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AGRILEARN

Exploring new technologies to enhance the skills of people in rural areas, aiming to environmentally-friendly digital agriculture to tackle climate change

AGRILEARN

Research of current good practices, needs, and interests of the target group report

LEAD BY: AUA

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Contents

1. Scope of the deliverable:

The purpose of this deliverable is to explore the current good practices, needs, and interests related to digital and smart agriculture, with a focus on rural areas. The AGRILEARN project aims to enhance the skills of farmers and agricultural professionals by providing them with knowledge and tools related to environmentally-friendly digital agriculture, as part of a broader effort to address climate change. This report serves as a foundation for the development of tailored Vocational Education and Training (VET) materials, with the goal of equipping farmers with the technical, entrepreneurial, and climate-smart skills necessary to adopt innovative agricultural practices.

Through research and the analysis of responses from farmers in Spain, Cyprus, the Netherlands, and Greece, this report identifies the key drivers and challenges in smart agriculture adoption. The insights gained from this analysis will guide the creation of VET materials that are designed to meet the diverse needs of farmers, facilitating the transition toward a more sustainable, productive, and climate-resilient agricultural sector.

2. Research of current good practices related to digital/smart agriculture.

2.1 Projects

SMART FARMING Erasmus+ KA2

Smart Farming can be seen as the use of sensing technology and digitalization in agriculture to atomize, guide and optimize management and agricultural activities for crops and livestock production through the wide analysis and capitalization of collected information and data. Precision agriculture (PA) is an important aspect of smart farming and can be defined as a management strategy that gathers, processes and analyzes temporal, spatial and individual data and combines it with other information to support management decisions according to estimated variability for improved resource use efficiency, productivity, quality, profitability and sustainability of agricultural production. In practice, PA typically, but not necessarily relies heavily on new technologies and digitalization. Especially positioning systems, sensor technologies, automation, robotics and digitized auxiliary data like elevation models, weather data, soil unit mapping and satellite data. This joint project aims to develop comprehensive educational programs and tools to address the current demand and anticipate the future needs of the agricultural industry in Europe.

Akmi International - AGRIFOOD4FUTURE

AGRIFOOD4FUTURE is a world-class ERASMUS+ initiative aimed at building VET skills and educational programs addressing the needs of the “agriculture of the future”. By bringing together European leading actors from VET-academia-research-business across regions with tradition in the agri-food (yet lagging in new practices adoption), we aim at building centers of vocational excellence able to respond to existing and emerging needs in the sector, while targeting the key priorities of the sector: digitalization, decarbonization and sustainability. Scientists, policymakers, and open-visioned agrifood players have noted the transformative potential of new and emerging agriculture practices, such as climate-smart agriculture, smart farming, precision agriculture, regenerative and organic practices, NEXUS-based approach to agri-food, etc., but found difficulties to implement it at large scales. Barriers such as the insufficient level of awareness, soft and technical skills, and limited entrepreneurial mindset of, usually, more conservative farming professionals have been inhibitors of change. Aligned with the need to write new narratives for the “agriculture of the future” we aim to implement and develop vocational training and educational systems from low to higher EQF levels, including lifelong learning tools for farmer advisors, SMEs, and agro-food players. AGRIFOOD4FUTURE will provide them with exemplary best practices and advances in the sector. It will equip them with technical, soft, and entrepreneurial skills towards new ventures and an innovative mindset. It will foster

perception change and acceptance of the agro-food sector as a "bright" vocational career option while preparing the sector for the adoption of smart, advanced, and sustainable practices.

Smart Agriculture Training & Implementation (SATI)

This project is an effort from the VET point of view to digitize agriculture in the European area, taking into account the steps that have been made by the European Parliament and the Commission.

AgriSmart

The E+ AGRISMART project is the result of a strategic partnership of 6 European countries, aiming at adapting VET & WBL provisions to existing and emerging occupational needs & strengthening the climate-smart and digital skills of workers in agriculture. The EU has prioritised the promotion of sustainable agriculture, also referred to as "climate-smart" agriculture and has signed up to relevant international commitments. Digital technologies are central to the development of a smarter, resource-efficient, more competitive agricultural sector. The digital divide between urban and rural areas in Europe, a barrier towards this goal, persists, notwithstanding the EU's efforts and various activities to improve digital skills in rural areas. It should further be noted that in terms of initial and continuing education and training, the vast majority of farm managers in the EU rely solely on practical experience; Work-Based Learning (WBL) is, thus, vital for achieving the development of climate-smart and digital skills in the sector and, in turn, VET programs and WBL schemes need to update their offerings and skills portfolio to better address learners' climate-smart and digital skill training needs and to develop training opportunities for upskilling existing workers based on such competences. AGRISMART project's outputs will be some tools for responding to this challenge.

Demeter Project

DEMETER aims to put digital means at the service of farmers:

i. Using a human-in-the-loop model that constantly focuses on mixing human knowledge and expertise with digital information.
ii. Focusing on interoperability as the main digital enabler, extending the coverage of interoperability across data, services, platforms, M2M (machine to machine) communication, and online intelligence but also human knowledge, and the implementation of interoperability by connecting farmers, advisors and providers of ICT solutions and machinery.
iii. Transforming the sector by building the solution on an array of digital technologies: Internet of Things, Earth Observation, Big Data, Artificial

Intelligence, and of digital practices: cooperation, mobility and open innovation.

SmartAKIS – Smart Farming Thematic Network

Smart-AKIS has implemented a multi-actor innovation process following a bottom-up approach, integrating information gathered at the European level with the findings and insights gathered through surveys and workshops at the grassroots level in the project's Innovation Hubs. As a result, a number of policy gaps and briefs have been elaborated, following a thematic approach that aims at covering the most relevant areas for policy development for the adoption and uptake of Smart Farming in the EU.

AGREEN Project

The project "Cross-Border Alliance for Climate-Smart and Green Agriculture in the Black Sea Basin" /AGREEN/ aims to build capacities for networking and a transnational knowledge-transfer base to escalate the drive for establishing climate-smart farming and maintaining higher rates of economic and social fulfilment as it is the evolution and future.

The AGREEN project promotes the concept of climate-sustainable agriculture as an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate.

NEFERTITI Farm Demo

Project Networking European Farms to Enhance Cross Fertilisation and Innovation Uptake Through Demonstration (NEFERTITI) is a unique Network (selected under Horizon 2020, Societal Challenge 2, RUR 12-2017 call) comprising 32 partners and coordinated by ACTA, the head of Network of the French Agricultural Technical Institutes. Under the project NEFERTITI 10 interactive thematic networks will be established bringing together 45 regional clusters (hubs) of demo-farmers and actors involved (advisors, NGOs, industry, education, researchers and policy makers) in 17 countries. The project NEFERTITI focuses on creating added value from the exchange of knowledge, actors, farmers and technical content between networks in order to boost innovation uptake and to improve peer-to-peer learning and network connectivity between farming actors across Europe. In the end, it all contributes to a more competitive, sustainable and climate-smart agriculture.

Bodossaki Foundation

Bodossaki Foundation funded a programme for smart agriculture. The innovative Smart Farming programme is the result of the partnership between the Bodossaki Foundation, AB Vassilopoulos and the American Farm School, to support Greek primary production. The programme introduces new technologies in Greek primary

production and is an important step for the development of intelligent agriculture in our country. With the installation of 12 state-of-the-art telemetry systems in selected areas across the country, producers have access to accurate, real-time, mapped information made directly available on their computers or mobile devices. This will enable them to make informed decisions based on important meteorological and soil parameters. This equipment was further enhanced with appropriate software, to maximise the benefits to local producers. In practical terms, the programme is directly benefiting about 155 farmers, while this number will significantly increase with the addition of indirect beneficiaries, who will have access to an open data platform to be developed and made publicly available.

TERRATECH Project

The masTERs course on smArt Agriculture TECHnologies (TERRATECH) project aims to develop an advanced interactive certified MSc course related to Agricultural IoT applications that will train individuals with the necessary skills & knowledge to work in the rising “Smart/Precision Agriculture” industry. For this project, six academic institutions, five SMEs, one research center and two agricultural/farming-related entities, residing all over Europe in Austria, Bulgaria, France, Greece, Hungary, Italy, Latvia, Netherlands, Portugal and Spain joined to create an MSc on Smart Agriculture Technologies.

BEATLES Project

BEATLES aspires to change the way agri-food systems currently operate and accelerate the systemic and systematic behavioural shift to climate-smart agriculture and smart farming technologies fully aligned with the ambitions of the Farm to Fork and Biodiversity Strategies, and the new CAP at regional and EU levels. By adopting a food systems approach, the agri-food value chain is viewed as a system of interlinked components where interactions lead to systemic innovations. Through targeted selection of agri-food value chains across the EU and by engaging multiple stakeholders in the co-creation of systemic innovations, in the context of appropriate behavioural and experimental settings, the project will provide an integrative inventory of behavioural insights about the full range of “lock-ins” and levers that hinder or motivate behavioural change, including individual, systemic and policy factors.

Kenya - Climate Smart Agriculture Project

The objective of the Climate Smart Agriculture Project for Kenya is to increase agricultural productivity and build resilience to climate change risks in the targeted smallholder farming and pastoral communities in Kenya, and in the event of an Eligible Crisis or Emergency, to provide an immediate and effective response. There are five components to the project, the first component being upscaling climate-smart agricultural practices. This component will finance interventions that promote and

facilitate the adoption of TIMPs to achieve the CSA triple-wins of increased productivity, enhanced resilience (adaptation), and reduced GHG emissions (mitigation) per unit of output (as co-benefits). The second component is the strengthening of climate-smart agricultural research and seed systems. This component will support the development, validation, and adoption of context-specific CSA TIMPS to target beneficiaries under components one and three and also develop sustainable seed production and distribution systems. The third component is the supporting agro-weather, market, climate, and advisory services. This component will finance the development of agro-weather forecasting and marketing information systems and their dissemination tools through three subcomponents: improving agrometeorological forecasting and monitoring; using big data to develop a climate-smart, agro-weather and market information system and advisories; and building institutional and technical capacity for agro-meteorological observation and forecasting, agricultural statistics collection and analyses, and market advisory services. The fourth component is the project coordination and management. This component will finance activities related to national and county-level project coordination and management, including developing annual work plans and budgets (AWP&Bs), fiduciary aspects (financial management and procurement), human resource (HR) management, safeguards compliance monitoring, development and implementation of a Management Information System (MIS) and ICT-based platforms, monitoring and evaluation (M&E) and impact evaluation (IE) studies, and a communication strategy and citizen engagement. All decision-making bodies will include both men and women. Finally, the fifth component is the contingency emergency response. This zero-cost component will finance eligible expenditures under the Immediate Response Mechanism (IRM) in case of natural or man-made crises or disasters, severe economic shocks, or other crises and emergencies in Kenya.

Flanders Research Institute for Agriculture, Fisheries and Food – ILVO

Flanders Research Institute for Agriculture, Fisheries and Food (ILVO) is an independent scientific research institute of Flanders' Government. ILVO's task is to generate knowledge for more sustainability in the agriculture, fisheries and agri-food sectors. Starting from a strong anchor in Flanders, their work extends throughout Belgium, Europe and the rest of the world. The mission of ILVO is clear and remarkably contemporary: to build knowledge that will make it possible to produce enough healthy and varied food for the 10 billion people that the world will need to feed while staying within our planetary limits.

SmartAgriHubs

Summary: SmartAgriHubs is an EU project under the Horizon 2020 instrument and brings together a consortium of well over 164 partners in the European agri-food sector. The project aims to realise the digitisation of European agriculture by fostering an agricultural innovation ecosystem dedicated to excellence, sustainability and

success. It involves a network of Digital Innovation Hubs (DIHs) that provide support, knowledge, and expertise to farmers and agribusinesses. The project aims to boost the adoption of digital technologies in agriculture and offers training programs and educational resources.

INTRODUCING INTERNET OF FOOD & FARM 2020

Summary: IoF2020 is a European project that focuses on the deployment of IoT technologies in agriculture. While its primary goal is research and implementation, the project contributes to knowledge dissemination and training. It involves various stakeholders, including farmers, technology developers, and researchers

EIT Food

Summary: EIT Food is part of the European Institute of Innovation and Technology (EIT) and focuses on transforming the food system through innovation. EIT Food supports various educational programs, accelerators, and events that promote digital literacy and entrepreneurship in the agri-food sector.

European Network for Rural Development (ENRD)

Summary: The European Network for Rural Development (ENRD) acts as a hub for connecting rural Europe and serves as a platform for the sharing of ideas and experiences on how RDPs are working in practice, plus how they can be improved in all Member States.

ENRD work to fulfil this role includes: i) Knowledge development to inform rural development thinking (expert analysis of RDPs, identification of good practice etc.) ii) Events, including Seminars, Workshops and Thematic Group meetings to support networking, exchange and learning between EU rural development stakeholders iii) Communication outputs to disseminate views, opinion and knowledge (website, networking magazine, thematic publications, newsletter etc.)

Educational Institutions and Research Centres

Summary: Agricultural universities and research institutions across the EU have been actively involved in developing courses and training programs related to smart agriculture. These programs cover various aspects, including precision farming, data management, and digital technologies. In Greece, the Training and Lifelong Learning Center (KEDIVIM) of the Agricultural University of Athens (AUA), is a Unit of the Agricultural University of Athens, that ensures coordination and interdisciplinary cooperation in the development of training programs, continuous education and lifelong learning in general, based on the National and European institutional framework for Lifelong Learning. There are also European Online Courses and Training Materials. Examples of that are FutureLearn European Institute of Innovation & Technology (EIT) offers courses that may focus on smart agriculture within the

European context. Wageningen University in the Netherlands is renowned for its work in smart agriculture and provides online courses but it is also collaborating with other educational Institutions on research projects funded by the EU.

iBO Institute

The Institute for Bio-Economy and Agri-Technology (iBO), is one of the five Institutes of the Centre for Research and Technology – Hellas (CERTH), a legal entity governed by private law with non-profit status, supervised by the General Secretariat for Research and Technology (GSRT) of the Greek Ministry of Development and Investments. The domains of expertise are 'Agro Intelligence', 'Energy- Sustainability', ' Ergonomics-Biomechanics'. iBO focuses on the scientific field of agri-technology and the broader scientific area of biosystems engineering under the integration of multi-disciplinary and inter-disciplinary specializations and research units. At the same time, iBO's research priorities include rational environmental management and sustainability assessment of bio-production activities, and the optimisation of human interactions within these activities, all in the direction of adopting the principles of the circular economy.

Ecologic Institute: Science and Policy for a Sustainable World

Ecologic Institute is an independent, academic think tank for environmental research and policy analysis. Since its founding in 1995, Ecologic Institute has been dedicated to improving environmental policy, sustainable development and policy practice. We strengthen the European and international dimensions in research, education and environmental policy discourse.

CopaCogeca

Copa and Cogeca are the united voices of farmers and agri-cooperatives in the EU. Together, we ensure that EU agriculture is sustainable, innovative and competitive while guaranteeing food security for 500 million people throughout Europe.

CGIAR Research Program

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) marshals the science and expertise of CGIAR and its partners to catalyse positive change for climate-smart agriculture (CSA). CCAFS positions CGIAR - the world's largest agricultural research partnership - to play a major role in bringing to scale the practices, technologies and institutions that enable agriculture to meet triple goals of food security, adaptation and mitigation. CCAFS' work is carried out with the kind support of the CGIAR Trust Fund donors and through bilateral funding agreements. CCAFS uses the concept of climate-smart agriculture to structure its approach to climate-responsive options. Climate-smart agriculture (CSA) is an integrative approach to address these interlinked challenges of food security and climate change, that explicitly aims for three objectives:

i. Sustainably increasing agricultural productivity, to support equitable increases in farm incomes, food security and development.
ii. Adapting and building resilience of agricultural and food security systems to climate change at multiple levels; and
iii. Reducing greenhouse gas emissions from agriculture (including crops, livestock and fisheries).

AgriSkills

Agriskills consists of five European partners from Germany, Greece, North Macedonia, Austria, and Slovenia, united with a mission to support sustainable development in rural areas across Europe at the regional level. Agriskills' team boasts extensive experience in business development, vocational training, digital technologies, innovation management and regional development. Its primary focus revolves around five key activities:

i. Identifying skills gaps in digital agriculture, business development, and financing.

ii. Developing a multilingual training course to enable farmers, agribusinesses, and other stakeholders to identify and exploit growth opportunities through the application of digital technologies.

iii. Building the AgriSkills 4.0 e-Learning Platform and mobile app for self-paced, blended learning and open online courses for farmers, VET providers, and agricultural entrepreneurs working in rural areas.

iv. Collecting good practices and describing use cases and initiatives in the field of digital technologies, relevant skills and competences.

v. Organizing multiplier events to launch an AgriSkills Training Course and disseminate all collected good practices, use cases, and initiatives in digital farming and skills building.

Trust Food

TRUSTFOOD is a Digital Europe project that designs and delivers short-term training courses for upskilling and reskilling of the labour force, with a particular focus on SMEs owners, managers, and employees in the Food Supply Chain sector. The aim of this project is to support the development of advanced digital skills of people in the labour force, with a focus on SMEs, as well as to job seekers by providing access to high-quality specialised training courses, reflecting the latest developments in the area of Blockchain technologies applied holistically to the Food Supply Chain. The courses will be highly practical and will provide specific knowledge about key digital technologies of Blockchain and their applications to the Food Supply Chain. The courses will be also focusing on job seekers in the particular area.

Climate Farm Demo

Climate Farm Demo is a unique pan-European network of Pilot Demo Farmers (PDFs) covering 28 countries and all pedo-climatic areas. Its overall aim is to accelerate the adoption of Climate Smart Farming (CSF) practices and solutions by farmers and all actors of the Climate Smart Agriculture Knowledge & Innovation Systems (AKIS) with a view to adapting agricultural production systems to climate change and to achieving a carbon neutral agricultural sector by 2050, thereby meeting the targets of the EU Climate strategy.

To reach this objective, the project adopts a MultiActor approach by connecting 1500 Pilot Demo Farmers and their Climate Farm Advisors (CFAs) at European and national levels to increase knowledge exchange & cross-fertilisation in their respective AKIS. The CFA's will support the PDFs in implementing Adaptation and Mitigation Measures suggested by contextualized guidelines and will assess & monitor their environmental performance thanks to harmonized methodologies & tools.

Technical and social innovations covering a broad range of thematic areas will be demonstrated to the wider farming community across six annual demo campaigns by organizing 4500 demo events and supporting interactive and peer-to-peer learning. New and innovative CSF solutions will be co-created in 10 Living Labs spread across Europe, and lessons learned from multi-actor innovation will be shared and scaled.

A set of public and private rewarding mechanisms will be identified, proposed, and demonstrated to the AKIS actors, thus incentivizing the uptake of CSF solutions while ensuring sustainable business models. Strategic and operational cooperation will be organized with projects, flagship initiatives, and policymakers at European and national levels in order to share knowledge, organize coordinated actions, and produce policy briefs. Finally, to accelerate the wide spreading and uptake of results, an ambitious dissemination, exploitation, and communication strategy will be deployed at the EU and national levels

2.2 Horizon 2020 programs

The EU's Horizon 2020 program has funded various projects related to smart agriculture. This program supports research and innovation initiatives, and some projects have a focus on developing technologies for precision farming, data analytics, and automation in agriculture.

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AGRILEARN

Network for the exchange and transfer of innovative knowledge between European wine-growing regions to increase the productivity and sustainability of the sector

Summary: Winetwork is a European collaborative project for the exchange and transfer of innovative knowledge between European wine-growing regions to increase the productivity and sustainability of the sector. For 3 years, 11 partners from 7 European countries exchanged their knowledge on two important diseases in vineyards: grapevine trunk diseases (GTD) and Flavesence dorée (FD). These diseases have been extending for several years in different European countries, with big economic importance on the European wine industry. As many winegrowers are testing innovative and sustainable approaches to fight these diseases, it is very beneficial to collect and share these ideas between European countries. The project approach is based on interactions between a network of Facilitator Agents (FA), regional technical working groups (TGW) and two scientific working groups (SWG). The Winetwork project has directly and regularly involved around 451 people to collect, identify and synthesise best practices and research results from all of Europe to present and share them with the whole community. The overall objective of the Winetwork project is to close the research and innovation gap by setting up a thematic network for the promotion of an interactive innovation-driven research ecosystem applied to the wine-growing sector. After 36 months of work, several conclusions can be drawn:

i. A powerful network of facilitator agents and a European professional people exchanging on two diseases has been built
ii. The methodology to improve exchange between research and practices and to detect innovation has been proven efficient
iii. The facilitator-agent profile has been proven crucial for bridging the gap
iv. A European reference website of knowledge on grapevine trunk diseases and FD: the knowledge reservoir
v. A wide range of created material synthesizing updated knowledge of GTDs and FD has been made available
vi. Sustainability of the created network and knowledge has been performed due to the free and easy access of all the material created through the knowledge reservoir
vii. The methodology of this project can be very useful to replicate in other similar initiatives but with wider stakes and impacts

Optimised Pest Integrated Management to precisely detect and control plant diseases in perennial crops and open-field vegetables

The overall objective of OPTIMA is to develop an environmentally friendly Integrated Pest Management (IPM) framework for apple scab in apple orchards, downy mildew in vineyards and Alternaria leaf blight in carrots by providing: (i) combined use of bio-PPPs and synthetic PPPs, (ii) Decision Support Systems (DSS) for disease prediction, (iii) spectral disease detection systems and (iv) precision spraying techniques.

Sensors and daTA tRainiG towards high-performance Agri-food sysTEms (STARGATE)

Summary: STARGATE aims to enhance the ability of the Centre for Biotechnology and Fine Chemistry (CBQF) of the Catholic University of Portugal (UCP) to respond to a key challenge: to evolve the agri-food system's practice to promote more resilient and sustainable systems, starting from more resistant, nutritious and diverse crops at the farm level, to guarantee safer, healthier and sustainable options for consumers. This will be attained by increasing CBQF's knowledge of high-tech sensors and phenotyping technologies with the perspective to develop predictive models relating to more resilient crops, robust to climate change and integrated into circular agriculture. These technologies have the potential to ultimately lead to benefits for society, regarding increased production, efficiency, quality and sustainability.

STARGATE intends to:

i. Strengthen scientific excellence at UCP in the use of phenotyping, multi-omics, signal and image data management and analysis tools and development of predictive models for crop performance towards food chain decisions.
ii. Strengthen innovation capacity and interactions with the industry, promoting UCP's autonomy to collaborate with farmers and industry in this area, performing early-stage monitoring of agri-food production systems to understand and improve performance in downstream steps of the food chain, promoting advanced innovation transferable to the agri-food sector;
iii. Boost competencies in research management, communication and proposal preparation, to maximise the impact of UCP's activities and improve success in securing international funding;
iv. Establish the foundation for the STARGATE Knowledge Hub in Portugal, bringing together transdisciplinary expertise, to exploit and realise the potential of sensor-based, signal, image and multi-omics data, towards sustainable food systems, fostering innovation and partnerships with the private sector.

To achieve these objectives, a comprehensive set of training activities and active engagement with different agri-food chain stakeholders will be carried out.

reSilienT fARminG by Adaptive microclimaTe managEment

Summary: STARGATE develops a breakthrough, multiscale and holistic climate-smart agriculture methodology, capitalizing on innovations in the field of microclimate and weather risk management and in the field of landscape design. It is based on Earth Observation, weather/climate intelligence and IoT technologies to support more effective farm/parcel management and related options for adaptation to climatic changes. At the same time, local and regional policy formulation based on the STARGATE's climate-smart tools is leading to better landscape management, protection against climatic risks and implementation related to mitigation of microclimate changes. STARGATE is following the PPP model using the Living Lab approach, to shape a Climate-Smart Agriculture multi-actor regional framework by connecting research organizations, policy-making organizations, ICT companies, farmers and other stakeholders. Moreover, STARGATE studies the benefits of applying agri-environmental-climate technical solutions to achieve sustainable agricultural development at the field and landscape level including livestock farming and agroforestry. This means that STARGATE supports farm management modernization and at the same time, allows the understanding of the underlying ecological factors that shape the rural landscape.

Field-testing and demonstration of digital and space-based technologies with agro-ecological and organic practices in systemic innovation

Summary: Robotic traps, mobile robots for pesticide monitoring and 3D spot spraying are innovations aimed at reducing the use of pesticides and fertilisers. Developed by the EU-funded PestNu project, the aim is to field-test and demonstrate digital and space-based technologies and agroecological and organic practices (AOP). The project will develop real-time nutrient analysers and use Copernicus data to map soil and plant nutrients and pests. The technology will be interconnected to a user-centred cloud agricultural management system. Specifically, the project will test its solutions in aquaponic and hydroponic greenhouses and open-field vegetable cultivation in Greece and Spain. The AOP include on-site production of bio fertilisers from agriculture wastewaters through an automated drainage recycling system and advanced nutritional programmes for organic farming.

Agroecology for Europe

Summary: The world is facing a large number of challenges - degradation of soils, water quality due to high nutrient concentrations and occurrence of pesticide residues impacting food quality and human health, biodiversity loss, high food loss during processing and storage, food waste and access to food - which many are strongly impacting agriculture, food production and food systems. The recent pandemic Covid19 crisis as well as the war in Ukraine has stressed even more the necessity to

promote a drastic change of agricultural and food systems in Europe. In this respect, agroecology is increasingly seen as an important pathway as it designs, develops and promotes the transition towards sustainable farming and food systems (Wezel et al. 2018a). In the last decade, the concept has gained increased recognition in the scientific, agricultural and political spheres (IAASTD, 2009; IPES-Food, 2016), and with the United Nations and FAO (De Schutter, 2010; FAO 2015, 2017; HLPE 2019), embracing agroecology as a science, a set of practices, as well as a social movement (Wezel et al. 2009).

Although a certain development of agroecology and its different facets in Europe can be stated (Nicot et al. 2018, Wezel et al. 2018b), it remains so far too limited to allow a successful transition to sustainable agriculture and food systems. Therefore, a strong development with ambitious and longer-term joint actions at the European level is needed in research, innovation, training and education as well as in the funding domain. In order to foster and support the development of agroecology, the AE4EU aim to fulfil six key strategic objectives:

i. Increase connections between relevant actors through the mapping of agroecology in Europe aiming to describe and analyse the different contexts, realities and state of development of agroecology. Different workshops involving various stakeholders (from funders to NGOs) will be achieved as well as analysis aiming to connect relevant actors of initiatives, living labs, research infrastructures, funding schemes and policies with the final aim of building a European Agroecology Exchange Network of networks.
ii. Develop skills and methods for developing research infrastructure and living labs. Via the assessment of agroecological living labs and research infrastructure at the national and European level, the project will provide empirical evidence on how to successfully develop this type of initiative. This will provide the foundation to build toolboxes containing serviceable skills and tested methods facilitating the establishment, operation, monitoring and evaluation of agroecological living labs and research infrastructure.
iii. Prepare funders for increased and complementary funding of agroecology through the analysis of public and private funding schemes to identify potential adaptations to enhance cooperation and coordination of funders.
iv. Improve human and social capital with the set-up of a European Agroecology Exchange Network Hub as an online space to facilitate and foster the exchange of knowledge at the European level.
v. Improve capacity to tailor policy interventions to specific situations to enhance the understanding of current policy that could favour the development of agroecology and provide recommendations for future policies
vi. Provide in the medium and long term for research, innovation projects, and initiatives as well as enhanced knowledge and good practice. This will be achieved through the development of a road map and a European network of

networks to accelerate the transition towards sustainable farming practices by promoting networking, connectivity and place-based innovation in a co-creative environment.

Trapview - Automated pest-monitoring system for sustainable growing with optimal insecticide use

Summary: The Food and Agriculture Organization of the UN (FAO) is expecting that the world population will grow to 9 billion by 2050. This 25 per cent population growth will require a similar growth of food production, mostly through increasing the size of arable land and productivity (crop yields). Pest insects are one of the major obstacles in increasing food production. They destroy approximately 14 per cent of all annual crop production. Each year, almost 5 million tons of more than 600 different pesticide types are applied but only 1 percent is effective. This means that 99 per cent of sprayed pesticides are released to non-target soils, water bodies and the atmosphere, and absorbed by practically every living organism. In addition to health and environmental risks, there is also the risk that pests become resistant to pesticides because many growers are spraying too much or spraying at the wrong time. As a consequence, target pests become resistant to a particular chemical substance, rendering it ineffective for future use. Assessment of the exact time for spraying is usually made based on information gathered from pheromone traps for monitoring insect populations. This is very labor-intensive and time-consuming. The time needed to reach a proper crop protection decision often surpasses the time window for optimal crop protection application. If growers were alerted in real-time when the number of pests reached the economic threshold levels, insecticide efficiency would increase by more than 30 per cent. Growers, especially those with more than 100 hectares of cropland, are interested in solutions for daily pest monitoring that would help them decrease pest control expenses and use less pesticide.

Therefore, the overall objectives for the Trapview project are to:

i. Reduce the expense of growing healthy food (decrease the cost of manual field inspections and insecticide use).
ii. Reduce the amount of insecticide residues in food due to more optimal spraying times.
iii. Decrease the probability of pest insects becoming resistant to insecticides.
iv. Enable real-time alerts about insect pest situations in the fields to determine the exact time to spray to achieve optimal pesticide efficiency.

In order to achieve these, the following project goals were set for the project:

i. Develop reliable, robust and completely self-sustainable low-maintenance automated pest monitoring traps with functional mechanisms for changing sticky plates.
ii. Improve the accuracy of the state-of-the-art computer vision system that automatically identifies the pest insects in the images taken by automated traps.
iii. Further develop web and mobile applications that would serve the pest-related information to Trapview users in real-time.
iv. Predict insect occurrences on a broader geographical scale (where pest insects occur and how they move across regions) and commercialize the pest information.

SMART agriculture for innovative vegetable crop PROTECTion: harnessing advanced methodologies and technologies

Summary: SMARTPROTECT is a thematic network focusing on cross-regional knowledge sharing of SMART IPM solutions for farmers and advisors. The aim is to stimulate knowledge flow in the regional AKISs across the EU and connect these on the innovative potential of advanced methodologies for Integrated Pest Management (IPM) in vegetable production, integrating precision farming technologies and data analytics. Through a well-balanced consortium and an emphasis on a multi-actor approach, the outcome of the project and exploitation of its results will stimulate an increased adaptation of IPM methodologies, taking the specific regional needs of farmers across Europe into account. The EU-wide concern for environmental sustainability and economic competitiveness for agriculture requires the entire agriculture sector to grow under IPM conditions. This project develops a basis for a common EU approach to collecting, sharing, managing and disseminating knowledge on IPM in order to maximise the knowledge flow. Farmers from different European regions will thus dispose of the latest knowledge, best practices and practical tools for the implementation of IPM in their daily practice in crops in open fields and greenhouses. The project provides an e-platform for the exchange on a variety of innovative IPM techniques. We will benchmark practices in the frame of their socio-economic and regulatory context, select those with a high innovation potential and disseminate them through participatory events including cross-border exchange visits. Local and regional knowledge sharing will lead to interactive cross-regional seminars for farmers and advisors, resulting in a final SMARTPROTECT innovation rally. The project's results will be deployed through a targeted communication and wide dissemination strategy, providing an online data-sharing platform and close interaction with EU and national initiatives and projects, the National Rural Networks and the EIP-AGRI.

2.3 Online Courses

Coursera

Coursera is the global online learning platform that offers anyone, anywhere access to online courses and degrees from world-class universities and companies.

Online courses such as 'Discover Best Practice Farming for a Sustainable 2050', 'Transformation of the Global Food System', 'Challenges of Agribusiness Management', 'Strategies and Tools to Mitigate Agricultural Risk', 'Challenges of Agribusiness Management', 'Sustainable Agricultural Land Management'. There are also courses teaching 'Geographic Information Systems', 'Environmental Analysis' and 'Imagery Automation Applications'.

EdX Platform

EdX is the online learning platform from world-leading digital education company 2U, Inc. It was founded by Harvard and MIT as an experiment to make the world's best education available to everyone. Today, as part of 2U, edX connects over 81 million people worldwide with online learning that delivers real professional progress across nearly every career discipline, from artificial intelligence and robotics to sustainability and public health. It offers thousands of job-relevant programs designed to give every ambitious learner a path to achievement. Edx Platform also gives the ability for everyone interested in smart agriculture to enrol in courses which are all about it.

For example, the course 'WBGx: e-Learning on Digital Agriculture'. This course will provide a high-level overview of DAT concepts, potential impact, range of technologies available, used cases as well as forward-looking technologies. The course will introduce the participants to different agriculture data platforms already available and will encourage them to discover the scope and utility of the open data platforms for analytics and intelligence in agriculture.

Another course in the EdX platform that offers information on smart technology in agriculture is ' WageningenX: Drones for Agriculture: Prepare and Design Your Drone (UAV) Mission'. By taking this course, someone can learn how to plan an end-to-end mission (from image acquisition to data visualization) for a specific drone application and how to execute a drone mission safely.

4. Needs assessment analysis

From the demographics of the questionnaire, we can tell that most of the participants in Spain, Cyprus and Greece belong to the 25-45 age group with an exception in the Netherlands where the majority of them are 45-60 years old (Figure 1). This comes in agreement with the years of experience in the agricultural sector. The older the farmers are the more years of experience they have. In Cyprus, most had 5-10 years (33,3%) and 30% 20+ years of experience. Respectively in Spain, 53,7% of the participants had less than 5 years of experience and only 22% more than 20 years. The same in Greece where 44,4% belong to the age group of 25-35 and 48,9% of the participants have 5-10 years of experience. On the other hand, Netherlands older farmers are the majority and have more than 20 years of experience (50%) (Figure 2).

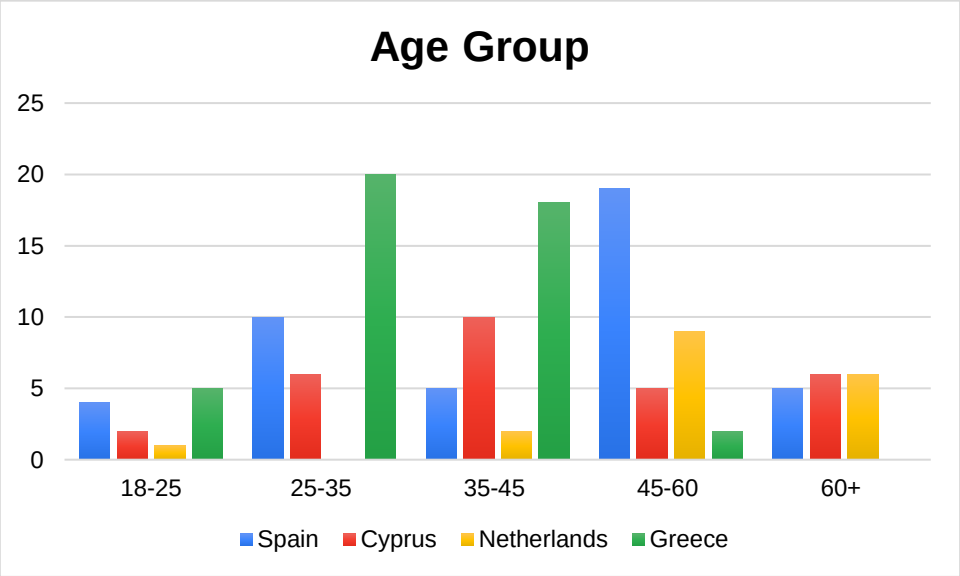

Figure 1: Age Group

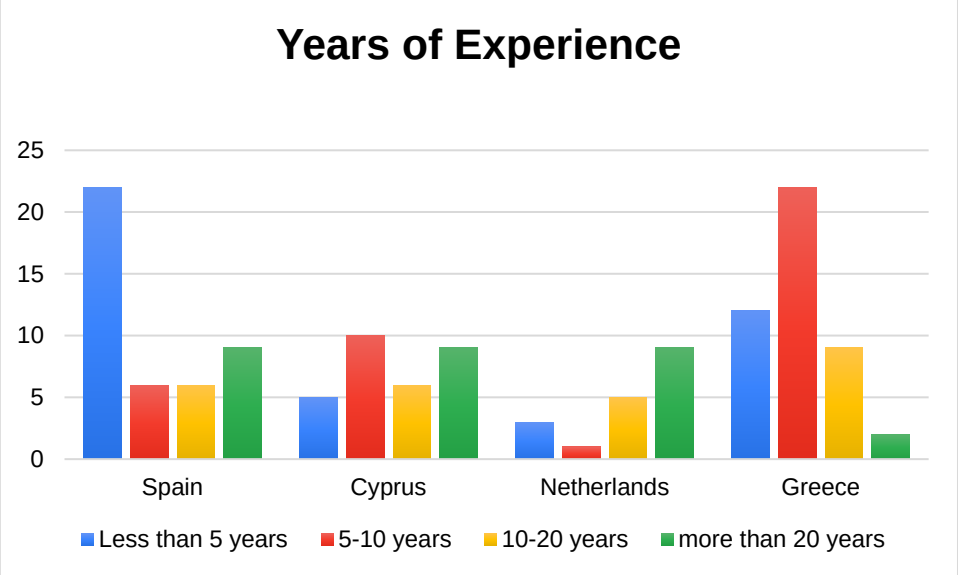

Figure 2: Year of Experience

In Greece, Cyprus and the Netherlands more than 70% of the respondents knew what smart/digital agriculture is. In contrast, Spain farmers where most of them (53,7%) don't know what smart/digital agriculture is. The ones who knew what smart farming is learning about it from university/school and web search. This comes in agreement with the fact that most of the farmers are quite young with little experience in the agricultural sector (Figure 3).

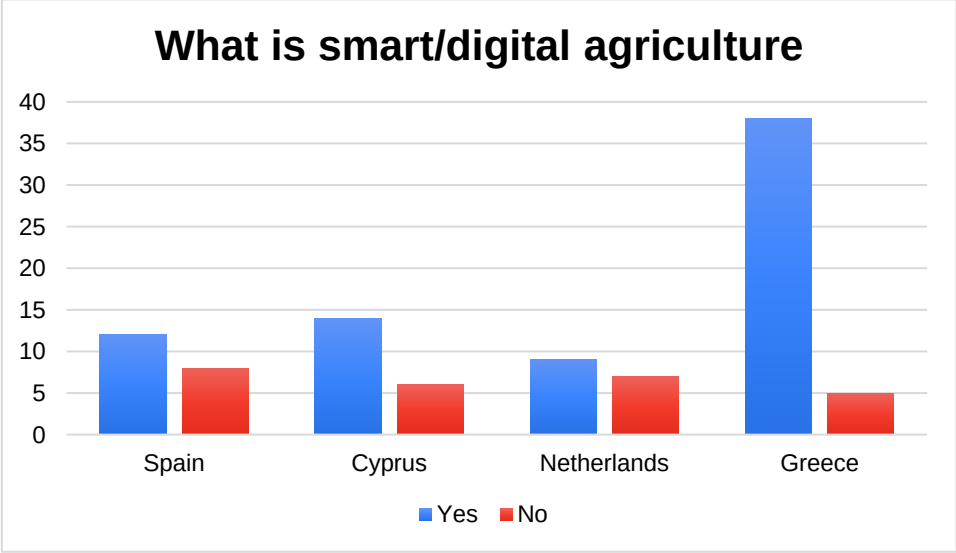

Figure 3: What is Smart Agriculture

In both the Netherlands and Cyprus, most of the farmers got to learn what smart agriculture is via the web, in Greece via Workshops/ Seminars and in Cyprus the majority of the respondents learned about it at school/university. In all countries, the answers indicate an even distribution since at least 55% of the respondents

who knew what smart technologies in agriculture are, already use smart technologies in their farms and their professional activities (Figure 4).

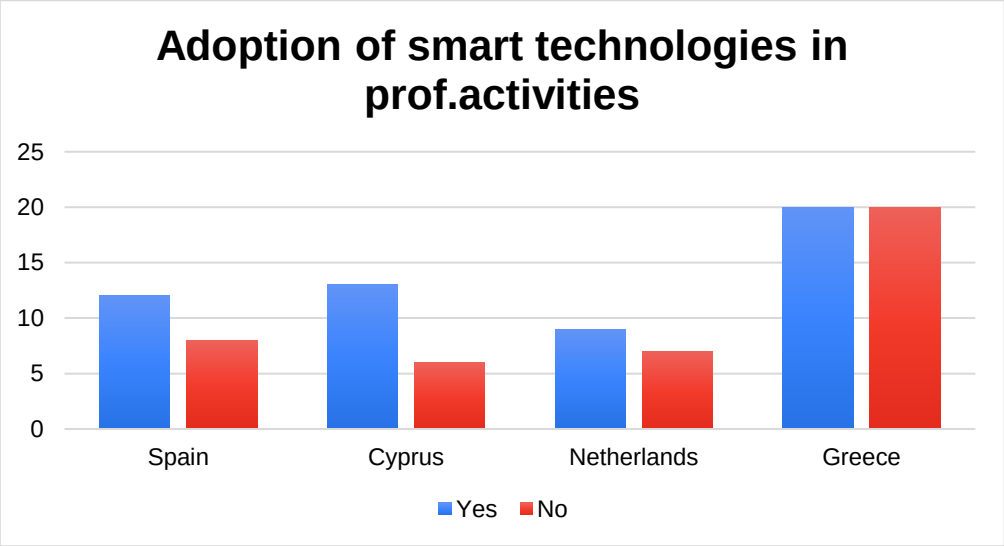

Figure 4: Adoption of Smart Technologies in Professional Activities

More than 55% of the respondents find it easy to use smart technologies in agriculture which explains why in the Netherlands, Cyprus and Greece most of the farmers use automated machines and weather station sensors in their crops and in Spain, most farmers use UAVs and automated machines (Figure 5).

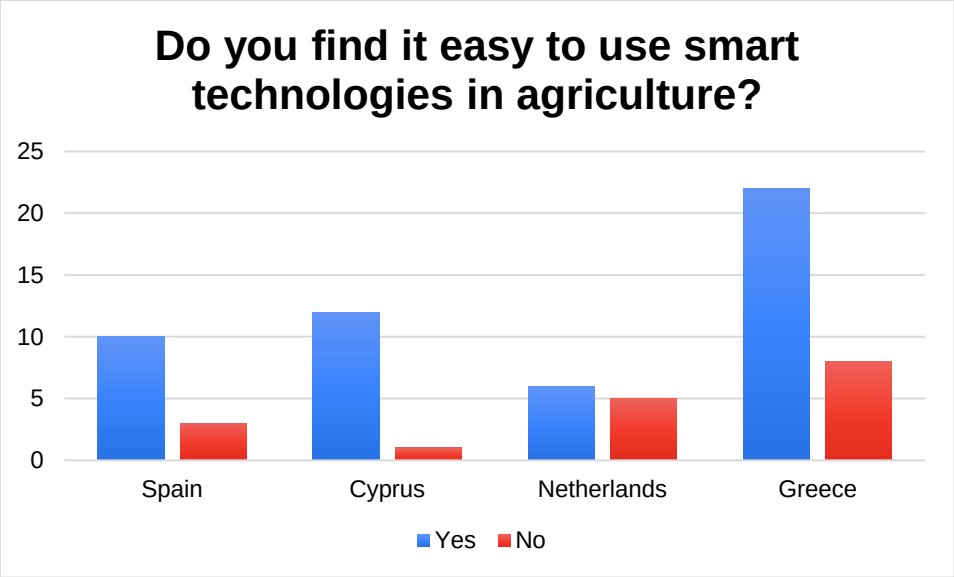

Figure 5: Ease of Use of Smart Agriculture Technologies

In Cyprus and Greece, most of the farmers haven't received formal training/education in smart agriculture. The ones who did receive any kind of formal training chose online courses. In contrast in the Netherlands and Spain where the majority of the farmers have received formal training (Figure 6) by showing preference for online courses and workshops but in the Netherlands do not find it easy to put into practice what they've learned, maybe because of the age group that most of the responders belong to.

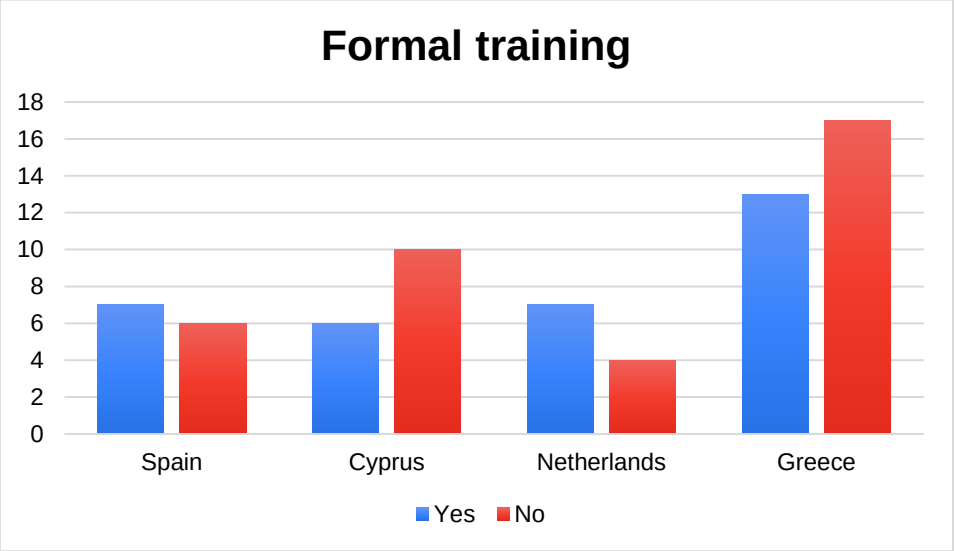

Figure 6: Formal Training

Contrariwise farmers from Cyprus and Spain find it easy to make use of what they learned about smart/digital technologies in agriculture (Figure 7).

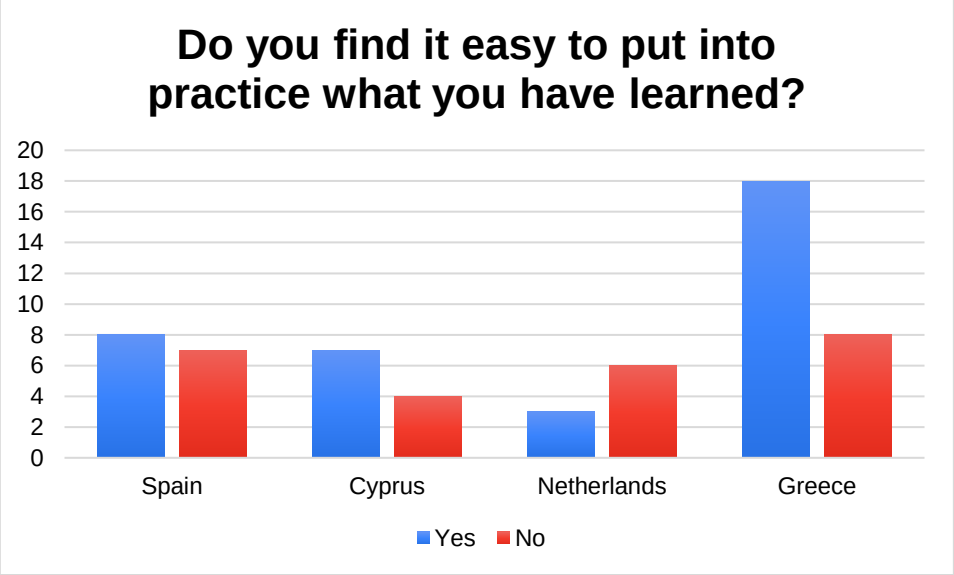

Figure 7: Ease of Putting into Practice what was Learned

In the Netherlands, farmers get informed about the latest developments/ achievements in smart agriculture via journals that have to do with smart technologies in agriculture. On the other hand, Greek, Spanish and Cyprus farmers use all kinds of media (web search, social media, seminars or journals) maybe it's because they are familiar with them because of their young age (most of them 25-35yo). The majority of respondents from all countries indicated that adopting smart technologies in agriculture will help crop production and only very few of them (7,7%) in the Netherlands and 3% in Greece, think that smart technologies will not help their crop production (Figure 8).

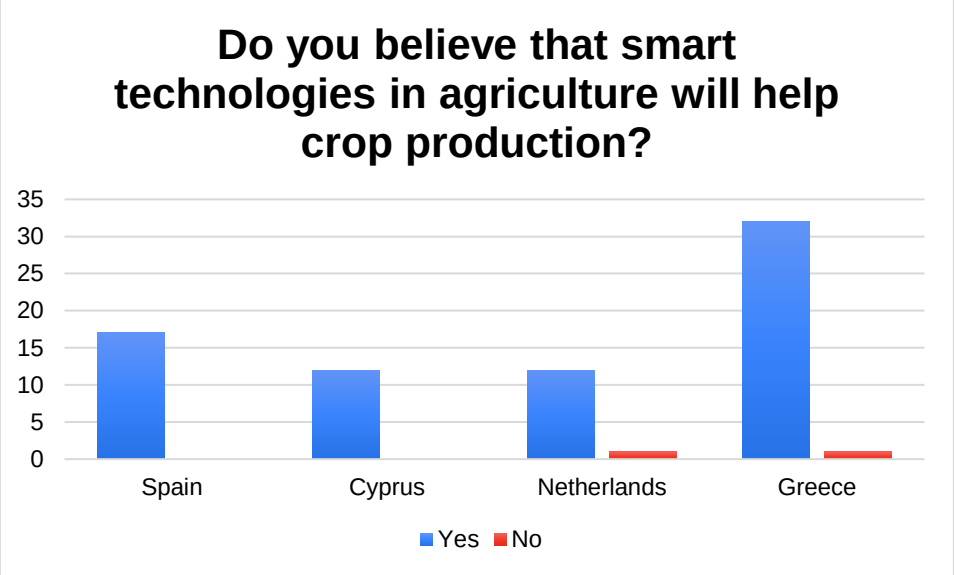

Figure 8: Opinion on whether Smart Agriculture Technologies will Help Crop Production

As far as the ways that will help farmers get familiar with smart/digital agriculture in the Netherlands taking courses and getting help from local farmer groups or cooperatives are the dominant answers. Not only that, having on-farm trials and pilot projects seemed a very preferable answer. On the other hand, in Cyprus, 50% of the responders voted for on-farm trials and pilot projects and 20% of them preferred courses/workshops to teach them how to. In Spain, there is a balanced distribution of the answers with less preference in getting help by consultancies or farm advisory services.

Farmers in all participating countries agreed that climate change and weather variability have affected their farming. Changes in average temperature and in precipitation patterns are the main factors that affect farmers' crops in these countries. This suits the fact that farmers in the Netherlands and Cyprus think that the main benefit of adopting smart technologies in agriculture will be the early weather warning system. Not only that but in Spain, farmers answered that also the cost of supplies and changes in market prices have a negative impact on their farming and finding. This justifies the fact that Spanish farmers believe that the main benefit of smart agriculture will be optimized resource use in order to reduce farming expenses. Generally, there is an even spread of responses across all options(Adaptive crop management, optimized resource use (water, fertilizers, pesticides etc.), early warning systems and climate-resilient crop selection), though, believing that smart agriculture can offer adaptive crop management by selecting crop varieties that are better suited to climate changing climate

condition in each region, optimize the use of resources such as water, fertilizers and pesticides etc. (Figure 9).

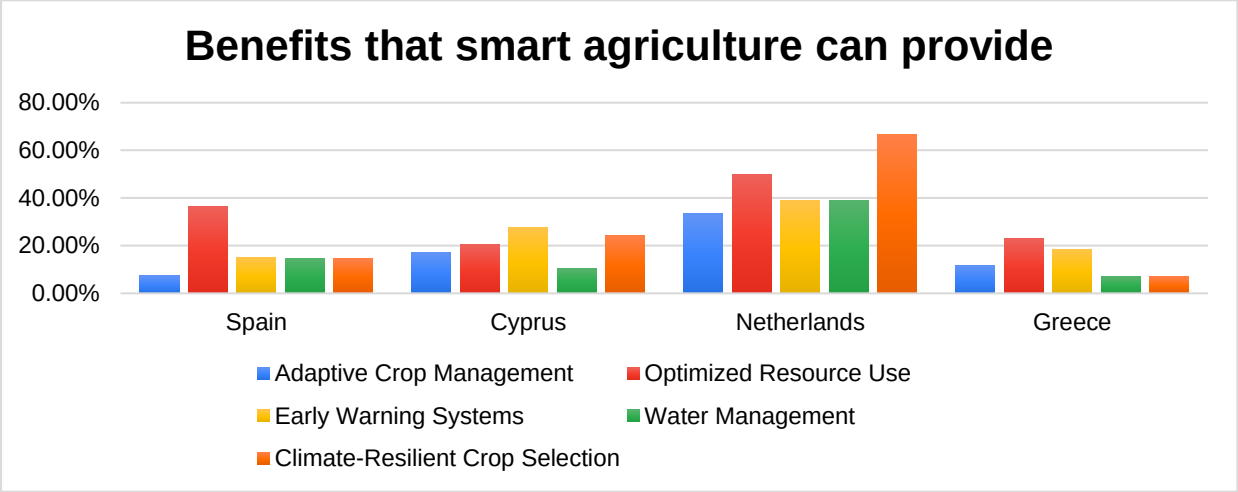

Figure 9: Benefits of Smart Agriculture

In the next question which was about the expectations of the farmers when adopting smart technologies in their farming, the most dominant answers were the increase of productivity and income for farmers in all countries. A remarkable result is that in both the Netherlands and Spain farmers are very aware of how harmful the emissions of greenhouse gases are and also, hope that smart technologies in farming will help reduce those gases.

The paradox is that in the Netherlands although farmers are quite informed about smart technologies in agriculture and their benefits, they don't seem interested in VET training, maybe because most of them are more than 60 years old, on the contrary farmers in Cyprus, Spain and Greece who are keen on having VET training (Figure 10).

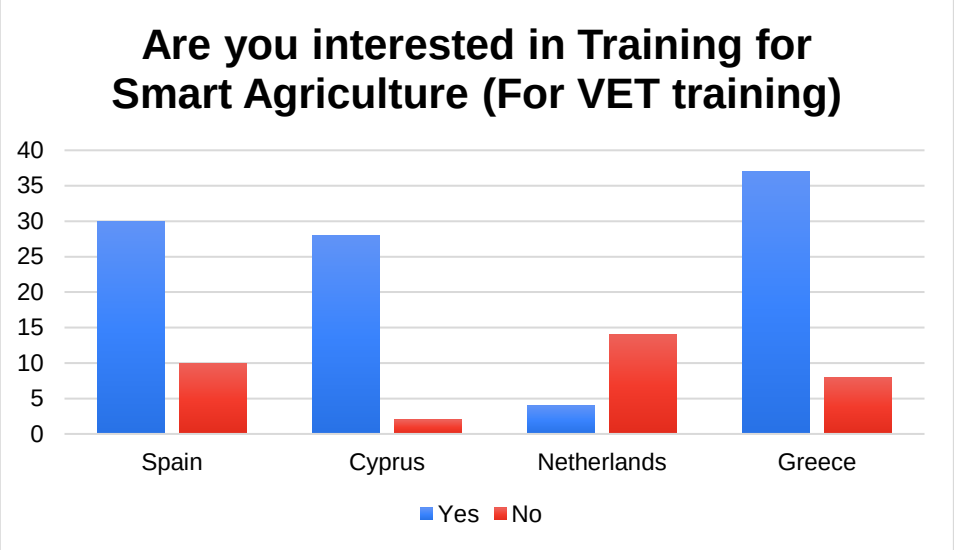

Figure 10: Interest in VET for Smart Agriculture

5. Key outcomes for the development of the VET material

The outcomes from the practices mentioned in Chapter 2 ('Research on current good practices related to digital/smart agriculture') directly contributed to the development of VET training materials for the project. Different projects focus on varying needs and themes, which together provide structured information on digital/smart agriculture. For example, some projects emphasize technologies such as precision agriculture, the Internet of Things, and automation. These practices can be integrated into VET materials so that farmers can be trained to use digital tools like sensors, drones, and automated machines to optimize farm management and improve productivity. Examples of such projects include SMART FARMING Erasmus+ KA2 and AGRIFOOD4FUTURE.

Climate change is a dynamic phenomenon that requires us to adapt to different circumstances using the best available tools. A substantial amount of work has been done to integrate smart agriculture solutions based on climate changes. Based on the research into good practices, projects like Climate Farm Demo and the AGREEN Project set the stage for adapting agriculture to climate change using smart technologies. VET programs can use these practices to teach climate-smart agricultural strategies, such as adaptive crop management, optimized resource use, and early warning systems.

A major challenge is the barriers that farmers and stakeholders face when adopting new technologies. Overcoming these barriers, such as a lack of

awareness and technical skills, can be achieved by creating accessible training programs that build both technical and soft skills. This enables farmers to adopt new technologies and develop an innovative mindset. For example, the AGRISMART project promotes this mindset by providing relevant training.

Combining insights from the questionnaires with the solutions identified through research in other projects suggests that the AgriLearn VET material should have a hybrid format, featuring both online and hands-on training courses and case studies to reinforce learning. This approach ensures that farmers and stakeholders of different ages and educational backgrounds can engage with the educational material. Beginning with the basic principles of smart/digital agriculture will help farmers progress to more advanced techniques and technologies that can have a tangible impact on their production. This same principle has been followed by the TERRATECH project, which emphasizes interactive courses related to smart agriculture IoT applications. Based on this model, the AgriLearn VET materials can be designed using a modular, blended learning approach, combining theoretical knowledge with hands-on, technology-based skills. Additionally, mentorship opportunities are important to support older farmers who may struggle to implement digital agriculture practices.

The questionnaires' analysis provided several insights into the adoption and use of smart/digital agriculture technologies across different countries, focusing on Spain, Cyprus, Netherlands and Greece.

Starting off with the key findings, we have some based on demographics and experience, awareness and adoption of smart agriculture, training and ease of use, perceived benefits and challenges and the main outcome: interest in further training.

The demographic results from the questionnaires showed diversity in opinions regarding the adoption of smart/digital technologies in agriculture. Younger farmers are more open to adopting these technologies, while older farmers may face challenges due to unfamiliarity with digital tools. Therefore, the VET material must be user-friendly and highly accessible. It should be designed with multiple learning paths. For younger, tech-savvy farmers, the materials can introduce advanced tools and technologies like drones, automation, and smart sensors. For older, less experienced farmers, the focus should be on simplifying the use of technology through practical guides and demonstrations. The training materials should also be tailored to farmers' current knowledge levels. Introductory modules are crucial, so that every farmer or stakeholder who uses the material can maximize their understanding and application of smart/digital agriculture.

In conclusion, the analysis highlights a strong interest in smart agriculture, especially among younger farmers, and identifies key areas for improvement, such as making training more accessible and practical for older farmers. Climate change adaptation and resource management are seen as critical drivers for adopting these technologies.

Moreover, Vocational Education and Training (VET) materials should emphasize the benefits of smart agriculture. Demonstrating successful case studies makes the concepts more tangible than just presenting them theoretically. Additionally, there is strong interest in smart agriculture training, although older farmers seem less interested, likely due to the perceived complexity of new technologies. This is why the training should be flexible, with self-paced modules to accommodate different learning speeds and preferences.

Key Components of AgriLearn VET Material:

1. Modular structure to address different knowledge levels and preferences.
2. Hands-on learning: Including field demos, case studies, and real-world applications.
3. Blended learning: Combining online tools, videos, and other resources to suit diverse learning preferences.
4. Cost-benefit analysis: Demonstrating the economic advantages of adopting smart agriculture practices, as farmers and stakeholders are interested in improving both quality and quantity with reduced human labor.

To create effective VET material for smart agriculture, it's crucial to align the content with the needs, preferences, and challenges identified in the analysis from your document.

Because of the generation gap among farmers in the participating countries, we focused our efforts on creating a tailor-made material. That not only will be user-friendly but also comprehensive to both farmers who have an idea about smart inputs and management in agriculture but also those who are older and lack technological skills. Since older farmers in the Netherlands find it challenging to implement what they've learned, focus on simplifying technology (Modules 1 & 2). Break down the steps for using automated machinery, weather sensors, and other tools (Modules 3, 4). Step-by-step guides on theoretical knowledge will set the foundations for the principles of smart inputs in agriculture and give the essential tools for self-improvement to those who want it. The educational material uses a modular structure. This allows farmers to pick topics most relevant to their needs and experience level. Real-life examples and different case studies will simulate

online learners, allowing them to practice without immediate access to smart technologies (Module 5).

Another key finding is that farmers opted for multiple learning formats. Hybrid formats (videos, step-by-step guides, etc.) will help farmers keep up with the educational process. Farmers in the Netherlands and Cyprus highlighted the value of local farmer groups and cooperatives. Facilitate group learning activities, discussion forums, or even mentorship programs where experienced farmers can share their practical knowledge with peers. That is why we developed a module dedicated to useful contacts (Module 7) for 'Community support and networking'.

By following the key outcome of the questionnaires, we can create an engaging, practical, and accessible VET curriculum that meets the needs of diverse farmers across regions and experience levels. Hoping that our training material will give the ability to farmers to be introduced to smart technologies in agriculture we also develop a module (Module 9) where we can make interconnections and put references for other similar material for those who want to expand their knowledge.

6. Conclusion

The AGRILEARN project has successfully identified the critical factors influencing the adoption and utilization of smart agriculture technologies across the regions of Spain, Cyprus, the Netherlands, and Greece. Through comprehensive research, it became evident that while awareness of smart agriculture is widespread, there are significant variations in the levels of adoption and ease of use, largely influenced by the age and experience of farmers. Younger farmers, especially those in Cyprus and Greece, have shown greater enthusiasm for adopting new technologies, while older farmers in the Netherlands face more challenges despite having substantial knowledge of the benefits.

Key findings from the questionnaire analyses revealed that the primary motivators for adopting smart agriculture are increasing productivity, optimizing resource use, and adapting to climate change. The technologies offer promising solutions such as automated machines, early warning systems, and climate-resilient crop management. However, barriers such as the cost of technology and the generational gap in technical skills remain substantial hurdles, especially in countries like the Netherlands where the farming population is older.

The development of tailored Vocational Education and Training (VET) materials is a crucial step toward overcoming these barriers. The report emphasized the need for flexible, modular education that can cater to both tech-savvy young farmers and those who are less familiar with smart agriculture practices. Hands-on training, workshops, and local cooperative networks are seen as essential components in facilitating the practical application of new technologies.

Overall, the AGRILEARN project points toward a future where smart agriculture can be more widely adopted, provided that targeted training and support systems are in place. The potential for smart technologies to address pressing issues such as climate change and resource management offers a path to more sustainable and profitable farming practices across Europe. The recommendations from this report will guide the next steps in developing accessible and effective VET materials, ensuring that farmers of all backgrounds are equipped to meet the challenges of modern agriculture.

Annex I

Questionnaire:

Smart agriculture, often referred to as precision farming or digital farming, represents a transformative approach to modernizing traditional agricultural practices through the integration of advanced technologies. Unlike conventional farming methods, smart agriculture relies on real-time data and intelligent decision-making to streamline processes and overcome challenges. Through the deployment of sensors in fields, farmers can monitor crucial parameters such as soil moisture, temperature, and crop health with unprecedented accuracy. Drones equipped with imaging technology provide a bird's-eye view of large expanses of farmland, enabling farmers to identify potential issues and make informed decisions about resource allocation.

The primary goal of smart agriculture is to enhance efficiency, productivity, and sustainability in farming operations.

This questionnaire will provide useful information about how informed farmers are in smart agriculture technologies. The aim of this programme is to lay groundwork for more farmers to adopt smart/digital agriculture technologies. In order to do this, the AgriLearn programme will create VET material which will help farmers to get to know all about smart agriculture.

Section A - Demographic info

1. In which age group do you belong? (please tick one)

   18-25 years old
   25-35 years old
   35-45 years old
   45-60 years old
   60+ years old

2. How many years of experience do you have in agriculture?

   Less than 5 years
   5-10 years
   10-20 years
   More than 20 years

3. What is your country/region?

   Country .....
   Region .....

Section B - Smart Agriculture Adoption

4. Do you know what smart/digital agriculture is?

   Yes
   No

   If 'No', skip to Question 14.

5. Where did you learn about smart agriculture and its abilities? (please tick all that apply)

   School/ University
   Web Search

Workshops/ Seminars

Social media

None of the above

6. Have you adopted any smart agriculture technologies on your farm or in your professional activities?

Yes
No

If 'No', skip to Question 10.

7. What type of smart agriculture did you used in your crop? (please tick all that apply)

Drones/GPS
Weather Station Sensors
Automated machines
Other (specify) .....

8. Do you find it easy to use smart technologies in agriculture?

Yes
No

Section C - Training/ Education

9. Have you ever received any kind of formal training or education on smart agriculture technologies?

Yes
No
If 'No', skip to Question 14.

10. Specify what kind of education on smart agriculture technologies did you received (please tick all that apply)

Online courses / Workshops
Educational institutions
Other (specify)

11. Do you find it easy to put into practice what you have learned?

Yes
No

12. How do you stay informed about the latest developments/ achievements in smart agriculture? (please tick all that apply)

Web search
Social Media
Seminars
Journals
Other (specify)

13. Do you believe that smart technologies in agriculture will help crop production?

Yes
No

14. In your opinion, are there any ways for farmers to get familiar with smart/digital agriculture?

On-Farm Trials and Pilot Projects
Courses & workshops to teach them the how to
Local Farmer Groups and Cooperatives
Farm Advisory Services
Consult with Agri-Tech Experts

Section D - Economic Aspects

15. What Type of Economic Challenges Have Affected Your Farming? (please tick all that apply)

    Changes in market prices
    Cost of supplies/ Trade barriers
    Government policies/ Impacts from wars
    Climate change and weather variability
    Technology adoption costs

Section E – Climate change and Smart/digital agriculture

Climate change is associated with increased temperature variability, altered precipitation patterns, extreme weather events, and shifts in pest and disease prevalence.

16. Do you have any observations referring to Climate Change in Your Area?

    Average temperature Changes
    Extreme Weather Events
    Changing Precipitation Patterns
    Other (specify)

17. In your opinion what would be the most important benefit that smart agriculture can provide in the face of climate change challenges?

    Adaptive Crop Management
    (real-time data on weather conditions, soil moisture, and crop health)
    Optimized Resource Use
    (use of resources such as water, fertilizers, and pesticides)
    Early Warning Systems
    (early signs of extreme weather events, drought, or the spread of pests and diseases)
    Water Management
    Climate-Resilient Crop Selection
    (selecting crop varieties that are better suited to the changing climate conditions in their region)

Other (specify)

Section F – Feedback

18. What do you expect smart agriculture will provide to both farmers and crops?

    Increasing the income and reducing labour
    Increasing productivity
    Reducing the harmful emissions of greenhouse gas
    Other (specify)
    .....

19. Are you interested in Training for Smart Agriculture (For VET training)

    Yes

    No

20. Do you have any additional comments or suggestions regarding smart agriculture education and training

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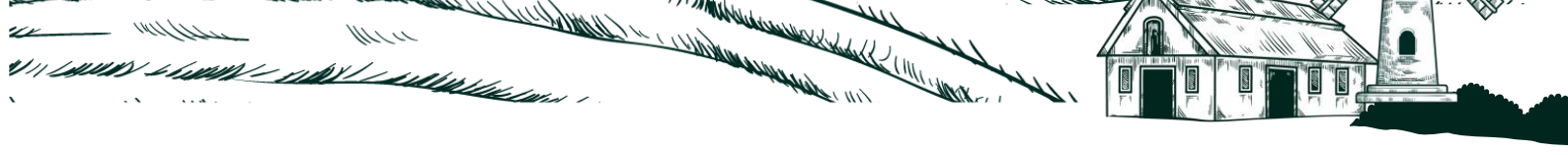

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