming/ Precision agriculture ● Historical phases of agricultural development ● Introduction to remote sensing, Geographic Information Systems ● Digital Farm management systems and tools
	The learner is able to:	● Understand the process of agricultural development ● Understand the objectives of different types of precision agriculture technologies and software and information systems ● Basic use open GIS platforms for organizing geospatial layers
	The learner is competent in:	● Distinguishing different types of contemporary agricultural production ● Communicate with Ag 4.0 specialists/professional to choose available options and evaluate pros/cons. ● Describe/solve basic technical problems
EQF Level	5	

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General unit contents:	- What is Agriculture 4.0? - Agriculture 4.0/Farming 4.0/Future Farming - A quick overview of the phases of agricultural production - Precision agriculture - Smart Farming/Connected Farming - Digital technologies in agriculture - Sensors - Soil sensing technologies - Crop sensing technologies - Nutrition management, plant health, plant protection - Sensors for plant protection - Environmental sensors (meteorology) - Sensors for Agricultural Machines - Sensors in Livestock

Duration of the module (hours)	
Theoretical training	Practical training
40	16

Evaluation Standard		
The requirement for passing the exam is to fulfil the criteria at least to 75%.		
Evaluation criterion	Evaluation method	Evaluation tool
Define the term "Agriculture 4.0"	Written / oral method	Oral response with Explanation / written exam / online test
Describe the historical phases of agricultural development	Written / oral method	Oral response with Explanation / written exam / online test
Sensors in digital agriculture, types of sensors	Written / oral method	Oral response with Explanation / written exam / online test / practical assessment in the field.
Describe the soil sensing technologies	Written / oral method	Oral response with Explanation / written exam / online test / practical assessment in the field.

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Describe the crop sensing technologies	Written / oral method	Oral response with Explanation / written exam / online test / practical assessment in the field.
What are the sensors in livestock used for	Written / oral method	Oral response with Explanation / written exam / online test / practical assessment in the field.

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4.6.   LEARNING UNIT 6: DATA FOR SUSTAINABLE PRODUCTION

Learning outcomes	The learner has knowledge about:	- What are data from the agricultural systems - What are databases and platforms for collecting data - Basic of ethical and legal aspects about data ownership - Basic of creating network and participated relationship for sharing knowledge - Good user of website and application useful in agriculture (e.g. Google earth pro, Regional or national databases) - Basic for collect and manage data (e.g. office package, Q-gis) - Basic for interpret data derived for example from Remote sensing methods, Orthophoto.
	The learner is able to:	- Understand the process for collecting and processing data - Understand how data communicate from different sources (e.g. data from the field, satellite, gis software) - Understand the basic of different types of data management platform - Understand the basic of models and platforms functioning - Basic user of platforms for organizing data (e.g. excel, country notebook) - Awareness of the use of the best technologies according to the context
	The learner is competent in:	- Distinguishing different types and sources of data - Collecting and organizing data - Combining and processing data using different tools - Analyze, communicate, describe technical situations - Develop strategies well designed on target. The learner should have enough tools to understand different contexts and correspondent problems and solutions

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	● Basic for using agricultural technologies (e.g. smart app, sensors, models)
EQF Level	>5
General unit contents:	What are data? (Mainly theory) - Overview: Open data; Sharing data; Data propriety, quality and provenience; Personal data protection. Data sources and how data is collected (Theory and practices) - Overviewt: Data, databases at different levels and how to collect data. How to manage and interpret DATA? (Theory and practices) - Overview: Data analysis and visualization Using DATA (Theory and practices) - Basic information on data management and practical exercises Work project examples: How to use data for sustainable production? - Combining field data collected from on farm devices and remote sensing for mapping water stress in a vineyard - Combining field data from soil and culture, sensors and remote sensing maps for planning the suitable fertilization - Develop a QR code that would tell the story of a specific product on the label

Duration of the module (hours)	
Theoretical training	Practical training
48	12

Evaluation Standard		
The requirement for passing the exam is to fulfil the criteria at least to xx%.		
Evaluation criterion	**Evaluation method**	**Evaluation tool**
Define the tools for data collection	Written / oral method	Oral response with Explanation / written exam / online test
Describe the process from data collection to elaboration	Written / oral method	Oral response with Explanation / written exam / online test

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5. STUDY RESOURCES

LU1: COMMON AGRICULTURAL POLICY

- https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/cap-glance_en
- https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/key_policies/documents/factsheet-newcap-environment-fairness_en.pdf
- https://www.debatingeurope.eu/focus/arguments-for-and-against-the-common-agricultural-policy/#.YYOkmGDMK9I
- https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Performance_of_the_agricultural_sector
- https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/key_policies/documents/cap-post-2020-environ-benefits-simplification_en.pdf
- https://www.europarl.europa.eu/doceo/document/E-8-2015-003940_EN.html
- https://www.greens-efa.eu/en/article/document/where-does-the-eu-money-go
- https://www.dw.com/en/eu-agriculture-policy-what-are-the-bones-of-contention/a-55352567
- https://www.newscientist.com/article/mg12617141-100-europes-agriculture-policy-destroys-the-environment/
- https://www.theguardian.com/commentisfree/2016/jun/21/waste-cash-leavers-in-out-land-subsidie
- https://s3.eu-central-1.amazonaws.com/euobs-media/0b10da05b962cb1a51b53f976cf2c788.pdf
- https://www.theguardian.com/world/2020/mar/09/what-is-the-european-green-deal-and-will-it-really-cost-1tn
- https://www.europarl.europa.eu/factsheets/en/sheet/106/financing-of-the-cap
- https://www.economist.com/europe/2021/05/27/how-farmers-still-rule-europe
- https://www.sciencedirect.com/science/article/pii/S2590332220303559
- https://www.interregeurope.eu/progress/events/event/4315/practical-experiences-payment-for-ecosystem-services/

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- https://www.geospatialworld.net/news/eu-adopts-new-rules-to-enable-farm-checks-using-earth-observation-data/

LU2: SUSTAINABLE AGRICULTURE

- http://naturathlon.info/fileadmin/BfN/landwirtschaft/Dokumente/BfN-Agrar-Report_2017.pdf
- Bundesinformationszentrum Landwirtschaft, https://landwirtschaft.de/landwirtschaft-verstehen
- Mit High-tech zu mehr Nachhaltigkeit, https://agrarwirtschaft-info.de
- Informationsportal proplanta, https://proplanta.de
- Hamburg Open Online University, https://hoou.de
- Food and Agriculture Organisation of the United Nations, https://fao.org/sutainability
- Nachhaltiger Ackerbau,
  https://www.de.wikipedia.org/w/index.title=Nachhaltige_Landwirtschaft&oldid=215207095
- Lexikon der Nachhaltigkeit Achener Stiftung Kathy Beys,
  https://www.nachhaltigkeit.info/artikel/nachhaltige_landwirtschaft_1753.htm
- https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Bodenschutz/eckpunktepapier_ackerbaustrategie_bf.pdf
- https://www.researchgate.net/profile/John-Reganold/publication/260785326_Sustainable_Agriculture/links/548fae360cf2d1800d86298f/Sustainable-Agriculture.pdf

LU3: WATER MANAGEMENT

- https://www.youtube.com/watch?v=M3G5WSylJaY
- https://wmodr.pl/files/lzgVeUCvqQ44AzTm8wJLrUPkrWAotmpEdI5anhAd.pdf
- https://www.cdr.gov.pl/images/Brwinow/RFN/XIII_RFN/Romuald_Zmuda.pdf
- https://www.podrb.pl/doradztwo/ekologia/racjonalne-gospodarowanie-woda-w-rolnictwie
- Karaczun Z.M., Kozyra J. 2020. Impact of climate change on food security of Poland. SGGW Publishing House. Warsaw

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- https://www.agro.basf.pl/pl/bioroznorodnosc/woda/

- KLIMAT Project. Preparation of water needs assessment taking into account variant climate change projections, Task 3: Sustainable management of water, geological and forest resources of the country. IMiGW, Warsaw, 2010

- https://wody.gov.pl/nasze-dzialania/krajowy-program-renaturyzacji-wod-powierzchniowych

- https://www.podrb.pl/doradztwo/ekologia/racjonalne-gospodarowanie-woda-w-rolnictwie

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- Ślusarczyk E. 1975. Determination of general and useful retention in basic species of arable soils in the years 1971-1975, published by IUNG, Puławy

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- Wawer R., Matyka M., Łopatka A., Kozyra J. 2016. decision support systems in agricultural crop irrigation

- https://koalicjazywaziemia.pl/ekspertyza-woda-w-rolnictwie/

- https://raport.togetair.eu/woda/susza-marnotrawstwo-wody-i-ekstremalne-zjawiska-pogodowe/zasoby-wodne-w-procesie-zrownowazonego-zarzadzania

LU4: SUSTAINABLE WEED AND PEST MANAGEMENT

- https://www.sciencedirect.com/science/article/pii/S0168169918312869

- Nachhaltige Agrarproduktion (bmbf/de/forschung/energiewende-und-nachhaltiges-wirtschaften/bioökonomie/nachhaltige-agrarproduktion_node.html;jsessionid=C4F085A55AFB9621CACEABF0357F261.live381)

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- How to practise Integrated Pest Management?

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