ERASMUS+ VET PROGRAMME

Project Number and Name: 101092160 - AgroTec

Project name:
AgroTechnology VET Centres to Network and Train Future
Farmers in Jordan and Palestine

Project acronym: AgroTec

Deliverable D2.1	Project Requirements

Work Package (WP)	WP2: Networking and Project Requirements
WP Leader	Mutah University
WP members	The University of Jordan AgriWatch BV National University College of Technology Palestine Technical University - Kadoorie Palestine Polytechnic University Slovak University of Agriculture in Nitra Int@E UG
Due date	15 March 2024
Version/Status	V3.0

Beneficiary number	Beneficiary name
BE 001	AgriWatch BV
BE 002	The University of Jordan
BE 003	National University College of Technology
BE 004	Mutah University
BE 005	Palestine Technical University - Kadoorie
BE 006	Palestine Polytechnic University
BE 007	Slovak University of Agriculture in Nitra
BE 007	Int@E UG

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Table of Contents

WP1: Networking and Project Requirements
D2.1: Project Requirements

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List of Acronyms

This table shows the acronyms used in this deliverable in alphabetical order.

Acronym	Description
AgriWatch	AgriWatch BV
EC	European Commission
EO	Earth Observation
EU	European Union
JO	Jordan
HE	Higher Education
HEI	Higher Education Institution
GA	Grant Agreement
MS	Milestone
PS	Palestine
Int@E	Int@E UG
QP	Quality Plan
WP	Work Package
UJ	The University of Jordan
NUCT	National University College of Technology
MU	Mutah University
PPU	Palestine Polytechnic University
PTUK	*Palestine* Technical University - Kadoorie
SUA	Slovak University of Agriculture in Nitra
ToT	Training-of-Trainers
WEF	Water-Energy-Food

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1. Executive Summary

The AgroTec project, officially titled "AgroTechnology VET Centres to Network and Train Future Farmers in Jordan and Palestine (AgroTec), Project Number: 101092160," has achieved significant milestones in its pursuit of introducing smart agricultural tools. The collaboration involves key players: Jordanian universities (The University of Jordan, Mut'ah University, National University College of Technology), Palestinian universities (Palestine Technical University Kadoorie and Palestine Polytechnic University), and European partners (Slovak University of Agriculture in Nitra, Int@E UG in Germany, and AgriWatch BV, the Netherlands).

The primary objective of the AgroTec project is to introduce smart tools in agriculture. It goes beyond technological integration, focusing on providing essential teaching and training services to unemployed graduates. The project aims to re-qualify these graduates, thereby enhancing their job opportunities. A notable emphasis is placed on empowering women through targeted initiatives and the use of digital technologies. The anticipated outcomes are poised to significantly contribute to the national-level capacity-building process, enabling graduates to acquire the necessary skills and training for their professional growth.

In the scope of the WP2, a Network is established in the context of the AgroTec project as a collaborative platform for the needs analysis and exchange of good practices to promote the transfer of knowledge among its members. This links local partners' needs and requirements to the challenges in Jordan and Palestine in the domain of the AgroTec project. For this, the foundation of the AgroTec Network is solidified through the Memorandum of Collaboration. This memorandum is a binding agreement among the members, outlining their commitment to collective goals and cooperative efforts. It reflects the dedication of each participant to the success of the AgroTec project, including the AgroTec project's requirements and its overarching aim of introducing smart agricultural tools. Such partnerships can also help to identify research, and capacity-building needs to facilitate the exchange of knowledge and expertise in the AgroTec domains and planning interventions.

In this deliverable 2.1, we report on the progress of the AgroTec project's requirements in work package 2 (WP2) to provide an update on the activities, achievements, and challenges encountered up to the end of February 2024. This includes AgroTec Centres Requirements (Milestone 4) and Status of Equipment Purchase and Courses.

2. Introduction

The needs assessment at the local partner universities was conducted collaboratively with EU partners during multiple events, meetings, and workshops throughout the AgroTec and other relevant projects. Its aim was to identify skills and knowledge gaps, prioritize needs, assess capacities, and determine training requirements. These assessments were particularly focused on addressing both current and future needs of the target countries, such as Food Security and Water Management under Climate Change conditions, including drought.

Throughout these events, several physical and online meetings and workshops were conducted to address the requirements of skilled labour in the agricultural sector, particularly in smart farming. The aim was to enhance the efficiency of production input utilization, minimize waste, and maximize agricultural output. For example, during the AgroTec kick-off meeting (February 2023) in Amman, three workshops and several meetings were organised at the UJ, in which the current and future capacity needs of smart agriculture were presented by local partners and discussed thoroughly. Since then, we have continued to discuss this systematically and assess how to build capacities in this field, especially:

- Jordan and Palestine (JO&PS) need a paradigm shift in agricultural strategies, leveraging advanced technology and innovation for enhanced productivity and sustainability. Higher education institutions in JO&PS play a pivotal role in this transformation, focusing on advancing teaching in modern agricultural technology and leveraging European expertise. Shared challenges such as water scarcity, low rainfall, and inefficient water management further emphasise the urgency for collaborative efforts.
- Jordan faces additional challenges such as dwindling freshwater sources, population growth, and complex socio-political dynamics. The government is actively working to overcome challenges through initiatives in conservation agriculture, mechanisation, and modern irrigation systems. Collaborative efforts among academia, government, and industry stakeholders are crucial for catalysing transformative changes within the agricultural sector.
- Thus, the use of precision farming technologies at the partner organisations is vital;
- JO&PS urgently needs greater awareness and expertise in precision farming fields to cover local and regional needs, as there is little enthusiasm for the subject among the youth in these countries.
- These needs are aligning with the objectives of the Partner Universities through new attractive programs required (to increase the number of students in this field) for the local labour market (e.g., various agricultural contractor companies and specialised SMEs in planning, cultivation, monitoring, production, storage, sales and marketing of the agri-food value chain);
- to deliver capacity-building opportunities for the current labour force.

These assessment process helped the consortium partners understand the necessary skills/knowledge of Precision Farming and Agrarian Trade/Marketing Products and Services, required infrastructure (equipment and software/platforms), and the required available current and future faculty members in the local Partner Universities in these fields (incl. Agricultural Schools/IT, and Engineering Departments). The following specific activities were completed during the consultation process in JO&PS in the past year:
- The UJ/School of Agriculture, during the Stakeholders workshop on 19 February 2023, presented the UJ's overall assessment, framework and objectives (including the gaps, needs, priorities, and capabilities of the Schools of Agriculture and Engineering).
- Assessed the existing context in Jordan regarding the organisational/infrastructure capacity and technical expertise in applying Precision Farming and various climate services to understand Soil-Crop-Water interaction. In addition, details about the Sensors (Satellite, drone, and Ground ins-situ sensors) and Sensing Applications in Agriculture, the status of big data availability, data access and sharing mechanisms.
- Identifying the priorities for specific applications and products in the relevant food security and water themes linked to the AgroTec activities (equipment and courses). The need for equipment is emphasised, especially for upgrading capacity in producing ICT solutions tailored for agricultural purposes. This is vital for training sessions and developing modules applicable to agricultural practices. A notable initiative is the implementation of **a new Diploma course in Smart Farming**, addressing infrastructure gaps in institutions like UJ and Mutah, highlighting the necessity for modernization and enhancement in educational and technical capacities. Jordan and Palestine (JO&PL) are challenged to adopt modern agricultural strategies, leveraging advanced technology to enhance productivity. Higher education institutions in JO&PS are pivotal in advancing teaching on agricultural technology, aligning with European expertise. Shared challenges of water scarcity and inefficient water management underscore the urgency for collaborative efforts. The primary goal is to stimulate economic development in rural areas, where agriculture holds economic significance. The consortium, in collaboration with EU partners, aims to modernise courses, encouraging collaboration and unique contributions from each partner.
- Elaborated these needs/frameworks further during the management meeting in July 2023 in the Netherlands among all the AgroTec partners. These needs assessments were expanded upon during other related project meetings, workshops, and discussions with pertinent stakeholders, such as the National Agricultural Research Organization (NARC) in Jordan. The implementation of a new Diploma course in Smart Farming highlighted the imperative need for modernization in educational and

technical capacities within institutions like UJ and Mutah. The focus was on how to extend to the development of VET courses, ensuring students are equipped with skills to adapt to evolving field developments. By integrating European expertise into course development and teaching methodologies, the consortium aims to drive advancements in agricultural education and practice in the region.

- The required demonstration equipment to be purchased for the AgroTec training centres, including the established purchased plan and criteria were reported in the AgroTec D3.2 Deliverable – AgroTec centres equipment (submitted 20 July 2023).

As a result, all local partners in JO&PS chose to make extensive use of UJ's smart farming diploma course framework and the above considerations, while also exploring how to develop courses together and/or adapting them to meet their needs.

3. Objectives of the Deliverable

Establishment of AgroTec Network: As an integral component of the project, the AgroTec Network is envisioned to be a collaborative platform offering a multitude of benefits to its members:
- Capacity Enhancement: EU partners' contributions will elevate the capabilities of Jordanian and Palestinian partners, enhancing the qualifications and skills of their staff and students.
- Forum for Technological Discourse: Members gain access to discussions about the use of new technologies in the agri-food sector in Jordan and Palestine.
- Collaborative Actions: Participation in joint activities, including workshops, seminars, proposal submissions, project development, and publications in scientific journals and conferences.
- Knowledge Transfer: The AgroTec Network facilitates the exchange of good practices among its members through resources like the website and web portal, promoting the transfer of knowledge and fostering a culture of continuous improvement.
- Pioneering Project Proposals and Partnerships: A collaborative endeavour between AgriWatch, the ITC Faculty of the University of Twente, and Jordanian entities, including new partners, resulted in the "NexusWatch" project proposal. Submitted to the Dutch government's Orange Knowledge Programme and funded, it signifies a strategic leap in fostering international collaboration. ERASMUS-EDU-2024-CBHE project proposal "Tech-Farm" and ERASMUS-YOUTH-2024-CB project proposal "NEXUS" demonstrate a commitment to advancing education and youth empowerment in agriculture and water-related sectors.
- Expansive Networking Locally and Internationally: PTUK's establishment of nine cooperative networks with local agriculture entities solidifies its engagement with the local market, ensuring vital feedback for project refinement. PPU's proactive networking efforts extend to the Agro-Food private sector, the Ministry of Agriculture, and higher education institutions, creating a robust foundation for stakeholder engagement in the AgroTec project.

Integration of Smart Tools and IoT Sensor Networks:
- Focus on data enrichment for soil-crop monitoring, processing, marketing, and quality control.
- Strengthening the connection between technology and data-driven agriculture for improved efficiency and productivity.

Equipment Needs and Modernization:
- Implementation of a new Diploma course in Smart Farming to address infrastructure gaps and advocate for modernization.
- Creating a link between educational advancements and technological needs in agriculture.

Precision in Equipment Procurement:
- Meticulous planning for equipment procurement through central tenders in Euros to mitigate currency exchange risks.
- Establishing dynamic communication channels for efficient procurement processes.

Re-qualification and Job Opportunities:
- Targeted initiatives to re-qualify graduates and empower women, linking educational programs with employment prospects.
- Envisioning a skilled workforce contributing to the sustainable growth of the agricultural sector.

Capacity Building Initiatives:
- Addressing critical skill gaps through specialised training programs in remote sensing, IoT sensor data, and geospatial data analysis.
- Integrating European expertise to strengthen educational institutions' linkages in Jordan and Palestine.

Stimulating Economic Development in Rural Areas:
- Addressing challenges such as water scarcity, low rainfall, and inefficient water management through technological solutions.
- Establishing a link between technological solutions and rural economic development for a sustainable agricultural community.

Capacity Building through AgroTec Network:
- Establishing a collaborative platform to enhance the capacity of Jordanian and Palestinian partners through EU contributions.
- Fostering technological discourse, collaborative actions, and knowledge transfer through other initiatives like "NexusWatch," "Tech-Farm," and "NEXUS."

Establishment of Cooperative Networks:
- Collaborative efforts with local agriculture entities and the Agro-Food private sector to promote synergy and shared growth.
- Proactive networking with the Ministry of Agriculture and higher education institutions for stronger connections within the farming sector.

Communication Channels and Collaboration with EU Partners:
- Utilising effective communication channels like the AgroTec website, social media platforms, and project brochures for project visibility and outreach.
- Collaborating with EU partners to address challenges through capacity building in higher education and promoting cooperation between companies and partner institutions.

4. Significance of Smart Tools in Agriculture

The incorporation of intelligent tools in the agricultural sectors of Jordan and Palestine holds significant advantages, profoundly impacting various aspects of the industry.

Efficient Water Management: Spearheaded the implementation of precision irrigation systems and soil moisture sensors in Jordan, optimising water usage and increasing agricultural productivity. Developed tailored solutions to address water scarcity, contributing to sustainable agriculture practices.

Precision Farming: Successfully introduced and integrated intelligent technologies such as drones, GPS mapping, and remote sensing for precision farming techniques. Improved resource allocation, minimised environmental impact, and increased overall productivity.

Climate Resilience: Implemented early warning systems for weather-related risks and recommended climate-smart agricultural practices. Enabled farmers to adapt to changing climate conditions, enhancing resilience and mitigating the impact of unpredictable weather patterns.

Informed Decision-Making: Utilised smart agriculture data for advanced analytics and artificial intelligence, providing farmers with valuable insights into crop performance, market trends, and profitability. Enhanced decision-making processes, resource management, and farm profitability.

Access to Knowledge: Pioneered initiatives to bridge the gap in agricultural extension services and

technical expertise in rural areas. Introduced intelligent tools such as online resources, mobile apps, and virtual advisory services, empowering farmers with knowledge and skills to enhance their practices.

Market Connectivity: Established online platforms and e-commerce channels to directly connect farmers with buyers, wholesalers, and retailers. Reduced reliance on intermediaries, enhanced price transparency, and created new marketing opportunities for smallholder farmers.

Sustainable Agriculture: Championed resource-efficient practices and minimised agrochemical use to contribute to sustainable agriculture goals in Jordan and Palestine. Played a pivotal role in preserving soil health, conserving water resources, reducing greenhouse gas emissions, and protecting biodiversity.

5. Smart Agriculture Challenges in Jordan and Palestine

The integration of smart tools in agriculture across Jordan and Palestine (JO&PS) encounters various challenges, necessitating a comprehensive approach to ensure sustainable implementation and maximise benefits. These challenges include:

1. Limited Infrastructure: Numerous rural areas in Jordan and Palestine face challenges related to insufficient infrastructure, such as unreliable internet connectivity and electricity supply. These essential components are crucial for the proper functioning of smart agricultural technologies.

2. High Initial Costs: Smallholder farmers, particularly those with limited financial resources, encounter prohibitive initial costs associated with purchasing and implementing smart tools like sensors, drones, and precision irrigation systems.

3. Lack of Technical Expertise: Farmers may lack the necessary technical expertise to effectively use and maintain smart agricultural technologies. Initiatives focusing on training and capacity-building programs are essential to empower farmers and ensure optimal utilisation of these tools.

4. Access to Financing: Limited access to financing and credit facilities poses a challenge for smallholder farmers, hindering their ability to invest in smart agricultural technologies.

5. Data Privacy and Security Concerns: The significant data generated by smart agricultural technologies raises concerns regarding privacy, ownership, and security. Addressing these concerns is paramount to building trust among farmers and encouraging broader adoption of smart tools.

6. Adaptation to Local Conditions: Many smart agricultural technologies are developed elsewhere and may not align with the specific environmental and socio-economic conditions of JO&PS. Customization and adaptation of these technologies are imperative for ensuring their effectiveness in the local context.

7. Policy and Regulatory Barriers: Inadequate policies and regulations related to the use of smart agricultural technologies may act as barriers to their adoption. Governments play a pivotal role in developing supportive policies and regulatory frameworks to encourage investment and adoption.

8. Resistance to Change: Farmers may exhibit hesitation towards adopting new technologies due to a fear of change, cultural factors, or a lack of awareness about potential benefits. Effective extension services and awareness campaigns are essential to overcome this resistance and promote acceptance of smart agricultural tools.

To effectively address these challenges, a coordinated effort involving government agencies, non-governmental organisations, research institutions, and the private sector is essential. Such collaboration is crucial to provide the necessary support, resources, and incentives, enabling farmers in JO&PS to successfully adopt and benefit from smart agricultural technologies. This aligns with the overarching goal of the AgroTec project, which aims to promote agricultural sustainability and economic development in rural areas of JO&PS.

5.1 Challenges AgroTec Project

Challenges	Description
Extended Accreditation Process	The accreditation procedure for the Higher Diploma in Smart Agriculture program from the Ministry of Higher Education is time-consuming.
Protracted Equipment Procurement	The process of purchasing and delivering equipment may experience delays.
Limited Travel Budget	The budget allocated for travel is restricted.
Considerable Co-Financing (20%)	The local partners consider the co-finance requirement, set at 20%, to be relatively high.
Visa-related Issues	Challenges related to visas may arise.
Political Instability	The persisting political conflict and instability in the region present significant impediments to the execution of large-scale development initiatives like AgroTec. Ongoing political tensions, border restrictions, and security concerns can impede the smooth movement of goods, equipment, and personnel, affecting project timelines and operations.
Land Access Challenges in Palestine	Land access and tenure issues pose substantial hurdles in Palestine, where land ownership is frequently contested or restricted due to political and legal complexities. Ensuring secure access to land is vital for agricultural development and investment, but bureaucratic processes, land confiscation, and settlement expansion may hinder this.
Technology Adoption Barriers	Limited access to technology, technical expertise, and financial resources may impede the adoption of advanced agricultural technologies and practices among Palestinian farmers. Overcoming these barriers requires capacity-building initiatives, training programs, and targeted investments to promote innovation in agriculture.

6. AgroTec Centres

This section provides updates on the status of course development and equipment purchase up to the 15th of March 2024 (reporting period). Furthermore, the equipment and course specifications for all local partners in the AgroTec project are enclosed, each in a separate folder named with their acronym.

For example, the process of purchasing the equipment and selecting the companies at the University of Jordan, Mutah University (Government University-Following Government Procedures) has been finalised according to the following main procedures and the equipment will be installed during the next months:

- The Central Tenders Department at the University of Jordan and Mutah University requested quotations from potential suppliers, specifying equipment specifications and technical details for the supply, installation, operation and maintenance of equipment for the project.
- The Central Tenders Department received 5 closed offers submitted by companies.
- The Procurement Sub-Committee in the Central Tenders Department referred the tender to two companies to supply, install, operate and maintain the equipment according to the Government rules and regulations.

Regarding the AgroTec courses currently under development, a minimum of 12 courses are underway

or completed, tailored to the needs identified by local partners (See the table below). Moreover, in preparing course materials, climatic factors such as drought are being taken into account. This involves integrating field data collection and relevant case studies to tailor the courses to local conditions. These 12 courses are collaboratively developed by the 5 local universities with support from EU partners, as outlined in the table below:

No.	Course Name	Course Leader	Participating Partner
1.	Agrarian Marketing	SUA	MU
2.	Global Marketing	SUA	MU
3.	ICT in Agriculture (Precision Farming)	PTUK	INT@E
4.	Smart Agriculture Technologies (Modern Agriculture Systems)	PTUK	INT@E
5.	Food Marketing	PPU	SUA
6.	Disease management using Geo-ICT	PPU	AGRIWATCH BV
7.	Sensors & Sensing	UJ	AGRIWATCH BV
8.	Machine Learning, Modelling and FMIS	UJ	AGRIWATCH BV
9.	Geo-ICT in Agriculture (Remote sensing)	MU	AGRIWATCH BV
10.	Marketing Management	MU	SUA
11.	Consumer Behaviour	NUCT	SUA
12.	Water Energy Food Nexus	NUCT	SUA, INT@E, AGRIWATCH BV

UJ
Courses

STUDY PLAN – HIGHER DIPLOMA:

1.	School	Agriculture
2.	Department	Horticulture and Crop Science
3.	Program title (Arabic)	دبلوم عالي في الزراعة الذكية
4.	Program title (English)	Higher Diploma in Smart Agriculture

RULES & CONDITIONS:
1. This plan and admission policies conform to the University of Jordan regulations.
2. Priorities for admission:
   - The first priority: Bachelor in Horticulture and Crop Science, Bachelor in Plant Production, Bachelor in Land Water and Environment and Bachelor in Soil and Irrigation.
   - The second priority: Bachelor in Plant Protection, Bachelor in Animal Production, and Bachelor in Agricultural Sciences and any related sciences.

COMPONENTS OF CURRICULUM:
The curriculum for the Professional Diploma in (Smart Farming): consists of (24) credit hours distributed as follows:

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A. Obligatory courses (18) credit hours:

Course Number	Course Title	Credit Hours		
		Theoretical	Practical*	Total
0601705	Crop Physiology	3	-	3
0601723	Agriculture Systems	3	-	3
0601500	Smart Agriculture	3	-	3
0601501	Sensors and Actuators	2	1	3
0601502	Harvest and Postharvest Technologies	2	1	3
1931501	Robotics and AI applications in Agriculture	3	-	3
Total				18

B. Elective courses (6) credit hours from the following:

Course Number	Course Title	Credit Hours		
		Theoretical	Practical*	Total
0601503	Soilless Agriculture	1	2	3
0601504	Farm Management Information Systems	3	-	3
0601505	Hydraulic and Pneumatic Circuits	3	-	3
0601506	Precision Farming	3	-	3
0604702	Nutrient Management	3	-	3
0604707	Geographic Information System	2	1	3
0604708	Remote sensing	2	1	3

COURSE DESCRIPTION:

Course Number	Course Title	Description
0601705	Crop Physiology	This course covers the plant's relationship with water, with emphasis on the processes of adaptation to moisture stress, the plant's response to light through the processes of photosynthesis, photosynthesis, and flowering. Plant hormones, their structure, transport and mechanism of action. Nitrogen fixation processes inside the plant, different growth and development processes of the plant.
0601723	Agriculture Systems	This course covers crop rotation, intensive cultivation monoculture, intercropping, multiple cropping, alternative farming systems including organic farming, and low input sustainable agriculture. Tillage and soil management practices, under dry and irrigated conditions.

0601500	Smart Agriculture	An introduction to smart agriculture, the reality and challenges facing smart agriculture, the reality and requirements of the sector in smart agriculture, the Internet of Things (IoT) and its applications in smart agriculture, smart agricultural technologies and solutions to the requirements of smart agricultural applications. This course covers the requirements of smart agriculture in terms of devices, tools, techniques and their applications in collecting and analysing data on the farm. This course will also include field visits to distinctive projects or model farms in the private sector to familiarise students with the latest science, knowledge and technology.
0601501	Sensors and Actuators	Fundamentals and the principle of operation of electrical and electronic systems. Fundamentals of power conversion: transformers, sensors and actuators. Microsensors: force sensors, pressure sensors, manometers. Temperature, humidity and light sensors and their practical applications. Principles of operation of engines and motors. Piezoelectric actuators, micro-pumps and microactuators and their practical applications. The course will include visits to the laboratory of sensors and the hydroponic greenhouse, where students familiarise themselves with electro hydraulic circuit applications.
0601502	Harvest and Postharvest Technologies	Techniques used in harvesting vegetables and fruits and post-harvest technologies for vegetables, fruits, olives and palms, which include following the European protocol in good agricultural practices, washing, sorting, grading, storage, cooling, transportation and agricultural risks during these operations. It also includes handling and drying of grains and storage and sterilisation of grains. This course will also include field visits to distinctive projects or model farms in the private sector to familiarise students with the latest science, knowledge and technology.
1931501	Robotics and AI Applications in Agriculture	Agricultural Robotics; Agricultural Sensors; Artificial Intelligence Applications in Agriculture, Artificial Intelligence Supply Chain Systems; Disaster Prediction Systems; Internet of Things Technologies in Agriculture and drone applications in Agriculture
0601503	Soilless Agriculture	including hydroponic technology from the use of nutrient control systems, the design of fertiliser recipes, the control of the level of oxygen and humidity through sensors, including the media used, plant nutrients of all kinds, and methods of preserving them, as well as the management of carbon dioxide gases, lighting control, and product marketing techniques. This course will also include field visits to distinctive projects or model farms in the private sector to familiarise students with the latest science, knowledge and technology.

0601504	Farm Management Information Systems	This course includes means and methods of obtaining environmental information surrounding the plant, such as temperature, humidity, water stress, pH, concentration of elements and intensity of light, in addition to aerial and satellite images of vegetation cover and the physiological state of various crops. It also includes methods for analysing this data. Smart farm management.
0601505	Hydraulic and Pneumatic Circuits	Basic principles and operation of hydraulic and pneumatic systems and their importance in practical applications. Components and construction of hydraulic and pneumatic circuits and their interaction with electrical and electronic components. Symbols and reading of hydraulic and pneumatic diagrams. The course will include visits to the Machines Models' laboratory and mechanisation workshop, where students familiarise themselves with components and construction of some hydraulic and pneumatic circuits
0601506	Precision Farming	Background to precision farming, roles of geographic information systems (GIS), global positioning systems (GPS), multispectral and hyperspectral remote sensing systems for both large- and small-scale applications. The course will cover the application of precision farming for soil sampling, fertilisers needed through sensing technologies, yield monitoring, pest monitoring and the use of open-source multispectral data, in addition to the use of drone and air-borne hyperspectral technology for mapping and managing agricultural fields and large areas. Students will work on case studies where UAV technologies are used, VRT for fertilisers and pesticides are applied based on geospatially processed maps and ICT is utilised for management and marketing of crops.
0604702	Nutrient Management	This course includes criteria of classification for plant nutrients: Macronutrients: N, P, K, Mg and Ca, Micronutrients: Fe, Zn, Mn, B, Cu, Co and S, Beneficial nutrients: Na, Cl and Se. Role and function of essential nutrients in the plant, soil fertility evaluation, management of fertiliser application, cropping systems and soil fertility, crop rotation, fertilisers and efficient use of water, nutrient cycles and balance in nature
0604707	Geographic Information System	This course includes What is geographic information? Vector and Raster data models. Database for GIS. Selection of hardware and software. Theories of undertaking spatial analysis: measurements, network and connectivity, neighbourhood, surfaces, interpolation, digital elevation models, reclassification, and map overlay. Spatial data accuracy. Applications of GIS in environment management.
0604708	Remote sensing	This course includes Physical principles of remote sensing: radiation laws, reflectance and emission, atmospheric

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		interactions and windows, platforms and technology of optical remote sensing systems. Structure of satellite imagery and concepts of resolution. Digital image processing techniques: geometric correction, enhancement and filtering. Image classification: supervised and unsupervised classification, algorithms, class reparability accuracy assessment. Special image transformations: principal component analysis, vegetation indices and colour.

Equipment

The need for the equipment is to upgrade the capacity to produce and deliver ICT solutions for agriculture purposes. The required equipment will be used for the training of trainers (ToT) and the development of modules and digital solutions applicable to agriculture. Moreover, the equipment will be used in the new Diploma course in Smart Farming, which will be jointly run by the School of Agriculture and Engineering. This is based on the existing infrastructure gaps in UJ - Agricultural / Engineering Schools.

Multispectral camera	- A Hyperspectral sensor plus an RGB Camera, which are coaxial and synchronised - Integrated RGB camera with a spectrometer that acquires spectra registered with RGB images; - Wireless control: out-of-box wireless connection to CSC; - Platform independent: web application running on mobile, tablet and desktop browsers; - Capability to install on UAVs; - Simple to use in the Field; - Measurement browsers: an instant exploration of measurements after a data acquisition; - Real-time monitoring: live stream of camera images and spectra and reflectance graphs; - Spectral Range: 350-1100 nm; - Spectral channels: 2048; - Spectral resolution: 0.35 nm; - Weight: 300 or 800 grams. - Dedicated software
Weather station	- with data logger and controller - SDI-12 capability - calculate evapotranspiration - wind sensor: wind speed and direction: up to 75 m.s-1 and 0 to 360° - rain full: up to 360mm.hr-1 - RH sensor: 5-95% - Air temperature sensor: 0 to 70°C - Solar radiation: 0-2 kW.m-2 - soil temperature: -10 to +65°C - Mast: 2 m with cross arm, stakes, steel guy wires, baseplate and logger canopy
Soil water content logger	- with data logger and controller: - SDI-12 capability - Program repeat rate: Multiples of 1s

	- Real- time clock: ± 1 minutes per month typical, ±5 minutes per month worst case. (-20 to +60 °C)
	- Communications: RS232 115.2kBaud, USB-RS232 adapter cable supplied
	- Networking: Up to 7 GP2s on 100 m of network cabling, with optional power distribution over network cabling
	- Input protection: All terminals protected to ±15VDC, 24VAC, including battery reverse polarity
	- Regulatory compliance: Surge tested IEC61000-4-5 PASS A ESD tested IEC61000-4-2 PASS A EMC tested IEC61000-4-3 PASS A CE Compliant FCC Compliant
	- Environmental: Operating: -20 to +60 °C
	- Enclosure: Fitted with cable glands, IP65
	- Data storage: 4 MBytes FLASH memory. - Storage capacity (compressed): 2.5 million values (typical). Auto Wrap option (i.e. overwrite earliest data when memory is full) and/or manual deletion of data without interrupting logging.
	- Activity indicator: Every 10s, LED signals logging and error status
	- Sensors (QTY 20-40):
	- Measures moisture, temperature and EC
	- Digital SDI-12 for easy system integration
	- Rugged, buriable and low power
	- Accurate monitoring of growing conditions
	- Detachable and extendable cable system
	- Volumetric water content: 0 to 1.0 $m^3.m^{-3}$
	- Pore water conductivity (ECp)
	- Permittivity: for ECp ≤ 800 mS.m-1
	$1 \rightarrow 40$
	for ECp ≤ 500 mS.m-1
	$40 \rightarrow 80$
	- Bulk conductivity (ECb): 0 to 1200 mS.m-1
	- Temperature: -20°C to +60°C
	- with related software

What is the status of the above equipment:

☐   Awaiting Shipment

What is the purchased price of each piece of equipment in Euros:

Description	UoM	Qty.	Unit Price (Euro)	Total Price (Euro)
Environmental Remote Sensing System coSpectroCam (CSC) Device	Units	1	8,783.78	8,783.78
WatchDog 3250DR ET Weather Station	Unit	1	2,255.4	2,255.4

WatchDog 1200 micro station with 2 external ports Soil Data Logger	Each	1	283.78	283.78
SMEC 300 Triple Sensor-20f	Each	2	274.32	548.64
SpecWare 10 Pro Software	Each	1	270.27	270.27
Total amount				12141.87

Mutah

Courses

The following courses are offered in the Plant Production Department, and their contents have been developed to align with the department's objectives and the project objectives. The smart agriculture course will be included in the amendments to the proposed plan for the Plant Production Department for the academic year 2024/2025, to become an optional specialisation subject.

Course Name	Course No.
Agricultural Economic	1101210
Principles of Irrigation and Drainage	1101272
Agricultural Mechanization	1101360
Practical course in Irrigation Fertilizer Application	1101410
Extension and Agricultural Marketing	1101220
Plant Soil Water Relationship	1101430

The introduction of the smart agriculture course is slated for inclusion in the amendments to the proposed plan for the Plant Production Department during the academic year 2024/2025.

Equipment

WatchDog 3250DR ET Weather Station	Features, As per offer
SpecWare 10 Pro Software	As per offer
WatchDog 1200 micro station	With 2 external ports Soil Data Logger. As per offer
SMEC 300 Triple Sensor -20f	Track soil moisture, EC and soil temperature. As per the offer

NUCT

NUCT is developing and piloting an AgroTec Vocational Diploma entitled "Vocational Diploma in Smart Agriculture". The program will be launched in April 2024. Following is a summary of the accreditation of the AgroTec Vocational Diploma at NUCT.

Courses

No	Course Name	Credit Hours		
		Theoretical	**Practical**	**Total**
1	Agrarian Marketing	12	-	12
2	Global Marketing	12	-	12
3	ICT in Agriculture	12	24	36
4	Smart Agriculture Technologies	12	24	36
5	Food Marketing	12	-	12
6	Diagnosis of Pests and Stress in Agricultural Crops using ICT	12	18	30
7	Sensors and Sensing	12	24	36
8	Machine Learning, Modelling, and Farm Management Information Systems (FMIS)	6	24	30
9	Fundamentals of Remote Sensing data acquisition and mapping	12	24	36

10	Marketing Management	12	-	12
11	Consumer Behaviour	12	-	12
12	Water Energy Food Nexus	18	18	36
	Total	**144**	**156**	**300**

DESCRIPTION OF THE COURSES:

Topic 1: Agrarian Marketing

The content of the course is oriented on in-depth analysis of theoretical, methodological and pragmatical approaches to agrarian market of producers, processors and traders with agrarian commodities in relation to the market organization of the given country and region, as well as the effectiveness and successfulness of doing business. The content also includes current marketing problems of the main commodities in plant and animal production and food sector.

Topic 2: Global Marketing

The aim of the course is to build on the knowledge of the basics of marketing and gain new knowledge in the field of global marketing. Teaching is focused primarily on a decision-oriented framework for the development and implementation of global marketing programmes with orientation to the world regions and understanding marketing approaches for territorial expansion and international business cooperation.

Topic 3: ICT in Agriculture

The course provides knowledge on the basic principles of the ICT application in agriculture. The course will cover Global Positioning Systems (GPS), Geographic Information Systems (GIS), remote sensing, data acquisition, mapping, variable rate applications and the economics of precision agricultural technologies.

Topic 4: Smart Agriculture Technologies

This course addresses the concept and objectives of smart agriculture, areas of smart agriculture, mechanisms for transitioning to smart agriculture, methods and technologies of smart agriculture, smart agriculture and the Internet of Things, robotic farms, and smart agriculture in Jordan.

Topic 5: Food Marketing

This course provides an in-depth analysis of the fundamental elements of agricultural and food marketing. It will focus on the agricultural industry structure and the economics principles related to consumers and agricultural food producers. It will also cover an overview of marketing strategies and will serve to familiarize students with the asset market derivatives commonly used by agricultural producers and the recent technologies used in agricultural food marketing.

Topic 6: Diagnosis of Pests and Stress in Agricultural Crops using ICT

The course is concerned with plant disease problems in agriculture, horticulture (greenhouses, orchards and field crops) and forestry. This course aims to obtain hands-on experience in diagnosis of plant diseases using ICT systems. Also, this course aims to increase the ability to find out and develop work plans for pest and disease control. In addition to learn how to evaluate the effectiveness of pest and disease control operations.

Topic 7: Sensors and Sensing

This course provides an overview of theories and concepts relating to various remote sensing platforms (satellite, aerial and drone), sensors (multispectral, hyperspectral, LiDAR and thermal) and datasets, and their applications in broad agriculture domains. It covers remote sensing applications in crop, horticulture and livestock system analysis, crop growth and health monitoring and stress detection, disease control and pest management, precision agriculture and plant breeding, water resource and soil management and risk assessment.

Topic 8: Machine Learning, Modelling, and Farm Management Information Systems (FMIS)

This covers the concept of machine learning and its applications, applications of machine learning in the agricultural field, modelling methods, modelling tools, agricultural modelling, agricultural information analysis, agricultural information management.

Topic 9: Fundamentals of Remote Sensing data acquisition and mapping

This course deals with the concept of remote sensing, sensing from the ground, sensing from the air, sensing from space, remote sensing data and analysis, applications of remote sensing, agricultural mapping, and agricultural map analysis.

Topic 10: Marketing Management

This course covers the basics of marketing, types of markets in marketing, basic marketing concepts, steps of the marketing plan, market penetration strategy, how to target the market, product life cycle, competitive position, price discrimination, distribution channels in marketing, promotion budget, promotion tools, using Advertisements in the marketing process.

Topic 11: Consumer Behaviour

An essential component of marketing is understanding consumer behaviour. This course provides an overview of fundamental consumer behaviour concepts and the interrelated dynamics between consumer behaviour and marketing strategies. The course examines the influences affecting purchasing behaviour of individuals as consumers, which contribute towards successful domestic and international marketing management.

Topic 12: Water Energy Food Nexus

This course introduces the knowledge of nexus and the link between water-energy-food. It has become increasingly important to understand the interdependencies and interrelationships between the three resources. Understand the use of alternative energy to improve water resources in terms of quantity and quality. The course offers students how to assess the Nexus and take a decision. The course will provide students skills of how to govern the Nexus. Besides, it discusses cases studies on this topic.

Before starting the accreditation process, the college council responsible for the program recommends this to the university council. The Board discusses the suitability of the program and grants approval if it deems it appropriate.

After obtaining the approval of the University Council, the procedures for obtaining accreditation from the Ministry of Higher Education begin.

Before starting teaching, the university must obtain the approval of the Ministry of Higher Education. This application must contain comprehensive details, including:
- Duration of teaching
- Teaching location
- Target group
- Qualifications of faculty members
- An outline of the theoretical and practical topics to be covered

After the start of teaching, the college is responsible for informing the Ministry of Higher Education of the following information:
- List of participating students
- A list of the names of students who completed the program upon its conclusion.

STAGE OF ACCREDITATION AT SUBMISSION POINT:
- Preparing a proposal to develop a higher diploma program in smart agriculture by the College of Agriculture.
- The recommendations of the formed committee No. 1/2023 dated 4/3/2023 to study the proposal to create a higher diploma in smart agriculture were presented to the Council of Deans at its session No. 13/2023 dated 4/3/2023.
- In its session No. 13/2023, dated 4/3/2023, the Council of Deans decided to approve the procedures for developing the Higher Diploma Program in Smart Agriculture, provided that the matter is presented to the Study Plan Committee to proceed with the development of the program according to the rules.
- The Council of the College of Agriculture, in its session No. 3/2023/2024 dated 5/12/2023, by its resolution No. 36/3/2023/2024, recommended approval and proceeding with the procedures for accrediting the Higher Diploma in Smart Agriculture.
- An official letter from the Dean of the School of Agriculture was sent to the Vice President for Scientific Colleges Affairs for approval to proceed with the procedures for accrediting the Higher Diploma in Smart Agriculture.
- The Vice President of the University for Scientific Colleges Affairs agreed to proceed with the procedures for accrediting the Higher Diploma in Smart Agriculture and directed the Accreditation and Quality Assurance Centre to take the necessary action according to the University rules.
- The University of Jordan obtained the general accreditation for the Higher Diploma in Smart Agriculture program from the Ministry of Higher Education) Licensing decision: Higher Education Council Session No. 18, dated 1/23/2023 (Decision No. 10419)), is currently working on the procedures for obtaining the special accreditation.

Equipment

The need for the equipment is to upgrade the capacity to produce and deliver ICT solutions for agriculture purposes. The required equipment will be used for ToT and the development of modules and digital solutions applicable to agriculture. The equipment will be used in the new Vocational Diploma courses in Smart Agriculture, which will be run by NUCT.

What is the status of the above equipment:

☐   Signing the purchasing agreement with the selected supplier for the remaining equipment.
☐   Awaiting Shipment.

What is the purchased price of each piece of equipment in Euros:

Description	UoM	Qty.	Unit Price (Euro)	Total Price (Euro)
Environmental Remote Sensing System coSpectroCam (CSC) Device	Units	1	8,783.78	8,783.78
WatchDog 3250DR ET Weather Station	Unit	1	2,255.4	2,255.4
WatchDog 1200 micro station with 2 external ports Soil Data Logger	Each	1	283.78	283.78
SMEC 300 Triple Sensor-20f	Each	2	274.32	548.64
SpecWare 10 Pro Software	Each	1	270.27	270.27
Total amount				12141.87

PTUK

Courses

Course 1: ICT in Agriculture, and the outlines are:
- Introduction to ICT in agriculture
- Farm management software and applications in agriculture
- Type and Use of sensors and IoT in agriculture
- Electronic marketplaces and e-commerce in agriculture
- Geographic Information Systems (GIS) and Remote Sensing in agriculture
- Data management and AI in agriculture
- ICT for weather forecasting
- ICT-enabled extension services for farmers.

Course 2: Smart Agriculture Technologies and the outlines are:
- Introduction to Smart Agriculture Technologies
  what is smart agriculture, what is needed for smart agriculture, and challenges, etc.

Co-funded by
the European Union

- Smart soil management and technologies
- Smart crop management and technologies
- Smart irrigation management and technologies
- Smart livestock farming and animal tracking technologies
- Smart greenhouse management and technologies
- Use of Blockchain technology in agriculture
- Smart packaging, labelling and 3D technologies in agriculture

These courses will be developed in cooperation with UJ. PTUK will implement the two courses in the study plan of the Faculty of Agricultural Science and Technology in both bachelor's degrees and master's degrees as elective courses. Both in Agriculture and Smart Agriculture Technologies. Courses are highly relevant to the objectives and implementation of the AgroTec project, as they provide essential knowledge and skills needed to leverage technology for agricultural advancement.

Accreditation letter: The courses will be implemented as elective courses and accreditation is not required.

Equipment

Item with specifications	Qty
Soil sensors unit (temperature sensor, moisture, conductivity EC) - Measuring depth: 10cm, 20 cm and 30 cm - Compatible with soil node in 2 and gateway in 7. Soil temperature: measuring range: from -40 to 80C accuracy: +- 5 response time<=15s Soil moisture: measuring range:0-100%RH accuracy: 2% response time: <=4s Soil conductivity: Measuring range: 0-20000us/cm Accuracy 3% Response time <1%s	6
Soil node to connect to gateway supports 3G and 4G supports long-range wireless communication connects to wide range of sensors powered by solar energy connects to actuators - Compatible with gateway in 7.	3

Wind speed and wind direction unit
Wind speed 20mA, 5V and 10V/pulse
   -   Compatible with weather station node in 6 and gateway in 7
   -
Wind direction
Powered by 10-30V DC
0.4 WAT
Response time <0.5s
Output RS485
	3

rain gauge 30V DC 0.24WAT Ambient temperature 0-70C Output RS485 0.24WAT - Compatible with weather station node in 6 and gateway in 7.	3
CO2 sensor Range 0 to 10000 ppm Temperature -20 to 60C Power DC 10-30 V Output RS485 - Compatible with weather station node in 6 and gateway in 7.	3
Air temperature + air humidity + solar radiation one unit: 30 V DC power supply 0.8WAT Output RS485 Temperature from -40 to 80C - Compatible with weather station node in 6 and gateway in 7.	3
Weather station nodes support 3G and 4G supports long-range wireless communication connects to a wide range of sensors powered by solar energy connects to actuators - Compatible with gateway in 7.	3

Gateway High secure connection. High local storage for up to 3 years. Long-range wireless connectivity with the Nodes (Sensors) or over 3G/4G. Supported with real-time Dashboards using Website & Mobile APP. Multi-user authentication levels (User, Admin, Super Admin). Ability to connect multiple nodes.	3
Uninterruptible power supply (UPS) for each station to backup electricity for not losing data	3
Aluminium structure to support all items	3
Web dashboard	1
Cloud to support data collection and query 24/7 - Hosting for at least three years - SIM cards and communication	1
Installation in the field and panel setup for all items to guarantee operative data collection and monitoring	
Maintenance for at least one year	
Training of staff in the first year	

What is the status of the above equipment?
- □ Purchased and Delivered to the university

What is the purchased price of each piece of equipment in Euros:

Snipe company

Al-Irsal – Mekka center

Ramallah - Palestine

+970-594-303-002

info@snipe.ps

Date : 5-12-2023

BILL TO

Dr.Yousef Daraghmeh

Palestine Technical University Kadoorie

Tulkarem

DESCRIPTION	QTY	UNIT PRICE	TOTAL
Soil sensor unit	6	140	840
Soil node	3	130	390
Wind speed	3	150	450
Rain gauge	3	150	450
CO2 sensor	3	100	300
Air temperature & humidity	3	200	600
Weather station node	3	250	750
Gateway	3	1100	3300
Uninterruptable Power supply	3	520	1560
Aluminum structure	3	470	1410
Web dashboard	1	480	480
Cloud database 3 years	3	350	1050
Installation	3	390	1170
Maintenance one year per visit	4	150	600
Training visits	4	150	600

Notes, how payment was made, warranty/returns policies

SUBTOTAL	13950
DISCOUNT	0.00
SUBTOTAL LESS DISCOUNT	0.00

Balance Paid Euro   13950

PPU

Courses

PPU developed two courses:
1. Food Marketing
2. Plant Diagnosis

Concerning the accreditation letter, PPU is presently in the process of developing a diploma in smart agriculture, a two-year program. PPU is planning to submit the proposal for accreditation to the ministry by the end of March 2024.

Equipment

- PPU got approval from the EACEA on their equipment earlier (For details, please see Deliverable D3.2, AgroTec centres equipment).
- PPU requested 3 pieces of equipment and received offers from 3 companies.
- PPU received two pieces so far at the PPU (Agrilife-from Mazaya company), and (Chlorophyll metre from Labtech company).
- PPU is waiting for the delivery of the (Kjeldahl digester from Biotech company).
- PPU received a letter from the company about the possibility of a delivery delay due to a security check from the Israeli side for the device.

What is the status of the above equipment:
- ☐ Installed and Operational (Both Agrilive and chlorophyll metre)
- ☐ Awaiting Shipment (Kjeldahl digester).

What is the purchased price of each piece of equipment in Euros (for details about the equipment, see the table below):

Equipment 1 - Digestion Unit (Kjeldahl digestor): 8600 euro

Equipment 2 - Agrilive monitoring system: 3800 euro

Equipment 3 - Chlorophyll metre: 2155 euro.

Digestion Unit (Kjeldahl digestor)	● Digestion unit for at least 6 samples with suction unit and scrubber. ● Temperature up to 450°C. Including 12 Kjeldhal tubes and 1000 catalyst tablets KJELDATHERM® KJELDATHERM® digestion system KT 8s, 8 x KTG tube 250/volume 300 ml, 230VAC 50-60Hz 1000W Digestion tubes 8 x KJELDATHERM digestion block with two-tier console and operating unit 1 x Insert rack for tubes 1 Exhaust manifold with drip tray 1 x Water jet pump 1 x Isoversinic-tubing 1.5 m
Agrilive monitoring system, including gateway, the node and set of sensors	Received an offer from BioTech Medical SuppliesCo from 19/7/2023
Chlorophyll metre/ CCM-200	Measured Parameters: Optical absorbance in two different wavebands: 653nm (Chlorophyll) & 931nm (Near Infra-Red). Measurement Area: 9.52mm (3/8") dia. circle, (.71 mm) Resolution: .1 CCI unit Repeatability: +/- 1% Source: Custom 2 wavelength LED module Detector: Silicon photodiode with integral amplifier for absorbance measurement, power monitoring, and temperature compensation. Storage Capacity: 8 Mbyte of memory for up to 160,000 data measurements, or 94,000 with added GPS data entries. Data Modes: (3) Single point, user selectable from 1-30 point averaging, and a statistical 10-30 point protocol that asks to replace data points beyond a 2 sigma standard deviation.

	User Interface: 128 x 32-pixel graphic display, beep signals, keys for: setup, measurement protocols, diagnostics, data control and user input of alphanumeric comment lines. I/O: USB 1.1 & RS-232; multi-point file output, single point out on demand, NMEA 0183 compliant for GPS data input.

7. Courses linking to the AgroTec project

- Understanding ICT in agriculture is fundamental to the AgroTec project's mission of digitising the agricultural sector in Jordan and Palestine.
- Smart agriculture technologies encompass a wide range of innovative solutions that align with the objectives of the AgroTec project to modernise and enhance the agricultural sector in Jordan and Palestine.
- The course provides participants with knowledge and skills to effectively utilise digital tools and technologies integrated into the AgroTec system, such as soil sensors, weather stations, and farm management software for real-time monitoring, automation, and traceability.
- Students gain insights into how remote sensing, GIS, and precision agriculture techniques can improve crop monitoring, resource management, and decision-making processes, aligning with the project's objectives of enhancing productivity and sustainability.
- Mastery of data analytics and decision support systems empowers stakeholders to extract actionable insights from the wealth of data generated by the AgroTec system, facilitating evidence-based decision-making and continuous improvement in agricultural practices.

8. Equipment linking to the AgroTec project

The equipment listed above plays crucial roles in the implementation and success of the AgroTec project, which aims to revolutionise the agricultural sector in Jordan and Palestine through digitalization and advanced technology integration.

The need for the equipment is to upgrade the capacity to produce and deliver ICT solutions for agriculture purposes. The required equipment will be used for the training of trainers (ToT) and the development of modules and digital solutions applicable to agriculture. Furthermore, the equipment will be utilized in the new courses currently under development by all project partners.

9. Conclusions

In this deliverable 2.1, we reported on the progress of the AgroTec project's requirements to provide an update on the activities, achievements, and challenges encountered up to the end of February 2024. This includes AgroTec Centres Requirements and Status of Equipment Purchase and Courses.

The AgroTec Project Partners had a thorough assessment of the project requirements including required VET courses, existing infrastructure at local university partners, alongside extensive discussions and evaluations of the necessary demonstration equipment for the AgroTec training centres. The selection process for the required sets of equipment was meticulously conducted, prioritising competence, professionalism, and adherence to best practices.

The equipment procurement process is finalised. This marks a significant step towards equipping the AgroTec training centres with cutting-edge tools and technologies.

All necessary procurement documents and equipment information, as well as the development of diploma courses in smart farming (in Arabic) are accessible in the shared AgroTec Workspace upon request.

Furthermore, as part of the next steps, the AgroTec project will plan for equipment installation, testing, and validation processes. These essential steps will involve close coordination between the project team, university partners, and relevant stakeholders to guarantee seamless integration of the demonstration equipment into the training centres.

Overall, the AgroTec project is making diligent progress towards the development of not only VET courses but also new (Vocational) Diploma Courses in Smart Farming, with a focus on providing essential teaching and training services to unemployed graduates. The anticipated outcomes are expected to significantly contribute to the national-level capacity-building process, enabling graduates to acquire the essential skills and training needed for their professional growth in precision farming.