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Newsletter

Boosting Innovation in Education and Research of Precision Agriculture in Palestine

#### **Project Progress**

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Aziz Salmeh (Project Coordinator)

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The management team of (BENEFIT) met, during the period 20-28/2/2022, with representatives of the national partner universities and with the University



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### Usage of drones for detection of plant anomalies

Technology, Faculty of **Technology** Institute of and Business in České Buděiovice. Czech **Republic** One of the technical innovations in precision agriculture is the use of drones for field imaging in order to detect crop anomalies. more expensive.



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# BENEFIT MOOC Promotional & Awareness

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course Al-Istiqlal University

1-What is a MOOC? massive open online course (MOOC) aimed at unlimited participation and open access via the Web. In addition traditional to course materials, such as filmed lectures, readings, and problem sets, many **MOOCs** provide interactive courses with user forums or social media discussions to support community interactions among students, professors, and teaching assistants

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University of Ruse / BENEFIT Team Activity <u>Read Full Subject</u> UCAS contribution to BENEFIT project <u>Read Full Subject</u> An-Najah National University (BENFIT Activities) Read Full Subject



Precision Agriculture Education and the Blocked vs. Interleaved Learning Neuromyth University of Patras

Precision Agriculture (PA) education is encouraged to explore user-centered systems and training approaches



**Read Full Subject** 



Co-funded by the Erasmus+ Programme of the European Union



# **Project Progress**

Aziz Salmeh (PROJECT COORDINATOR)



Boosting Innovation in Education and Research of Precision Agriculture in Palestine (BENEFIT) project aims to involving Palestinian HEI's in Research Movement related to Precision Agriculture in Europe and encourage Palestinian researchers and academics to have an interest to topics related to the concept, domains, tools and digital technology of the Precision Agriculture.

In order to scale up the experience in precious agriculture, around 90 technicians, researchers, and academics from six Palestinian universities have been participated in three online intensive capacity building training courses led by four

European universities . These training have covered topics related to precision farming like GPS guidance, control systems, sensors, robotics, drones, autonomous vehicles, variable rate technology, GPS-based soil sampling, automated hardware, telematics, and software and their possible application in agriculture processes.

The obtained knowledge will assist the teams to design and develop curriculum and courses' syllabuses proposed for each Palestinian HEI. In fact, the training represents the starting point for the pre-produced curricula and syllabus for each Palestinian University.

At this level, and after the participated in the training courses, each Palestinian university has prepared one term of reference that serve as training blueprint to develop or enhance course or study program and enrich the learning, research and teaching process inside Palestinian Universities, focusing on precision agriculture in local communities. Additionally, Palestinian partners require equipment for their new laboratories focusing on precision agriculture. At this stage, the Palestinian universities has completed their equipment procurement and deployment process that include different forms of complex smart systems, sensors, and measure devises as well as computers and related software.













Finally, as a part of dissemination activities, some Palestinian universities organize public events and workshops about precision agriculture targeting local community, farmers and students like the workshop organized by the Agricultural Research Center at Palestine Technical University – Kadoorie, on smart farming devices, including weather monitoring devices, plant diseases and insects in the field, targeting the staff of the College of Agriculture Science and Technology, the College of Applied Sciences, and the College of Engineering and Technology. To see more <u>Click here</u>.



Additionally, the College of Agriculture at Hebron University hosts Land Foundation for Agricultural Development in training workshop "Promoting ecological approach of agriculture in Palestinian society". Students and graduates were introduced to the Municipal Seed Bank in the UAWC and its importance in preserving Palestinian municipal varieties. It was also explained for participants how to apply for incentive grants to start their own entrepreneurial projects aimed at developing the agricultural sector. To see More <u>Click here</u>



Similarly, AI IsteqIal University, organized a workshop to introduce the the AgriLive system supplied by the BENEFIT project to Many representatives of the University departments, including the project team, agricultural engineers, engineers from the computer department, the projects department and a number of interested from the academic staff, were participated in this training. To see more <u>Click here.</u>





# Usage of drones for detection of plant anomalies

Roman Danel, Marta Harničárová, Jan Valíček, Michal Řepka

Faculty of Technology, Institute of Technology and Business in České Budějovice, Czech Republic

One of the technical innovations in precision agriculture is the use of drones for field imaging in order to detect crop anomalies. Detailed images of sown areas have been available for some time from aerial photography and remote sensing. However, satellite images must be ordered in advance, their quality is affected by the weather and they are more expensive.

Drones are suitable for detecting plant anomalies, which allow the repeated imaging of fields from a low height using multispectral cameras. From the captured images, it is possible to detect problems in the examined area by analyzing the image and color changes, for example:

- Detection of insufficient irrigation (color changes of crops not corresponding to the season)
- Identification of plant diseases and pests (especially bacterial and fungal infections)
- Checking the condition of treetops (places that cannot be checked from the ground)
- Occurrence of strips of other (unsuitable) soil or rock species in the study area
- Analysis of the permeability of the amelioration system
- Inaccurate sowing detection
- Identification of crop spraying by sprayer (too large a dose)
- Search for waterlogged places
- Distribution of invasive plants or weeds
- Documentation of crop losses for insurance claims

#### Drones' usage in project Agrihub

The AGRIHUB project (2021-2022) deals with the use of drones to identify plant problems (lack of moisture or pests). The project is leaded by Zuzana Palková (SUA) and Marcel Konečný (ADDSEN). For identifying problematic areas in the crop the vegetation indexes are used. The most popular are Normalized Difference Vegetation Index (NDVI) and Enhanced vegetation index (EVI). NDVI is a simple graphical indicator that can be used to analyze remote sensing measurements, assessing whether or not the target being observed contains live green vegetation. The NDVI is computed as the difference between near-infrared (NIR) and red (RED) reflectance divided by their sum.

$$NDVI_{i} = \frac{NIR - RED}{NIR + RED}$$
$$EVI = G \cdot \frac{(NIR - R)}{(NIR + C_{1} \cdot R - C_{2} \cdot B + L)}$$

NDVIi represents smoothed NDVI observed at time step i and their ratio yields a measure of photosynthetic activity within values between - 1 and 1. Low NDVI values indicate moisture-stressed vegetation and higher values indicate a higher density of green vegetation. It is also used for drought monitoring and famine early warning.

#### Usage of drones for detection of plant anomalies

The Enhanced Vegetation Index (EVI) can be used to quantify vegetation greenness. EVI corrects for some atmospheric conditions and canopy background noise and is more sensitive in areas with dense vegetation. It incorporates an "L" value to adjust for canopy background, "C" values as coefficients for atmospheric resistance, and values from the blue band "B" (coefficient G is a gain factor). These enhancements allow for index calculation as a ratio between the R and NIR values, while reducing the background noise, atmospheric noise, and saturation in most cases. We can further link the analysis of drone images with the analysis of data obtained from existing public data sources. There are a number of services (mostly paid) that offer data on soils, geological conditions, climatic conditions, precipitation, areas at risk of floods, forest databases, etc.



Fig. 1 Identification of the area affected by the invasive plant Impatiens gladurifera in the Mszana area (Poland, 2017) by drone imaging [Source: Olszewski, P. & Grabowski, J. (2019). Ocena zasobów i zagrożeń związanych z roślinnymi gatunkami inwazyjnymi na terenach transgranicznych. Final conference of the INVARO project, Ostrava, February 2019 [In Polish]].

#### Project Invaro - identification of the invasive plants spread using drones

Drones was also used in the Czechcross-border Polish co-operation project called **INVARO:** led bv Associate Professor Barbara Stalmachová from the VŠB-Technical University of Ostrava in co-operation GIG with the (Głowny Instvtut Górnictwa, Poland). The project took place in the years 2016-2019 and its goal was to map the spread of invasive plants on the Czech-Polish border and then determine the strategy for preventing further spread. Data on the occurrence of individual plant species were collected using drones and research on the terrain. The spread of invasive plants in the mapped area was modelled using a GIS system database. based on data in the Selected sites were photographed using drones for three consecutive

years and changes were evaluated using GIS. The investigated location consists of densely populated and industrial areas, which created problems with imaging, as drones are not permitted to fly over built-up areas. The main output of the project was the 'Plan for Reducing the Risks Associated with Invasive Plant Species'. The results of the project and publications created within it are available at website <u>http://invaro.vsb.cz/</u> [In Czech and Polish].



#### Problems in the analysis of vegetation using drone images

When using a drone to analyse the state of vegetation and identify anomalies, we must take into account some limitations and possible problems:

- In the Czech Republic, it is not possible to fly a drone over a populated area and over houses
- The height of the air column affects the image analysis. The higher the drone moves, the more color distortion occurs, and subsequent correction is required
- A database of the reference images is not yet available, containing already known and described anomalies that could be used to evaluate color changes
- Imaging of the same area over time in order to monitor changes due to the nature of the analyzed data, the evaluation can be in a longer time horizon
- Costs for imaging and evaluation. The weight of the equipment used has an effect.
- Price of multispectral cameras cameras modified with special mounts are used with drones, price 200 to 300 thousand CZK (approximately 10.000 €)
- The drone is suitable for the analysis of smaller areas and for detailed evaluation, for larger areas it is more suitable aerial photography (the problem is connected with the batteries and their performance with current drones)
- For professional use, it is necessary to have a pilot who has passed the tests to perform aerial work.



## BENEFIT Team at AI Quds Open University Meets with Partner Universities





The management team of "Boosting Innovation in Education and Research of Precision Agriculture in Palestine( BENEFIT) met, during the period 20-28/2/2022, with representatives of the national partner universities (AI-Istiqlal University, An-Najah National University, Hebron University, Palestine Technical University-Kadoorie, and with the University College of Applied Sciences via "Zoom technology".

The meetings aimed to evaluate the activities of the project which is funded by the European Union through the Erasmus+ program and is implemented in collaboration between Palestinian and European universities.

The meeting also aimed to identify the mechanism for implementing activities on the ground, monitor progress of technical and administrative work, and work on resolving any difficulties that partners may encounter while carrying out these activities.

The meetings included the adoption of a future work plan to be followed in order to achieve the project's objectives within the timeframe proposed. It was also agreed to expand the project's target groups through implementing different activities, such as workshops, introductory meetings, and field days for farmers and students of Faculties of Agriculture.

This project is being carried out over a three-year period by the management of Al-Quds Open University in collaboration with ten Palestinian and European universities, with the goal of developing some curricula and courses taught in the agricultural faculties of partner universities in smart agriculture. In addition to improving the technical capabilities of the cadre of partner institutions, including researchers and lecturers in the same field, and work to encourage farmers to use various smart farming techniques because they have a positive impact on farm productivity and profitability, in line with the agricultural sectoral strategy.

The delegation included Dr. Aziz Salama, the Project Coordinator from the Faculty of Agriculture, and Ms. Randa Abdelhay from the Continuing Education and Community Service Center.





#### BENEFIT MOOC Promotional & Awareness course *AI-IstiqIal University*

1- What is a MOOC?

A massive open online course (MOOC) aimed at unlimited participation and open access via the Web. In addition to traditional course materials, such as filmed lectures, readings, and problem sets, many MOOCs provide interactive courses with user forums or social media discussions to support community interactions among students, professors, and teaching assistants, as well as immediate feedback to quick quizzes and assignments. MOOCs are a widely researched development in distance education, first introduced in 2008, that emerged as a popular mode of learning in 2012.

While each MOOC has its own unique structure and style, MOOCs can generally be divided into 2 categories: xMOOCs and cMOOCs.

The original first MOOC was in fact a cMOOC. Both terms cMOOC and xMOOC were coined by Stephen Downes and George Siemens the creators of the first MOOC ever in 2008 entitled "Connectivism and Connective Knowledge", which also enrolled 2200 participants. The cMOOC is based on the Connectivism learning theory emphasizing the power of networking with other individuals, gleaning from diverse opinions, and focusing on end-goals as the foundation of learning. The participants in a cMOOC will have a dual role of being learners and teachers at the same time.

Instead of being structured as an open online community of learners, xMOOCs are based on a more traditional classroom structure: They are a combination a pre-recorded video lecture with quizzes, tests, or other assessments. xMOOCs are centered around a professor rather than around a community of students.

2- Why the MOOC is a great for the BENEFIT project ?

Creating a community of practice for P.A will serve the project objectives on many levels including the creation of a network including and gathering all individuals interested into the subject matter.

The idea of the Promotional course is not providing learning material for the participants but interrogating their curiosity to look for their own learning resources in the Network which can be gathered from websites, webinars, videos, other participants, forums, etc.

This community of practice which will be created during the first edition of the BENEFIT promotional and awareness course will be responsible of training farmers and other concerned stakeholders in the second edition of the course which will be organized during the last year of the project.

As the course is open to the whole world this will also disseminate the project activities and results in more geographical zones. This will also interest people from abroad to know more about Palestine.

A MOOC is massive course which means it will attract more people to the project from different geographical zones and backgrounds. A MOOC is an OPEN which means it does not discriminate its participants, it's open for everyone from any background. A MOOC is free which means it is free of charge and participants will not pay for that course. It is ONLINE which means participants will learn remotely, at their own pace and the time they choose to do so.



## Precision Agriculture Education and the Blocked vs. Interleaved Learning Neuromyth

#### Maria Fragkaki & Stylianos Mystakidis, University of Patras"

Precision Agriculture (PA) education is encouraged to explore user-centered systems and training approaches (Lindblom, Lundström, Ljung, & Jonsson, 2017). Active, student-centered and collaborative learning strategies have been implemented also during the COVID-19 pandemic (Pang, 2021). Therefore, PA practitioners and trainers are encouraged to explore consistently the latest findings of Neuroscience regarding optimal human learning to incorporate them into their teaching practice.

Neuroscience influences education, and these two areas have converged in a new field denominated "Neuroeducation", "Educational Neuroscience" or "Neuropedagogy". However, the growing interest in the education–brain relationship does not match the proper use of research findings. Indeed, the Organization for Economic Cooperation and Development (OECD) warned of the misunderstandings about the brain among teachers, labeling them as neuromyths (Howard-Jones, 2014). Neuromyths can be defined as "misconception[s] generated by a misunderstanding, a misreading, or a misquoting of facts scientifically established (by brain research) to make a case for use of brain research in education and other contexts" (Grospietsch & Lins, 2021).

#### The Blocked vs. Interleaved Learning Neuromyth

One common neuromyth with important implications for teaching is the notion that blocked learning is better than interleaved (Grospietsch & Lins, 2021). Blocked learning is a commonly used learning sequencing method in academic settings. It is the process of concentrating on a specific skill or lesson until it is mastered. After that material is learned, students are taught the next skill. Interleaved learning happens when we study two or more related concepts or skills simultaneously, instead of focusing exclusively on one concept or skill at a time. It can be helpful to alternate between them. For example, if we are learning topic A and topic B, rather than practice only A on one day and only B on the next, we can practice both on each day by incorporating a mixture of the two topics or by switching back and forth between them.

From a scientifically accurate perspective, students who engage in interleaved learning (mixed, juxtaposed learning of different topics) have better scores on long-term performance tests (after several weeks or months) and develop fewer misconceptions than students who sequentially learn content on one topic after another.

# Precision Agriculture Education and the Blocked vs. Interleaved Learning Neuromyth

Link with BENEFIT project & Neuropedagogy upskilling opportunity

As partners of the BENEFIT project have the task to develop innovative curriculum designs (as part of the Terms of Reference – ToR documents) on Precision Agriculture, it is recommended that neuroscience-informed practices should be considered in the Pedagogical Knowledge section.

Interested academics and educators are encouraged to dive deeper into Neuromyths and Neuroscience-informed teaching practices by enrolling into the upcoming free open online course that will be offered in the Neuropedagogy Erasmus+ project(Wyższa Szkoła Biznesu i nauk o Zdrowiu, 2021).

#### References

- Grospietsch, F., & Lins, I. (2021). Review on the Prevalence and Persistence of Neuromyths in Education – Where We Stand and What Is Still Needed. Frontiers in Education, 6. https://doi.org/10.3389/feduc.2021.665752
- Howard-Jones, P. A. (2014). Neuroscience and education: myths and messages. Nature Reviews Neuroscience, 15(12), 817–824. https://doi.org/10.1038/nrn3817
- Lindblom, J., Lundström, C., Ljung, M., & Jonsson, A. (2017). Promoting sustainable intensification in precision agriculture: review of decision support systems development and strategies. Precision Agriculture, 18(3), 309–331. https://doi.org/10.1007/s11119-016-9491-4
- Pang, A. L. H. (2021). Virtual pedagogy: design and delivery of an eWorkshop on PA under COVID-19 restrictions. Precision Agriculture '21, 795–802. https://doi.org/10.3920/978-90-8686-916-9\_95
- Wyższa Szkoła Biznesu i nauk o Zdrowiu. (2021). Neuropedagogy. Retrieved April 12, 2022, from https://www.neuropedagogy.eu/



## University of Ruse / BENEFIT Team Activity

The University of Ruse organizes traditional scientific events during the months of May and June. One of the more important one is the Innovative Youth EXPO. During this event pupils, students, PhD students and young researchers demonstrate their ideas and work using presentations, video materials, prototypes, papers, etc.







On 10th of June 2022 the Innovative Youth EXPO was organized in Kaneff Center of the University of Ruse. The **BENEFIT** project team from the university also took part in the event with a booth. There were presented the main goals, their implementation and the achieved results from the project. There was a strong interest towards the project activities from students and lecturers, working in the field of agricultural engineering and technologies. The developed specific lecture topics in the field of precision agriculture, well-illustrated with video materials, presentations, examples and tasks, as well as the specialized instrument for development of syllabus (the TORs) impressed the visitors.

The media partners of the EXPO also made the information accessible to all stakeholders from the academic community, business and industry, interested in precision agriculture.





# UCAS contribution to BENEFIT project

للكلية الجامعية للعلوم التطبيقية University College of Applied Sciences Leader of Innovation

UCAS accomplished the first stage of BENEFIT project. The first stage has worked on developing four courses and supplying devices related to precision agriculture.

Safe Agriculture, Plant Protection. Fertilization. Irrigation and and vegetables Production are the four courses that have been developed under the framework of TAPACK methodology (a technology integration framework that identifies of knowledge three types instructors combine need to for successful edtech integration – technological, pedagogical, and content knowledge). This methodology combines the three type of knowledge – TK, PK, and CK – are recombined in various ways.



followed The development two stages: the first stage concentrated developing the Terms of on Reference (TOR) which focused on technical merging the with pedagogical and the practical side to boost innovation agricultural in teaching and research. These methodologies include preparing syllabus for each course depending on the content of each one of these courses. The second one seek to develop the contents of each courses



The second part of the first stage was establishing precision agricultural lab that includes many equipment and devices that are related to precision agriculture. These devices include Residue Pesticide detectors. Measurement devices. Incubators. Oxygen pumps, and other devices. Moreover, BENEFIT project worked on equipping a computer lab at the University College of Applied Sciences (UCAS).



It is noteworthy that BENEFIT project is funded by Erasmus+ and aims to enhance the capabilities of students and researchers in the field of precision agriculture in terms of the scientific concept through the development of courses taught at University College of Applied Sciences (UCAS) and practical application in modern technology.



## An-Najah National University (BENFIT Activities and SMART Technology Installation)



In the framework of the Improving the Agricultural Sector in Palestine, An-Najah National University is a partner in the "Boosting Innovation in Education and Research of Precision Agriculture in Palestine (BENEFIT Project)". BENFIT is a project of international cooperation selected for co-financing under the Erasmus + Capacity Building programme in Higher Education. The project seeks to involve Palestinian Higher Education Institutions in the research movement related to Precision and SMART Agricultural Practices. It promotes Palestinian farmers to utilize digital tools and technologies to develop the agricultural sector in Palestine collaboration with agricultural research through centers in Palestinian Universities. By collaborating with European Partners and research centers, the project defines state-of-the-art curriculum in Precision and SMART agriculture in order to promote the adoption of innovative agricultural practices, while equipping Palestinian Students with necessary tools, knowledge, and expertise to succeed in their future.

An-Najah National University has conducted a series of activities in the Project:

- Participating the Training of Trainers held by EU partners: training Palestinian researchers and academic staff members on Precision and SMART Agriculture
- Integrate Precision and SMART Agriculture in the existing curricula (Plant Nutrition, Plant, Propagation, Protected Agriculture, and Vegetable Production): academic and research staff members from An-Najah National University, in collaboration with EU counterparts, have developed the existing curriculum by including the state-of-the-art topics and tools related to Precision and SMART Agriculture.



• Purchasing and Installation of SMART Agricultural Technologies and Tools: during the first year of the project, the team members of the project, in collaboration with EU partners, have developed the technical specifications the SMART tools and technologies. Furthermore, the tools and technologies have been identified upon an intensive study of the current and future need of the agricultural sector in Palestine, and in-line with current state-of-the-art research in Precision and SMART agriculture. The equipment and tools been installed.

#### An-Najah National University (BENFIT Activities and SMART Technology Installation)

Several informative sessions have been conducted by academic staff to students and farmers. These sessions have been held on-campus (farms), the purpose of these informative sessions (besides being part of the project) is to put a spotlight on the future of agriculture and the utilization of the SMART technologies in the agricultural processes. This will stimulate framers to adopt these technologies, which will eventually increase the potential employment opportunities of our graduate students.







