Final Project Report
(Reporting time 15.11.2021 – 15.11.2022)

New Curricula in Precision Agriculture Using GIS Technologies and Sensing Data

CUPAGIS

INSERT TITLE OF THE UNIVERSITY, FACULTY

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

Joint Project: Capacity Building in the Field of Higher Education ERASMUS+ 2018

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1- TRANSVERSAL ISSUES

Table 1. TRANSVERSAL ISSUES		
	Question	**Answer**
1	Please, describe how and to what extent the project addresses transversal (/cross-cutting) issues relevant for your university and country (e.g. gender balance, sustainable development, unemployment, social cohesion, etc.). Maybe your university provides some support for people with fewer possibilities, free dormitories, scholarships, etc.	The two classes of students (first class 14 students in September 2021, second class 12 students in September 2022). the gender ratio, is more than 60 percent female. and our university gives free accommodation for students who come from far away from various parts of the country. Thus, our training gives the opportunity to people who come from agricultural and disadvantaged areas that have less opportunities to access training on agriculture and technology.
2	Please, describe how and to what extent the project addresses issues related to the involvement of people with fewer opportunities (people with disabilities…)	despite the fact that we do not have disabled students. our university gives advantage to students with health and mobility problems, for example; transport, accommodation, study, food, insurance, medical care, free of charge. and even cultural activities
3	If applicable, describe how the project has involved or disseminate the results toward institutions located in least developed regions in the country. Provide information if there is any plan /strategy for the future to do so.	Together with the PASENSO office, and through the local radio and even journalists and student science clubs, information about the project was disseminated to make it visible and to attract students from different parts of the country.
4	Please, describe to which extent the project has proved to be innovative and how do the project's results offer innovative and creative solutions to promote capacity building	Agriculture being an important and vital sector in Algeria, the teaching of a professional master in the field of precision agriculture is considered as an innovative training. Our master training is among the first and unique training in Algeria, and the contribution of technology tools in the training, has made it very attractive both for students and even for companies and institutions outside the university.

2- REGIONAL COOPERATION

Table 2. REGIONAL COOPERATION		
	Question	**Answer**
1	Please, explain how the project has contributed to regional integration and cooperation between different regions (between partner universities, EU universities, etc.)	Some public institutions, which are our partners and with which we have signed agreements, are very interested in using the materials acquired in the framework of the project to carry out manipulations and measurements.
2	Please provide information and quantify the inter-institutional agreements or bilateral agreements signed/to be signed by your university to promote cooperation in the field of education and/or research, as a result of cooperation in Erasmus+.	Our students have and still do some numerous internships with our partners. (with INRAA, SODEA, ITGC)

3- SUSTAINABILITY

Table 3. SUSTAINABILITY		
	Question	**Answer**
1	Please, explain the role, commitment and concrete measures taken in your university to guarantee the sustainability of the project outcomes/results beyond the project's lifetime (specify the funding sources if known);	the sustainability of the project is ensured by the PASENSO office, so through this office and the partners we have made a work plan so that our partners can make a bilateral benefit and all that has been mentioned in the agreements and even services are envisaged.
2	Please, explain how you have achieved a multiplier effect of the project; how the results have been exploited beyond the immediate target group and transferred to other contexts (for example to the wider education system, local economy and society, other institutions, other regions, etc.)	At the level of our university, there are projects that aim to deploy precision technologies in agriculture with farmers owning large lands. Our master's training on precision agriculture, it was proposed as a way to make our students work in practical internships. The equipment acquired has allowed us to cooperate with other colleagues to develop ideas in the field of precision agriculture. and some of our partners have volunteered to offer us their fields to carry out practical work and measurements.
3	What measures have been taken to formalise or institutionalise links with local non-university partners?	We organised visits and field trips for our students. These visits were a way to get in touch with the professional world and it allowed the students to understand the notions of precision agriculture, and to know how to master the technology tools. We also established relationships with our socio-economic partners in order to develop projects together, to ensure a good training and also to ensure the sustainability of the project.

4- EQUIPMENT

Table 4. EQUIPMENT		
	Question	**Answer**
1	Describe where and when equipment items have been installed and how they have been used in the project and will be used in the future	The computers and video-projection elements were installed in January-February 2022. We used them in the practical work done in the following courses: Technological tools for precision agriculture (QGIS software), Statistics (R system and programming). Workgroup members started to use sensors (e.g. NPK sensors, radiospectrometer, Raspberry, Deviner 2000, multispectral camera, Green seeker). We used these sensors in an introduction to precision agriculture with practical work to first year and second year master students. The sensing equipment will be fully used in the courses of the next second semester 2023, namely "Remote sensing" and "Sensors for precision agriculture". We also have a local project to develop a proof-of-concept environment showing all the steps to deploy precision technologies in our experimental field. The equipment received will be fully used in this project.

5-COURSE DEVELOPMENT

Please upload this file to the folder of your university on google drive:
https://drive.google.com/drive/folders/10l7r9ZBwoy4C7eLJ2QYWL4bdYubeuSSR?usp=share_link

6- Curricula

Course №	Title of the course and in which program it is taught (Bachelor, Master)	Its volume (in ECTS)	Number of students participating in the course	Name new elements in the course and estimate the percentage they represent in relation to the preexisting course	Link to the course on the university page	Please provide any official documents which prove allowance of the course for teaching in your university. Document should be signed and stamped of responsible department of the university
Course 1	Les SIG en agriculture de précision I	06	17	50% Basics of GIS 50 % of GIS sensing related to new technologies of precision agriculture	https://www.univ-sba.dz/snv/index.php	- Accredited at university and regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021

6- Curricula

Course 2	Biomathématiques et analyse des données	06	17	20% application of statistics and experimentation in precision agriculture	https://www.univ-sba.dz/snv/index.php	- Accredited at university and regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021
Course 3	Communication	**01**	**17**	**Classic courses**	https://www.univ-sba.dz/snv/index.php	- Accredited at university and regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021

6- Curricula

Course 4	Anglais	05	17	Classic courses Updatet 20%	https://www.univ-sba.dz/snv/index.php	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021
Course 5	Agressions et sante des plantes cultivées	04	17	Classic courses Updatet 20%	https://www.univ-sba.dz/snv/index.php	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021

6- Curricula

Course 6	Les SIG en agriculture de précision II	06	17	20% Basics of GIS 80 % of GIS sensing related to new technologies of precision agriculture	https://www.univ-sba.dz/snv/index.php	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021
Course 7	Législation	01	17	Classic courses Updatet 20%	https://www.univ-sba.dz/snv/index.php	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021

6- Curricula

Course 8	Cultures maraichères spéciales	06	17	Classic courses Updatet 20%	https://www.univ-sba.dz/snv/index.php	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021
Course 9	Technique de recher.Biblio.et Rédact.	04	17	Classic courses Updatet 20%	https://www.univ-sba.dz/snv/index.php	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021

6- Curricula

Course 10	Entreprenariat	01	17	Classic courses Updatet 80%	https://www.univ-sba.dz/snv/index.php	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021

∑(Total number of updated courses) = 10
∑(Total number of ECTS) = 40

6- Curricula

Table 6.1.2.NEW COURSES					
Course №	**Title of the course and in which program it is taught (Bachelor, Master)**	**Its volume (in ECTS)**	**Number of students participating in the course**	**Link to the course on the university page**	**Please provide any official documents which prove allowance of the course for teaching in your university. Document should be signed and stamped of responsible department of the university.**
Course 1	Remote sensing and application of earth and environment related to precision agriculture	06	17	https://www.univ-sba.dz/snv/index.php	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021
Course 2	Soil properties and its measurement	06	17	https://www.univ-sba.dz/snv/index.php	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricul for high school bachelors: 29 June 2021

6- Curricula

Course 3	Basics of the Precision agriculture – characteristics, technologies, economic efficiency, optimal use of resources	04	17	https://www.univ-sba.dz/snv/index.php	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021
Course 4	Acceptation des nouvelles technologies	02	17	https://www.univ-sba.dz/snv/index.php	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021

6- Curricula

Course 5	Course of sentinel 1 2 3 imagery for agriculture field monitoring	06	17	https://www.univ-sba.dz/snv/index.	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021
Course 6	Sensors In Precision Agriculture	05	17	https://www.univ-sba.dz/snv/index.	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021
Course 7	Technologies Web	03	17	https://www.univ-sba.dz/snv/index.	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021

6- Curricula

Course 8	Mechanization in precision farming	06	17	https://www.univ-sba.dz/snv/index.	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021
Course 9	Start-up initiatives for future farmers	02	17	https://www.univ-sba.dz/snv/index.	regional levels: 20 March 2021. - Accredited by the national commission at the Ministry of higher education: 12 July 2021 - Integrated in the official ministry list of curricula for high school bachelors: 29 June 2021

∑(Total number of new courses) = 09
∑(Total number of ECTS) = 38

6 2 -Curricula Description

6.2. TEACHING MATERIALS			
Title of the materials	**Type (manuals/text books/methodological recommendations)**	**Short description**	**Location of the teaching material (place/ link in the internet)**
Remote sensing and application of earth and environment related to precision agriculture	Document and PowerPoint	General concepts of remote sensing. It allows to students to be familiar with tools of discipline	
Les SIG en agriculture de précision I	Pdf and PowerPoint	GIS is used in precision agriculture to manage spatial information and help students make decisions.	
Soil properties and its measurement	Pdf and PowerPoint	Soil-Specific Farming: Precision Agriculture focuses on principles and applications of soil-specific farming, providing information on rapidly evolving agricultural technologies.	

6 2 -Curricula Description

4	Basics of the Precision agriculture – characteristics, technologies, economic efficiency, optimal use of resources	pdf and PowerPoint	Students will introduced to all basic knowledge of precision farming	
5	Biomathématiques et analyse des données	pdf and PowerPoint	Increasingly, precision agriculture is being used to measure resources and inputs and to quantify results from both. It allows farmers to use the most precise and correct amounts of inputs; whether this is water, fertilizer, chemical controls or seeds.	
6	Acceptation des nouvelles technologies	Pdf and PowerPoint	In this courses students will learn how to convince farmers to use new technologies.	
7	Application of Precision Agriculture for crops growing	Pdf and PowerPoint	In this courses students will learn how to deal with new technologies in the field of crop growing.	

6 2 -Curricula Description

8	Agressions et sante des plantes cultivées	Pdf and power pint	In this courses students will learn how to deal with new technologies in the field of plant agression.	
9	Sensors In Precision Agriculture	pdf and PowerPoint	The main aim of this course is to provide the students information about possibilities of sensors for the purposes of Precision Agriculture	
10	Application of precision agriculture for crops growing	Pdf and PowerPoint	L'étudiant doit acquérir des connaissances spécifiques sur l'agriculture de précision. L'étude des principales applications de ce système de production sur les cultures qui abordera tous les aspects agro techniques et économiques.	
11	Les SIG en agriculture de precision II	Pdf and PowerPoint	Avoir des connaissances précises sur les systèmes d'information géographiques. Les données récoltées via les capteurs sont traitées et mise dans une base de données qui nous permet ensuite de faire des analyses thématiques et réaliser des cartes de fertilité des sols.	

6 2 -Curricula Description

12	Sentinel 123 imagery	Pdf and PowerPoint	Acquisition of recognition techniques, for processing sentinel images. This will give the student the appropriate tools and methods, in terms of work, recognition of agricultural plots and identification in the field of plant physiological problems. This module allows students to monitor performance remotely and how to remedy it in the event of stress.	
13	Agression et santé des plantes cultivées	pdf and PowerPoint	Savoir reconnaitre et diagnostiquer les principales maladies selon l'agent causal de la pathologie, et les dégâts ou dommages occasionnés par des animaux de différents groupes taxonomiques ou toutes autres affections causées par des agents abiotiques	
14	WEB technologies	Pdf and PowerPoint	Présenter les systèmes d'information dans le contexte Internet. Le module initie à la programmation Web via les langages HTML, CSS et PHP.	
15	Legislation	Pdf	Étudier l'agronomie dans le cadre d'un master professionnel nécessite des connaissances juridique et légale des composantes de ce domaine ; un arsenal juridique important, dont lois et règlementations, a été mis en place par l'Etat Algérien afin de garantir la légalité dans ce domaine.	
16	Cultures maraichères spéciales	pdf and PowerPoint	L'étudiant doit acquérir des connaissances spécifiques des cultures caractérisées par des caractères stratégiques pour le pays. L'étude des principales cultures maraichères abordera tous les aspects agrotechniques et économiques	

6 2 -Curricula Description

17	Agrimuculture	Pdf and PowerPoint	L'objectif de tout producteur consiste à obtenir une récolte à rendement élevé et de qualité, qui réponde aux besoins de l'utilisateur final. De nombreux facteurs agronomiques sont susceptibles d'influencer ces paramètres. La plupart peuvent être contrôlés par le producteur dans des conditions climatiques et de sol spécifiques. Donc dans cette vision que le programme est fait pour rendre l'étudiant capable à faire la conduite de verger	
18	Mechanisation in precision farming	Pdf and powerpoint	This course aims to improve, complete and deepen the knowledge in mechanization in precision farming (MPF) acquired beforehand in bachelor's degree, learning different new technologies for MPF, learning how to choose, analyze and understand to identify the best equipment for each kind of crops. the different stages of agricultural production, learn modern techniques and methods in MPF and their impact on crop yields. acquire essential decision support tools for better management of resources.	
19	English	pdf	At the end of the module, in relation to the subjects treated, the student must be able to: Apply strategies to follow courses and presentations in the field of biology and take notes In discussion, exchange relatively complex information, negotiate, express and support opinions Give a short oral presentation, ask and answer questions Read, understand and summarize a text in his academic field Use independent working techniques	

6 2 -Curricula Description

20	Techiques de recherche Bibliographique	pdf	Afin que l'étudiant puisse entamer son mémoire de fin d'étude, et établir un document selon les normes universelles, sur la base d'une consultation bibliographique méthodique, quel que soit la nature de la documentation qui serait à sa disponibilité.	
21	Sturt-up for future farmers	pdf	L'objectif de cette matière est d'apprendre aux étudiants -Les étapes-types du financement d'une start-up Comment obtenir les aides publiques à la création d'entreprises innovantes -Rencontres avec des investisseurs -Connaitre les Bases de marketing B to B appliquées aux produits innovants	
22	Entreprenariat	Pdf and PowerPoint	Diffuser l'esprit d'entreprendre auprès des jeunes. Asseoir un cadre fiscal durable pour l'entrepreneur. Mobiliser tous les talents pour la création d'entreprise. Proposer de nouvelles sources de financement pour les entreprises. Promouvoir et valoriser l'entrepreneuriat « responsable ».	

7. Pilot teaching

We have not found any official way to complete a pilot course, nor to use it in the design of new curricula on precision agriculture.

1. The main topics of agriculture and precision agriculture are covered in the curriculum: this will ensure that students can work both in conventional agriculture and on agricultural farms using precision technologies. This is a crucial aspect to avoid our students being blocked by the fact that they only know about precision technologies. Finally, we decided to have half of the core courses on conventional agriculture, and the other half on precision technologies.
2. the design of the program is in line with the bologna processes, and encompasses very recent teaching units
3. We managed to design this new Master's degree course on precision agriculture in the second year of the project. It was approved in 2020, but due to the COVID-19 pandemic we avoided launching the programmes in September 2020. We got local approval at the university. Then we got the programme approved by the national commission. Finally, our Ministry of Higher Education approved the programmes and included them in the Ministry's official list of programmes.

7. Pilot teaching

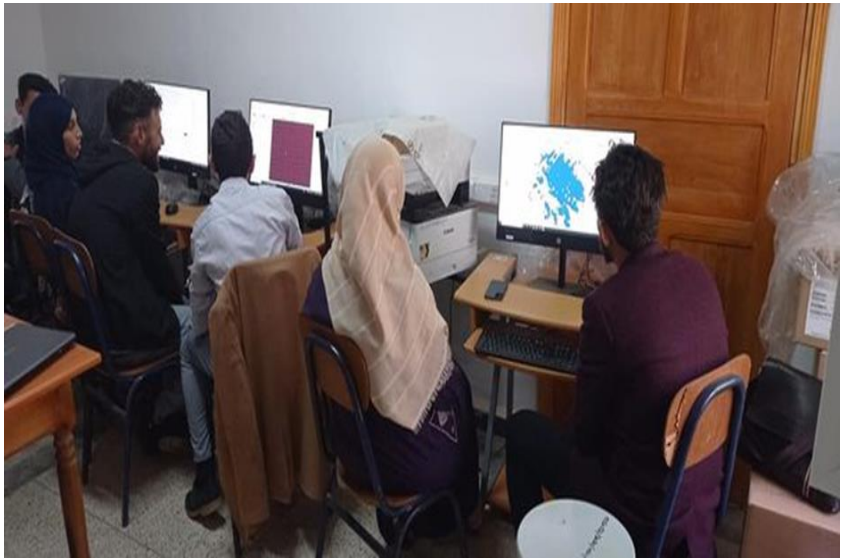
- Number of the enrolled students:
  We have 17 enrolled students in master 2 and 11 students in master 1, and more than 60 percent are women, which respond to European conditions.
- Did you involve in the pilot teaching any people with fewer opportunities?
  We cannot contribute in the process of student's selection
- Amount of the courses with ECTS, involved in the pilot teaching:
  The amount of credit in the whole curriculum is 120 ETC along of two years of Master classes.
- Number of teachers involved in the pilot teaching:
  We 21 teachers giving different courses and they belong to different fields.

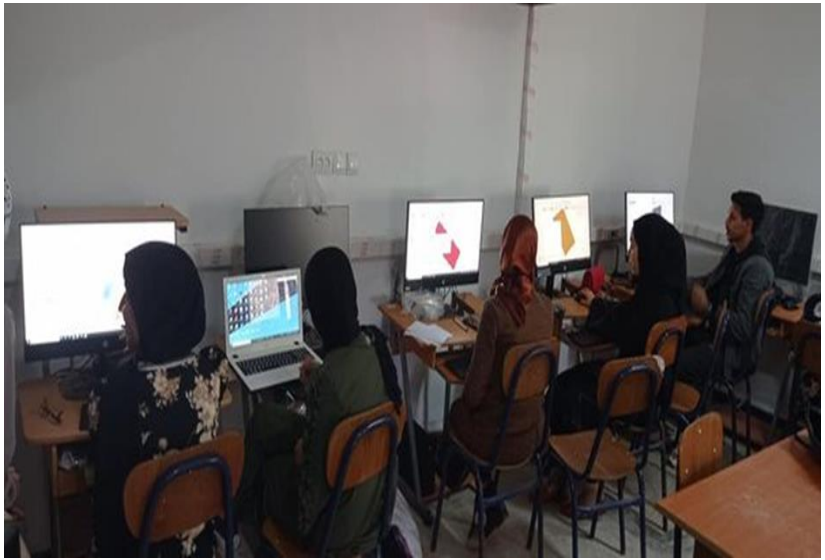
8. Quality assurance (reporting time: 15.11.2021 – 15.11.2022)

In the year 2021, we obtained a peer review from the national commission to get approval to launch our new programmes. This peer review questioned the arguments for obtaining the 'professional' label for our curriculum. We did this through the many agreements we have with many professional speakers. Then we obtained the national agreement in July 2021.

during the year 2022 we consulted the students through a questionnaire to find out about the level of satisfaction with the quality of the training and the internships, to be able to know the weak points of our team and then to be corrected through a well-studied plan.

CUPAGIS laboratory





It is planned to finish this field preparation about the end of 2022.
Thus, the PAGIS equipment with be fully exploited in 2023.

- 2.2 CUPAGIS LABORATORY AND ROOMS

LABS AND ROOMS	COURSES
VCR	- Remote sensing and application of earth and environment related to precision agriculture - Les SIG en agriculture de précision I - Soil properties and its measurement - Biomathématiques et analyse des données - Basics of the Precision agriculture - Acceptation des nouvelles technologies - Course of sentinel 1 2 3 imagery for agriculture field monitoring - Les SIG en agriculture de précision II - Application of Precision Agriculture for crops growing - Sensors In Precision Agriculture - Agressions et sante des plantes cultivées - Technologies Web
PAGIS	- Remote sensing and application of earth and environment related to precision agriculture - Les SIG en agriculture de précision I - Biomathématiques et analyse des données - Course of sentinel 1 2 3 imagery for agriculture field monitoring - Les SIG en agriculture de précision II - Application of Precision Agriculture for crops growing - Sensors In Precision Agriculture - Agressions et sante des plantes cultivées - Technologies Web

10. Dissemination and Sustainability (reporting time: 15.11.2021 – 15.11.2022))

Table 10.1 DISSEMINATION		
	Question	**Answer**
1	**How many and which dissemination materials were produced (leaflets, brochures, flyers, publications etc.) in the period 15.11.2021 – 15.11.2022? Please, provide designs (scans) in the presentation.**	We have used the same brochures and leaflets as those used in 2021 to disseminate our training bachelor offer among the students: **https://193.194.79.133/snv/images/fakiri/cupagis.pdf** We were continuously active in Erasmus Day October **https://www.univ-sba.dz/index.php/fr/relations-fr/799-erasmus-days-2021-fr**
2	**Provide a link to the Internet sources where publications about the project/dissemination materials were posted**	**https://web.facebook.com/cupagis?_rdc=1&_rdr** **https://www.univ-sba.dz/snv/** **https://www.univ-sba.dz/index.php/fr/81-categorie-fr-fr/actu-fr-fr/340-projet-cupagis-fr**
3	**How many non-consortium organizations (for example, universities/teachers, students, administrative staff of universities) were informed about the project in the period 15.11.2021 – 15.11.2022?**	We cannot provide the exact number but we were constantly using all social media tools student clubs and local radio and local press to inform people and students from other universities. https://web.facebook.com/cupagis?_rdc=1&_rdr

Table 10.2 DISSEMINATION EVENTS					
No	**Date**	**Title**	**Target Audience**	**Number of participants**	**Is there a press-release of the event (YES/NO). If YES, provide it.**
1	27-03-2022	Presentation of the MASTER training on precision agriculture developed in Cupagis	Master's students	40	NO
2	07-04-2022	Remote sensing of precision agriculture	Master's students	20	**NO**

∑(Total number of dissemination events) = 03

11. Regional Cooperation (reporting time: 15.11.2021 – 15.11.2022)

- Within the period 15.11.2021 – 15.11.2022? of the project, were any employment events/fairs conducted and how many?
- How many CUPAGIS+ agreements with non-academic stakeholders/enterprises/other members of the consortium/ other non-consortium members were signed in the period 15.11.2021 – 15.11.2022? or are planned to be signed in the future to maintain and develop the project results?

- Please, update the online table with the signed CUPAGIS+ Agreements. This table will be published on the project website and the Beneficiary space
Link to Google drive:
https://docs.google.com/spreadsheets/d/1nqo2T0KrHcuX12u2ugONxDVT1IGh0z-DS1Lw11wI3VI/edit?usp=sharing
WITH OUR PARTNERS We have prepared an experimental field to use the materials for our practical work. The idea is to develop a project within the experimental field in order to show how precision agriculture works and to prospect new projects with other partners with the cooperation of the PASENSO office.

A new project will see the light of day in the coming months with the partners that we have signed an agreement, the project can be summed up in the integration of the aspects of precision agriculture, such as the production of fertilizer modulation maps and the rational water management at plot level

Thank you for you attention!

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

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