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VIRAL

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UVOD

Poštovani,
Pred Vama je drugi broj informativno-stručnog biltena Erasmus+ projekta VIRAL (Vitalising ICT Relevance in Agriculture Learning) za 2021. godinu. Nadali smo se da će teškoće koje je prouzrokovala pandemija izazvana pojavom virusa SARS-CoV-2, ostaviti manje traga na realizaciju projekta u 2021.godini. Na žalost, to se desilo samo delimično, čini se tek toliko da ne zaboravimo kako je sarađivati u normalnim okolonostima. Potrudili smo se da to ne ostavi prevelike posledice na planove koje smo sebi zacrtali u realizaciji projekta i da nastavimo sa započetim radom.

Veoma često o poljoprivrednoj proizvodnji se govori kao o strateškoj privrednoj grani. To je slučaj ne samo u našem okruženju, već i šire, što i ne začuđuje imajući u vidu da se njome obezbeđuje hrana za ljude. Međutim objektivno posmatrano, poljoprivreda je dugo bila tehnološki najzaostalija privredna grana u pogledu inovacija i tehnološkog unapređenja, kao i obima istraživača koji je bio uključen u rešavanje problema u poljoprivredi. Stiče se utisak da je nivo znanja tokom predhodnog perioda u poljoprivrednoj proizvodnji bio sasvim zadovoljavajući imajući u vidu realne potrebe u proizvodnji. Danas je situacija nešto drugačina. Očekivana demografska ekspanzija čovečanstva, povećani kriterijumi po pitanju kvaliteta i zdravstvene bezbednosti proizvoda kao i proizvodnja u uslovima ograničenih agroekoloških potencijala, postavlja nove izazove pred poljoprivrednu proizvodnju uopšte. Poljoprivredna prozvodnja u najvećem broju slučajeva podrazumeva interakciju ogromnog broja faktora (biljka, zemljište, klima, agrotehničke mere...) koje prosečni poljoprivredni proizvođač veoma često ne može sagledati na sveobuhvatan način kako bi doneo valjalnu odluku o tome šta i na koji način uraditi. Uglavnom se koriste

INTRODUCTION

Dear all,
We present to you the second issue of the informative-professional bulletin of the Erasmus + project VIRAL (Vitalizing ICT Relevance in Agriculture Learning) for 2021. We hoped that the difficulties caused by the pandemic caused by the appearance of the SARS-CoV-2 virus would leave less trace on the realization of the project in 2021. Unfortunately, that happened only partially, so much that we do not forget what it is like to cooperate in normal circumstances. Unfortunately, happened in part only so much that we do not forget what it is like to cooperate in normal circumstances. We tried not to leave too much consequences on the plans we set for ourselves in the realization of the project and to continue with the work that we started.

Very often, agricultural production is referred to as a strategic economic branch. This is the case not only in our environment, but also beyond, which is not surprising considering that it provides food for people. However, objectively speaking, agriculture has long been the least technologically developed industry in terms of innovation and technological advancement, as well as the volume of researchers involved in solving problems in agriculture. The impression is that the level of knowledge during the previous period in agricultural production was quite satisfactory taking into consideration the real needs in production. Today the situation is somewhat different. The expected demographic expansion of humanity, increased criteria regarding the quality and health safety of products as well as production in conditions of limited agro-ecological potentials, sets new challenges to agricultural production in general. Very often, agricultural production is spoken of as a strategic economic branch. This is the case not only

ranije definisani obrasci u radu sa manjim ili većim izmenama (ne nužno i unapređenjima). Savremeni pristup u proizvodnji prikazan između ostalog i u primeni informativno komunikacionih tehnologija (IKT) u vidu dodatnog alata koji može pomoći u pravilnom rukovođenju proizvodnjom, je svakako način ostvarivanja željenih rezultata i ekonomične proizvodnje. Koliko će takav pristup i u kom obimu postati stvarnost u narednom periodu za prosečnog proizvođača u Bosni i Hercegovini i Crnoj Gori, gde se projekat VIRAL implementira, veoma je teško predvideti. Ali je neophodno kretati se u tom pravcu.

U predhodnom periodu na projektu VIRAL najviše pažnje smo posvetili obuci nastavnog osoblja poljoprivrednih fakulteta za primenu IKT u poljoprivredi, radu sa studentima i započeli intenzivnu saradnju sa privredom. Radili smo na sagledavanju trenutnog stanja u primeni IKT u poljoprivredi i inkluziji nastavnog osoblja i studenata poljoprivrednih fakulteta u ovu oblast. Kroz niz obuka, radionica, seminara i konferencija, kao i nabavku specifične opreme sticali smo novo znanje i delili ga sa drugim kolegama.
Posebno smo ponosni na rad sa studentima, koji je uključivao niz aktivnosti kako formalnog obrazovanja (predavanja, radionice i treninzi) tako i neformalnog, kroz organizaciju i realizaciju studentskih takmičenja – hakatona. Za najveći broj studenata i nastavnika sa poljoprivrednih fakulteta, učešće na hakatonima je bilo jedinstveno i novo iskustvo, koje je krunisano uspešnim događajima u Nikšiću, Banjaluci i Mostaru. Godinu smo priveli kraju organizacijom virtuelnog EXPO događaja SmAgTech 2021. Događaj je predstavljao novi izazov u organizacionom i tehnološkom smislu, ne samo za partnere na projektu već i sve učesnike koji su bili deo ovog događaja.

Na kraju, ali ne i namanje važno radili smo na uspostavljanju saradnje sa velikim brojem učesnika u ovoj oblasti kao i stalnoj promociji svega što je rađeno i što projekat može da ponudi drugima. Sigurni smo da je to jedan od značajnih segmenta održivosti projekta u narednom periodu.

in our environment, but also beyond, which is not surprising considering that it provides food for people. However, objectively speaking, agriculture has long been the most technologically backward industry in terms of innovation and technological advancement, as well as the volume of researchers involved in solving problems in agriculture. One gets the impression that the level of knowledge during the previous period in agricultural production was quite satisfactory having in mind the real needs in production. Today the situation is somewhat different. The expected demographic expansion of humanity, increased criteria regarding the quality and health safety of products as well as production in conditions of limited agro-ecological potentials, poses new challenges to agricultural production in general. Agricultural production in most cases involves the interaction of a huge number of factors (plant, land, climate, agronomic measures ...) that the average farmer often can not see in a comprehensive way to make a valid decision on what to do and how. Previously defined patterns are mostly used in working with minor or major changes (not necessarily improvements). The modern approach in production is presented, among other things, in the application of information and communication technologies (ICT) as an additional tool that can help in the proper management of production, is certainly a way to achieve the desired results and economical production. It is very difficult to predict to what extent such an approach will become a reality in the coming period for the average producer in Bosnia and Herzegovina and Montenegro, where the VIRAL project is being implemented. But it is necessary to move in that direction.

In the previous period, on the VIRAL project, we paid the most attention to the training of teaching staff of agricultural faculties for the application of ICT in agriculture, work with students and began intensive cooperation with the economy. We worked on reviewing the current situation in the application of ICT in agriculture and the inclusion of teaching staff and students of agricultural faculties in this area. Through trainings, workshops, seminars and conferences, as

U ovom broju predstavljamo kratak osvrt na najznačajnije aktivnosti na projektu. U formi stručnih radova donosimo i segmente primene IKT u poljoprivredi od strane stručnjaka koji to rade. Zadovoljstvo nam je da vam predstavimo i druge aktivnosti (projekte i institucije) u oblasti primene IKT u poljoprivredi. Nadamo se da ćete naći nešto zanimljivo i za sebe.

Kao koordinator VIRAL projekta imam zadovoljstvo da radim sa ljudima koji su posvećeni realizaciji ovog projekta, profesionalni u radu i ogromnim razumevanjem za povremena "iskakanja" u realizaciji. Nadam se da ćemo kao tim nastaviti sa uspešnom realizacijom projekta i u 2022. godini.
U ime konzorcijuma projekta VIRAL želim Vam uspešnu i "komunikativnu" Novu 2022. godinu. Živeli!

Miljan Cvetković

well as the purchase of specific equipment, we acquired new knowledge and shared it with other colleagues.

We are especially proud of our work with students, which included activities of both formal education (lectures, workshops and trainings) and non-formal, through the organization and implementation of student competitions - hackathons. For most students and teachers from agricultural faculties, participation in hackathons was a unique and new experience, which was crowned with successful events in Nikšić, Banja Luka and Mostar. We ended the year by organizing the virtual EXPO event SmAgTech 2021. The event was a new challenge in organizational and technological terms, not only for project partners but also for all participants who were part of this event.

Last but not least, we worked on establishing cooperation with a large number of participants in this field as well as constant promotion of everything that has been done and that the project can offer to others. We are sure that this is one of the important segments of the project's sustainability in the coming period.
In this issue, we present a brief overview of the most significant activities on the project. In the form of professional papers, we also bring segments of the application of ICT in agriculture by experts for ICT. We are pleased to present other activities (projects and institutions) in the field of ICT in agriculture. We hope you find something interesting for yourself.

As the coordinator of the VIRAL project, I have the pleasure to work with people who are dedicated to the realization of this project, professional in their work and with a great understanding for the occasional "bounces" in the realization. I hope that as a team we will continue with the successful realization of the project in 2022.
On behalf of the consortium of the VIRAL project, I wish you a successful and "communicative" New 2022. Cheers!

Razgovor o hackathonima obilježio sastanak u Mostaru

Discussion on hacakthons marked the meeting held in Mostar

WP.3, outcome 3.2.
Implementation of student pitching competitions – hackatons

U prostorijama INTERA Tehnološkog Parka održan je projektni sastanak i radionica u periodu od 25.2. do 26.2.2021. godine. Sastanak je bio fokusiran na trenutne aktivnosti projekta VIRAL s posebnim naglaskom na hackathone u Banja Luci, Mostaru i Nikšiću planirane za proljeće 2021. godine.

A project meeting and workshop were held in the premises of INTERA Technoloy Park in the period from 25/02 to 26/02/2021. The meeting was focused on the current activities of the VIRAL project with special emphasis on hackathons in Banja Luka, Mostar and Nikšić planned for spring 2021.

Projektni sastanak je započeo uvodnim obraćanjem Ane Bogdanović (INTERA TP) i prof. dr. Miljana Cvetkovića (UNIBL) koji je prezentirao status implementacije projekta

Project meeting started with the welcome speech given by Ana Bogdanović (INTERA TP) and presentation of the project implementation status held by Miljan Cvetković (UNIBL).

Aleksandar Janičić (IPC Tehnopolis), Ana Bogdanović (INTERA TP) i Marko Rosić (ICBL) prezentirali su hackathone i studentska natjecanja koja su organizirale njihove organizacije u prethodnom periodu.

Aleksandar Janičić (IEC Tehnopolis), Ana Bogdanović (INTERA TP) and Marko Rosić (ICBL) presented hackathons and student competitions previously organized by their home institutions.

Tijekom sastanka projektni partneri su razgovarali o ciljevima hackathona, datumu i trajanju hackathona, temama, mentorima, moderatorima i motivacijskim govornicima, programu hackathona, odgovornostima partnera, promociji te nagradnom fondu.
Projektni partneri iz poslovnog sektora presentirali su izazove nadgledanja efikasnosti radnika, jačanja kapaciteta radnika, sustava kontrole alkoholne fermentacije te sustava za vizualizaciju podataka o stanju usjeva.

During the meeting, project partner duscussed on goals of the hackathons, date, time and duration of the hackathons, topic of the hackathons, mentors, moderators and motivation speakers, program of the hackathons, responsibilities among the partners, promotion and prize fund.
Project partners from business sector presented the challenges of monitoring the efficiency of employees, strengthening capacities of employees, alcohol fermentation control system and system for visualization of data on the condition of crops.

Na kraju sastanka predstavnici INTERA TP-a, IPC Tehnopolis i ICBL-a predstavili su optimalni budžet i vremenski plan za daljnje aktivnosti.

Project team meeting ended with the representatives of INTERA TP, ICBL and IEC
Tehnopolis presenting the optimal budget for hackathons as well as timetable for further activities.

Za više informacija posjetite: http://viral-erasmus.org/sastanak-u-mostaru/

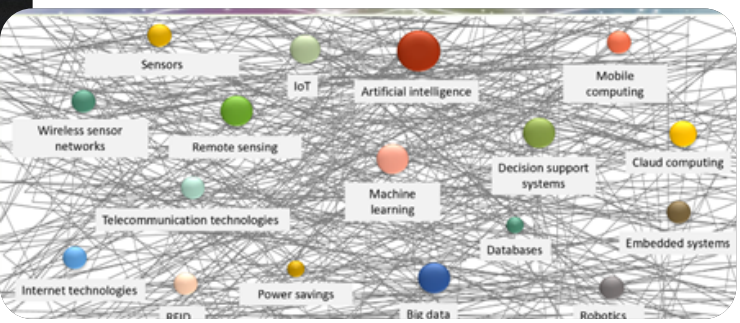
For more information visit: http://viralerasmus.org/en/meeting-in-mostar/

Pripremila/Prepared by:
Ana Bogdanović, INTERA TP

Mogu li digitalne tehnologije pomoći pčelama i pčelarima da opstanu?

Can digital technologies help bees and beekeepers to survive?

WP.2, outcome 2.1.
Improved competences of use of ICT in agriculture



Svjedoci upliva digitalnih tehnologija u skoro sve aspekte ljudskog djelovanja. Ipak, pčelarstvo ne treba posmatrati samo kao još jednu oblast koju želimo digitalizovati zbog ovog globalnog trenda. Uvođenje digitalnih tehnologija u pčelarstvo je prije svega pokušaj spašavanja pčela od izumiranja. Jer, naročito posljednjih godina, evidentan je pad broja pčela, što može imati katastrofalne posljedice i na proizvodnju hrane.

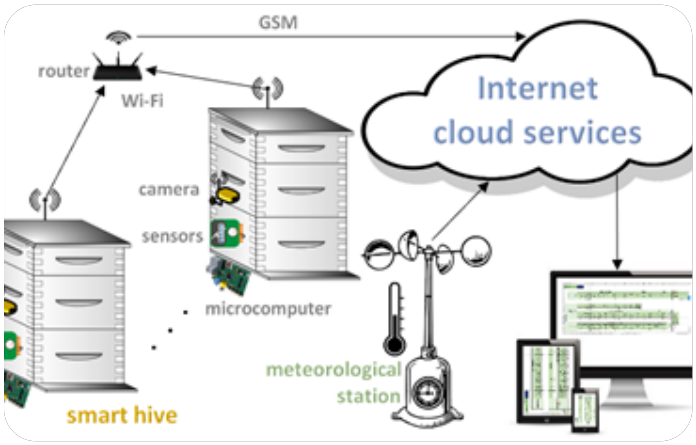
Primjena novih tehnologija trebala bi da unaprijedi pčelarsku praksu i dovede do većih prinosa, ali prilikom razmatranja opravdanosti uvođenja digitalnih tehnologija u pčelarstvo treba imati u vidu da je ukupna vrijednost svih pčelinjih proizvoda daleko manja od značaja i koristi pčela kao oprašivača. Gotovo 500 milijardi eura godišnje u globalnoj proizvodnji hrane zasnovano je na direktnom doprinosu oprašivača. Međutim, u posljednjih 10 godina gubici pčelinjih društava iz godine u godinu kontinualno rastu. Prema nekim preliminarnim rezultatima, pčelari su od aprila 2020. do aprila 2021. izgubili više od 45% svojih pčelinjih zajednica. Prijetnje s kojima se suočavaju su brojne i različite: paraziti, patogeni, pesticidi, nedovoljna paša, loša pčelarska praksa i klimatske promjene.

Suočavamo se sa realnim problemom koji nije važan samo za pčelare, već za cijelu populaciju. Stoga treba da otvorimo naše umove i u potrazi za rješenjima razmišljamo i o mo-

We are witnessing the influence of digital technologies in almost all aspects of human activity. However, beekeeping should not be viewed only as another area that we want to digitize due to this global trend. The introduction of digital technologies in beekeeping is primarily an attempt to save bees from extinction. Mainly because, especially in recent years, there is an evident decline in the number of bees, which could also have catastrophic consequences on food production.

The application of new technologies should improve beekeeping practices and lead to the higher yields. When considering and justifying the introduction of digital technologies in beekeeping, we should keep in mind that the total value of all bee products is far less important than the benefits of bees as pollinators. Almost 500 billion euros every year from global food production is based on the direct contribution of pollinators. How-

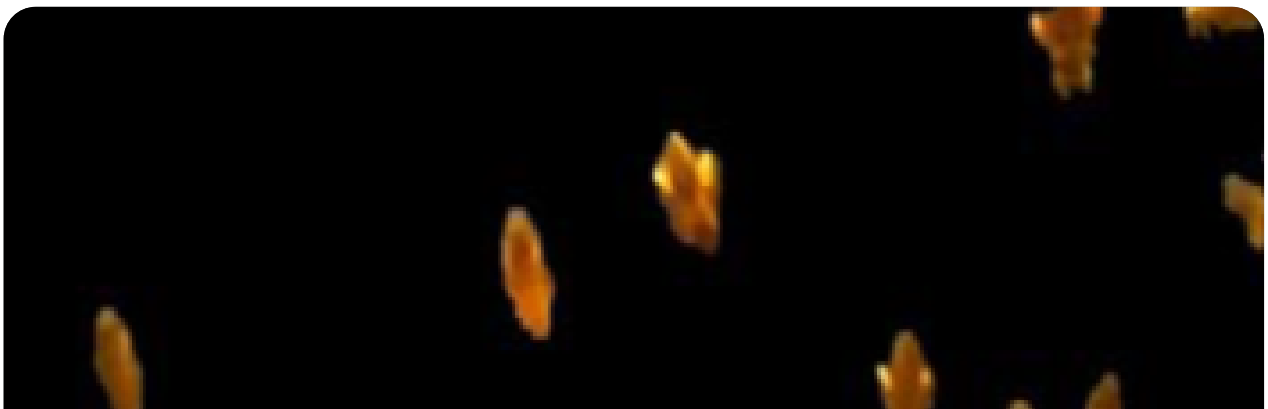
gućnostima koje nude digitalne tehnologije.



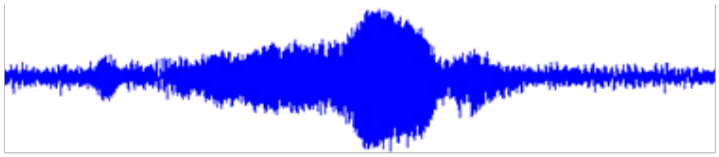
Daljinsko praćenje pčelinjih društava je segment u kojem nove tehnologije mogu značajno pomoći, ali je vrlo važno razumjeti njihove mogućnosti i ograničenja. Najvažnija stanja u kojima se pčelinje društvo može naći mogu se pratiti pomoću relativno malog broja senzora kojima se mjere težina košnice, temperatura unutar i izvan košnice, vlažnost unutar košnice, audio signali unutar košnice i aktivnost pčela na ulazu u košnicu i tokom slobodnog leta. Košnice opremljene digitalnim sistemima koji omogućavaju daljinsko praćenje stanja pčelinjih društava nazivaju se pametne košnice.
Na primjer, ako temperatura u košnici naglo padne i postane približno jednaka vanjskoj temperaturi, to je znak da je društvo uginulo. Temperatura se može koristiti i da se utvrdi da li se pčelinje leglo formira prerano ili prekasno, jer je stvaranje pčelinjeg legla praćeno povećanjem temperature.
Zujanje pčela koje se snima mikrofonima u košnici može ukazivati na mnoga stanja, uključujući zdravstveni status, nivo stresa, aktivnosti vezane za rojenje i status matice. Vremensko-frekvencijska analiza zujanja pčela jasno pokazuje da je osnovna frekvencija zvuka koji se stvara mahanjem krila u rasponu

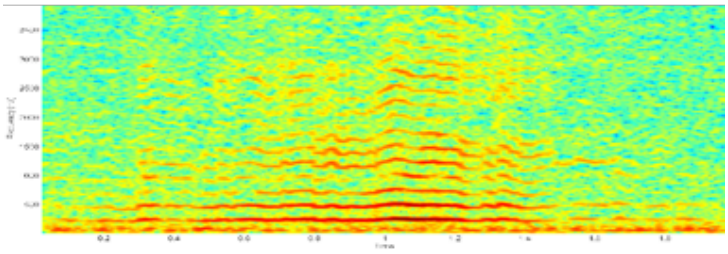
ever, in the last 10 years, the losses of bee colonies have been growing continuously every year. According to some preliminary results, beekeepers lost more than 45% of their honeybee colonies from April 2020 to April 2021. The threats they face are numerous and varied: parasites, pathogens, pesticides, malnutrition, poor beekeeping practices and the climate change.
We are facing a real problem that is important not only for beekeepers, but for the entire human population. Therefore, we need to open our minds and, while looking for solutions, think about the possibilities offered by digital technologies.
Remote monitoring of bee colonies is a segment in which new technologies can help significantly, but it is very important to understand their capabilities and limitations. The most important conditions in which bee colonies can be found can be monitored by a relatively small number of sensors that measure hive weight, temperature inside and outside the hive, humidity inside the hive, audio signals inside the hive and bee activity at the hive entrance and during a free flight. Hives equipped with digital systems that enable remote monitoring of the condition of bee colonies are called smart hives. For example, if the temperature in the hive suddenly drops and becomes approximately equal to the outside temperature, it is a sign that the colony has died. The temperature can also be used to investigate whether a bee brood is formed too early or too late because a bee brood formation is accompanied by an increase in temperature.

The buzzing of bees recorded by microphones in the hive can indicate several conditions, including health status, stress levels, swarming activities, and queen status. Time-frequency analysis of bee buzzing clearly shows that the fundamental frequency of the sound generated by fluttering



od 180-250 Hz. Nedavna istraživanja sugerišu da algoritmi mašinskog učenja primijenjeni na podatke o vibracijama snimljenim pomoću akcelerometra mogu predvidjeti rojenje sa preko 90% preciznosti do 30 dana prije događaja.



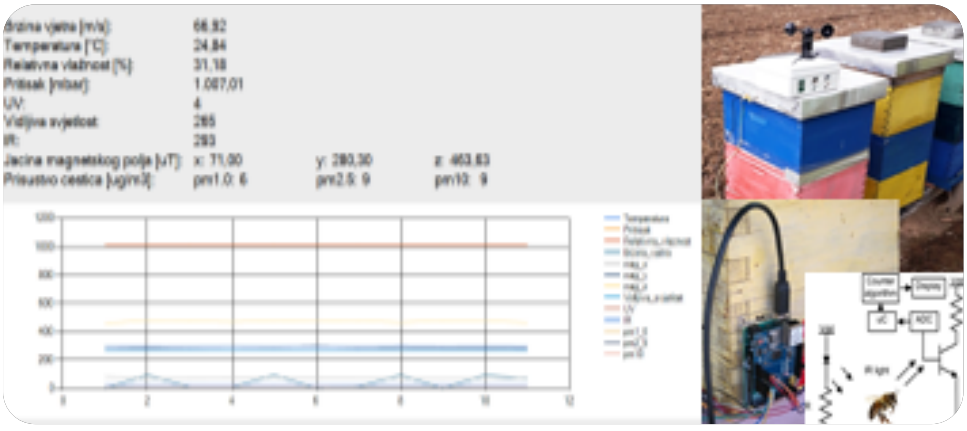


Analizom slika i video zapisa pčela na ulazu u košnicu, te njihovim prebrojavanjem, mogu se izvesti zaključci o aktivnostima pčela u pronalaženju hrane. Obično se povećana aktivnost povezuje sa zdravom zajednicom. Važno je napomenuti da velika razlika u broju pčela koje izlaze iz košnice i onih koje se vraćaju u nju može ukazivati na poremećaj kolapsa kolonija (eng. Colony Collapse Disorder - CCD), sindrom koji dovodi do izumiranja pčela. Kroz istraživanja koja provodimo na Elektrotehničkom fakultetu Univerziteta u Banjoj Luci pokazali smo da je moguće izdvojiti i prebrojati ne samo pojedinačne pčele iz video zapisa snimljenog ugrađenom kamerom na ulazu u košnicu, već je moguće i detektovati koje pčele nose polen. Iako je praćenje pčela tokom njihovog slobodnog leta prilično izazovan zadatak jer su pčele malih dimenzija i brzo lete, pa čak i ljudski

the wings is in the range of 180-250 Hz. Recent research suggests that machine learning algorithms applied to accelerometer-recorded vibration data can predict swarming with over 90% accuracy up to 30 days before the event.

By analyzing images and videos of bees at the hive entrance, and counting them, conclusions can be drawn about the foraging bee activities. Usually, increased activity is associated with a healthy community. It is important to note that a large difference in the number of bees go out from hives and those returning to them may indicate Colony Collapse Disorder (CCD) syndrome that leads to the extinction of bees. Through the research we conduct at the Faculty of Electrical Engineering, University of Banja Luka, we have shown that it is possible to isolate and count not only individual bees from a video recorded by a built-in camera at the hive entrance, and it is also possible to detect which bees are carrying pollen. Although tracking bees during their free flight is quite challenging task because bees are small and fly fast, and even a human observer must make a significant effort to find bees by watching videos, our research has yielded promising results in detecting bees in video sequences.

Weather and other environmental conditions have a strong influence on bee activities. Therefore, when making conclusions about the state of the colony based on the measurements we talked about, these parameters must also be taken into account. Probably due to the very complex interdependence of abiotic and biotic factors inside and outside the hives, weather and other environmental conditions, which are difficult to understand even for the experts in the field of beekeeping, electronic decision support systems in this area are still at an early stage. Therefore, beekeepers still rely mainly on the notes they make during regular inspections of bee colonies. Although there are a large number of mobile applications for the beekeeping diary, beekeepers, at

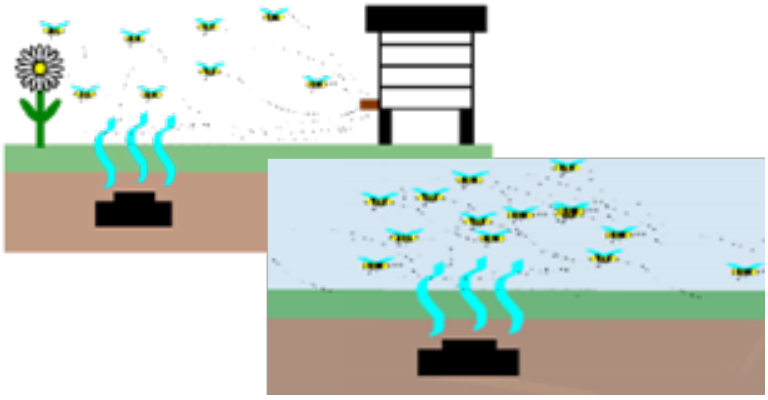


posmatrač mora uložiti značajan napor da pronađe pčele gledanjem video zapisa, kroz naša istraživanja smo dobili obećavajuće rezultate detekcije pčela u video sekvencama. Vrijeme i drugi uslovi sredine imaju snažan uticaj na aktivnosti pčela. Stoga se, pri donošenju zaključaka o stanju zajednice na osnovu mjerenja o kojima smo govorili, moraju uzeti u obzir i ovi parametri.

Vjerovatno zbog vrlo složene međuzavisnosti abiotičkih i biotičkih faktora unutar i izvan košnice, klimatskih i drugih ostalih uslova sredine, koje je teško razumjeti čak i stručnjacima iz oblasti pčelarstva, elektronski sistemi za podršku odlučivanju u ovoj oblasti su još uvijek u ranoj fazi razvoja. Stoga se pčelari i dalje uglavnom oslanjaju na bilješke koje prave tokom redovnih pregleda pčelinjih društava. Iako postoji veliki broj mobilnih aplikacija za pčelarski dnevnik, pčelari ih, barem kod nas, rijetko ili gotovo nikada ne koriste, jer teško odustaju od ustaljene prakse. Korištenje mobilnih aplikacija usporava pregled pčelinjih društava, posebno kada se radi u rukavicama, pa je pčelarski dnevnik sa glasovnim unosom podataka bolje rješenje.
U potrazi za hranom, pčele sakupljaju i unose u košnicu ne samo polen, nektar i vodu, već i druge čestice iz vazduha koje se kao rezultat elektrostatičkog naelektrisanja lijepe za njihova tijela obrasla dlačicama. Naknadnom analizom sadržaja košnice moguće je utvrditi da li u okolini ima nekih specifičnih čestica. To nam omogućava da pčele koristimo kao biosenzore za praćenje zagađenja životne sredine. Štaviše, pčele se mogu obučiti da određeni miris tumače kao izvor hrane, nakon čega se mogu koristiti da aktivno pretražuju neku oblast za česticama tog specifičnog mirisa. Ova aktivna pretraga ima za cilj da precizno odredi mjesto gdje su određene čestice prisutne kroz analizu prostorne distribucije pčela. U Bee4Exp projektu koristimo metodu aktivne pretrage kako bismo locirali neeksplodirane mine u minski sumnjivom području. Koristimo dronove, koji su opremljeni kamerama koje mogu snimati video zapise ultra visoke definicije i obradu video signala za analizu prostorne distribucije pčela kako bismo odredili mjesta na kojima se pčele sakupljaju. Lokacije na kojima je pronađen znatno veći broj pčela u odnosu

least in our country, rarely or almost never use them, because they are reluctant to give up the established practice. The use of mobile applications slows down the inspection of bee societies, especially when working in gloves, so a beekeeping diary with voice data entry is a better solution.
Searching for food, bees collect and bring into the hive not only pollen, nectar and water, but also other particles from the air that stick to their hairy bodies as a result of electrostatic charge. Subsequent analysis of the contents of the hive can determine whether there are any specific particles in the environment. This allows us to use bees as biosensors to monitor environmental pollution.

Moreover, bees can be trained to interpret a particular odour as a food source, after



which they can be used to actively search an area for particles of that specific odour. This active search aims to pinpoint the exact location of certain particles through the analysis of the spatial distribution of bees. In Bee4Exp project, we use this active search method to locate unexploded ordnance in a mine suspected area. We use drones, cameras that can record ultra-high definition videos, and video signal processing to analyze the spatial distribution of bees to determine where bees gather. Locations where a significantly higher number of bees were found compared to other locations in the area are declared potentially suspicious for the presence of the explosives.

The fight against varroa (Varroa sp.) and nosema (Nosema sp.) is one of the priorities in beekeeping. A system for their early detection would probably have the greatest im-

na druge lokacije u okruženju, proglašavaju se potencijalno sumnjivim na prisustvo eksploziva.
Borba protiv varoe (Varroa sp.) i noseme (Nosema sp.) je jedan od prioriteta u pčelarstvu. Sistem za njihovo rano otkrivanje vjerovatno bi najviše uticao na očuvanje pčela, ali nažalost, još uvijek ne postoji pouzdana metoda automatskog otkrivanja i diferencijacije štetočina i bolesti pčelinjih društava.

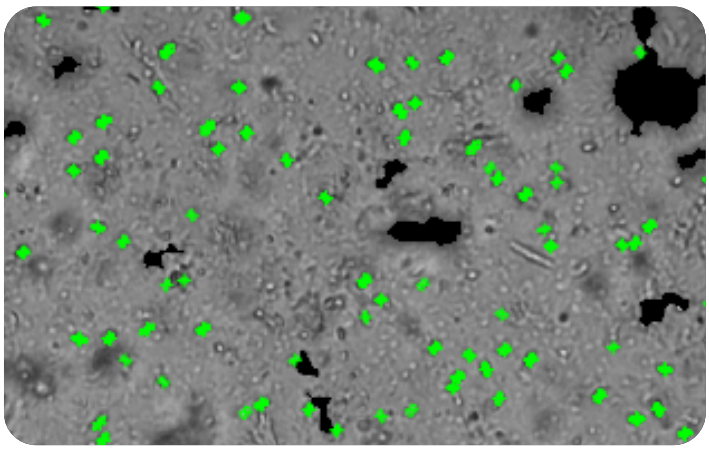
Neka istraživanja pokazuju da je moguće razlikovati zdrave od bolesnih pčela korištenjem metoda vještačke inteligencije, ali su ove studije provedene na bazi slika pojedinačnih pčela i daleko su od praktične primjene. Novija istraživanja pokušavaju procijeniti količinu varoe analizom uzoraka vazduha iz košnice koristeći gasne senzore. Digitalnom analizom slike mogu se otkriti male spore nosema apis na slikama snimljenim relativno jeftinim mikroskopima. Ovo otvara mogućnosti pojednostavljenja dijagnostike koja se sada radi samo u malom broju laboratorija.

Primjena digitalnih tehnologija u pčelarskoj praksi je neizbježna, i pametne košnice su već komercijalno dostupne. Kao rana faza cyber pčelarstva, neke inicijative, poput Sentinel Apiary Program-a u SAD-u, započele su s ciljem prikupljanja podataka koji pomažu istraživačima da bolje razumiju fluktuacije zdravlja i veličine pčelinjih zajednica, efekte varoe i nozeme, smrtnost društava, uticaje tretmana i efikasnost upravljanja. Sentinel Apiary Program se oslanja na pčelare koji se uključuju u istraživanja i dijele svoje podatke kako bi program bio uspješan. Cilj ovakvih programa je formiranje sistema ranog upozorenja koji će upozoravati pčelare na potencijalne probleme zbog porasta varoe ili nozeme, ili promjena u težini košnica u nekim regijama.

Iako postoje velike mogućnosti koje pružaju digitalne tehnologije, još uvijek smo, nažalost, daleko od rješenja problema smanjenja broja pčela i ostvarenja postavljenih ciljeva. Digitalne tehnologije se vrlo brzo razvijaju, ali je potrebno vrijeme da postanu dio pčelarske prakse. Da bi tehnički dobra rješenja bila prihvaćena, moraju biti jednostavna za korištenje, a troškovi uvođenja novih tehnologi-

pact on bee conservation, but unfortunately, there is still no reliable method of automatic detection and differentiation of pests and diseases of bee colonies. Some research indicates that it is possible to distinguish healthy from sick honeybees using artificial intelligence methods, but these studies were conducted on the image database of individual bees and are far from practical application.

Recent research attempts to estimate the amount of varroa by analyzing air samples from the hive using gas sensors. Small spores of nosema apis can be detected by digital image analysis on images taken with relatively cheap microscopes. This opens up the possibility of simplifying diagnostics, which is currently done only in a small number of laboratories.
The application of digital technologies in beekeeping practice is inevitable, and smart hives are already commercially available. As an early stage of cyber beekeeping, some initiatives, like the U.S. Sentinel Apiary Program, began to collect data to help researchers better understand fluctuations in bee colonies health and size, varroa and nosema effects, mortality, treatment impacts, and efficacy management. The goal of such programs is to establish an early warning system that will warn beekeepers of potential problems due to the increases in of varroa or nosema, or changes in the weight of the hives in some regions.



Although there are great opportunities provided by digital technologies, we are still, unfortunately, far from solving the problem of decreasing the number of bees and achieving the set objectives. Digital technologies are developing very fast, but it still takes time

ja moraju biti prihvatljivi u odnosu na funkcionalnost i koristi koje donose. Potreban je multidisciplinarni pristup kako bi se premostio jaz u razmišljanju između pčelara i profesionalaca iz oblasti digitalnih tehnologija koji treba da obrate pažnju na stvarne potrebe pčelara. I na kraju, ali ne i najmanje važno: obrazovanje je ključno. Pčelari bi trebali biti upoznati s mogućnostima digitalnih tehnologija i dostupnim rješenjima, a stručnjaci digitalnih tehnologija bi trebali naučiti osnove biologije pčela, razumjeti procese pčelarenja i potrebe pčelara. Nadamo se da će aktivnosti koje sprovodimo u okviru VIRAL projekta doprinijeti tome.

Pripremila/Prepared by:
Zdenka Babić, UNIBL

for them to become part of the beekeeping practice. For good technical solutions to be accepted, they must be user-friendly, and the costs of introducing new technologies must be acceptable in relation to the functionality and benefits they bring. A multidisciplinary approach is needed to bridge the gap in thinking between beekeepers and digital technology professionals who need to pay attention to the real needs of beekeepers. Last but not least: education is the key. Beekeepers should be familiar with the possibilities of digital technologies and available solutions, and digital technology experts would learn basics of the bee biology, understand the beekeeping process and the needs of beekeepers. We hope that the activities we carry out within the VIRAL project will contribute to this.

Academy-Business Cooperation (ABCooperation)

Improved knowledge on university-bussiness cooperation (online workshop)

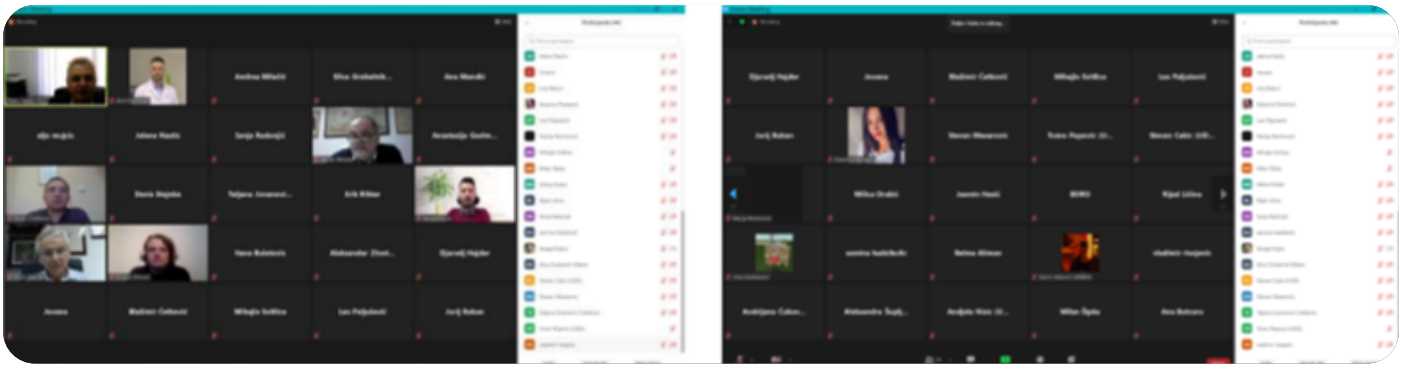
WP.4, outcome 4.1.
Improved knowledge on university-business cooperation

Delavnica z naslovom »Akademsko-poslovno sodelovanje (ABCooperation)« je bila uspešno izvedena 9. februarja 2021. Delavnica je potekala na spletni platformi kje se je udeležilo 66 udeležencev. ABCooperation, delavnica o možnostih sodelovanja med univerzo in gospodarskim sektorjem je bila aktivnost v okviru četrtega delovnega paketa (WP4), ki je koordiniran is strani Univerze v Banjaluki in Univerze v Mariboru.

Sprva je bilo predvideno, da bodo aktivnosti v sklopu tega delovnega paketa potekala v živo v Sloveniji, z razlogom, da bi lahko sodelovanje prikazali tudi na praktičnih primerih. Vendar pa je bilo kasneje na ravni konzorcija sprejeto, da se delavnica organizira preko spleta. Glavni razlogi za to so bili razmere glede COVIDA19 in posledično nezmnožnosti potovanja.
Izbrani predavatelji na tem dogodku so bili predstavniki univerz in predstavniki podjetij, ki delujejo na področju IKT v kmetijstvu in širše. Izbrani so bili na podlagi predlogov iz Wageningen University (WUR), Univerze v Bukarišti (UR) in Univerze Donja Gorica (UDG).

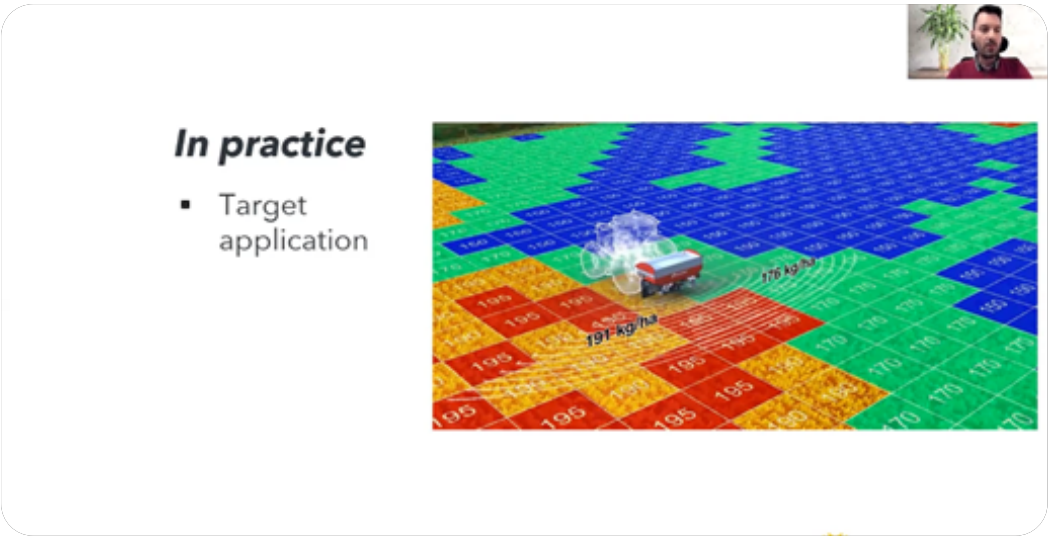
The workshop "Academy-Business Cooperation (ABCooperation)" was held successfully on February 9th 2021. The workshop was held online with 66 participants. ABCooperation, workshop on the possibilities of cooperation between the university and the business sector was an activity within the work package four (WP4) coordinated by the University of Banja Luka and the University of Maribor.

It was planned that the activity would be carried out in Slovenia, in order to demonstrate the mentioned cooperation on practical examples. Due to the COVID19 pandemic and the inability to travel, at the consortium level a decision was made to organize an introductory workshop online. Representatives of universities and private companies were selected for the selected lecturers in th online workshop companies operating in the field of ICT in agriculture and beyond. The selection of lecturers was made on the basis of suggestions from the Wageningen University & Research (WUR), the University of Bucharest (UR), the University of Maribor (UM) and the University Donja Gorica (UDG).



Udeleženci delavnice so lahko od predavateljev slišali tematike z naslednjimi naslovi: gospodarsko-akademsko raziskovalno sodelovanje na področju programskega inženiringa: izkušnje in pridobljena znanja, sodelovanje Univerze za agronomijo in veterinarstvo v Bukarešti s specializiranimi podjetji za IKT, gospodarsko-akademsko partnerstvo v Sloveniji - uporaba dronov in satelitskih posnetkov v natančnem kmetijstvu in gospodarsko-akademsko sodelovanje v Črni gori - digitalne rešitve za pametno kmetijstvo. Delavnico je vodil prof. dr. Željko Vaško, uvodni govorec pa je bil professor Vahid Garousi, ki ima veliko let izkušenj. Na delavnico se je vse skupaj prijavilo in udeležilo 66 ljudi iz Bosne in Hercegovine, Črne gore, Srbije, Romunije, Slovenije, Nizozemske, Nemčije, Španije in Gruzije.

The participants of the workshop were able to hear topics from the lecturers with the following titles: Industry-Academia Research Collaboration in Software Engineering: Experience and Lessons Learned, Cooperation of University of Agronomic Science and Veterinary Medicine of Bucharest with specialized companies in ICT, Industry-Faculty Partnership in Slovenia - The use of Drone and Satellite Imagery in Precise Agriculture, Industry-Academia Collaboration in Montenegro - Digital Solutions for Smart Agriculture. The workshop was moderated by Prof. Dr. Željko Vaško. The introductory speaker at the workshop was Professor Vahid Garousi, who has many years of experience. A total of 66 people from Bosnia and Herzegovina, Montenegro, Serbia, Romania, Slovenia, the Netherlands, Germany, Spain and Georgia registered for this workshop.



IKT v kmetijstvu ponuja širok nabor rešitev za nekatere kmetijske izzive. Najpomembnejši razlog za implementacijo digitalizacije v kmetijstvu je ekonomski, imlementira pa se tudi iz drugih potreb. Lahko prinese velike koristi v zvezi z okoljskimi vprašanji, kot so učinkovitejša uporaba vode, manjša uporab gnojil in fitofarmacevtskih sredstev, manjša poraba goriva, optimizacija obdelave ipd. Zato je takšno sodelovanje še posebej pomembno. Mednarodno sodelovanje in nenazadnje sodelovanje med podjetji ter drugimi deležniki lahko uspešno vzpodbudi razvoj in uporabo IKT v kmetijstvu.
Ta delavnica je bila dober primer sodelovanja in eden izmed načinov približevanja IKT vsem zainteresirancem.

Več informacij lahko najdete: http://viralerasmus.org/uspesnim-sastankom-nastavljene-aktivnosti-na-viral-projektu/
Gradiva delavnice so na voljo na spletni strani: http://viralerasmus.org/ict-u-poljoprivredi/

Pripravil/Prepared by:
Erik Rihter, UM-FKBV

ICT in agriculture offers a wide range of solutions to some agricultural challenges. The most important reason for the implementation of digitalization in agriculture is economic, but it is also implemented for other needs. It can bring great benefits in relation to environmental issues, such as more efficient use of water, less use of fertilizers and plant protection products, lower fuel consumption, optimization of processing, etc. Therefore, such cooperation is particularly important. International cooperation and cooperation between companies and other stakeholders can successfully promote the development and use of ICT in agriculture.

This workshop was a good example of cooperation and one of the ways to bring ICT closer to all stakeholders.

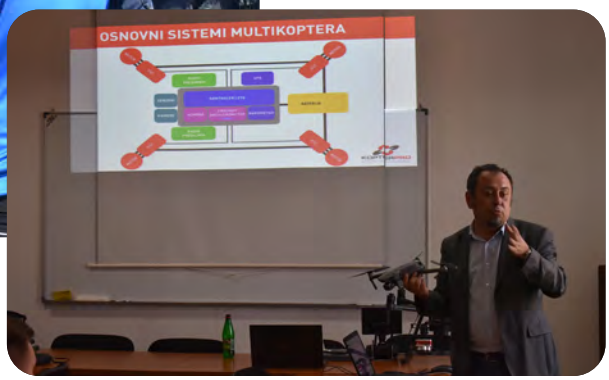
For more information visit:
http://viralerasmus.org/en/successful-meeting-continued-activities-on-the-viral-project/

Workshop materials are available on the project website http://viralerasmus.org/ict-u-poljoprivredi/

IKT Edukacija za studente Poljoprivrednog fakulteta Univerziteta u Banjoj Luci

ICT Education for students of the Faculty of Agriculture University of Banja Luka

WP.5, outcome 5.1.
Improved student employability



U cilju podizanja nivoa obučenosti studenata Poljoprivrednog fakulteta, te time i njihove bolje zapošljivosti (WP5) 19.02.2021. godine na Poljoprivrednom fakultetu je održana edukativna radionica za studente, o korišćenju bespilotnih letelica. Radionicu je implementirao gospodin Momir Alvirović iz komapnije "Agrodron". Radionica je bila namenjena studentima II i III ciklusa studija. U okviru prvog dela radionice studenti su imali teoretska predavanja na ovu temu, dok su u drugom praktičnom delu radionice imali priliku da upravljaju dronom Poljoprivrednog fakulteta. Započeta edukacija će biti nastavljena i u narednom period.

Za više informacija posetite:
http://viralerasmus.org/ikt-edukacija-za-studente-poljoprivrednog-fakulteta-univerziteta-u-banjoj-luci/

Pripremili/Prepared by:
Tatjana Jovanović Cvetković, UNIBL
Miljan Cvetković, UNIBL

In order to raise the level of training of students of the Faculty of Agriculture, and thus their better employability (WP5) an educational workshop for students on the use of unmanned aerial vehicles was held at the Faculty of Agriculture on 19th of February. Mr. Momir Alvirović from the company "Agrodron" implemented the workshop. The workshop was intended for students of the second and third cycle of studies. Within the first part of the workshop, students had theoretical lectures on this topic, while in the second practical part of the workshop they had the opportunity to operate a drone at the Faculty of Agriculture. The started education will be continued in the following period as well.

For more information visit:
http://viralerasmus.org/en/ict-education-for-students-of-the-faculty-of-agriculture-university-of-banja-luka/

Potpisan ugovor o saradnji u oblasti primene IKT u poljoprivredi

Agreement on cooperation in the field of application of ICT in agriculture signed

WP.2, outcome 2.1.
Improved competences of use of ICT in agriculture

Dana 26.03.2021. godine u prostorijama Poljoprivrednog fakulteta Univerziteta u Banjoj Luci potpisan je ugovor o poslovno tehničkoj saradnji u oblasti primene IKT u poljoprivredi. Ugovor su potpisali dekan Poljoprivrednog fakulteta prof.dr Zlatan Kovačević i predsednik Asocijacije za bespilotne sisteme u privredi (konzorcijum Agrodron) Momir Alvirović. Ugovor je inciran aktivnostima u okviru projekta Viral. Ugovorne strane su se saglasile da međusobno razvijaju poslovno-tehničku saradnju u svim poslovima iz onih oblasti za koje su obe ugovorne strane registrovane kod nadležnog suda, sa posebnim akcentom na primenu informaciono-komunikacionih tehnologija i sistema sa daljinskim upravljanjem (tzv. dronova) u poljoprivredi.

Za više informacija posetite: http://viral-erasmus.org/potpisan-ugovor-o-saradnji-u-oblasti-primene-ikt-u-poljoprivredi/

Pripremili/Prepared by:
Tatjana Jovanović Cvetković, UNIBL
Miljan Cvetković, UNIBL

On March 26th in the premises of the Faculty of Agriculture, University of Banja Luka, an agreement on business and technical cooperation in the field of application of ICT in agriculture was signed. The contract was signed by the Dean of the Faculty of Agriculture, Proffesor Zlatan Kovacevic, and the President of the Association for Unmanned Systems in the Economy (Agrodron Consortium), Momir Alvirovic. The contract was initiated by activities within the Viral project. The contracting parties agreed to develop business-technical cooperation in all matters in those areas for which both contracting parties are registered with the competent court, with special emphasis on the application of information and communication technologies and remote control systems (so-called drones) in agriculture.

For more information visit:
http://viralerasmus.org/en/agreement-on-cooperation-in-the-field-of-application-of-ict-in-agriculture-signed/

Dronovi u poljoprivredi
Drones in agriculture

WP.5. outcome 5.2; 5.3; 5.4
Improved knowledge of extension service providers, agronomists and agriculture cooperatives policy makers about ICT in agriculture

Poljoprivredni fakultet Univerziteta „Bijeljina" bio je domaćin tradicionalnog seminara za poljoprivredne proizvođače i druge zainteresovane subjekte u poljoprivredi i agrobiznisu. Seminar pod nazivom „Izazovi poljoprivredne proizvodnje u 2021. godini" održan je 10.03.2021. godine u amfiteatru Poljoprivrednog fakulteta Univerziteta „Bijeljina".
Skup je prevashodno bio namjenjen poljoprivrednim proizvođačima, poslovnom sektoru u oblasti agrara, savetodavcima kao i drugim indivudulanim i privrednim subjektima u oblasti agrara, ali i učesnicima tekućeg projekta VIRAL kao jedan oblik diseminacije do sada stečenog znanja iz ove oblasti.

Predavači su bili profesori sa Univerziteta „Bijeljina", Univerziteta u Beogradu, Univerziteta u Banja Luci, te predstavnici kompanije iz oblasti precizne poljoprivrede (bespilotne letjelice-dron). Na samom početku skupa, predavače i učesnike je pozdravio direktor Univerziteta „Bijeljina", prof. dr Boro Krstić. U nastavku skupa, pozdravnu riječ su uputili gradonačelnik Bijeljine, Ljubiša Petrović, zatim direktor Uprave BiH za zaštitu zdravlja bilja, prof. dr Goran Perković, jedan od učesnika projekta VIRAL, prof. dr Aljo Mujčić sa Elektrotehničkog fakulteta u Tuzli, kao i predstavnik Ministarstva poljoprivrede, šumarstva i vodoprivrede Republike Srpske, dr Zoran Maletić.

The Faculty of Agriculture of the Bijeljina University hosted the traditional seminar for agricultural producers and other interested entities in agriculture and agribusiness. The seminar entitled "Challenges of agricultural production in 2021" was held on the 10th March in the amphitheater of the Faculty of Agriculture, Bijeljina University.

The lecturers were professors from the Bijeljina University, the University of Belgrade, the University of Banja Luka, and representatives of the company in the field of precision agriculture (unmanned aerial vehicles-drones). At the very beginning of the gathering, the lecturers and participants were greeted by the director of the Bijeljina University, prof. dr Boro Krstić. In the continuation, the welcoming speech was given by the mayor, Ljubiša Petrović, then by the director of the Administration of Bosnia and Herzegovina for plant health protection, prof. dr Goran Perkovic, one of the participants in the project VIRAL, prof. dr Aljo Mujčić from the Faculty of Electrical Engineering in Tuzla, as well as a representative of the Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska, dr Zoran Maletić.

Momir Alvirović iz firme Agrodron je govorio o praktičnim aspektima primene dronova u poljoprivredi, sa posebnim akcentom na ratarsku proizvodnju koja je jedna od vodećih na području Semberije.

U drugom dijelu skupa izvedena je praktična vježba primjene bespilotnih letjelica u svrhu detekcije i zaštite bilja od štetočina i bolesti, a koju je izvela kompanija Agro Tim iz Beograda. Učesnici su na licu mjesta imali priliku vidjeti primjenu dronova na usjevima, te se uvjeriti u njihovu efikasnost i preciznost.

Za više informacija posjetite:
http://ubn.rs.ba/izazovi-poljoprivredne-proizvodnje-u-2021-godini

Pripremili/Prepared by:
Miroslav Nedeljković, UBN
Boro Krstić, UBN
Jovana Vujić, UBN

Momir Alvirović from the company Agrodron spoke about the practical aspects of the application of drones in agriculture, with special emphasis on crop production, which is one of the leaders in the area of Semberija.

In the second part of the gathering, a practical exercise of using unmanned aerial vehicles for the purpose of detecting and protecting plants from pests and diseases was performed by the company Agro Tim from Belgrade. Participants had the opportunity to see the application of drones on crops on the spot and see for themselves their efficiency and accuracy.

For more information visit:
http://ubn.rs.ba/izazovi-poljoprivredne-proizvodnje-u-2021-godini

Demonstrirana praktična upotreba dronova u voćarstvu

Demonstrated practical use of drones in fruit production

WP.5. outcome 5.2; 5.3; 5.4
Improved knowledge of extension service providers, agronomists and agriculture cooperatives, policy makers about ICT in agriculture

Uvažavajući potrebu upoznavanja sa ciljevima projekta VIRAL, te širenja (diseminacije) njegovog značaja održana je demonstracija upotrebe drona u zaštiti voćaka od prouzrokovača bolesti i štetočina. Demonstracija je organizovana u saradnji sa Ministarstvom poljoprivrede, šumarstva i vodoprivrede Republike Srpske i komapnijom "Agrovoće" koja je jedan o članova konzorcijuma projekta VIRAL. Demonstracija je realizovana 26.03.2021. u zasadima šljive kompanije "Agrovoće" kao i Eksperimentalno edukacionom dobru Poljoprivrednog fakulteta u Banjoj Luci.

Za više informacija posetite: http://viralerasmus.org/ikt-edukacija-za-studente-poljoprivrednog-fakulteta-univerziteta-u-banjoj-luci/

Pripremili/Prepared by:
Tatjana Jovanović Cvetković, UNIBL
Miljan Cvetković, UNIBL

Recognizing the need to get acquainted with the goals of the VIRAL project, and the dissemination (dissemination) of its importance, a demonstration of the use of drones in the protection of fruit trees from pathogens and pests was held. The demonstration was organized in cooperation with the Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska and the company "Agrovoće", which is one of the members of the consortium of the VIRAL project. The demonstration was realized on March 26, 2021. in the plum orchards of the company "Agrovoće" as well as the Experimental Educational Property of the Faculty of Agriculture in Banja Luka.

For more information visit:
http://viralerasmus.org/ikt-edukacija-za-studente-poljoprivrednog-fakulteta-univerziteta-u-banjoj-luci/

Sastanak u Bijeljini posvećen hakatonu i saradnji sa privredom

Meeting in Bijeljina dedicated to hackathons and cooperation with the business sector

WP.4, outcome 4.2. outcome 4.3.
Set of EXPO founding documents, guidelines and materials
Constituted EXPO managing structures and plan of work

Nastavljajući projektne aktivnosti u Bijeljini je tokom dva dana (10. i 11. maja) održan radni sastanak. Sastanak je prevashodno bio namjenjen učesnicima Erasmus+ Viral projekta, a domaćin je bio Poljoprivredni fakultet Univerziteta „Bijeljina".

Tokom prvog radnog dana, nakon pozdravne riječi dekana Poljoprivrednog fakulteta Univerziteta "Bijeljina" prof. dr Bore Krstića, razmatralo se o trenutnom statusu implementacije projekta kao i o predstojećoj aktivnosti u okviru radnog paketa WP3, odnosno studentskom takmičenju hackathon.

Na ovu temu nešto više govorio je koordinator projekta „Viral" prof. dr Miljan Cvetković, kao i predstavnici centra Tehnopolis, odnosno Marijana Jovović, predstavnici INTERA Mostar, Ana Bogdanović i Marko Rosić kao predstavnik ICBL-a. Tom prilikom dogovorene su osnovne pretpostavke za samu realizaciju hakatona kao i dinamika realizacije zaduženja pojedinih učesnika.
Nakon kratke pauze nastavljen je rad u paralenim grupama na radnom paketu WP2 i WP4. U okviru radne grupe WP2 bilo je razgovora na temu kreiranja Univerzitetskih ToT timova i pripremanje aplikativnih alata za pravljenje studentskih kurseva iz oblasti robotike, primjene dron tehnologija kao i

Continuing the project activities, a working meeting was held in Bijeljina (10th and 11th May). The meeting was organized for the participants of the Erasmus + Viral project, and was hosted by the Faculty of Agriculture of the Bijeljina University.
During the first working day, after the welcoming speech of the dean of the Faculty of Agriculture of the Bijeljina University, Boro Krstić, PhD, it was discussed about the current status of project implementation as well as the upcoming activity within the WP3 or student competition hackathon.
The coordinator of the Viral project, Miljan Cvetković, PhD, as well as representatives of the Technopolis Center, Mariana Jovović, representatives of INTERA Mostar, Ana Bogdanović, and Marko Rosić as a representative of ICBL gave speech on this topic. On that occasion, the basic preconditions for the realization of the hackathon were agreed upon, as well as the dynamics of the reali-

mobilnih aplikacija i GIS sistema. Radna grupa za WP4 je diskutovala na temu organizacije EXPO događaja. Radne aktivnosti su se odvijale u tri grupe čiji su učesnici bili predstavnici sa Univerziteta u Tuzli, Univerziteta u Banjoj Luci, zatim Univerziteta u Donjoj Gorici i Univerziteta u Mariboru. Nakon toga, nešto više o samom prirodi i svrsi kursa ICT u poljoprivredi govorili su Ana Mandić sa Sveučilišta Mostar, kao i prof. dr Aljo Mujčić sa Univerziteta u Tuzli, kao i prof. dr Zdenka Babić sa Univerziteta u Banjoj Luci.

Drugog radnog dana se nastavilo sa aktivnostima na radnom paketu WP2.3 i WP2.4, da bi se nakon kraće pauze pristupilo aktivnosti na radnom paketu WP4, odnosno WP4.2 i WP4.3 koji imaju za cilj tumačenje i prikupljanje osnivačkih dokumenata, te davanje smjernica i planova rada za predstojeći EXPO. Nakon toga, koordinator projekta prof. Miljan Cvetković, kao i predstavnici WEBIN-a, Marko Stojanović i Jelena NastićStojanović govorili su na temu preduzimanja potrebnih aktivnosti u vezi nadolazećeg sastavljanja srednjoročnog narativnog i finansijskog izvještaja. Prije zatvaranja dvodnevnog sastanka, učesnici su ponovo prodiskutovali o aktivnostima vezanim za radne pakete projekta.

Za više informacija posetite:
http://viralerasmus.org/odrzana-radionica-na-univerzitetu-u-bijeljini/

Pripremili/Prepared by:
Miroslav Nedeljković, Bijeljina University
Aleksandar Životić, Bijeljina University
Boro Krstić , Bijeljina University

zation of the indebtedness of individual participants.

After a short break, work continued in parallel groups on WP2 and WP4. Within the WP2, there were discussions on the topic of creating University ToT teams and preparation of application tools for creating student courses in the field of robotics, application of drone technologies as well as mobile applications and GIS systems. The working group for WP4 discussed the topic of organizing EXPO events. The work activities took place in three groups whose participants were representatives from the University of Tuzla, the University of Banja Luka, the University of Donja Gorica and the University of Maribor. Then, Ana Mandić from the University of Mostar spoke about the nature and purpose of the ICT course in agriculture, as well as Aljo Mujčić, PhD, from the University of Tuzla and Zdenka Babić, PhD, from the University of Banja Luka.

On the second working day, the activities on the work package WP2.3 and WP2.4 continued, and after a short break, we continued with the activities on the work packages WP4.2 and WP4.3, which aim to interpret and collect the founding documents, and providing guidelines and work plans for the upcoming EXPO. After that, the project coordinator Miljan Cvetković, PhD, as well as representatives of WEBIN, Marko Stojanović and Jelena Nastić-Stojanović, spoke on the topic of undertaking the necessary activities regarding the upcoming mid-term narrative and financial report. Before closing the two-day meeting, the participants re-discussed the activities related to the project work packages.

For more information visit:
http://viralerasmus.org/en/a-workshop-was-held-at-the-university-of-bijeljina/

Iskustvo sa sistemom za podršku donošenja odluka u zaštiti bilja: www.agroupozorenje.rs

Experience with: www.agroupozorenje.rs decision support system in plant protection

WP.2, outcome 2.1.
Improved competences of use of ICT in agriculture

Tokom 20tog veka, u Srbiji je radila mreža državnih poljoprivrednih službi. One su bile prilagođene za rad sa velikim poljoprivrednim preduzećima. Tokom tranzicije, veliki broj malih poljoprivrednih proizvođača, postali su veliki. Istovremeno, u Srbiji su počeli da se šire lanci marketa. Oni su počeli da kupuju povrće i voće od proizvođača koji su mogli da zadovolje potrebne količine i kvalitet.

Globalno otopljavanje uslovilo je pojavu većeg broja novih štetotnih organizama. Istovremeno, već postojeći štetni organizmi počeli su da povećevaju broj generacija. Uspešna zaštita bilja postala je ključna za uspešnu poljoprivrednu proizvodnju.

Početkom 21-ov veka, nekoliko agronoma, počelo je profesionalno da se bavi savetodavstvom u Srbiji. Nabavljena je oprema: automatske meteorološke stanice, svetlosne i feromonske klopke i počelo se sa redovnim pregledima polja. Nabavljena oprema uz vizuelne preglede bili su osnova za sprovođenje uspešnih programa zaštite bilja. Razmenu informacija smo obavljali telefonom, elektronskom poštom ili lično. To je uzimalo mnogo vremena i pokazalo se nepraktično.

During 20th Century in Serbia start to work network of state agicultur station. Their work was adapted to large state agricultural enterprises. During transition, large number of small agricultur producers, stay big. In the same time start to work big market chains. Thay start to buy vegetable and fruit from big local producers.

Global warming brought a number of new pests, and already present have begun to increase the number of generations. Successful plant protection has become crucial to successful agricultural production.

Since beginning of 21st Century few agronomist start profesional private conultant practice in Serbia. We buy equipment: automatic meteorological stations, light traps, pheromone traps and work in the field. This equipent start to be our eyes. To exchange data we were in constant contact by phone, e-mail or in person. That use lot of our time.

Od ideje do realizacije:

Ideja da napravimo sajt za razmenu i obradu podataka koji će nam pomoći u upuzorenju na štetne organizme je brzo nastala. Mađutim nismo imali dovoljno znanja da je realizujemo. Tokom 2008. godine na poziv Zlatka Jovanovića, prisustvovali smo seminaru u organizaciji Ambasade SAD i USAID-a o sistemima upozorenja na štetne organizme. Tamo smo dobili odgovor kako ovakav sistem treba da izgleda i ovde bi hteli još jednom da im se zahvalimo.
Osnovna ideja je bila da Agroupozorenje bude mesto za razmenu informacija. Tokom razrade ideje, shvatili smo da bi infromacija mogli da podelimo sa ostalim zainteresovanim ljudima. Napravili smeo šemu protoka informacija:

Na jednoj strani su bili sakupljači informacija sa terena: meteorološke stanice, ljudi koji poseduju feromonske klopke, ljudi koji poseduju svetlosne klopke i ljudi koji vrše vizuelne preglede bilja. Oni su punili bazu podataka.

Baza podataka je primala podatke iz različitih izvora, čuvala ih, sortirala i automatski obrađivala. Meteorološki podaci su obrađeni pomoću algoritama za razvoj bolesti i štetočina koji su se nama u radu pokazali kao najpouzdaniji. Svi prikupljeni i obrađeni podaci su postali vidljivi za sve posetioce sajta. Sada su u bazi povezani podaci sa preko 100 mesta u Srbiji.

Moderatori su zaduženi da na osnovu podataka iz baze prave upozorenja. Upozorenja se postavljaju na sajt sortirani po biljnim vrstama.

Postoje dve vrste upozorenja: prva sadrži informaciju koji šteteni organizam bi u narednom periodu mogao da naravi štetu. Na taj način zainteresovana lica mogu da donesu odluku da li i koje sredstvao će da upotrebe. Druga vrsta upozorenja je namenjana za pretplatnike i ona sadrži osim upozorenja i konkretnu preporuku koje sredstvo zaštite bilja treba upotrebiti u koje vreme.

From idea to realization:

The idea of creating a site where we exchange data and that will warn as of harmful organisms has been around for a long time. But the bigger problem was how to do it. In 2008, thanks to Mr. Zlatko Jovanovic from US ambasy and USAID, we attended a seminar on warning of the emergence of harmful organisms. That's where we got the answer to what it's supposed to look like, and on this place I like thank to him.

The original idea was for Agrowarning to be a place to exchange information. During the work we realized that we could share that data with other interested people. So we've created an information flow sheme. On one side were information collector: meteorological stations, people who had phereomone traps, people who had light traps... Thay are filling out the database.

Data base stack data. Automatic retrieval of meteorological data is enabled from different sources of meteorological data. Computer processed the data collected using algorithms on the development of diseases and pests. All collected and processed data are visible to all visitors to the site, for more than 100 places in Serbia. On

this way all people can see and create own decision based on realtime data.

Moderators use data from databese, and make warnings. Thay posted warnings or news on the site by the appropriate plant. There are two type of news: First include information from wich harmful organisam, in wich time we can expect damage. So producers can use plant protection product in right time. Second include warnings and our recomandation with exactli plant protection products.

Koje biljne vrste Agroupozorenje pokriva?

Trenutno se daju upozorenja za breskvu, crni luk, jabuku, ječam, krompir, krušku, kukuruz, kupusnjače, lesku, lubenicu, malinu, mrkvu, orah, papriku, paradajz, pšenicu, šećernu repu, šljivu, vinovu lozu i višnju. Ukoliko se javi iznenada štetni organizam na nekoj drugoj gajenoj biljci, upozorenje se može dati i za njega, u delu "ostale biljne vrste".

Broj upozorenja po gajenoj biljnoj vrsti zavisi od godine. Na primer: za pšenicu je kod nas dovoljno dati 1-3 upozorenja godišnje, a za jabuku i do 25 godišnje!

Podaci su uz pomoć GIS tehnologije prikazani na karti, pa svako može da vidi kako se kreće neki štetni organizam u njegovoj blizini. Stanje svakog štetnog organizma je prikazano u zelenoj, žutoj i crvenoj boji koje imaju jasno značenje.

Poslednjih sedam godina, tokom vegetacione sezone, baza podataka preuzima i prognozirane meteorološke podate. Rezultati na osnovu prognoziranih podataka, takođe se prikazuju na sajtu za naredna tri dana. Na ovaj način Agroupozorenje pomaže u donošenju odluke o sprovođenju mera zaštite bilja.

Agroupozorenje daje tri nivoa informacija:

Prvi nivo Agroupozorenja su podaci sa klopki i obrađeni meteorološki podaci o štetnim organizmima.

Ovaj deo smatramo najvažnijim delom našeg alata. On je osnova Integralne zaštite bilja. Svi mi znamo da je najbolja efikasnost fungicida ako ih koristimo preventivno. Svi posetioci sajta mogu da vide sakupljene i obrađene podatke koji im mogu pomoći da samostalno donesu odluku o merama zaštite bilja. Mi smo očekivali da će korištenje ovog dela sajta biti dominantno. Međutim, obaj deo sajta koristi mali deo zaštitara praktičara.

Drugi nivo Agroupozorenja su novosti / upozorenja sa informacijom na kojoj biljci može-

Which plant species does the Agrowarning cover?

Warnings are currently being issued for peaches, onions, apples, barley, potatoes, pears, corn, cabbage, hazelnuts, watermelons, raspberries, carrots, walnuts, peppers, tomatoes, wheat, sugar beets, plums, vines and cherries. If a harmful organism suddenly appears on another cultivated plant, warnings can be given for it, in the section "other plant species".

The number of warnings per cultivated plant species depends on the year. For example, for wheat, it is enough to give 1-3 warnings a year, and for apples up to 25 a year!

The data are shown on the map with the help of GIS technology, so everyone can see how a harmful organism moves. The condition of each harmful organism is shown in green, yellow and red, which have a clear meaning.
In last seven years, during vegetation season we fill data base with predicted meteorological data. The results of the processed forecast meteorological data are also displayed on the site for the next three days. In this way, Agroupozorenje helps in making a decision on the implementation of plant protection measures.

Agrowarning provides three level of information.

First level Agrowarning is: Data from traps and processed data about harmfull organisam.

This part is the most important on our tool. This data is base of Integral pest menagement. All of us know that best efficasy fungicide (plant protection products) provide if we use it preventively. All site visitors can see all collected numbers and processed

mo očekivati neki štetni orfanizam i u koje vreme.

Ovaj deo smo mislili da će naviše da koriste proizvođači bilja. Međutim, posle 12 godina rada sajta, vidimo da ovaj deo stručni savetodavci takođe dominantno koriste. Šta je razlog?

Na praksu nam dolazi mnogo studenata. Oni imaju skromno teoretsko znanje o modelima i upotrebi modela o razvoju bolesti i štetočina. Na taj način i praktična upotreba ovakvih alata je mala. Za jedan problem u proizvodnji postoji više rešenja jer pravo rešenje za konkretan zasad ili polje zavisi od mnogo okolnosti: vremena setve, uzgojnog oblika, đubrenja, istorije pojave štetočine na tom području...

Treći nivo Agroupozorenja sadrži tačne preporuke koje sadrže informacije kada ja najbolje vreme za primenu konkretnog sredstva za zaštitu bilja. Ovaj deo vide samo pretplatnici, jer smatramo da nikome nemožemo nametati naša rešenja a još manje biti odgovorni za uspeh zaštite bilja na nekom usevu ili zasadu koga nisamo nikad ni videli. Po našem iskustvu ovaj deo najviše koriste mali proizvođači koji imaju ogračničeno znanje o zaštiti bilja.

Kakva je pozdanost sistema za davanje podrške u donošenju odluka u zaštiti bilja.

Poljoprivredna proizodnja na otvorenom zavisi najviše od temperature i padavina.

Alati kao što je Agroupozorenje bi bili savršeni da imamo uvek tačnu prognozu za tri dana unapred, ali je nemamo.

Što više podataka imamo, manja je šansa da donesemo odluku koja je lošija od optimalne.

U ovom momentu nema alata koji u potpunosti može da zameni odluku umesto stručnjaka koji radi u polju i odgovoran je za proizvodnju.

Zato je u ovom momentu i sa trenutno prisutnim saznanjima sistem kao što je _ koji pomaže stručnjaku u donošenju odluke najbolje rešenje.

Pripremili/Prepared by:
Dragan Vajgand, Agroprotekt doo
Florian Farkaš, Rona konsalnting

values and make decision when thay can expect some damage base on it. We expect that such a way of use would be dominant. But this part of our site use only a small part of plant protection practitioner.

Second part Agrowarning is: News / warnings with information: Whish plant, Which harmful organism and What time we can axpect damage

Farmers use this part the most. After twelve year we see that also consultant use this part the most. What is reason? Well, a lot of students come to us for practice. Thay have limited theoretical knowledge of the use of disease and pest development models. We recomand more practicaly lectures during studying becouse for one problem in plant protection exist few solution. Solution depand of conditions of plant, time of sowing, breeding form, fertilization, availability of plant protection products, preasure of pests and ecetera...

Third part Agrowarning is: Recommendation with information: when is best time to apply specifically plant protection products? This part can see only subscriber. By our experience subscriber are small producers wich have limited knowledge about plant protection.

What is Reliability of decision support sistem in plant protection:
Agricultural production in the open field depends mostly on temperature and precipitation.
Agro-warning sistem would be a perfect tool if the weather forecast for three days in advance was always accurate. But we don't.

The more data he has, the less chance there is that the decision he made will be worse than optimal.
In this moment there is no tool that can total replace the decision of an expert who work in field and is charge of a production.
In this moment and present level of knowledge decision support sistem is best solution.

Četiri inovacije u oblasti poljoprivrede prezentovane na VIRAL hakatonu

Four innovations in agriculture presented on VIRAL hackathon

WP.3, outcome 3.2.
Implementation of student pitching competitions - hackatons

Veliko finale VIRAL hakatona održano je 19. maja u Inovaciono preduzetničkom centru Tehnopolis. DEMO dan – kruna dvodnevnog rada – bio je prilika da četiri tima predstave žiriju svoje inovativne ideje iz oblasti informaciono komunikacionih tehnologija i poljoprivrede, do kojih su došli nakon 48h rada na hakatonu.

Uz podršku mentora iz četiri oblasti: biznis developement-a, pitch-a, softverskog i hardverskog prototyping-a, timovi su od 17. do 19. maja neprekidno radili na rješavanju definisanih problema hakatona, stvarajući inovativna i kreativna rješenja, kako bi pomogli poljoprivrednicima da unaprijede procese i sisteme u svojim preduzećima.
Tri tima su radila na optimizaciji i automatizaciji sistema za navodnjavanje i na DEMO danu prezentovali funkcionalne prototipe, izrađene uz podršku TechLab-a IPC Tehnopolis, dok je jedan tim kreirao softversko riješenje koje omogućava optimizaciju i mjerenje učinkovitosti radne snage.
Da 48h nije malo vremena da se kreiraju sjajna i funkcionalna rješenje, dokazali su timovi GoDigital, Mechanic Crops, Demetra i Perfect H20, koji su svojim inovativnim idejama oduševili prisutne.

Kako je istakao Aleksandar Janičić, koordinator Centra za razvoj preduzetništva i up-

The VIRAL hackathon grand finale was held on 19th of May at the Innovation entrepreneurship centre Tehnopolis. DEMO Day – the crown of two days of work – was an opportunity for the four teams to present to the jury their innovative ideas in the field of information communication technologies and agriculture, which they came up with after 48 hours of work on the hackathon.

Backed by mentors from four fields: business developer, pitch, software, and hardware prototyping, the teams worked from 17 to 19 May to solve defined hackathon problems, creating innovative and creative solutions to help farmers improve processes and systems in their businesses.
The three teams worked on optimizing and automating irrigation systems and presented functional prototypes on DEMO day, made with the support of TechLab IEC Tehnopolis, while one team created a software solution that enables optimization and mea-

ravljanje projektim u IPC Tehnopolis, iako je cilj hakatona bio da se uveže IKT i poljoprivredni sektor u cilju rješavanja konkretnih problema poljoprivrednika, mnogo veća vrijednost samog događaja se ogleda u multidisciplinarnoj saradnji studenata iz različitih studentskih jedinica, koji su zajedničkim radom u kratkom periodu postigli veliki uspjeh i predstavili sjajna rješenja: „Želja nam je da mladi, inovativni ljudi nastave da razmišljaju proaktivno i da se studentske ideje generišu i razvijaju pod krovom Tehnopolisa i u narednom periodu“. Posebno se zahvalio sponzorima koji su prepoznali značaj VIRAL hakatona i podržali ga i to generalnom pokrovitelju – Stalnoj radnoj grupi za regionalni ruralni razvoj u jugoistočnoj- Evropi (SWG) koja je podršku pružila u okviru projekta Diverzifikacija ekonomskih aktivnosti u ruralnim područjima jugoistočne Evrope kroz razvoj lanca vrijednosti, a koji implementira u partnerstvu sa Njemačkom organizacijom za međunarodnu saradnju (GIZ); generalnim sponzorima hakatona – Crnogorskom Telekomu, ICT Cortex-u i Coca-Cola HBC Crna Gora koja je pored novčane podrške obezbijedila i osvježenje za sve učesnike hakatona; partneru hakatona – Alter Modusu i prijateljima hakatona – Glavnom gradu Podgorica, Hipotekarnoj banci i Swisslion-Takovo.

Za više informacija posetite:
http://www.tehnopolis.me/online/mne/cetiri-inovacije-u-oblasti-poljoprivrede-prezentovane-na-viral-hakatonu/

http://viralerasmus.org/u-niksicu-na-hakatonu-studenti-sa-veceg-broja-univerziteta-iz-zemlje-i-inostranstva/

surement of workforce performance.
The teams GoDigital, Mechanic Crops, Demetra, and Perfect H20 proved by presenting their innovative ideas that 48 hours is not a short time to create a great and functional solution.

As Aleksandar Janicic, the coordinator of the Centre for Entrepreneurship Development and Project Management at IEC Tehnopolis pointed out, although the hackathon aimed to import ICT and the agricultural sector to solve specific problems of farmers, much greater value of the event itself is reflected in the multidisciplinary cooperation of students from different student units, who have achieved great success together in a short period and presented great solutions: “We wish that young, innovative people continue to think proactively and that student ideas are generated and developed under the roof of Tehnopolis and in the coming period.” In particular, he thanked sponsors who recognized the importance of viral hackathon and supported it to the general patron – the Standard Working Group for Regional Rural Development in Southeast Europe (SWG), which supported the project to diversify economic activities in rural areas of Southeast Europe through the development of the value chain, implemented in partnership with the German Organization for International Cooperation (GIZ); general sponsors of the hackathon – Montenegrin Telekom, ICT Cortex and Coca-Cola HBC Montenegro, which in addition to monetary support provided refreshments for all hackathon participants; partner of the hackathon – Alter Modus and friends of the hackathon – Podgorica Glavni Grad, Hipotekarna Banka, and Swisslion-Takovo.

For more information visit:
http://www.tehnopolis.me/online/en/four-innovations-agriculture-presented-viral-hackathon/

Titulu pobjednika VIRAL hakatona u Nikšiću odnio je tim GoDigital

The VIRAL hackathon in Nikšić was won by team GoDigita

WP.3, outcome 3.3.
Video compendium

Titulu pobjednika VIRAL hakatona odnio je tim GoDigital, koji je naveo da su veoma zadovoljni cijelim procesom i da su na hakatonu puno naučili, kako o poljoprivredi, tako i o primjeni IKT u tom sektoru. Oni su kreirali hardversko/softversko rješenje FIRM sistem (Farmer Irrigation Remote Monitoring), koji nudi mogućnosti navodnjavanja „jednim klikom“ – optimizaciju resursa za navodnjavanje gazdinstva, efikasniju raspodjelu radne snage, informacije o visini temperature vazduha, procentu vlažnosti vazduha i zemljišta, veći obim prinosa sa manje ulaganja i mogućnost prilagođavanja biljnim vrstama.

For more information visit:
https://www.youtube.com/watch?v=-zl0slmNVZkY

The title of winner of the VIRAL hackathon was won by team GoDigital, who stated that they are very satisfied with the whole process and have learned a lot about agriculture and the ICT in the sector. They have created a hardware/software solution FIRM system (Farmer Irrigation Remote Monitoring), which offers irrigation capabilities with a “single-click” – optimization of resources for irrigation of farms, more efficient allocation of labour, information on air temperature, percentage of humidity of air and soil, higher yield volume with less investment and the ability to adapt to plant species.

Za više informacija posetite:
https://www.youtube.com/watch?v=-zl0slmNVZkY

The second-placed team is Demetra, which presented the software solution of the AGRICULTURAL Labour Automation Tool, i.e. plantations where harvesting takes place by hand-picking technique and there is no possibility of adequate monitoring of workforce efficiency. With their application, it is possible to automate the system, control the dynamics of employees’ work, obtain “real-time” data, manage costs, and have constant insight into the job done, especially taking care of labour transparency and protection of

Drugoplasirani tim je Demetra, koji je predstavio softversko rješenje ALAT (Agricultural Labour Automatisation Tool) namijenjeno plantažama gdje se berba odvija tehnikom ručnog branja i ne postoji mogućnost adekvatnog praćenja efikasnosti radne snage. Njihovom aplikacijom moguće je automatizovati sistem, kontrolisati dinamiku rada zaposlenih, dobiti „real time“ podatke, upravljati troškovima i imati konstantan uvid u obavljeni posao, posebno vodeći računa o transparentnosti rada i zaštiti prava radnika. Kako kažu, na hakatonu su uz pomoć mentora i posvećenog tima Tehnopolisa, uspjeli da savladaju nove vještine i upoznaju ljude sa kojima će nastaviti saradnju.

For more information visit:
https://www.youtube.com/watch?v=qtQn_uOtN4Y&t=1s

Treće mjesto je pripalo timu Mechanic Crops, koji je ponudio softversko/hardversko rješenje koje podrazumijeva vještačku inteligenciju u kombinaciji sa novom vrstom sistema za navodnjavanje koja omogućava da imate „inženjera na farmi“ koji je dostupan 24h i koji omogućava maksimalnu uštedu vode.

For more information visit:
https://www.youtube.com/watch?v=b_7hmMFhuoY

Pripremili/Prepared by:
Tehnopolis team

workers' rights. They say that with the help of mentors and a dedicated team of Tehnopolis, they have managed to master new skills and meet people with whom they will continue to cooperate.
Za više informacija posetite:
https://www.youtube.com/watch?v=qtQn_uOtN4Y&t=1s

Third place went to team Mechanic Crops, which offered a software/hardware solution that implies artificial intelligence in combination with a new type of irrigation system that allows you to have an "irrigation engineer on the farm" that is available for 24 hours and enables maximum water savings.

Za više informacija posetite:
https://www.youtube.com/watch?v=b_7hmMFhuoY

Četiri tima predstavila inovativna rješenja za poljoprivredni sektor

Four teams presented innovative solutions for the agricultural sector

WP.3, outcome 3.2.
Implementation of student pitching competitions - hackatons

Da se informacionim tehnologijama može unaprijediti poslovanje preduzeća iz poljoprivrednog sektora dokazali su studenti Univerziteta iz Banja Luke, Tuzle i Bijeljine na VIRAL hackathonu koji su zajednički organizovali Inovacioni centar Banja Luka, Univerzitet u Banjoj Luci, Univerzitet u Tuzli i Univerzitet Bijeljina. Oni su od četvrtka, 20.5. do subote, 22.5.2021. godine predano radili na rješavanju izazova s kojima se susreću lokalna preduzeća iz ovog sektora razvijajući mobilne, desktop ili web aplikacije fokusirane na optimizaciju sistema navodnjavanja ipraćenje učinkovitosti radne snage.

Full stack, Agro Code, Demetra i Error 404 su čiji su članovi tijekom 48 sati spojili svoja znanja i vještine sa savjetima iskusnih mentora iz svijeta programiranja, dizajna, poljoprivrede, marketinga i drugih područja stvarajući inovativna i obećavajuća rješenja za lokalna preduzeća.

Svoja znanja sa učesnicima su kroz mentorske susrete podijelili Miloš Ljubojević, Suad Kasapović, Saša Vuković, Andrej Tomić, Željko Džafić i Miroslav Ivković kao i svi članovi projektnog tima. Učesnici su prisustvovali i radionici prezentacionih vještina koju je održala Dragana Bajović, menadžer poslovnog inkubatora ICBL-a, a imali su priliku i čuti iskustva mladiog uspješnog preduzetnika Andreja Tomića, koji je ujedno bio i mentor.

Predavanja, radionice, rad s mentorima i zabava obilježili su VIRAL hackathon, a učesnici su svoja rješenja prezentovali u subotu, 22.5.2021. godine pred stručnom komisijom. Organizatori su, u saradnji s brojnim partnerima, osigurali sljedeće nagrade:

Students of the University of Banja Luka, Tuzla and Bijeljina at the VIRAL hackathon, jointly organized by the Innovation Center Banja Luka, the University of Banja Luka, the University of Tuzla and the University of Bijeljina, proved that information technology can improve the business of companies from the agricultural sector. They are from Thursday, 20.5. until Saturday, May 22, 2021 worked diligently on solving the challenges faced by local companies in this sector by developing mobile, desktop or web applications focused on optimizing irrigation systems and monitoring workforce efficiency.

Full stack, Agro Code, Demetra and Error 404 are the name of the teams whose members combined their knowledge and skills with the advice of experienced mentors from the world of programming, design, agriculture, marketing and other fields over 48 hours, creating innovative and promising solutions for local businesses.

Miloš Ljubojević, Suad Kasapović, Sasa Vuković, Andrej Tomić, Željko Džafić and Miroslav Ivković, as well as all members of the project team, shared their knowledge with the participants through mentoring meetings. Participants also attended a workshop on presentation skills held by Dragana Bajović, manager of the ICBL business incubator, and had the opportunity to hear the experiences of the young successful entrepreneur Andrej Tomić, who was also a mentor.

Lectures, workshops, work with mentors and entertainment marked the VIRAL hackathon, and participants presented their solutions on Saturday, May 22, 2021. years before the expert commission. The organizers, in cooperation with numerous partners, provided the following awards:

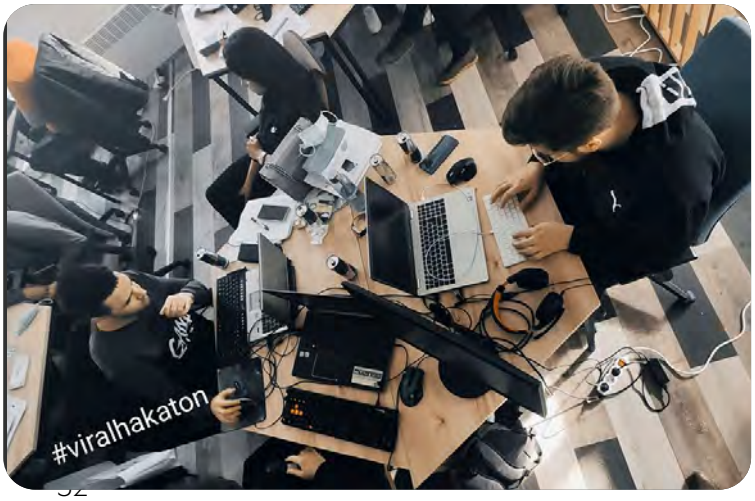
1. Prvo mjesto – 4 laptopa koje je obezbijedilo Ministarstvo poljoprivrede Republike Srpske te set wirelles tastature i miša koji je obezbijedila kompanija Virgin Pulse iz Tuzle.
2. Drugo mjesto – 4 tableta koje je obezbijedilo Ministarstvo poljoprivrede Republike Srpske, te bežične slušalice koje je obezbijedila kompanija Virgin Pulse iz Tuzle.
3. Treće mjesto – 4 pametna stata koje je obezbijedila kompanija Prointer, te bežični miš koji je obezbijedila kompanija Virgin Pulse iz Tuzle
4. Četvrto mjesto – Poklon kursevi od IT Akademije i Biznis akademije.

Aplikacija koja rješava problem praćenja učinkovitosti radne snage donijela je timu Full stack kojeg su činili studenti Univerziteta u Tuzli i studetni Univeziteta u Bijejilini prvo mjesto. Drugo mjesto je osvojio tim Agro Code sastavljen od studenata Univerzieta u Banja Luci dok je treće mjesto pripalo timu Demetra. Četvrto mjesto je osvojio tim Error 404.

Posebnu zahvalnost dugujemo našim sponzorima i to: Ministarstvu poljoprivrede, šumarstva i vodoprivrede Republike Srpske, kompaniji Prointer ITSS, kompaniji Agrimatco, kompaniji Virgin Pulse, Upravi Bosne i Hercegovine za zaštitu bilja, kompaniji Vitinka, Manja, Nescafe i Red bull. Specijalnu zahvalnost dugujemo i kompaniji Business Academy i ITAcademy, koji su osigurala nagradni fond za studente.

Za više informacija posetite:
http://viralerasmus.org/en/20-students-12-mentors-5-teams-3-cities-1-winner/

Pripremili/Prepared by:
Marko Rosić, ICBL



1. First place - 4 laptops provided by the Ministry of Agriculture of the Republic of Srpska and a set of wireless keyboards and mice provided by the company Virgin Pulse from Tuzla.
2. Second place - 4 tablets provided by the Ministry of Agriculture of the Republic of Srpska, and wireless headphones provided by the company Virgin Pulse from Tuzla.
3. Third place - 4 smart watches provided by the company Prointer, and a wireless mouse provided by the company Virgin Pulse from Tuzla
4. Fourth place - Gift courses from the IT Academy and the Business Academy.

The application that solves the problem of monitoring the efficiency of the workforce brought the first place to the Full stack team, which consisted of students from the University of Tuzla and students of the University of Bijeljina. The second place was won by the Agro Code team composed of students from the University of Banja Luka, while the third place went to the Demeter team. Fourth place went to the Error 404 team.

We owe special gratitude to our sponsors: the Ministry of Agriculture, Forestry and Water Management of Republika Srpska, Prointer ITSS, Agrimatco, Virgin Pulse, the Administration of Bosnia and Herzegovina for Plant Protection, Vitinka, Manja, Nescafe and Red Bull. We also owe special thanks to Business Academy and ITAcademy, which provided a prize fund for students.

For more information visit:
http://viralerasmus.org/20-studenata-12-mentora-5-timova-3-grada-1-pobednik/

Full Stack pobijedio na hakatonu u Banjaluci

Full Stack won the hackathon in Banja Luka

WP.3, outcome 3.3.
Video compendium

Predstavnici tima Full Stack su odnijeli prvo mjesto na hakatonu u Banjaluci. Tim su činili studenti Elektrotehničkog fakulteta iz Tuzle i studenti Poljoprivrednog fakultetaUniverziteta u Bijeljini. Problem koji su oni sa svojim rješenjem riješili je praćenje produktivnosti radnika i to specifično kod berbe različitih kultura. Naziv njihove aplikacije je „Gajba“.
Rješenje se sastoji iz web aplikacije i mobilne android aplikacije. Kroz mobilnu aplikaciju se omogućava svakom radniku prikaz njegovih podataka na dnevnom nivou, dok nadređenima omogućuje praćenje učinka svakog od radnika. Kroz aplikaciju je omogućena komunikacija sa radnicima, te direktno dodjeljivanje zadataka i detaljna uputstva za berbu u zavisnosti od kulture koja se bere. Dodatni benefit koji nosi ova aplikacija jeste funkcija nagrađivanja koja omogućuje da se kroz aplikaciju nagradi najbolji radnik na dnevnom, sedmičnom ili mjesečnom nivou.

Za više informacija posetite:
https://www.youtube.com/watch?v=XC-DR5mahHcA&t=8s

Pripremili/Prepared by:
Marko Rosić, ICBL

Representatives of the Full Stack team took first place at the hackathon in Banja Luka. The team consisted of students from the Faculty of Electrical Engineering in Tuzla and students from the Faculty of Agriculture at the University of Bijeljina. The problem they solved with their solution is the monitoring of workers' productivity, specifically in the harvesting of different crops. The name of their application is "Crate".
The solution consists of a web application and a mobile android application. Through the mobile application, each employee is enabled to view his data on a daily basis, while superiors are enabled to monitor the performance of each employee. The application enables communication with workers, as well as direct assignment of tasks and detailed instructions for harvesting, depending on the crop being harvested. An additional benefit of this application is the reward function that allows the best employee to be rewarded on a daily, weekly or monthly basis through the application.

For more information visit:
https://www.youtube.com/watch?v=XC-DR5mahHcA&t=8s

Organizacija EXPO SmAgTech – glavna tema sastanka v Martiboru

EXPO SmAgTech – the main topic of the meeting in Maribor

WP.2, outcome 2.4. ToT course toolkits
WP.4, outcome 4.2. outcome 4.3.
Set of EXPO founding documents, guidelines and materials
Constituted EXPO managing structures and plan of work

Na Univerzi v Mariboru, Fakulteti za kmetijstvo in biosistemske vede (FKBV) smo 7. in 8. septembra organizirali projektni sestanek in delavnico, posvečeno aktualnim aktivnostim projekta VIRAL. Poleg gostiteljev je na dogodku sodelovalo 32 predstavnikov partnerskih institucij iz Bosne in Hercegovine, Črne gore, Srbije in Slovenije.

Po pozdravnem nagovoru dekana prof. Dr. Branka Krambergerja je zbrane nagovorila dr. Silva Grobelnik Mlakar in predstavila institucijo gostiteljico. Opisala je mejnike v razvoju institucije, njen pomen v kmetijskem izobraževanju v Sloveniji, študijske programe, ki jih fakulteta ponuja, in možnosti, ki jih imajo tuji študenti v okviru projektov mobilnosti (Erasmus+ in Ceepus). Poudarila je pomen

At the University of Maribor, Faculty of Agriculture and Life Sciences, a project meeting and workshop were held in September 7th and 8th, dedicated to current activities on the VIRAL project. In addition to representatives of University of Maribor, the meeting was attended by 32 representatives of project partners from Bosna and Hercegovina, Montenegro and Serbia.

After the welcoming speech of the dean prof. dr. Branko Kramberger, dr. Silva Grobelnik Mlakar presented the host institution. She described the milestones in the development of the institution, its importance in agricultural education in Slovenia, the study programs offered by the faculty, and the opportunities that students have within mo-

fakultetnega posestva –Univerzitetnega kmetijskega centra Pohorski dvor in Meranovo (UKC) kot poligona za raziskovalno in praktično delo študentov in znanstvenikov.

Delovni del se je začel s predavanji dr. Jurija Rakuna in asist. Erika Rihterja (Uporaba IKT v kmetijski proizvodnji v Sloveniji) in dr. Denisa Stajnka (Ohranitveno kmetijstvo in uporaba sodobne tehnike setve). Prva dva predavatelja sta predstavila stanje v slovenskem kmetijstvu preko nacionalnih in mednarodnih projektov, ki jih FKBV vodi in pri katerih sodeluje:
- Analiza stanja na področju preciznega kmetijstva na slovnenskih kmetijah (rezultatih obsežne raziskave, izvedene v okviru projekta Transfarm 4.0 – Interreg, Srednja Evropa)
- Razvoj po meri izdelanega brezžičnega senzorskega omrežja, shranjevanja in analize podatkov podprtih v oblaku (pilotni projekt EIP Pametno kmetijstvo – senzorski sistemi za monitoring in napovedi v kmetijstvu z uporabo umetne inteligence),
- Razvoj po meri izdelanega drona, opremljenega z nizkocenovno multispektralno kamero, ki omogoča natančno tretiranje rastlin
- Raziskave in projekte v katere so vključeni študenti: nacionalni projekti (Po kreativni poti do praktičnega znanja in Študentski inovativni projekti za družbeno korist) in mednarodni projekt (Field Robot Event).

Nekaj razvite opreme (dron, robot, senzorji) smo razstavili v predavalnici, kjer je potekalo srečanje.

Profesor Stajnko nas je spomnil, da se zaradi podnebnih sprememb kmetijstvo sooča z velikimi izzivi in je ohranitveno kmetijstvo (OK) bistveno za zagotavljanje dolgoročne rodovitnosti tal. Ker je najpomembnejši izziv v OK natančno odlaganje semen v rastlinske ostanke, je uporaba nekaterih tehnologij nujna (GPS ali RTK sistemi).

V nadaljevanju je koordinator projekta dr. Miljan Cvetković povzel aktivnosti, ki jih predvideva dnevni red seje za prihodnja dva dni. V prvem delu je bilo obravnavano stanje

bility projects (Erasmus + and Ceepus). She emphasized the importance of the faculty estate - the University Agricultural Center Pohorski dvor and Meranovo (UKC) as a polygon for research and practical work of students and scientists.

The working part began with lectures of dr. Jurij Rakun and assist. Erik Rihter (Use of ICT in agricultural production in Slovenia) and of dr. Denis Stajnko (Conservation agriculture and application of modern sowing techniques). The first two lecturers presented the situation in Slovenian agriculture via national and international projects that faculty and participate in:
- Analysis of the situation in the field of precision agriculture on Slovenian farms (results of an extensive survey conducted within the project Transfarm 4.0 - Interreg, Central Europe),
- Development of custom build wireless sensor network and cloud supported data storage and analysis (pilot EIP project Smart farming – AI-supported sensor network for monitoring and predictions in agriculture using artificial intelligence).
- Development of a custom-made drone equipped with a low-cost multispectral camera that allows precise plant treatment.
- Research and projects involving students: national projects (Creative Path to Practical Knowledge, Student Innovative Projects for Social Benefit) and the international Project (Field Robot Event).

Some developed equipment (drone, robot, sensors) has been put on display in the lecture room where the meeting was held.

Professor Stajnko reminded us that agriculture faces significant challenges due to climate changes; that is why conservation agriculture (CA) is essential for ensuring long-term soil fertility. Because the most crucial challenge in CA is the precise deposition of seeds in plant residues, digital accessories (GPS or RTK systems) are a must.

izvajanja projektnih aktivnosti. Koordinator projekta je opozoril na zamudo pri nabavi opreme in možnost podaljšanja projekta do enega leta. Nadaljevali smo s pregledom dela in izvajanja DP2; določene so bile nadaljnje naloge in časovni roki glede končne oblike in orodij za usposabljanja ToT (uvod, informacije o temah, dodatna predstavitev, vprašanja in popravek vsebine).

Po krajšem premoru je koordinator projekta predstavil okvirni program virtualnega SmAgTech EXPO, ki bo potekal 16.–17. novembra. Udeleženci so razpravljali o strukturi in organizaciji dogodka; predlagali so govornike v plenarnem delu ter teme in izvajalce vabljenih predavanj v okviru posameznih sekcij. Imenovane so bile osebe, odgovorne za izvajanje posameznih dejavnosti in določeni časovni roki. Udeleženci so razpravljali tudi o sekciji v kateri bodo imeli študentje priložnost predstaviti svoje zgodbe o uspehu; zmagovalci hackatonov, organiziranih v okviru projektov VIRAL; pridobljene izkušnje pri delu z IKT in priložnosti, ki jih te ponujajo.
Razprava se je nadaljevala z vprašanji; katera podjetja povabiti kot udeležence sejemskega dela dogodka (1), kakšna je ponudbo za podjetja, ki bodo sodelovala (2) in katere informacije od teh podjetij želimo (3). Udeleženci so se strinjali, da
povabimo:

In the continuation, project coordinator dr. Miljan Cvetković summed up the activities envisaged in meeting agenda for the next two days. The first part discussed the status of the implementation of the project activities. The project coordinator pointed out the delay in equipment procurement and the possibility for project prolongation up to one year. Work continued on the WP2 implementation status; further tasks and deadlines were set regarding the final form of crash course and ToT course toolkits (introduction, information about the topics, additional presentation, questions, and content revision).

After a short break project coordinator presented the tentative schedule of the virtual SmAgTech EXPO to be held on 16.–17. November. Attendees discussed the structure and organisation of the event; they proposed speakers in the plenary part, and topics and presenter of invited lectures under each session. The persons responsible for carrying out particular activities were appointed and deadlines were set. Participants also discussed the event' section where the students can present their stories of success: winners of hackathons organised in the frame of VIRAL projects, experiences gained when working with ICT, and its opportunities.

• podjetja, ki se ukvarjajo z implementacijo IKT v kmetijstvu (GIS, droni, mobilne aplikacije ...);
• Podjetja s področja kmetijske in živilske tehnologije, ki pri svojem delu uporabljajo IKT in bi jih lahko zanimala zaposlitev diplomantov, pripravništvo, štipendiranje ali usposabljanja študentov;
• Ugledne institucije (fundacije, inštituti, programi ...), ki lahko angažirajo študente.
ponudimo:
• Brezplačno oglaševanje svojih dejavnosti na stojnicah (aktivno dva dni in pasivno več kot mesec dni);
• Možnost vzpostavitve stika s potencialnimi strankami ali poslovnimi partnerji iz sosednjih držav in širše;
• Sposobnost komuniciranja s študenti kot potencialnimi zaposlenimi.
zahtevamo:
• Ažurno dostavo materialov v zahtevani obliki;
• Aktivno sodelovanje v obeh dneh na dogodku (min. 1,5 ure) za komunikacijo z zainteresiranimi študenti in drugimi podjetji; • Aktivno promocijo dogodka.

Po odmoru je potekala seja upravnega odbora. Vzporedno so se imeli ostali udeleženci priložnost seznaniti s kadrovskimi in infrastrukturnimi zmogljivostmi institucije gostiteljice. Udeleženci so si nato ogledali botanični vrt, ki ga upravlja fakulteta. V okviru vodenega ogleda smo gostitelji prikazali primer digitalizacije nekaterih delov vrta (sistemska njiva, zeliščni vrt, zelenjavni in sadni vrt, pinetum in skalnjak). Vsebine so ustvarili študenti različnih fakultet Univerze v Mariboru v okviru dveh projektov. Vsebine so obiskovalcem na voljo v slovenskem, angleškem in nemškem jeziku preko QR-kod, nameščenih v digitaliziranih delih vrta.

The discussion continued with the questions which companies to invite as participants in the fair part of the event (1), what is the offer for participating companies (2) and what we ask from those companies (3). Attendees agreed to invite:
• Companies dealing with the implementation of ICT in agriculture (GIS, drones, mobile applications ...);
• Companies in the field of agricultural and food technology, which apply some of the ICT in their work and which may be interested in employment of graduates, students internship, scholarships, or training;
• Reputable institutions (foundations, institutes, programs ...) that can engage students.
to offer:
• Free advertising of their activities on the stand (active for two days and passive for more than a month);
• The possibility of establishing contact with potential clients or business partners from neighbouring countries and beyond;
• Ability to communicate with students as potential employees.
to request:
• Accurate delivery of the materials in the requested format;
• Active participation during both days of the event (min. 1.5 hours) to communicate with interested students and other businesses;
• Active promotion of the event.

After the break Steering Committee meeting was held. In parallel, the other participants had the opportunity to get acquainted with the human and infrastructure capacities of the host institution.
The participants then visited the botanical garden managed by the faculty. As part of a guided tour, the hosts showed an example of digitization of some sections of the botanical garden (systematic field, herb garden, vegetable and fruit garden, pinetum and rock garden). The contents were created by students from different faculties under two projects. Contents are accessible to visitors in Slovene, English and German languages via QR-codes installed in digitized parts of the garden.

The second working day was held at Meranovo – the cradle of contemporary wine-mak-

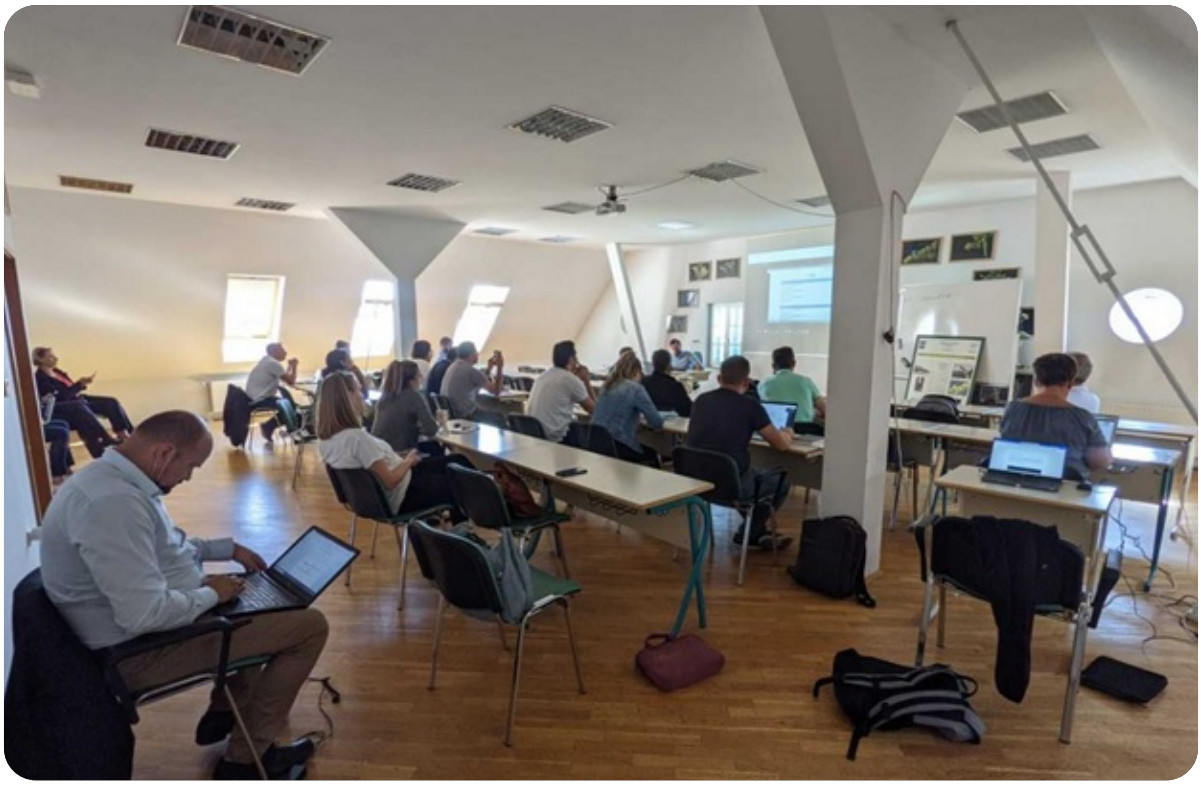
Drugi delovni dan je potekal na Meranovem – zibelki sodobnega vinarstva na Štajerskem. Leta 1822 je nadvojvoda Janez Avstrijski zasadil prve plemenite sorte vinske trte v tej vinorodni regiji po tehniki, ki so jo uporabljali v Porenju. Fakulteta nadaljuje tradicijo, saj je Meranovo danes del UKC - tehnološkega centra za vinogradništvo in vinarstvo. Sestanek se je nadaljeval s predstavitvijo virtualne platforme EXPO, ki jo je izvedel Admir Veljović (WEBIN). Udeleženci so imeli priložnost videti virtualne konferenčne dvorane in sekcije, točke, kjer se lahko udeleženci prijavijo ter stojnice kjer se lahko študenti in razstavljavci (podjetja) predstavijo. Razpravljali smo o razpoložljivih funkcijah in orodjih za interaktivnost ter o tem, kako jih lahko izkoristimo. Marko Stojanović (WEBIN) je prikazal vsebino osnutkov dokumentov – statuta konzorcija pravnih oseb in dogovora projektnih partnerjev, o nadaljevanju nekaterih aktivnosti tudi po zaključku projekta (organiziranje sejemskega dogodka).

Projektni sestanek smo zaključili s povzetkom dogovorjenih aktivnosti, obveznosti in časovnih rokov izvedbe, ki bodo pripomogli k uspešni izvedbi EXPO SmAgTech.

ing in the Štajerska region. In 1822 the Archduke John of Austria planted the noble varieties of vine in this wine-growing region, following the technique used in the Rhineland. The faculty continues the tradition since Meranovo is now a part of UKC - technological centre for viticulture and oenology. The meeting continued with the presentation of the virtual platform of EXPO done by Admir Veljović (WEBIN). Attendees had the opportunity to see virtual conference halls and sections, points where attendees can register, and students and exhibitors (companies) present themselves. We discussed available features and interactivity tools and how we can exploit them. Marko Stojanović (WEBIN) showed the content of the draft documents – the statute of a legal entity and agreement that we will set up regarding the sustainability of the project and in which the partner institutions will participate.

The project meeting ended with a summary of the agreed activities, obligations and deadlines that will contribute to the successful realization of the EXPO SmAgTech.

The second day of the meeting was dedicated to the implementation of work package 2, ie activities WP2.7 and WP2.4.



Drugi dan sastanka bio je posvećen realizaciji radnog paketa 2, odnosno aktivnosti RP2.7 i RP2.4.

Informacija o sestanku najdete tudi na: http://viralerasmus.org/na-sas-tanku-u-mariboru-dogovoreni-nared-ni-koraci-u-organizaciji-expo-dogadjaja/

Pripravila/Prepared by:
Silva Grobelnik Mlakar, UM

Information about the meeting can also be found at: http://viralerasmus.org/na-sas-tanku-u-mariboru-dogovoreni-nared-ni-koraci-u-organizaciji-expo-dogadjaja/

Studenti iz Mostara zadovoljni hackathonom

Students from Mostar satisfied with the hackathon

WP.3, outcome 3.2.
Implementation of student pitching competitions - hackatons

INTERA Tehnološki Park, Agromediteranski fakultet Univerziteta Džemal Bijedić i Agronomsko i prehrambeno-tehnološki fakultet Sveučilišta u Mostaru organizirali su hackathon u periodu od 21.5. do 23.5.2021. godine.

GreenIT, InfiniteLoop, Bambus, Infogrom i LM timovi su čiji su članovi tijekom 48 sati spojili svoja znanja i vještine sa savjetima iskusnih mentora iz svijeta programiranja, dizajna, poljoprivrede, marketinga i drugih područja stvarajući inovativna i obećavajuća rješenja za lokalna poduzeća.

INTERA Technology Park, Agro-Mediterranean Faculty (Dzemal Bijedic University of Mostar) and Faculty of Agriculture and Food technology (University of Mostar) organized the hackathon in the period from 21/05 to 23/05/2021.

GreenIT, InfiniteLoop, Bambus, Infogram and LM teams during 48 hours combined their knowledge and skills with the advice of experienced mentors from the fields of programming, design, agriculture, marketing and other fields, in order to create innovative and promising solutions for local businesses.

Svoja znanja sa sudionicima su kroz mentorske susrete podijelili Robert Rozić, Petar Lukić, Borko Latinčić, Josip Nikolić, Miran Maslo, Emina Junuz, kao i svi članovi projektnog tima. Sudionici su prisustvovali i radionici prezentacijskih vještina koju je održao Goran Dodig, certificirani trener INTERA Tehnološkog Parka, a imali su priliku i čuti iskustva prethodnih pobjednika hackathona koji su se održali u prostorijama INTERA Tehnološkog Parka – Admira Dizdara, Farisa Seferagića i Gorana Šimića.

Robert Rozić, Petar Lukić, Borko Latinčić, Josip Nikolić, Miran Maslo, Emina Junuz, as well as all members of the project team shared their knowledge with the participants through mentoring sessions. Participants also attended a presentation skills workshop held by Goran Dodig, certified coach of INTERA Technology Park, and had the opportunity to hear the experiences of previous hackathon winners held at INTERA Technology Park - Admir Dizdar, Faris Seferagić and Goran Šimić.

Predavanja, radionice, rad s mentorima i zabava obilježili su vikend za sudionike VIRAL hackathona koji su svoja rješenja prezentirali pred stručnom komisijom.

Predavanja, radionice, rad s mentorima i zabava obilježili su vikend za sudionike VIRAL hackathona koji su svoja rješenja prezentirali pred stručnom komisijom.
Organizatori su, u suradnji s brojnim partnerima, osigurali nagradni fond u vrijednosti od 4000 KM kojim su nagrađeni timovi i pojedinci u kategorijama za najbolju prezentaciju, najbolji dizajn aplikacije te prvo i drugo mjesto.

„Moje iskustvo na hackathonu bilo je veoma pozitivno i zanimljivo, prije svega poučno jer smo naučili raditi kao tim, upoznala sam nove ljude te bih rado preporučila i drugim studentima da se prijave.“, rekla je Ivana Raos, članica tima GreenIT.

Organizatori su istaknuli i posebnu zahvalnost poduzećima Jaffa-komerc, Hepok, Mesna industrija Šišović, Sjemenarna, Business Academy i ITAcademy, koja su osigurala nagradni fond za studente, te poduzećima Leda, Coffeehouse, Red Bull, Suncokret, Restoran MM i AirRec koja su svojim proizvodima i uslugama podržali organizaciju hackathona.

Za više informacija posjetite: https://youtu.be/kdZvYBqNLek

Pripremila/Prepared by:
Ana Bogdanović, INTERA TP

Lectures, workshops, work with mentors and fun marked the weekend for participants who presented their solutions to the jury.
The organizers, in cooperation with numerous partners, provided a prize fund worth 4000 KM, which awarded teams and individuals in the categories for best presentation, best application design and first and second place.

“My experience at the hackathon was very positive and interesting, especially instructive because we learned to work as a team, I met new people and I would be happy to recommend other students to apply,” said Ivana Raos, a member of the GreenIT team.

The organizers also expressed special gratitude to the companies Jaffa-komerc, Hepok, Mesna industrija Šišović, Sjemenarna, Business Academy and ITAcademy, which provided a prize fund for students, and the companies Leda, Coffeehouse, Red Bull, Suncokret, Restaurant MM and AirRec, which products and services supported the organization of the hackathon.

For more information visit:
https://youtu.be/kdZvYBqNLek

Prezentacija softverskih rješenja razvijenih na hackathonu u Mostaru

Presentation of software solutions developed on the hackathon in Mostar

WP.3, outcome 3.3.
Video compendium

Prvu nagradu na hackathonu u Mostaru osvojio je tim GreenIT (Iva Maglica, Danijel Tolj, Ivana Raos, Ivona Vlaho) koji je za svoj trud nagrađen novčanom nagradom u iznosu od 2000 KM i edukativnim tečajevima poduzeća ITAcademy i Business Academy. Njihova aplikacija rješava problem mjerenja i kontrole temperature u rashladnim komorama.

Njihova aplikacija je fleksibilno softversko rješenje koje je namijenjeno za industrijske svrhe za praćenje i kontroliranje senzora i parametara u stvarnom vremenu. Aplikacija omogućava praćenje i slanje notifikacija korisniku u slučaju greške u komori, a način primanja notifikacija određuje klijent.

Više detalja pogledajte na:
https://youtu.be/gi7dNmQNbVM

The first prize at the hackathon in Mostar was won by the GreenIT team (Iva Maglica, Danijel Tolj, Ivana Raos, Ivona Vlaho), which was awarded a cash prize of 2,000 KM and educational courses from ITAcademy and Business Academy. Their application solves the problem of measuring and controlling the temperature in cooling chambers.

Their application is a flexible software solution designed for industrial purposes to monitor and control sensors and parameters in real time. The application allows tracking and sending notifications to the user in case of an error in the chamber, and the method of receiving notifications is determined by the client.

For more details visit:
https://youtu.be/gi7dNmQNbVM

Tim Bambus (Tarik Dalipagić, Sanel Novalić, Denis Tojaga, Emina Handžić) je prezentirao aplikaciju fokusiranu na praćenje učinkovitosti radne snage i time osvojio novčanu nagradu u iznosu od 1000 KM i poklon bonove poduzeća Sjemenarna.

Njihova mobilna aplikacija se zasniva na NFC tehnologijama i nudi detaljan pregled procesa na terenu te omogućava nagrađivanje radnika.

Više detalja pogledajte na:
https://youtu.be/nPDJRq0qKBs

Pripremila/Prepared by:
Ana Bogdanović, INTERA TP

The Bambus team (Tarik Dalipagić, Sanel Novalić, Denis Tojaga, Emina Handžić) presented an application focused on tracking the efficiency of the workforce and won the cash prize in the amount of 1000 KM and a gift card of the Sjemenarna company.

Their mobile application is based on NFC technologies and offers a detailed overview of the field process and allows the rewarding of workers.

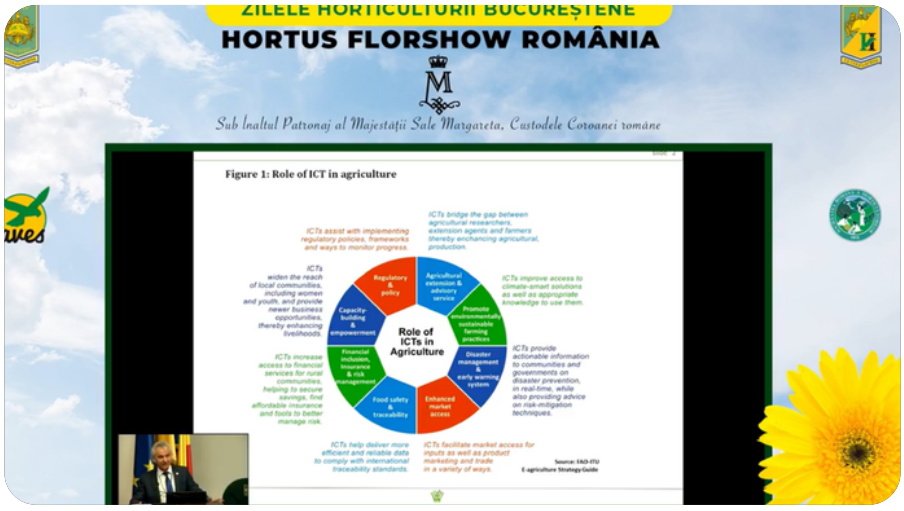
For more details visit:
https://youtu.be/nPDJRq0qKBs

Aplicații digitale în sprijinul fermierilor horticultori

Digital applications in support of horticultural farmers

WP.5, outcome 5.3. outcome 5.5.
Improved knowledge of agronomists, agriculture cooperatives and agriculture businesses about ICT in agriculture

În data de 14 mai, între orele 09.00 – 11.00, USAMV București a organizat workshop-ul „Aplicații digitale în sprijinul fermierilor horticoli" - parte a proiectului VIRAL, în cadrul evenimentului Zilele Horticulturii Bucureștene - Hortus Florshow România. Specialiștii din firme de profil au prezentat aplicații privind monitorizarea inteligentă a culturilor, drone și vehicule autonome pentru e-agricultură. A fost detaliat un sistem tomografic inovator pentru monitorizarea în timp real a culturilor. Unul dintre studenții noștri a prezentat utilizarea inteligenței artificiale în fenotiparea plantelor.
Evenimentul s-a derulat într-un sistem hibrid și în direct pe site-urile de socializare ale Facultății de Horticultură și USAMV București.
Evenimentul a fost moderat de domnul profesor dr. Florin Stănică, care a început



și programul atelierului cu o prezentare a proiectului "Vitalizarea relevanței TIC în învățământul agricol - VIRAL".

On May, 14th, between 09.00 – 11.00, USAMV Bucharest organized the workshop "Digital applications in support of horticultural farmers"- part of VIRAL project, within Bucharest Horticulture Days - Hortus Florshow Romania event. Specialists from business companies presented applications for intelligent crop monitoring, drones and autonomous vehicles for e-agriculture. An innovative tomographic system for crop monitoring was detailed. One of our students presented artificial intelligence use in plant phenotyping.
The event was in a hybrid system and live on the Faculty of Horticulture and USAMV Bucharest social media websites.

The event was moderated by Prof. dr. Florin Stănică, who also started the workshop program with a presentation of the project "Vitalising ICT Relevance in Agriculture Learning – VIRAL".

Răzvan Ungurelu, Manager general de proiect la Syswin Solutions a prezentat sistemul SysAgria – „o soluție inteligentă pentru monitorizarea și eficientizarea culturilor horticole”.

Sorin Petrache, Manager la Bayer Horticultural Manager, a detaliat „Aplicația Bayer Mobile – Inovația tuturor”.

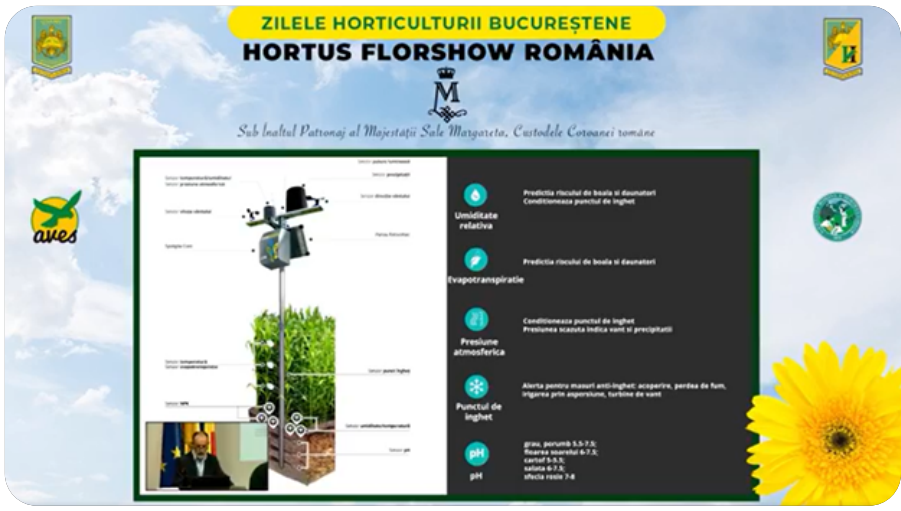
Cătălin Constantin Popa, administrator, și Marcel Ionescu, specialist în agricultură de precizie la Drontek Service au vorbit despre „Agricultura de precizie. Drone și vehicule autonome”.

Adrian Moldovan, reprezentantul companiei Terrasigna a prezentat un inovator „Sistem tomografic de monitorizare a culturilor agricole”, parte dintr-un proiect internațional.

Mihai Frangulea, masterand la Universitatea Wageningen, a detaliat „Realizarea fenotipării plantelor folosind o aplicație web bazată pe inteligență artificială”, proiect la care au participat mai mulți studenți de la Universitatea de Științe Agronomice și Medicină Veterinară din București.

Pentru mai multe informații vizitați:
https://www.facebook.com/Facultatea.de.Horticultura.Bucuresti/videos/134127782089898

Elaborat de către/Prepared by:
Ana Butcaru, USAMV



Răzvan Ungurelu, General Project Manager at Syswin Solutions presented the SysAgria system - “an intelligent solution for monitoring and streamlining horticultural crops”.

Sorin Petrache, Bayer Horticultural Manager, detailed the “Bayer Mobile Application - Everyone’s Innovation”.

Cătălin Constantin Popa, Administrator, and Marcel Ionescu, precision agriculture specialist at Drontek Service spoke about “Precision agriculture. Drones and autonomous vehicles”.

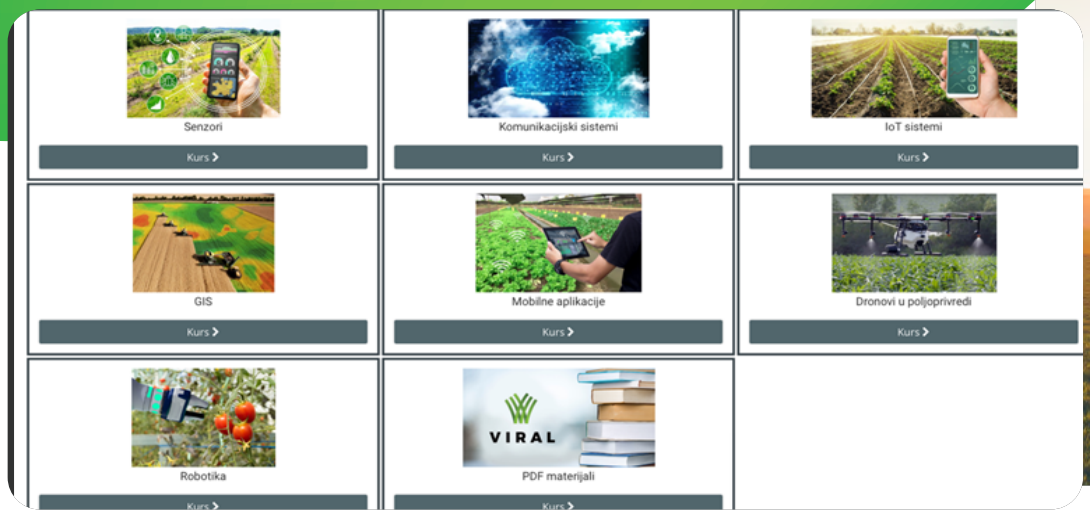
Adrian Moldovan, the representative of Terrasigna company presented an innovative “Tomographic system for monitoring agricultural crops”, part of an international project.

Mihai Frangulea, masterand at the Wageningen University, detailed “Achieving plant phenotyping using a web application based on artificial intelligence”, project where more students from the University of Agronomic Sciences and Veterinary Medicine of Bucharest.

For more information visit:
https://www.facebook.com/Facultatea.de.Horticultura.Bucuresti/videos/134127782089898

Kurs za studente
Crash Course

WP.2, outcome 2.7.
Crash course on ICT in agriculture



U cilju približavanja informaciono-komunikacionih tehnologija našim studentima i mogućnost njihove primjene u poljoprivredi, univerziteti koji učestvuju na projektu VIRAL u okviru radnog paketa 2 i zadatka 2.7 pripremili su kurs za studente. Ovaj kurs ima za cilj da studente i ostale zainteresirane upozna sa osnovama primjene informaciono-komunikacionih tehnologija u poljoprivredi.
Kurs su pripremile kolege sa tehničkih fakulteta Univerziteta u Banjoj Luci, Univerziteta u Tuzli, Univerziteta u Donjoj Gorici i Univerziteta u Mariboru uz podršku svojih kolega sa poljoprivrednih fakulteta istih univerziteta. Značajnu podršku u izradi kursa dale su i kolege sa Univerziteta u Wageningen-u.

Kurs je podijeljen na šest cjelina. U uvodnom dijelu predstavljeni su senzori i komunikacioni sistemi kao cjeline koje čine sastavni dio svih ostalih cjelina koji su predstavljeni u ovom kursu. IoT sistemi su predstavljeni kroz četiri predavanja i uključuju obradu informacija od senzora do konačnih aplikacija koje se nalaze na korisničkim uređajima. Primjena GIS sistema predstavljena je u trećem dijelu i sadrži opis sistema počev od tipova podataka

To bring information and communication technologies closer to our students and the possibility of their application in agriculture, the universities participating in the VIRAL project within work package two and task 2.7 have prepared a course for students. This course aims to introduce students and other stakeholders to the basics of applying information and communication technologies in agriculture.
Colleagues prepared the course from the technical faculties of the University of Banja Luka, the University of Tuzla, the University of Donja Gorica and the University of Maribor with the support of their colleagues from the agricultural faculties of the same universities. Colleagues from the University of Wageningen also gave significant support in the development of the course.

The course is divided into six parts. In the first introductory part, sensors and communication systems are presented as units that form an integral part of all other units presented in this course. IoT systems are demonstrated through four lectures and include information from sensors to final ap-

do praktičnih rješenja primjene ovih sistema. Mobilne aplikacije su postale naša svakodnevnica u različitim segmentima naših svakodnevnih aktivnosti. Primjena mobilnih aplikacija u poljoprivredi je predstavljena u četvrtom dijelu kursa. Realizacija različitih aktivnosti nad poljoprivrednim usjevima te snimanje stanja poljoprivrednih usjeva uveliko je olakšana primjenom posebno dizajniranih dronova za primjenu u poljoprivredi. Opis, princip rada i primjena dronova u poljoprivredi je predstavljena u petom dijelu ovog kursa. Posljednji šesti segment obrađuje primjenu robota u poljoprivredi.

Svaka cjelina uključuje četiri predavanja i studentima su na raspolaganju video predavanja i prezentacije koje prate ova predavanja. Poslije svakog predavanja kreiran je test za provjeru znanja iz odgovarajuće oblasti. Na kraju je pripremljen i završni test čijim polaganjem studenti dobijaju certifikat o odslušanom i položenom kursu.
Ovaj kurs je zamišljen da bude oblik dodatnog obrazovanja i može biti značajan u daljem radu i zapošljavanju naših studenata ali ostalih koji rade u poljoprivrednom sektoru i zainteresirani su za primjenu informaciono-komunikacionih tehnologija.

Kurs daje osnove primjene informaciono komunikacionih tehnologija u poljoprivredi i nadamo se da će biti dobra osnova za dalji rad studenata u ovoj oblasti koji žele nastaviti raditi na ovim sistemima i produbiti svoja znanja u oblasti najnovijih trendova primjene ovih tehnologija u poljoprivredi.

Pripremili/Prepared by:
Aljo Mujčić, UNTZ
Alma Šećerbegović, UNTZ

plications located on user terminals. The application of GIS systems is presented in the third part. It contains a description of the system, starting from data types to practical solutions for applying these systems. Mobile applications have become our daily routine in various segments of our daily activities. The application of mobile applications in agriculture is presented in the fourth part of the course. The implementation of multiple actions on crops and recording the condition of crops has been greatly facilitated by using specially designed drones in agriculture. The fifth part of this course presents the description, principle of operation, and application of drones in agriculture. The last sixth segment deals with the application of robots in agriculture.

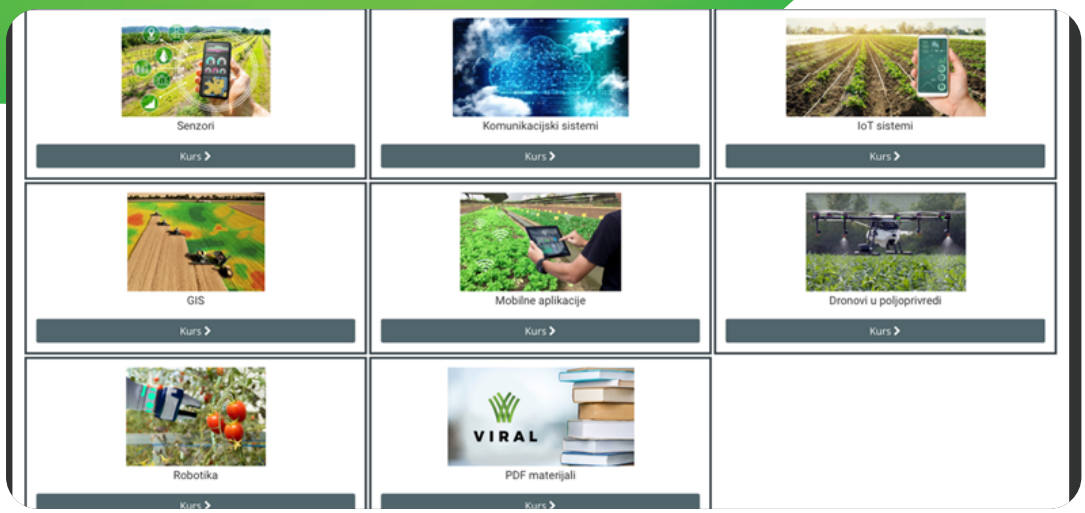
Each unit includes four lectures, and students have access to video lectures and presentations that accompany these lectures. After each lesson, students will test their knowledge in this area. In the end, the final test was prepared, by taking which students receive a certificate of completed and passed the course.

This course is designed to be part of additional education. However, it can be important in the further work and employment of our students and others who work in the agricultural sector and are interested in applying information and communication technologies.

The course provides the basics of applying information and communication technologies in agriculture. We hope that it will be a sound basis for further work of students in this field who want to continue working on these systems and deepen their knowledge of the latest agricultural technologies trends.

Timovi za obuku trenera
Training of trainers Teems

WP.2, outcome 2.3.
Created University ToT teams



U okviru aktivnosti koje se provode u sklopu radnog paketa 2 i zadatka 2.4 izvršeno je formiranje timova za obuku farmera i savjetodavaca poljoprivredne struke. Također je planirana obuka drugih nastavnika koji treba da vrše dalje obuke osoba iz poljoprivredne struke.
Svrha kreiranja timova je da se dobije univerzitetski resurs za daljnje usavršavanje drugih nastavnika ali i stručnjaka u društvu u području korištenja ICT-a u poljoprivredi.
Ovi timovi će u okviru ovog radnog paketa nastaviti s razvojem ubrzanog kursa za studente kroz zadatak 2.7. U okviru petog radnog paketa će se provoditi izvannastavne obuke za studente, te dodatnih 5 obuka za različite vanjske ciljne skupine stručnjaka (agronome, savjetodavne službe , zadruge, poduzeća itd.).
Svaki tim će se specijalizirati jednu temu koju pokriva ovaj WP.

As part of the activities implemented within work package two and task 2.4, teams for the training of farmers and agricultural advisors are created. Furthermore, within this task, the education of other teachers is also planned, who should perform further educational training of persons from the farming profession.
The purpose of creating teams is to obtain a university resource for further training other teachers and experts in society in the field of ICT use in agriculture.
Within this work package, these teams will continue with the development of a crash course for students (Task 2.7). Finally, within the fifth work package, they will deliver extra-curricular training courses for students and additional five training courses for different external target groups of professionals (agronomists, extension service, cooperatives, businesses, etc.).

Timovi su podijeljeni u sljedećih pet oblasti:
1. Mobilne aplikacije
2. IoT sistemi
3. GIS
4. Dronovi
5. Roboti

Tim za mobilne aplikacije će predvoditi Univerzitet Donja Gorica. Primjenu IoT sistema u poljoprivredi pripremit će nastavnici sa Univerziteta u Tuzli. Primjenu GIS sistema i upotrebu dronova obradit će Univerzitet u Banja Luci. GIS sisteme će predvoditi nastavnici sa Elektrotehnički fakultet. Nastavnici sa Univerziteta u Mariboru obradit će primjenu robota u poljoprivrednoj proizvodnji.

Obuka farmera je planirana kao jednodnevna obuka koja se sastoji iz dva dijela.
Obuka savjetodavaca poljoprivredne struke je planirana kao dvodnevna tako da prvi dan prolaze osnovnu obuku koja je namijenjena farmerima a drugi dan priprema se dodatna obuka koja uključuje praktični dio obuke u svakoj od oblasti. Savjetodavci će steći dovoljno znanja kako bi mogli pomagati zainteresovanim farmerima pri implementaciji ICT sistema u različitim granama poljoprivrede.
Univerziteti takođe stoje na raspolaganju farmerima i savjetodavcima i vrše stalno unapređenje primjene ICT u poljoprivredi.

U cilju što uspješnijeg procesa obuke pripremljene su prezentacije potrebne za provođenje edukacije farmera i savjetodavaca. Osim toga napisan je poseban materijal za obuku farmera i savjetodavaca. Ovaj materijal će biti na raspolaganju svima koji su zainteresirani za oblast primjene ICT tehnologija u poljoprivredi. Materijal je pripremljen od strane profesora sa prethodno navedenih univerziteta.

Za više informacija posetite:
http://viralerasmus.org/preuzimanja/

Pripremili/Prepared by:
Aljo Mujčić, UNTZ
Alma Šećerbegović, UNTZ

Each team will specialize in one topic covered by this WP.
The teams are divided into the following five areas:
1. Mobile applications
2. IoT systems
3. GIS
4. Drones
5. Robots

The University of Donja Gorica will lead the team for mobile applications. Teachers from the University of Tuzla will prepare the application of the IoT system in agriculture. The University of Banja Luka will handle the application of the GIS system and drones. Teachers will lead GIS systems from the Faculty of Electrical Engineering. Finally, teachers from the University of Maribor will prepare the application of robots in agricultural production.

Farmer training is planned as a one-day training consisting of two parts.
The training of agricultural advisors is planned as two days. On the first day, they undergo basic training intended for farmers. On the second day, additional training is prepared, which includes the practical part of the training in each area. Advisors should be able to assist interested farmers in implementing ICT systems in different branches of agriculture.
Universities are also available to farmers and advisors and are constantly improving ICT application in agriculture.

Educational material, including presentations, is prepared for farmers and advisors' training. In addition, training material for farmers and advisors was written. This material will be available to all who are interested in the field of application of ICT technologies in agriculture. Professors from the universities, as mentioned earlier, prepared the material.

For more information visit:
http://viralerasmus.org/en/downloads/

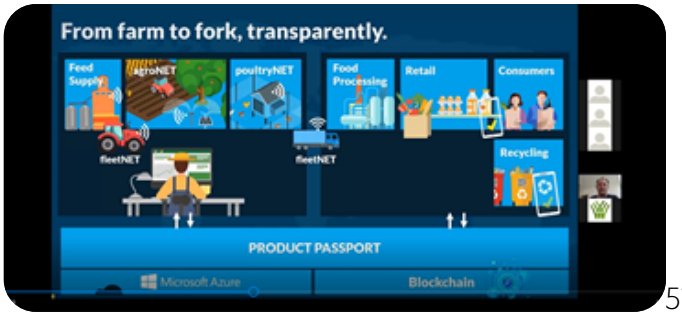
Rolul și importanța TIC în dezvoltarea viitoare a agriculturii/

The role and importance of ICT in Agriculture future development

WP.5, outcome 5.2. outcome 5.3. outcome 5.5.
Improved knowledge of extension service providers, agronomists, agriculture cooperatives and agriculture businesses about ICT in agriculture

Atelierul despre rolul și importanța TIC în dezvoltarea viitoare a agriculturii a făcut parte din conferința internațională Agriculture for Life, Life for Agriculture (https://agricultureforlife.usamv.ro/), și a avut loc online pe 4 iunie 2021.
Ca lectori, au fost selectați reprezentanți ai universităților și companiilor private active în domeniul TIC. Selecția lor a fost făcută pe baza sugestiilor de la Universitatea din Banja Luka, Wageningen University & Research, Universitatea din Maribor și USAMV București. La eveniment, au interacționat peste 60 de participanți, majoritatea din România, cadre didactice, cercetători, studenți dar și fermieri interesați de agricultura digitală.

The workshop on the role and importance of ICT in agriculture future development was part of the international conference Agriculture for Life, Life for Agriculture (https://agricultureforlife.usamv.ro/), and took place online on June 4, 2021.
Representatives of universities and private companies active in the field of ICT were selected as lecturers. Their selection was made based on suggestions from the University of Banja Luka, Wageningen University & Research, the University of Maribor and the USAMV Bucharest. More than 60 participants were attending the event, most of them being from Romania, teaching staff, researchers, students but also farmers interested in digital agriculture.



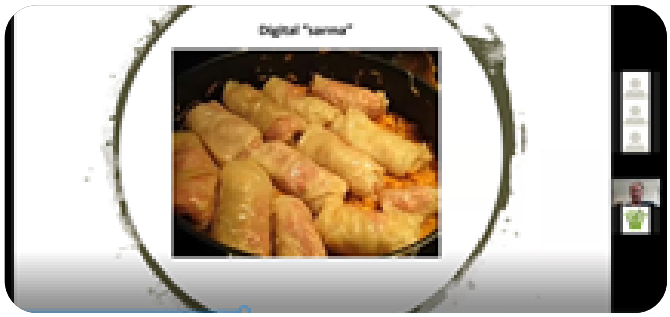
Atelierul a fost moderat de către domnii profesori dr. Florin Stănică, dr. Miljan Cvetković și dr. Adrian Asănică.
La început, a fost făcută o scurtă introducere a proiectului VIRAL de către domnul Prof. dr. Florin Stănică și domnul Prof. dr. Miljan Cvetković. „De la VIRAL la real" a început cu descrierea proiectului, partenerilor, obiectivelor și pachetelor de lucru. A fost prezentată o schemă cuprinzătoare cu rolul TIC în agricultură (FAO), site-ul web al proiectului (http://viralerasmus.org/) cu o bază de date importantă care include toate documentele și prezentările evenimentelor de până acum. A urmat o trecere în revistă interesantă a ceea ce s-a făcut până acum, documentele justificative aflându-se pe site-ul proiectului. Srđan Krčo de la DunavNET, Serbia a continuat cu o prezentare despre cum să combinăm mâncarea gustoasă cu tehnologia digitală. Au fost prezentate mai multe proiecte internaționale privind aplicarea IoT în livezi, vii, creșterea animalelor. Un mesaj important de luat acasă a fost referitor la impactul modelelor și a algoritmilor privind modul de interpretare a datelor agricole.

João Valente de la Wageningen University & Research a vorbit despre roboții flexibili pentru automatizarea inteligentă a operațiunilor agricole de precizie. Au fost detaliate câteva aplicații în proiect în cultura viței de vie (depistarea precoce a Botrytisului, tratamente fitosanitare, roboți de transport pentru struguri), cultura rapiței (controlul dăunătorilor, plivirea plantelor rumex în pajiști, recoltarea pentru silozuri) și afinului (monitorizare, prelevare automată de probe și analize de sol în câmp, depistarea bolilor la afin, programe de protecție fitosanitară țintite și autonome).

Denis Stajnko de la Universitatea din Maribor,

The workshop was moderated by Prof. dr. Florin Stănică, Prof. dr. Miljan Cvetković and Prof. dr. Adrian Asănică.

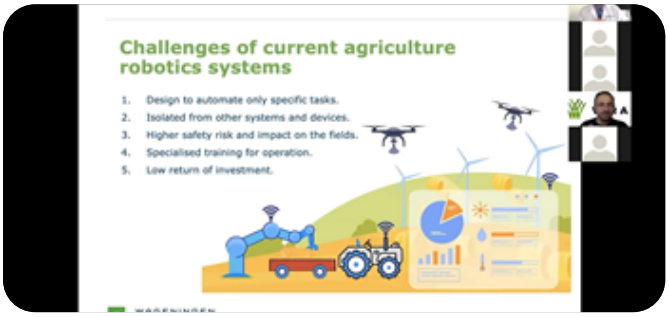
In the beginning, a short introduction of the VIRAL project was done by Prof. dr. Florin Stănică and Prof. dr. Miljan Cvetković. "From VIRAL to real" began with the project description of partners, objectives and work packages. A comprehensive scheme with the role of ICT in agriculture (FAO), the project website (http://viralerasmus.org/) with already an important database including all the documents and events presentations until now, were presented. They were followed by an interesting review of what was done until now, supporting documents being on the project website.
Srđan Krčo from DunavNET, Serbia continued with an interesting presentation on how to combine tasty food with digital technology. Several international projects were presented on how to apply IoT in orchards, vineyards, animal husbandry. An important take-home message was the importance of models and algorithms on how to interpret the agricultural data.



João Valente from Wageningen University & Research spoke about the flexible robots for intelligent automation of precision agriculture operations. The projects have several pilots on grapevines (early detection of Botrytis, phytosanitary treatment, grape transport robots), rapeseeds (pest control, rumex plant weeding in grasslands, silage harvesting) and blueberries (monitoring, automated field soil sampling and analysis, early-stage blueberry disease detection, targeted and autonomous agrochemical spraying).

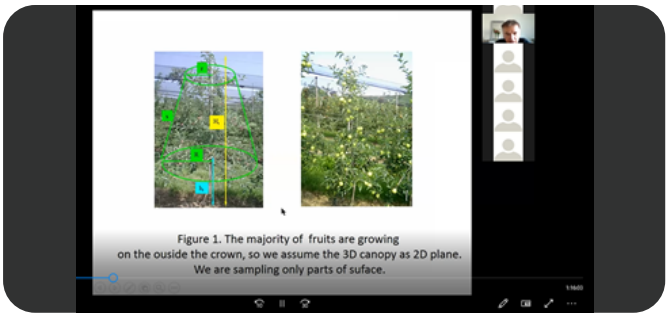
Denis Stajnko from the University

Slovenia, a subliniat necesitatea puternică ca



tehnologia digitală să permită colectarea și procesarea datelor mai rapide și mai obiective. În livezi, măsurătorile manuale necesită mult timp. Profesorul Stajnko a prezentat un algoritm utilizat pentru statisticile anuale WAPA în Slovenia încă din 2004, ceea ce a evaluat și în Austria, Germania, Elveția, Italia și Croația. Acest algoritm permite, de la analiza imaginilor, modelarea dezvoltării fructelor de măr și păr și estimarea recoltei, estimarea randamentului în condiții de livadă cu o acuratețe de 90-95%.

Următorii vorbitori vin de la Universitatea din Maribor și Universitatea „Džemal Bi-



jedić" Mostar cu o prezentare amplă a rezultatelor WP1 (Forme și canale de transfer de cunoștințe în sectorul agricol – lacune și provocări). Silva Grobelnik Mlakar a prezentat o evaluare foarte interesantă a chestionarelor (raportul complet este încărcat pe site-ul web al proiectului).

Cristian Moise de la USAMV București a prezentat mai multe proiecte axate pe observarea satelitară a pământului și proiecte legate

of Maribor, Slovenia highlighted the strong necessity for digital technology to enables faster and more objective collection and processing of data. In orchards, manual measurements are time intensive. Professor Stajnko presented an algorithm used for WAPA annual statistics in Slovenia since 2004, that what also evaluated in Austria, Germany, Swiss, Italy and Croatia. This algorithm enables, from image analysis, modeling of apple and pear fruit development and estimation of the harvested, yield under orchard conditions with 90-95% accuracy.

The next speakers come from the University of Maribor and the University "Džemal Bijedić" Mostar with an exten-

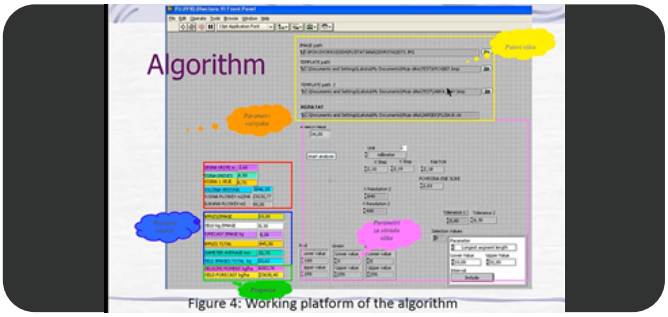
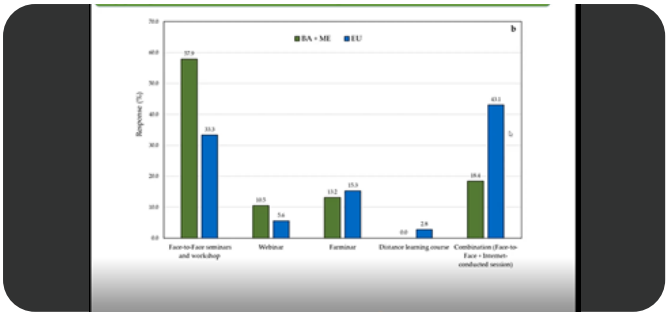


Figure 4: Working platform of the algorithm

sive presentation on the results of the WP1 (Forms and channels of knowledge transfer in agricultural sector – gaps and challenges). Silva Grobelnik Mlakar presented a very interesting questionnaires assessment (the full report is uploaded on the project website).

Cristian Moise from USAMV Bucharest pre-

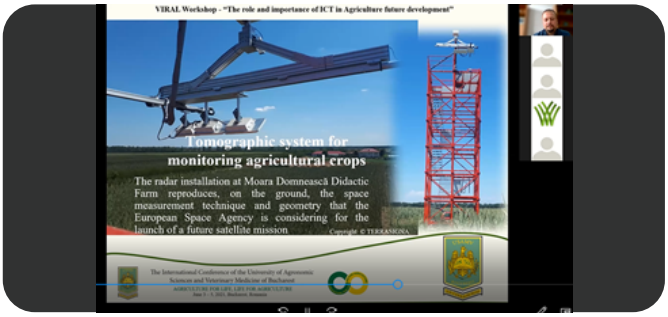


de geoinformații pentru aplicații de mediu și agricultură. Au fost discutate tehnologii satelitare, geomatică dar și strategia națională de participare în noul context european de coordonare a cercetării în domeniile securității și industriei spațiale.

Atelierul a arătat mai multe exemple de utilizare a TIC în agricultură și a evidențiat necesitatea acesteia în zilele noastre. Numărul de participanți și feedback-ul lor au arătat un mare interes pentru recunoașterea TIC ca instrument indispensabil pentru agricultură.

Pentru mai multe informații vizitați:
http://viralerasmus.org/en/the-role-and-importance-of-ict-in-agriculture-future-development-viral-workshop/

Elaborat de către/Prepared by:
Ana Butcaru, USAMV



sented several projects focused on earth observation and geoinformation-related projects for environment and agriculture applications. Satellite technologies, geomatics but also the national participation strategy in the new European context of research coordination in the fields of security and space industry were discussed.

The workshop showed more examples of ICT use in agriculture and highlighted its necessity nowadays. The number of participants and their feedback showed great interest in the acknowledgment of ICT as an indispensable tool for agriculture.

For more information visit:
http://viralerasmus.org/en/the-role-and-importance-of-ict-in-agriculture-future-development-viral-workshop/

UDG i “Plantaže 13 Jul” ugostili učesnike VIRAL projekta

UDG and “Plantaže 13 Jul” hosted VIRAL project participants

WP.2, outcome 2.4. ToT course toolkits
WP.4, outcome 4.2. outcome 4.3.
Set of EXPO founding documents, guidelines and materials
Constituted EXPO managing structures and plan of work

Na Univerzitetu Donja Gorica u periodu od 17. do 18. jula 2021. godine održan je projektni sastanak i radionica koji su prevashodno bili namjenjeni učesnicima Erasmus+ Viral projekta. Sastanak i radionica su bili posvećeni aktivnostima i razvoju sljedećih radnih paketa: WP 2.4, WP4.2 i WP4.3.

U ime Univerziteta Donja Gorica prof. dr Vesna Maraš, dekanica Fakulteta za prehrambenu tehnologiju bezbjednost hrane i ekologiju i saradnica na projektu koordinatorka pomenutog fakulteta su prisutnima poželjele dobrodošlicu i uspješan rad.

In the period from 17 to 18 July 2021, a project meeting and workshop was held at the University of Donja Gorica, which was primarily intended for participants in the Erasmus + Viral project. The meeting and workshop were dedicated to the activities and development of the following work packages: WP 2.4, WP4.2 and WP4.3.

On behalf of the University of Donja Gorica prof. Dr. Vesna Maras, dean of the Faculty of Food Technology, Food Safety and Ecology and project associate and coordinator of the mentioned faculty wished the audience a welcome and successful work.

Prisutni su imali čast da radni dio započne sa temom: "REVITALISING AGRICULTURE THROUGH ICT" i govornikom prof. Dr Petraq Papajorgij. Predavanje se baziralo na novim dostignućima iz IT sektora. Nakon predavanja radni dio se odvijao u paralelnim grupama na na radnim paketima WP 2.4, WP4.2 i WP4.3. Radni paket WP 2.4 se odnosio na ToT teams and ToT course toolkits, a radni paketi WP4.2 i WP4.3 odnosili su se na Set of EXPO founding documents, guidelines and materials i Constituted EXPO managing structures and plan of work

Attendees had the honor to begin the work with the topic: "REVITALISING AGRICULTURE THROUGH ICT" and speaker prof. Dr. Petraq Papajorgij. The lecture was based on new achievements in the IT sector. After the lecture, the working part took place in parallel groups on the work packages WP 2.4, WP4.2 and WP4.3. The WP 2.4 work package referred to the ToT teams and ToT course toolkits, and the WP4.2 and WP4.3 work packages related to the Set of EXPO founding documents, guidelines and materials and the Constituted EXPO managing structures and work plan.

Tokom paralelnih grupa za radni paket WP 2.4 dogovoreni su sadržaji, rokovi, uputstva, kao i struktura kursa za studente. U okviru radnih paketa WP4.2 i WP4.3 prisutni su diskutovali o:

1. Upravljačkim tijelima,
2. Virtuelnom sajamu,
3. Konferenciji,
4. Berzi zapošljavanja.

Paralelne grupe su nakon završenog rada prezentovali svim prisutnim aktivnosti koje su dogovorene i koje ih čekaju, takođe su dogovoreni rokovi, sa čim je prvi radni dan završen.

During the parallel groups for the work package WP 2.4, the contents, deadlines, instructions, as well as the structure of the course for students were agreed. Within the work packages WP4.2 and WP4.3, the participants discussed:

1. Governing bodies,
2. Virtual Fair,
3. Conference,
4. Employment exchanges.

After the work was completed, the parallel groups presented to all present the activities that have been agreed and that await them, deadlines have also been agreed, with which the first working day is over.

Drugog radnog dana učesnici sastanka i radionice u okviru projekta Viral su imali priliku da posjete kompaniju koja je saradnik na projektu „13. Jul Plantaže“. U okviru posjete učesnici su mogli da vide podrume – Šipčanik i Stari Podrum i probaju vina, kao i da se uvjere u rad senzora koji su instalirani i koji se koriste u ovoj kompanji.
O ovoj temi prisutne je upoznala saradnica na projektu Katarina Pavićević, takođe i saradnica za uzgoj voća i vitikulturu u sektoru za istraživanje i razvoj poduzeća “13. Jul Plantaže”. Prisutni su u zasadima breskve imali priliku da vide meteorološku stanicu, senzore za nadgledanje vlažnosti tla i uređaje sa digitalnim zamkama za praćenje prisustva i broja štetočina. Ova oprema je instalirana je u svrhu prikupljanja klimatskih podataka, praćenja vlažnosti zemljišta i snimaka dobijenih iz digitalnih feromonskih zamki postavljenih u zasadima breskve na Ćemovskom polju, da bi se doprinijelo dobijanju boljeg finalnog proizvoda.

Za više informacija posetite: http://viral-erasmus.org/udg-i-plantaze-13-jul-ugostili-ucesnike-viral-projekta/

Pripremili/Prepared by:
Jovana Drobnjak, UDG
Andrijana Ćurković, UDG
Katarina Gošović, Plantaže
Božidar Krunić, UDG

On the second working day, the participants of the meeting and workshop within the Viral project had the opportunity to visit the company that is a collaborator on the project “13. jul Plantaže“. During the visit, the participants were able to see the cellars - Shipcanik and Stari Podrum and taste the wines, as well as to see the work of sensors that are installed and used in this company.
The project associate Katarina Pavicevic, also an associate for fruit growing and viticulture in the sector for research and development of the company “13. jul Plantaže“ introduced the participants to this topic. Present in the peach orchards had the opportunity to see the meteorological station, sensors for monitoring soil moisture and devices with digital traps for monitoring the presence and number of pests. This equipment was installed for the purpose of collecting climate data, monitoring soil moisture and recordings obtained from digital pheromone traps set in peach orchards on Cemovsko polje, to contribute to obtaining a better final product.

For more information visit:
http://viralerasmus.org/en/udg-and-plantaze-13-jul-hosted-viral-project-participants/

SMART-MES telemetry station for precision agriculture

SMART-MES telemetrijska stanica za preciznu poljoprivredu.

WP.2, outcome 2.4. ToT course toolkits

"Montenegrin Association for New Technologies (MANT)" in cooperation with "Plantaže 13 Jul" company, within VIRAL project has been developed feasible and a low-cost IoT based station/system for precision agriculture, named SMART-MES. The system can be used in both education and practical implementation. A field/crop data are acquired by self-powered measuring station and sent to remote collector (gateway), located in the home or office. The collector accepts the data and forward them via home/office WiFi to commercial or open IoT servers (as ThingSpeak) for further visualization, analyze and react back. Using available APIs, any web application on any server can communicate with ThingSpeak IoT server, and thus with field station. Every authorized person or farmer, who has computer or gadget with Internet access can monitor parameters of interest and control back associated processes as irrigation or ventilation. In this short report, the principle of operation, hardware and software architecture as well as demonstration results of SMART-MES telemetry station are presented.

SMART-MES uses the last technological achievements in both hardware and software, Figure 1. The sensors acquire data of importance as temperature, humidity, soil moisture, light intensity etc. and send them to the SMART-MES STATION, which consists of nodeMCU (modern networked microprocessor as it is ESP32), LoRaWAN communication module, actuator and sensors' front end, power supply based on autonomous solar-battery system and output (power switch) module. The sensor can send data by wire or wireless protocol in depending of its distance to station. The pre-processed data

Crnogorska Asocijacija za Nove Tehnologije (MANT) u okviru VIRAL projekta je razvila podesnu i jeftinu IoT baziranu stanicu/sistem za preciznu poljoprivredu, pod nazivom SMART-MES. Sistem se može koristiti i u edukaciji i u praktičnoj primjeni. Podaci o parametrima sa plantaže se prikupljaju pomoću mjerne stanice sa sopstvenim napajanjem i šalju do udaljenog kolektora (gatveja), koji se nalazi u kući, kancelariji ili radnok baraci. Kolektor prihvata podatke i prosleđuje ih preko kućne/kancelarijske WiFi mreže na komercijalne ili otvorene IoT servere (kao što je ThingSpeak) za dalju vizuelizaciju, analizu i kontrolu. Koristeći dostupne API-jeve, svaka web aplikacija na bilo kom serveru može da komunicira sa ThingSpeak IoT serverom, a samim tim i sa terenskom stanicom. Svako ovlašćeno lice ili poljoprivrednik, koji ima računar ili gadžet (mobilni telefon ili IPad) sa pristupom Internetu, može da prati parametre od interesa i kontroliše procese, kao što su navodnjavanje ili ventilacija. U ovom kartkom report prikazan je princip rada, hardverska i softverska arhitektura, kao i demonstracijski rezultati SMART-MES telemetrijske stanice.

SMART-MES koristi poslednja tehnološka dostignuća i u hardveru i u softveru, Slika 1. Senzori prikupljaju podatke od značaja kao što su temperatura, vlažnost vazduha, vlažnost zemljišta, intenzitet svetlosti itd. i šalju ih prema SMART-MES STANICI, koja se sastoji od nodeMCU (savremeni umreženi mikroprocesor serije ESP32), komunikacionog modula baziranom na LoRa protokolu, aktuatora, napajanja zasnovanog na autonomnom sistemu solarne baterije i izlaznog (relejskog) modula. Senzor može da šalje podatke žičnim ili bežičnim putem u zavisnosti od udaljenosti do stanice.

are sent via LoRa communication protocol to REMOTE COLLECTOR (Gateway), which further via Wi-Fi and router (hot spot) communicates to CLOUD. The CLOUD integrates commercial IoT platforms like ThingSpeak. As a result, the measured quantities can be monitored via the Internet anywhere, at any time. Both station and collector are based on ESP-32 microcontrollers.

Obrađeni podaci od stanice se šalju preko komunikacionog protokola LoRa do UDALJENOG KOLEKTORA (Gatewaa), koji dalje preko Vi-Fi i rutera (hot spot) komunicira sa CLOUD-om. CLOUD integriše komercijalne IoT platforme kao što je ThingSpeak. Mjerene promenljive se mogu pratiti preko Interneta bilo gdje i u bilo koje vrijeme. I stanica i kolektor su zasnovani na ESP-32 mikrokontroleru.

SMART-MES sistem je pogodan za primenu u vinogradarstvu, gde ga testirala kompanija „Plantaže 13 jul", takođe član VIRAL konzorcijuma, Slika 2. SMART-MES se može koristiti za preciznu mikropoljoprivredu i hortikulturu u urbanim prostorima, Slika 3. U tom slučaju za mjerenje temperature i vlažnosti vazduha koristi široko dostupne senzore, dok je za potrebe praćenja vlažnosti zemljišta MANT u saradnji sa "MECOnetom" i "Plantažama

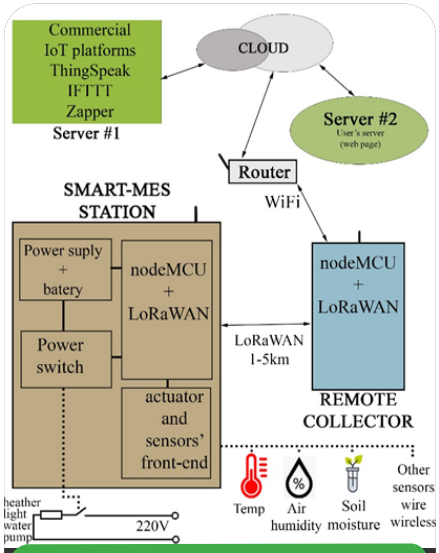


Figure 1: Architecture of VIRAL's SMART-MES station

Arhitektura MANT-ove SMART-MES stanice

Figure 2: SMART-MES station for purpose of precision agriculture (vineyard)

SMART-MES stanica za potrebe precizne poljoprivrede (u oblasti vinogradstva)

Figure 3: SMART-MES station for purpose of precision micro farming, left station, right, developed capacitive sensor.

SMART-MES stanica za precizni "mikrofarming", desno, razvijeni kapacitivni senzor.

SMART-MES system is very suitable for application in vineyard and viticulture, where it is tested by "Plantaze 13 July" company, also member of VIRAL consortium, Figure 2, left. The station can be used for precise Microfarming and Horticulture, Figure 3, left. For measurement of the air temperature and humidity SMART-MES uses widely available sensors, while for soil moisture monitoring MANT in Cooperation with MECOnet and Plantaže 13 Jul developed own family of capacitance sensors as seen down Figure 3, right. Those sensors are very stable and well calibrated, based on capacitive principle with extremely low-power consumption.

The SMART-MES system was thoroughly tested over a period of 12 months and shown precise and reliable results. Figure 4, shows visualization of the data sent to ThingSpeak for 3 channels, as well as visualization of active command value. The system, also, has an interface for sending commands implemented in JavaScript code that can be very easily embedded in any web environment (any remote web site).

13. Jul" razvio sopstvenu familiju kapacitivnih senzora, Slika 3, desno. Ovi senzori su veoma stabilni i dobro kalibrisani, zasnovani na kapacitivnom principu sa izuzetno malom potrošnjom.

SMART-MES sistem je temeljno testiran u periodu od 12 meseci i pokazao je precizne i pouzdane rezultate. Na Slici 4 prikazana je vizuelizacija podataka poslatih prema ThingSpeak IoT server za 3 kanala, kao i vizuelizacija vrijednosti aktivne komande. Sistem takođe ima interfejs za slanje komandi implementiran u JavaScript kodu, koji se vrlo lako može ugraditi u bilo koje web okruženje (bilo koji udaljeni web sajt).

Radovan Stojanović, MANT
Jovan Đurković, MANT
Ivan Stojanović, MANT

Regionalni partneri VIRAL projekta na dvodnevnom sastanku u Tehnopolisu

Regional partners of the VIRAL project at a two-day meeting in Tehnopolis

WP.2, outcome 2.4. ToT course toolkits
WP.4, outcome 4.2. outcome 4.3.
Set of EXPO founding documents, guidelines and materials
Constituted EXPO managing structures and plan of work

Nastavljajući projektne aktivnosti na projektu VIRAL u Nikšiću je tokom dva dana (22. i 23. jul) održan radni sastanak i radionica. Sastanak i radionica su prevashodno bili namjenjeni učesnicima Erasmus+ Viral projekta, a domaćin je bio IPC Tehnopolis.

Nakon što je izvršni direktor IPC Tehnopolis, Ratko Bataković, poželio dobrodošlicu svim učesnicima, prisutnima se obratio Aleksandar Janičić koordinator Centra za razvoj preduzetništva i upravljanje projektima. Aleksandar je naveo kako je Tehnopolis postao centar za razvoj preduzetništva u Crnoj Gori, te prepoznatljiv i pouzdan part-

Continuing the project activities on the VIRAL project, a working meeting and workshop was held in Nikšić for two days (July 22 and 23). The meeting and the workshop were primarily intended for the participants of the Erasmus + Viral project, and the host was IPC Technopolis.

After the executive director of IPC Tehnopolis, Ratko Bataković, welcomed all participants, Aleksandar Janičić, coordinator of the Center for Entrepreneurship Development and Project Management, addressed the audience. Aleksandar stated that Technopolis has become a center for the development

ner ne samo na nacionalnom nego i na regionalnom i međunarodnom nivou. Istakao je značaj ovakvih događaja, koji pored realizacije projektnih aktivnosti koje su u fokusu, imaju značajnu vrijednost kada je u pitanju umrežavanje i generisanje ideja za nove projekte koji će doprineti razvoju preduzetničkog i inovativnog ekosistema u celom regionu.

of entrepreneurship in Montenegro, and a recognizable and reliable partner not only at the national but also at the regional and international level. He emphasized the importance of such events, which, in addition to the realization of project activities that are in focus, have significant value when it comes to networking and generating ideas for new projects that will contribute to the development of entrepreneurial and innovative ecosystem throughout the region.

Tokom prvog radnog dana, nakon pozdravnih

reči, prof. dr Miljan Cvetković je prisutne podsetio na aktivnosti koje su predviđene agendom za naredna dva dana. U prvom dijelu razgovarano je o statusu implementacije aktivnosti na projektu, posebno u svijetlu ocjene srednjeročnog izveštaja, koji je dostavljen od strane EACEA.

Cvetković je ukazao da je projekat u kategoriji dobrih, što je pokazatelj da se u narednom periodu mora više raditi kako bi se što bolje realizovale preporuke iz izveštaja:

- nabavka opreme u što kraćem roku i
- ubrzana realizacija dela aktivnosti iz radnog paketa 2 (WP2).

U drugom dijelu sastanka razgovarano je realizaciji radnog paketa 2, WP2, gde je posebno bilo riječi o kursu za studente, stepenu njegove realizacije, ali i pitanjima njegove implementacije na fakultetima. Razgovarano je i o izradi trening materijala koji će se koristiti u implementaciji treninga za različite učesnike u oblasti agroturizma. U diskusiji su učešće posebno uzeli predstavnici tehničkih fakulteta kao i drugi učesnici koji učestvuju u realizaciji samih aktivnosti.

Tokom prvog dana, učesnici su imali prilike da se upoznaju sa kadrovskim i infrastrukturnim

During the first working day, after greetings, Miljan Cvetković reminded those present of the activities envisaged by the agenda for the next two days. The first part discussed the status of implementation of project activities, especially in light of the evaluation of the mid-term report submitted by the EACEA. Cvetković pointed out that the project is in the category of good, which is an indicator that more work must be done in the coming period in order to better implement the recommendations from the report:

- procurement of equipment as soon as possible and
- accelerated implementation of part of the activities from work package 2 (WP2).

In the second part of the meeting, the implementation of work package 2, WP2, was discussed, where the course for students, the degree of its implementation, but also the issues of its implementation at the faculties were discussed. They also discussed the development of training materials that will be used in the implementation of training for various participants in the field of agritourism. Representatives of technical faculties as well as other participants who participate in

kapacitetima IPC Tehnopolis, posebno dijela koji se donosi na primjenu IKT u poljoprivredi i ostalim segmentima.
Drugi radni dan je bio posvjećen aktivnostima na realizaciji sajma EXPO. Učesnici su imali priliku da se upoznaju sa osnovnom strukturom samog događaja, kao i vizuelnim identitetom koji je predstavila Ana Bogdanović iz INTERE.
Tokom samog sastanka definisani su i rokovi, zaduženja i obaveze pojedinih partnera koje bi trebalo da doprinesu uspješnoj realizaciji sajma. Sastanak je završen rezimiranjem dogovorenih aktivnosti, kao i dogovorom za realizaciju sastanaka u narednom periodu u skladu sa epidemiološkom situacijom.

Za više informacija posetite:
http://viralerasmus.org/regionalni-partneri-viral-projekta-na-dvodnevnom-sastanku-u-tehnopolisu/

Pripremili/Prepared by:
Tehnopolis team

the realization of the activities themselves took part in the discussion.
During the first day, participants had the opportunity to get acquainted with the human and infrastructure capacities of IPC Tehnopolis, especially the part that is brought to the application of ICT in agriculture and other segments.
The second working day was dedicated to the activities on the realization of the EXPO fair. Participants had little opportunity to get acquainted with the basic structure of the event itself, as well as the visual identity presented by Ana Bogdanović from INTERA.
During the meeting, deadlines, duties and obligations of individual partners were defined, which should contribute to the successful realization of the fair. The meeting ended with a summary of the agreed activities, as well as an agreement for the implementation of meetings in the coming period in accordance with the epidemiological situation.

For more information visit:
http://viralerasmus.org/en/regional-partners-of-the-viral-project-at-a-two-day-meeting-in-tehnopolis/

Hortikulturni inžinjering – novi smjer inspirisan VIRAL projektom

Horticultural engeeneering – new study programme inspired by VIRAl project

Poljoprivreda predstavlja važnu privrednu granu svake zemlje, pa tako i Bosne i Hercegovine. Poljoprivredna proizvodnja u našoj državi i pored postojanja dobrih uvjeta za proizvodnju, iskustva i tradicije nije dovoljno razvijena i puno zaostaje za poljoprivrednom proizvodnjom u razvijenim državama svijeta, ali i državama u regionu. Jedan od načina da se to stanje popravi jeste praćenje i uvođenje novih tehnologija i inovacija u proces proizvodnje.
Imajući u vidu socijalni, ekonomski i širi društveni značaj proizvodnje hrane i održive poljoprivrede, kao i buduće adaptacije poljoprivrednih gazdinstava na globalne pritiske povezane sa demografskim i klimatskim promjenama, stručnjaci ovog profila moraju da odgovore na nove izazove.

Bazirajući se na iskustvu u dugogodišnjem provođenju nastave na tri smjera, Agromediteranski fakultet je uvidio potrebu za uvođenjem novog smjera koji će objediniti sve oblasti biljne proizvodnje uz uvođenje novih tehnologija. Zahvaljujući idejama VI-

Agriculture is an important economic branch of every country, including Bosnia and Herzegovina. Agricultural production in our country, despite the existence of good conditions for production, experience and traditions is not sufficiently developed and lags far behind agricultural production in developed countries, but also countries in the region. One of the ways to improve this situation is to monitor and introduce new technologies and innovations in the production process..
Given the social, economic and wider social importance of food production and sustainable agriculture, as well as the future adaptation of farms to global pressures related to demographic and climate change, experts in this field must respond to new challenges.

Based on the experience in long-term teaching in three deparments, the Agromediterranean faculty of saw the need to introduce a new direction that will unite all areas of plant production with the introduction of new technologies. Thanks to the ideas of

RAL projekta pokrenuta je inicijativa za otvaranjem novog studijskog programa I ciklusa na Agromediteranskom fakultetu. Taj novi studijski program nazvan „Hortikulturni inžinjering“ je sa svojim nastavnim planom i programom pokušao da odgovori savremenim zahtjevima uvođenja informatičkih sistema u svrhu praćenja potreba za navodnjavanjem, gnojidbom, rezidbom, preventivnom detekcijom pojave bolesti i prisutnosti štetnika, praćenjem mikroklimatskih prilika kao jedne cjeline kojom se vodi jedna intenzivna poljoprivredna proizvodnja.
Zadatak hortikulturnih inžinjera se u novije vrijeme proširio ne samo u smislu uzgoja biljaka i primarne prerade plodova, nego uključuje konsalting, upravljanje, organizacijske aktivnosti, osiguranje kvalitete, marketing i usluge.

Studijski program Hortikulturni inžinjering ima za cilj da pruži multidisciplinarno obrazovanje u teoriji i praksi i da na taj način obezbijedi studentu potrebne stručne kompetencije za obavljanje širokog spektra aktivnosti iz ove oblasti.
Ciljevi studijskog programa i ishodi učenja Hortikultuni inžinjering su jasno definirani i podudarni sa sadržajem studijskog programa i nivoom ciklusa studija, što podrazumijeva:

- ovladavanje općim teorijskim znanjima i aplikativnim vještinama u upravljanju procesima biljne proizvodnje;
- prepoznavanje važnijih segmenata iz

the VIRAL project, an initiative was launched to open a new study program of the first cycle at the Agromediterranean faculty. This new study program called “Horticultural engineering” with its curriculum tried to meet modern requirements for the introduction of information systems to monitor the needs for irrigation, fertilization, pruning, preventive detection of disease and pests, monitoring microclimatic conditions as a whole. there is an intensive agricultural production.

The task of horticultural engineers has recently expanded not only in terms of plant cultivation and primary fruit processing, but also includes consulting, management, organizational activities, quality assurance, marketing and services.

The study program “Horticultural engineering” aims to provide multidisciplinary education in theory and practice and thus provide the student with the necessary professional competencies to perform a wide range of activities in this field.
Objectives of the study program and learning outcomes Horticultural engineering is clearly defined and consistent with the content of the study program and the level of the study cycle, which includes:

- mastering general theoretical knowledge and applied skills in managing plant production processes;

oblasti hortikulturnog inžinjeringa, te posjedovanje praktičnog i teoretskog znanja iz područja hortikulture - voćarstva, vinogradarstva i vinarstva, povrtlarstva i ukrasnog bilja uz primjenu informacionih tehnologija;
- upoznavanje sa specifičnostima hortikulturnog inžinjeringa, načinima i tehnologijama proizvodnje poljoprivrednih kultura po različitim uzgojnim principima;
- osposobljavanje studenata za sposobnost analiziranja i sintetiziranja činjenica i teorijskih znanja i primjene u unapređenju savremenih sistema hortikulturne proizvodnje;
- razvijanje vještina i kompetencija koje bi omogućile
- nastavak školovanja i rješavanje problema u usko specijaliziranim oblastima hortikulturne proizvodnje.

Studijski program Hortikulturni inžinjering traje tri godine, odnosno VI semestara, i vrednuje se sa 180 ECTS bodova. Nastava i ispiti se obavljaju tokom akademske godine koja se organizuje u dva semestra: zimski i ljetni. Nastava u toku jednog semestra traje 15 sedmica. Svi predmeti su jednosemestralni tj. izvode se samo u toku jednog semestra.

Ciljevi su također usklađeni sa strategijom fakulteta za obrazovanjem kadrova iz oblasti poljoprivrede, koji će zadovoljiti potrebe za novim trendovima i primjenom informacionih tehnologija u ovoj oblasti.

Za više informacija posjetite:
https://af.unmo.ba/studij/i-ciklus-studija/hortikulturni-inzinjering/

Pripremili/Prepared by:
Semina Hadžiabulić UNMO
Jasna Hasanbegović UNMO

- recognition of important segments in the field of horticultural engineering, and possession of practical and theoretical knowledge in the field of horticulture - fruit growing, viticulture and winemaking, horticulture and ornamental plants with the use of information technology;
- getting acquainted with the specifics of horticultural engineering, methods and technologies of crop production according to different growing principles;
- training students for the ability to analyze and synthesize facts and theoretical knowledge and application in the improvement of modern systems of horticultural production;
- developing skills and competencies that would enable
- continuing education and solving problems in narrowly specialized areas of horticultural production.

The study program “Horticultural engineering” lasts three years, ie VI semesters, and is valued at 180 ECTS credits. Leactures and exams are held during the academic year, which is organized in two semesters: winter and summer. Leactures last 15 weeks during one semester. All courses are one-semester, ie. they are performed only during one semester.

The goals are also in line with the strategy of the faculty for the education of youngsters in the field of agriculture, which will meet the needs for new trends and the application of information technology in this field.

For more information visit:
https://af.unmo.ba/studij/i-ciklus-studija/hortikulturni-inzinjering/

EXPO SmAgTech – glavna tema sastanka u Banjoj Luci

EXPO SmAgTech - the main topic of the meeting in Banja Luka

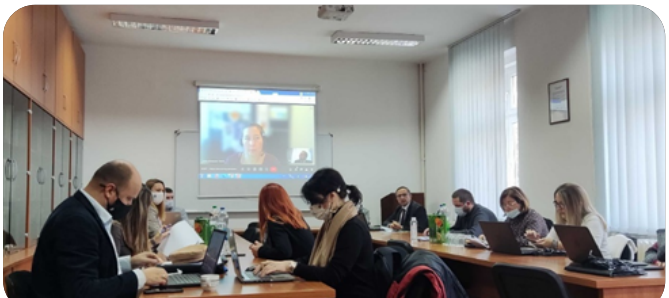
WP.4, outcome 4.3.
Constituted EXPO managing structures and plan of work

Na Poljoprivrednom fakultetu Univerziteta u Banjoj Luci je u periodu 28-29.10.2021. godine održan projektni sastanak i radionica, posvećeni aktuelnim aktivnostima na projektu VIRAL. Sastanak je bio koncipiran sa ciljem da se pored analize trenutnog stanja na projektu analizira i stanje u pogledu izveštavanja i prikupljanja neophodne dokumentacije. Sastanak i radionica su prevashodno bili namjenjeni učesnicima Erasmus+ Viral projekta, a domaćin je bio Poljoprivredni fakultet Univerziteta u Banjoj Luci.

U ime Univerziteta u Banjoj Luci, prof. dr Biljana Antunović, prorektor za međunarodnu saradnju je poželela dobrodošlicu i uspešan rad. Od samog početka sastanku se putem online veze pridružila i gospođa Jessica Giampaolo, novi projektni oficir na projektu VIRAL.

At the Faculty of Agriculture, University of Banja Luka, in the period 28-29.10.2021. a project meeting and workshop were held, dedicated to current activities on the VIRAL project. The meeting was conceived with the aim of analyzing the current situation on the project, as well as the situation in terms of reporting and collecting the necessary reporting documentation. The meeting and the workshop were primarily intended for the participants of the Erasmus + Viral project, and the host was the Faculty of Agriculture of the University of Banja Luka.

On behalf of the University of Banja Luka, prof. dr. Biljana Antunović, Vice Rector for International Cooperation, wished a welcome and successful work. From the very beginning, Mrs. Jessica Giampaolo, the new project officer on the VIRAL project, joined the meeting online.



Prof.dr Tamara Stojanović, administrator projekta VIRAL je prisutnima prezentovala trenutno stanje utroška sredstava na nivou projekta, kao i po pojedinačnim partnerima. Tamara je posebno istakla određene propuste u procesu izveštavanja koje je potrebno u narednom periodu popraviti i u narednom periodu voditi računa o načinu izveštavanja. Projektni oficir gospođa Giampaolo, je istakla zadovoljstvo onim što je dosada urađeno na projektu i osim niza komentara, stavila se na raspolaganju za zajedničko rešavanje poteškoća na koje se nailazi tokom realizacije projekta.

Tokom sastanka, razgovarano je o realizaciji pojedinih aktivnosti u okviru EXPO događaja. Diskutovana je dinamika realizacije, zaduženja odgovornih, način komunikacije sa predavačima i učesnicima. Posebno je analiziran način diseminacije informacija o održavanju samog događaja uz korišćenje različitih kanala informisanosti i društvenih mreža.

Učesnici su imali prilike da obiđu kompaniju "Agrovoće" jednog od partnera na projektu. Tom prilikom su se upoznali sa delatnošću kompanije kao i aktivnostima na uvođenju IKT u redovnoj proizvodnji.

Prilikom posete Eksperimentalno edukativnom centru poljoprivrednog fakuteta Univerziteta u Banjoj Luci, učesnici su imali prilike da se upoznaju sa delom opreme koja je nabavljena kroz projekat i instalirana na imanju. Takođe su se upoznali sa istraživačkim radom na samom oglednom dobru.

Professor Tamara Stojanović, administrator of the VIRAL project, presented to the audience the current state of spending at the project level, as well as by individual partners. Tamara especially pointed out certain omissions in the reporting process that need to be corrected in the coming period and take into account the manner of reporting in the coming period. The project officer, Mrs. Giampaolo, expressed her satisfaction with what has been done on the project so far, and in addition to a series of comments, she made herself available to jointly resolve the difficulties encountered during the project implementation.

During the meeting, the implementation of certain activities within the EXPO event was discussed.
The dynamics of realization, responsibilities, the way of communication with lecturers and participants were discussed. The way of disseminating information about the event itself with the use of various channels of information and social networks was especially analyzed.

The participants had the opportunity to visit the company "Agrovoće" of one of the partners in the project. On that occasion, they got acquainted with the company's activities as well as activities on the introduction of ICT in regular production.
During the visit to the Experimental Education Center of the Faculty of Agriculture of the University of Banja Luka, the attendees had the opportunity to get acquainted with a part of the equipment that was procured through the project and installed on the property. They also got acquainted with the research work on the demonstration property itself.

During the visit to the agricultural cooperative "Livač", the participants had the opportunity to get acquainted with the results of well-realized projects of this cooperative, as well as the main activities and products that the cooperative produces.

Tokom posete zemljoradničkoj zadruzi "Livač" učesnici su se upoznali sa rezultatima dobro realizovanih projekata ove zadruge, kao i glavnim aktivnostima i proizvodima.

Drugi dan sastanka bio je posvećen realizaciji radnog paketa 2, odnosno aktivnosti RP2.7 i RP2.4.

Za više informacija posetite: http://viralerasmus.org/uspesnim-sastankom-nastavljene-aktivnosti-na-viral-projektu/

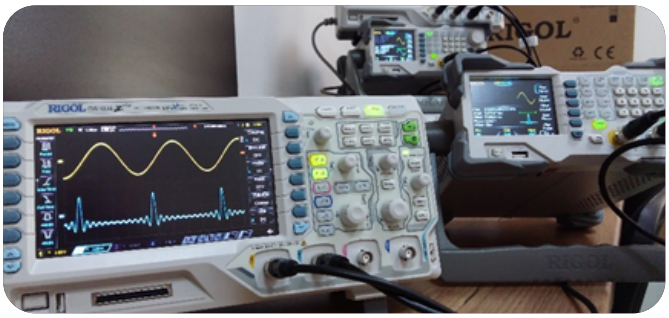
The second day of the meeting was dedicated to the implementation of work package 2, ie activities WP2.7 and WP2.4.

For more information visit: http://viralerasmus.org/en/successful-meeting-continued-activities-on-the-viral-project/

Pripremili/Prepared by:
Tatjana Jovanović Cvetković, UNIBL
Petar Nikolić, UNIBL

Oprema je stigla
The equipment has arrived

WP.2, outcome 2.2.
Purchased and installed equipment



Prvi dio opreme za fakultete u Bosni i Hercegovini i Crnoj Gori je stigao. Radi se o računarskoj opremi, solarnim panelima za proizvodnju energije i specifičnoj laboratorijskoj opremi. Jedan deo opreme je instaliran i pušten u rad, dok će najveći deo opreme biti instaliran tokom narednog perioda i pušten u pogon.
Ova specifična oprema, kada u potpunosti bude završena nabavka, će pomoći realizaciji planiranih VIRAL aktivnosti i unaprijediti kako nastavni proces, tako i naučno-istraživački rad nastavnika.

The first piece of equipment for the faculties in Bosnia and Herzegovina and Montenegro has arrived. These are computer equipment, solar panels for energy production and specific laboratory equipment. One part of the equipment has been installed and put into operation, while the largest part of the equipment will be installed during the next period and put into operation.

This specific equipment, when the procurement is fully completed, will help the realization of the planned VIRAL activities and improve both the teaching process and the scientific research work of teachers.

Pripremili/Prepared by:
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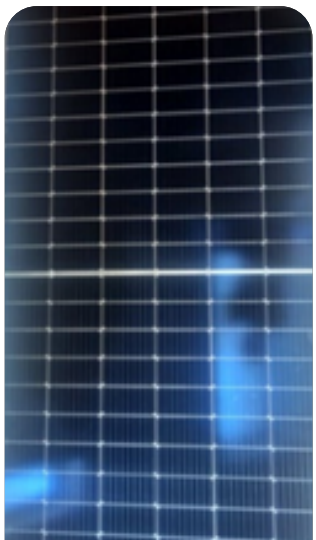
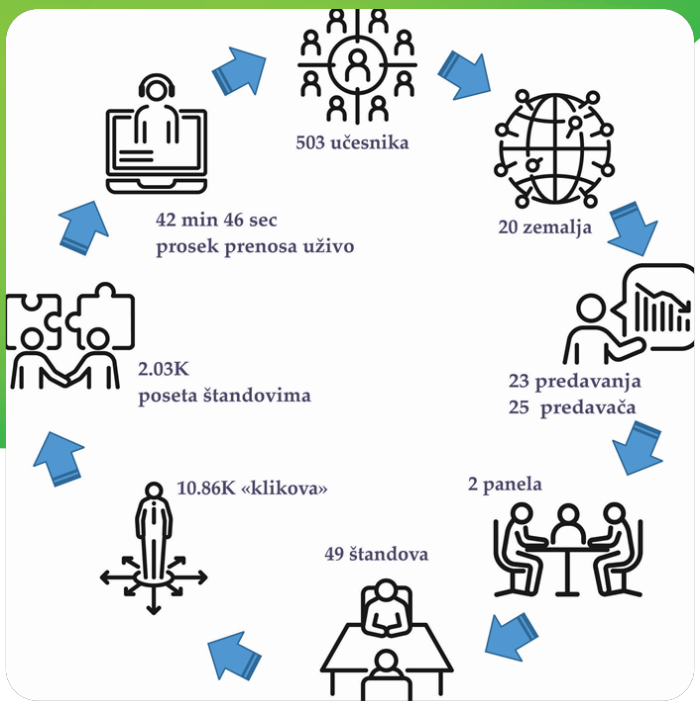
Ana Mandić, SUM
Aljo Mujčić, UNTZ
Jovana Drobnjak, UDG
Miljan Cvetković, UNIBL



SmAgTech EXPO 2021

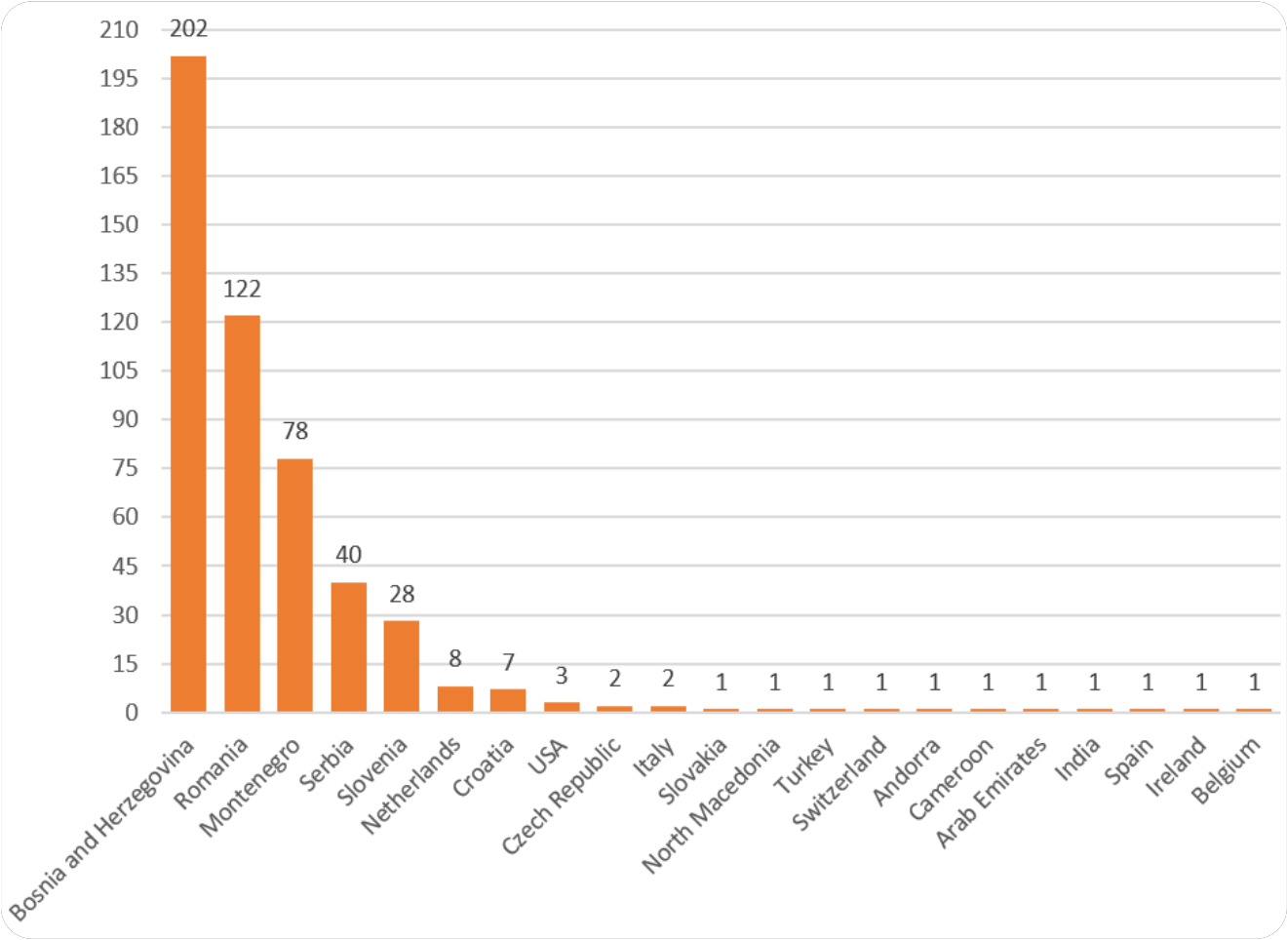


SmAgtech EXPO 2021, održan je u periodu 16-17.11.2021. godine. Događaj je realizovan putem virtuelne platforme, koja je pripremljena u skladu sa zahtevima projekta i vizuelnim okruženjem Univerziteta u Banjoj Luci, kao lokacijom dešavanja.

Za EXPO SmAgTech događaj ukupno se registrovalo 503 učesnika iz 20 zemalja. Najviše učesnika je bilo iz Bosne i Hercegovine, Rumunije i Crne Gore.

SmAgtech EXPO 2021, was held in the period 16-17.11.2021. The event was realized through a virtual platform, which was prepared on that occasion in accordance with the requirements of the project and the visual environment of the University of Banja Luka, as the location of the event.

A total of 503 participants from 20 countries registered for the EXPO SmAgTech event (Chart 1). Most participants were from Bosnia and Herzegovina, Romania and Montenegro.



Grafikon 1. Distribucija učesnika na osnovu zemlje iz koje dolaze

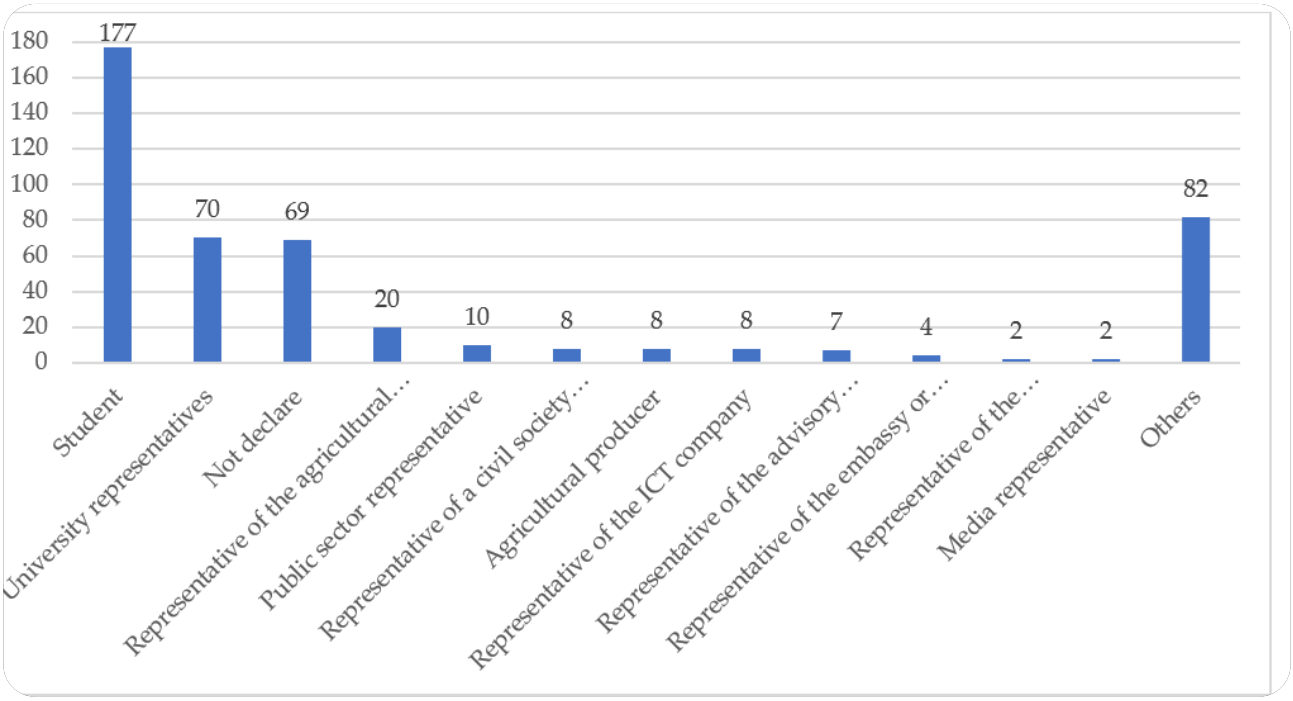
Najveći broj učesnika je iz kategorije studenata i nastavnog osoblja. Značajan broj učesnika se nije izjasnio ili je naveo da pripada kategoriji ostalih. Nešto manji broj učesnika je bio iz biznis sektora, bez obzira da li je reč o poljoprivrednim proizvođačima ili kompanijama u oblasti IKT (grafikon 2).

Značajno je istaći da je među registrovanim učesnicima bilo predstavnika javnog sektora i organizacija civilnog društva.

Chart 1. Distribution of participants based on the country they came from

The largest number of participants is from the category of students and teaching staff. A significant number of participants did not declare themselves or pointed out that they belong to the category of others. A slightly smaller number of participants were from the business sector, regardless of whether they were agricultural producers or companies in the field of ICT (Chart 2).

It is important to point out that among the registered participants were representatives of the public sector and civil society organizations.



Grafikon 2. Distribucija učesnika prema kategoriji kojoj pripadaju

U okviru konferencijskog dela događaja predstavljeno je četiri plenarna predavanja po pozivu i 19 predavanja u okviru 5 tematskih sekcija (prerada hrane, voćarstvo, vinogradarstvo i vinarstvo, zaštita biljaka i nove tehnologije u poljoprivredi).

Održane su i dve panel sesije posvećene upotrebi IKT u poljoprivredi, kao i odnosu studenata elektrotehnike i poljoprivrede prema primeni novih tehnologija u oblasti agrara.

U izložbenom delu događaja, predstavilo se ukupno 49 izlagača: 21 kompanija iz oblasti agrara i informativno komunikacionih tehnologija, 11 projekata koji se realizuju sa tematikom preimene IKT u poljoprivredi i 17 članica konzorcijuma projekta VIRAL.

Chart 2. Distribution of participants according to the category to which they belong

Within the conference part of the event, four plenary lectures by invitation and 19 lectures within five thematic sections (food processing, fruit growing, viticulture and winemaking, plant protection and new technologies in agriculture) were presented.

Two panel sessions were held on the use of ICT in agriculture, as well as the opinions of students of electrical engineering and agriculture towards the application of new technologies in the field of agriculture.

In the exhibition part of the event, a total of 49 exhibitors presented themselves; 21 companies in the field of agriculture and ICT, 11 projects implemented with the theme of ICT application in agriculture and 17 members of the consortium of the VIRAL project.

Slika 1-5. Predavanja održana u okviru paralelnih sesija
Figure 1-5. Lectures held in parallel sessions

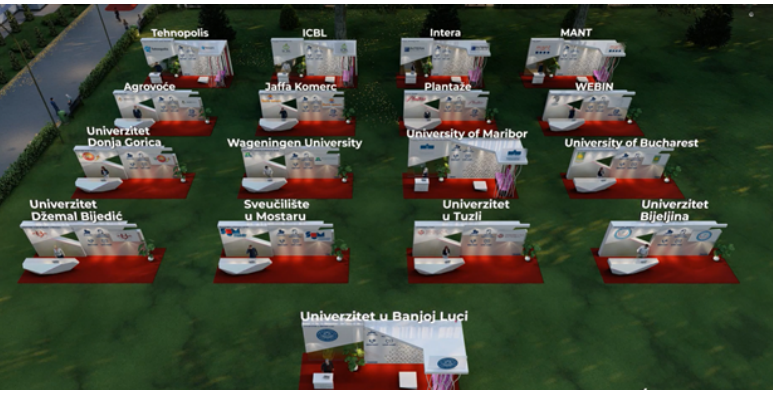


Figure 6-8. Izgledi štandova kompanija, projekata i predstavnika projektnog konzorcijuma (odozgo na dole) koji su se predstavili na sajmu

Tokom EXPO SmAgTech, registrovano je 10.86K zasebnih događaja na platformi, od čega 2.03K predstavlja aktivnosti na štandovima (tabela 1).

Tokom prvog dana registrovano je 262 zasebnih učesnika, koji su ostvarili 6.859 događaja na platformi ii 1.460 pristupa štandovima.

Drugog dana je bilo 128 registrovanih učesnika, koji su realizovali 3.124 događaja na platformi, od čega 570 poseta štandovima.
Prosečno trajanje praćenja prenosa uživo je bilo 42 min i 46 sec.

Slika 6-8. Prospects of stands of compa nies, projects and representatives of the project consortium (top to bottom) presented at the fair

During EXPO SmAgTech event, 10.86K of separate interactions on the platform were registered, of which 2.03K represents activities at the stands (Table 1).

During the first day, 262 separate participants were registered, who achieved 6,859 interactions on the platform and 1,460 accesses to the stands.

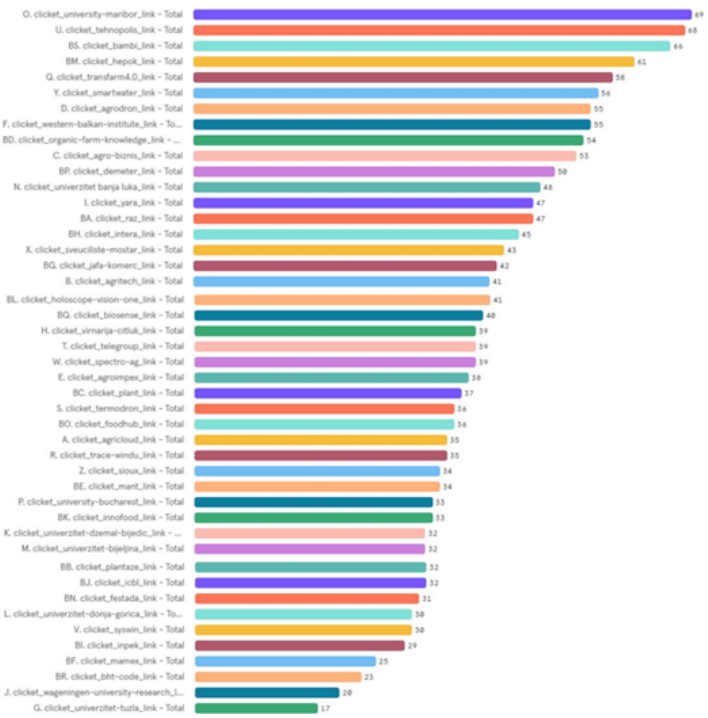
On the second day, there were 128 registered participants, who realized 3,124 interactions on the platform, of which 570 visited the stands. The average duration of the live broadcast was 42 minutes and 46 seconds.

	number of individual users	number of events on the platform	number of events per user	number of events on the stands
16.11.2021.	262	6.589	25	1.460
17.11.2021.	128	3.124	24	570
Conference	467	10.860	21	2.030

Tabela 1. Broj pojedinačnih aktivnosti na platformi tokom realizacije samog događaja

Table 1. Number of individual activities on the platform during the realization of the event

Najviše poseta bilo je na štandovima Univerziteta iz Maribora i Tehnopolisa kao i kompanija Bambi i Hepok (grafikon 3).



Grafikon 3. Broj poseta pojedinim štandovima tokom trajanja događaja

Most visits were at the stands of the University of Maribor and Technopolis, as well as the companies Bambi and Hepok (Chart 3).

Chart 3. Number of visits to individual stands during the event

Organizacija samog događaja, predstavlja značajan iskorak u povezivanju različitih aktera u poljoprivrednoj proizvodnji i primeni IKT u agraru. U tehničkom smislu implementacije predstavlja takođe veliki izazov, čija uspešna realizacija omogućava efikasniju distribuciju novih saznanja i boljeg povezivanja učesnika ne samo iz regiona već i čitavog sveta.

Lekcije naučene iz realizacije ovog događaja biće odlična osnova za unapređenje samog procesa organizacije i efikasniju realizaciju sledećeg događaja, koji je planiran za 2022. godinu.

Pripremili:
Miljan Cvetković, UNIBL
Petar Nikolić, UNIBL

Za više informacija posetite:
http://viralerasmus.org/expo-smagtech-prevazisao-ocekivanja/

Pripremili:
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Petar Nikolić, UNIBL

The organization of the event itself, represents a significant step forward in connecting different entrants in agricultural production and the application of ICT. In the technical sense, realization is a challenge, the successful realization of which enables more efficient distribution of new knowledge and better connections.

The lessons learned from the realization of this event will be an excellent basis for improving the process itself and more efficient realization of the next event in 2022.

For more information visit:
http://viralerasmus.org/en/expo-smagtech-exceeded-expectations/

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SMARTWATER projekat, inovativno rješenje za upravljanje vodnim resursima u poljoprivredi, upotreba Bluleaf aplikacije

SMARTWATER project, an innovative solution for water management in agriculture, a short overview of Bluleaf water management application

WP.2, outcome 2.1.
Improved competences of use of ICT in agriculture

Projekat SMARTWATER ima za cilj potaknuti usvajanje tehnika pametnog upravljanja vodnim resursima u poljoprivredi u BiH, kako bi se riješili problemi poput klimatskih promjena i suše, koji utiču na unapređenje nacionalne poljoprivrede.

Projekat SMARTWATER uključuje dvije glavne obrazovne institucije u BiH, UNI-BL i UNSA, kao i četiri međunarodna partnera, CSIC iz Španije, ISA iz Portugalije, kao i CIHEAM-IAMB i SYS iz Italije.

Projekat SMARTWATER će trajati tri godine (2021-2023), sa glavnim ciljem u jačanju novih kapaciteta umrežavanja, istraživanja i saradnje u oblasti nauke i tehnologije UNI-BL, UNSA i drugih povezanih institucija u BiH, u oblasti održivog upravljanja vodom u poljoprivredi, a u svrhu povećanja kompetencija i vještina pomenutih institucija prilikom apliciranja za dobijanje sredstava i u uspješnom učešću u istraživačkim programima Evropske unije (EU).

Mi već napredujemo u ovom izazovnom zadatku i jedna od aktivnosit je korišćenje Bluleaf-a, softverska aplikacija koju je dizajnirao i razvio Sysman Progetti & Servizi u cilju pružanja naprednih rješenja u oblasti digitalne poljoprivrede.

SMARTWATER project, an innovative solution for water management in agriculture, a short overview of Bluleaf water management application

SMARTWATER project aims to boost adoption of smart water management techniques in BiH agriculture, in order to address issues like climate change and drought, that prevent national agriculture improvement.
The SMARTWATER project will last three years (2021-2023) and the main aim is to reinforce new networking, research and S&T cooperation capacities of UNI-BL, UNSA and other connected BiH national institutions, in the field of sustainable agricultural water management to increase their competency and fund rising skills for a successful participation in the European Union (EU) Research Programs. SMARTWATER project involves two main BiH educational institutions, UNI-BL and UNSA, and four international partners, CSIC from Spain, ISA from Portugal, CIHEAM-IAMB and SYS from Italy.
We are already progressing in this challenge and one of the activities is using a Bluleaf, a software application designed and developed by Sysman Progetti & Servizi in order to provide advance solutions in the field of digital agriculture.

Bluleaf
Agricoltura Consapevole
www.bluleaf.it

Società Servizi Informatici SysMan
Progetti & Servizi Srl

Razvoj Bluleaf-a započeo je 2010. godine zahvaljujući istraživačkom projektu pod nazivom Hydrotech, a napravljena su mnoga poboljšanja u pogledu upotrebljivosti i implementiranja aplikacije. Danas je ovaj softver na tržištu na nacionalnom (talijanskom) i međunarodnom nivou sa više od 160 farmi koje koriste Bluleaf aplikaciju.

Sysman Progetti & Servizi je osnovan 1994. godine kao visoko specijalizovana kompanija za IT usluge. Zahvaljujući iskustvu stečenom tokom godina Sysman je danas jedna od najpriznatijih italijanskih kompanija u domenu digitalne poljoprivrede. Kompanija broji tri kancelarije u Mesanji, Bariju i Rimu i ima više od 30 zaposlenih.
Bluleaf nije lako definisati, ali prema opštoj definicije to je je DSS (sistem za podršku odlučivanju) dizajniran da optimizuje agronomski input kako bi pomogao farmeru da donese najbolju moguću odluku u toku poljoprivrednih aktivnosti. Takođe je i sistem za kontrolu kvaliteta.

The development of Bluleaf started in 2010 thanks to a research project called Hydrotech. During the years many improvements have been made in terms of usability and new features implemented. Today, the software is on the market at national (Italian) and international level with more than 160 farms using Bluleaf.

Sysman Progetti & Servizi was founded in 1994 as a highly specialised IT services company. Thanks to the experience gained through the years Sysman is today one of the most recognized Italian companies in the field of digital agriculture. The company count three offices located in Mesagne, Bari and Rome and more than 30 employs.
It is not easy to define Bluleaf in short terms. According to the classical definition Bluleaf is a DSS (Decisional Support System) designed to optimize the agronomical input in order help the farmer to take the best possible decision during farming activities. It is also a system for quality control.

Bluleaf features are organized in modules as described as follow:

- Irrigation Module

The irrigation module is based on the crop water balance, supported by on field data, to give water management support to the farmer in order to optimize the water usage and crop quality.

- Nutrition Module

Through the Nutritional balance it is possible to know and provide just what the crops needs in terms of nutrients.

- Crop defence Module

The crop defence module provide functionality for disease forecast and treatment recording in order to protect the crops and respect the environment.

- Management Module

Through the management module it is pos-

Bluleaf funkcije su organizovane u sledeće module:

- Modul za navodnjavanje

Modul za navodnjavanje je zasnovan na bilansu vode usjeva, podržan podacima sa terena, da bi se farmeru pružila podrška u upravljanju vodnim resursima u cilju optimizacije korišćenja vode i kvaliteta usjeva.

- Modul ishrane

Kroz obezbijeđivanje uravnotežene ishrane usjeva moguće je saznati i obezbijediti upravo ono što je potrebno usjevima u pogledu hranljivih materija.

- Modul za zaštitu biljaka

Modul za zaštitu biljaka obezbeđuje funkcionalnost za prognozu bolesti i snimanje tretmana u cilju zaštite usjeva, a u isto vrijeme i zaštite životne sredine.

- Modul upravljanja

Preko modula upravljanja moguće je registrovati i konsultovati tretmane usjeva i navodnjavanja od početka do kraja sezone.

- Modul kontrole kvaliteta

Preko modula kvaliteta moguće je pratiti parametar kvaliteta usjeva tokom sezone i obezbediti potrebne standarde kvaliteta proizvoda.

- GIS Modul

Preko GIS modula omogućeno je georeferenciranje parcela i proizvodnih jedinica, obrada prinosa i rasta, mape rizika od stresa, itd.

Logika iza modula za navodnjavanje Bluleaf može se sažeti kroz sledeće tačke:

1. Senzori koji detektuju podatke na terenu; Bluleaf-u je potrebna meteorološka stanica na terenu za prikupljanje vremenskih podataka;
2. Vodni bilans se izračunava po matematičkom modelu;
3. DSS daje savjete;
4. Korisnik može da odobri ili odbije (ili izmeni) raspored koji je predložio DSS.

Da bi povećao znanje i umrežio se, Sysman Progetti & Servizi je uključen u mnoge istraživačke projekte u vezi sa digitalnom poljoprivredom na regionalnom, nacionalnom i međunarodnom nivou. Tokom godina kompanija je stekla jaku saradnju sa važnim istraživačkim institutima i univerzitetima, kao što je CIHEAM Bari - Mediteranski agronomski institut u Bariju. Jedan od projekata u koji

sible to register and consult crop treatments and irrigations from the beginning to the end of the season.

- Quality control Module

Through the quality module it is possible to monitor the crops quality parameter during the season and assure the required product quality standards.

- GIS Module

Georeferencing plots and production units, processing vigor yield, stress maps etc.

The logic behind the Bluleaf irrigation module can be summarized through the following points:

1. Sensors detect on-field data; Bluleaf needs an on-field weather station to collect weather data;
2. The water balance is calculated by the mathematical model;
3. The DSS provide the advice;
4. the user can approve or denies (or modifies) the schedule proposed by the DSS;

To increase the company knowledge and networks, Sysman Progetti & Servizi is involve in many research projects regards digital agriculture at regional, national, and international level. Through the years the company have gained a strong collaboration link with important research institutes and universities, such as the CIHEAM-IAMB, Mediterra-

je Sysman sada uključen je i SMARTWATER.
U projektu SMARTWATER Sysman vodi Radni paket 5 koji uključuje aktivnosti komunikacije i diseminacije kao što je razvoj internet stranice projekta i specifične ICT (Informacione i komunikacione tehnologije), platforme za distribuciju i komunikaciju za prikupljanje i širenje rezultata projekta.
SMARTWATER će testirati Bluleaf u oblastima potrebe usjeva za vodom i planiranja navodnjavanja, kao i prikupljanja podataka na terenu, prenosa i upravljanja, i primene alata za internet i aplikacije za upravljanje navodnjavanjem u realnom vremenu. Sistem kombinuje agronomske, inženjerske, ekološke i ekonomske aspekte upravljanja vodnim resursima, ima za cilj da poboljša eko-efikasnost korišćenja vode u poljoprivredi i može se primjeniti i na farmama i na nivou regiona koji se navodnjava koristeći napredna tehnološka rješenja za kontinuirano pametno (na bazi senzora) praćenje kontinuuma zemljište-biljka-atmosfera i daljinsko upravljanje mrežama za navodnjavanje. Bluleaf je već testiran na nekoliko lokacija u južnoj i centralnoj Italiji, na Malti i u Libanu, potvrđujući njegovu robusnost i sposobnost da uštedi vodu i energiju u poređenju sa tradicionalnim praksama navodnjavanja.
SMARTWATER će koristiti Bluleaf platformu za integraciju vremenskih podataka u realnom vremenu, dostupnih na agrometeorološkim stanicama u BiH, sa podacima o specifičnosti zemljišta, usjevima i sistemu za navodnjavanje kako bi kreirao različite scenarije navodnjavanja na farmi koji liče na realnu situaciju na terenu .
Veza Bluleaf DSS-a i vremenskih podataka za BiH u realnom vremenu biće dostupna putem internet stranice projekta i aplikacije za pametne telefone. Osnovni cilj je da se promoviše upotreba novih tehnoloških rješenja (tj. usluga navodnjavanja pametnim telefonom) u praksi i da se demonstrira njihova prednost u odnosu na tradicionalne metode upravljanjem navodnjavanja.

Nataša Čereković, UNIBL
Luigi Capodieci, Sysman P&S

"This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 952396".

nean Agronomic Institute of Bari. One of the projects in which Sysman is involve now is SMARTWATER.
In SMARTWATER project Sysman oversees leading the Work Package 5 that includs the communication and dissemination activities such as the development of the project website and a specific ICT (Information and Communications Technology) dissemination and communication platform to collect and spread project results.
Besides, another purpose of Sysman in SMARTWATER is to provide Bluleaf to the project partners for experimental activities to test the software functionalities in new environments and spread the knowledge of the product.
SMARTWATER will test Bluleaf in the fields of crop water requirements and irrigation scheduling, on-field data acquisition, transmission and management, and application of web and app tools for real-time irrigation management. The system combines agronomic, engineering, environmental and economic aspects of water management, aims to improve the eco-efficiency of agricultural water use and may be applied at both farm and irrigation district scales using the advanced technological solutions for the continuous smart (sensor-based) monitoring of the soil-plant-atmosphere continuum and the remote control of irrigation supply networks. Bluleaf has already been tested at several locations in Southern and Central Italy, Malta, and Lebanon, confirming its robustness and its capability to save water and energy when compared to traditional irrigation practices.
SMARTWATER will use the Bluleaf platform to integrate real-time weather data, available at the agro-meteorological stations in BiH, with the specific soil, crop, and irrigation system data to create different on-farm irrigation scenarios resembling the effective situation on the ground.
A link to Bluleaf DSS and real-time BiH weather data will be available through the project website and a smartphone app. The overall objective is to promote the use of new technological solutions (i.e., smartphone irrigation service) in the practice and to demonstrate their advantage in respect to traditional irrigation scheduling methods.

Predstavljamo FoodHub
We present FoodHub

Univerzitet Donja Gorica je tokom godina prepoznat kao inovativna visokoškolska ustanova. Kao takva, težili smo da budemo drugačiji, bolji nego što smo bili juče i jedna od naših vizija jeste upravo ulaganje u nove ideje i projekte. Naš moto "Budite dio istorije budućnosti" jasno ukazuje na naš najvažniji cilj. Da bismo podstakli inovativni razvoj prehrambenog sektora zasnovanog na nauci, posebno u oblasti kvaliteta i bezbjednosti hrane, predložili smo osnivanje Centra izvrsnosti (FoodHub) sa misijom da kroz istraživanja kreira inovacije u prehrambenom sektoru kao i prenos znanja, razvoj i unapređenje autohtone i tradicionalne hrane i poljoprivrednih proizvoda i resursa.

Over the years, the University of Donja Gorica has been recognized as an innovative Higher Education Institution. We have always strived to be different and to grow every day, developing and investing in innovative ideas and bold projects, following the motto: "Be part of the History of the Future".

FoodHub represents exactly what the university stands for, bringing novel ideas to Montenegro and to the world, encouraging our students and researchers to have new perspectives. The main idea behind the Centre of Excellence for Digitalisation of Microbial Food Safety Risk Assessment and Quality Parameters for Accurate Food Authenticity Certification (FoodHub) is to create a reliable, scientifically sound hub in the areas of Food Processing, Food Production, and Food Safety for the benefit of all interested parties in the Montenegrin food sector. There is a pronounced need to think globally and act locally, to share knowledge and to innovate, to identify and protect the specificities of the Montenegrin food production sector, and above all, to create a synergistic connection between researchers, food producers, and decision-makers. This project has received funding from the Min-

Projekat se finansira iz grantova Ministarstva nauke za uspostavljanje centara izvrsnosti.

Riječi direktorice Centra
"Globalizacija tržišta hrane, klimatske promjene, promjene u načinu života ljudi, samo su neke od prijetnji koje ugrožavaju bezbjednost i kvalitet hrane i javno zdravlje. Svjedoci smo sve češćih incidenata vezanih za hranu i zato se okrećemo odabiru domaćih proizvoda, provjerenog kvaliteta. Ono što je važno, jeste da se mjere koje se odnose na proizvodnju zdravstveno bezbjedne i kvalitetne hrane, zasnivaju na prevazilaženju problema i to primjenom multidisciplinarnog pristupa uz ravnopravno učešće sektora nauke, proizvođača i potrošača. Zdravstvena bezbjednost hrane je stub zdravlja svake nacije. U Crnoj Gori, ulažu se veliki napori za osiguranje proizvodnje zdravstveno bezbjedne hrane. Međutim, pored toga, neophodno je osigurati naučno zasnovanu, inovativnu procjenu rizika u lancu proizvodnje hrane. U tom smislu osnovan je Centar izvrsnosti. Zahvaljujući izvrsnosti institucija koje čine konzorcijum, biće osigurani rezultati koji će biti apsolutno primjenjivi kako u praktične tako i u naučno-istraživačke svrhe."

Opšti cilj Centra izvrsnosti je obezbjeđenje pouzdanih, naučno utemeljenih rješenja za eliminaciju rizika vezanih za bezbjednost hrane, digitalizaciju alata za procjenu rizika, primjenu rješenja block-chain tehnologija za pouzadnu sertifikaciju i praćenje autentičnosti hrane, promociju i primjenu aplikacija u industriji proizvodnje hrane i u sektoru turizma. Pored strukturirane, naučno zasnovane procjene rizika koja uključuje molekularno-biološke analize, FoodHub je uključen u razvoj odgovarajućeg softvera za integrisano upravljanje podacima, povezivanje podataka i interaktivnu analizu prehrambenih lanaca. Softver će podržati sposobnost analize unakrsne kontaminacije, geografskih odnosa, grupisanja i sledljivosti. Mandatni konzorcijum će razviti naučnu osnovu za procjenu rizika u oblasti bezbjednosti hrane, valorizaciju, optimizaciju proizvodnje zasnovanu na genetičkoj i molekularnoj analizi, poboljšanje

istry of Science through the grant programme for the establishment of Centres of Excellence.

FoodHub in the Director's words
"The globalization of the food market, climate change, and changes in lifestyles are just some of the threats that endanger food safety and food quality, and ultimately public health. We are witnessing more and more frequent food-related incidents and that is why people are turning back to domestic products of proven origin and quality. What is important here is that the measures related to the production of safe and high-quality food are based on overcoming problems by applying a multidisciplinary approach with the equal participation of the science sector, producers, and consumers. The provision of safe and healthy food is a key goal for every country. In Montenegro, significant efforts continue to be made to ensure both the safety and quality of the food that is produced in the country. However, it remains of particular importance to provide a scientifically-based, innovative assessment of the potential risks associated with each stage of the food production chain. The Centre of Excellence was founded to provide precisely that service."
The overall goal of FoodHub is to offer reliable, science-based solutions for food safety risk elimination and hazard identification, digitalized food safety risk assessment tools, reliable certification and tracing of food authenticity, promotion, and ready-to-use applications for the food production industry and tourism sector in Montenegro. Besides

i standardizaciju proizvodne tehnologije, te stvaranje novih patenata.

Konzorcijum čini 12 institucija pod rukovodstvom Univerziteta Donja Gorica.
Izvrsnost naših partnera garant je uspjeha!

Konzorcijum će dalje rješavati gorući problem
nedostatka stručnosti i obuke u ekselentnim naukama u Crnoj Gori, kao što su bioinformatika, molekularna biologija, genomika, uz permanentno jačanje sektora nauke o hrani. Takođe, predviđeni su i programi obuke fokusirani prvenstveno na mlade istraživače koji će se obučavati u međunarodnim naučnim partnerskim institucijama kako bi vratili nedostajuće znanje u Crnu Goru i održali dugoročnu saradnju sa njima.
FoodHub ima važnu misiju: da unaprijedi i valorizuje postojeće snage crnogorske proizvodnje hrane, te da stvori kritičnu masu naučnika, kompanija i stranih partnera koji će obezbijediti kontinuirani razvoj održive proizvodnje hrane, u skladu sa politikama EU. Vjerujemo da će stvaranje sinergije između crnogorskih institucija i stranih partnera, kao i zajednička odgovornost naučnika, proizvođača hrane i kreatora politike obezbijediti održivost i dugoročnost ovog projekta.

Za više informacija posetite:
https://foodhub.udg.edu.me/

the structured, scientific assessment of the risks involving biomolecular and genetic analysis, FoodHub will address the necessity to develop appropriate software with integrated data management, data linkage, and interactive food chain analyses. The software will enable an all-in-one analysis of cross-contamination, geographical relations, clustering, and tracing. The consortium's mandate is to develop a scientific foundation for food safety risk assessment, valorization, production optimization based on genetic and molecular analysis, improvement and standardization of production technology, and creation of new patents.

The consortium consists of 12 institutions under the leadership of the University of Donja Gorica.
The excellence of our partners is a guarantee of success!

The consortium will also address the burning problem of lack of expertise and training in cutting-edge science in Montenegro such as bioinformatics, molecular biology, genomics, as well as strengthen the food science sector. We also envisage specialized training programs at international scientific partner institutions primarily focused on our young researchers and their career development who will bring missing expertise to Montenegro and maintain established collaborations.
FoodHub has an important mission: to enhance and valorize existing strengths of Montenegrin food production, and to create a critical mass of scientists, companies, and foreign partners that will secure continuous development of sustainable food production, in line with the EU policies. We believe that creating synergy between Montenegrin institutions and foreign partners, and shared responsibility among scientists, food producers, and policymakers will ensure the sustainability and long life of this project.

For more information visit:
https://foodhub.udg.edu.me/en/

Mamex kompanija u susret inovacijama
Mamex company – to meet innovation

WP.5, outcome 5.5.
Improved knowledge of agriculture businesses about ICT in agriculture

Od 10. do 11. maja održan je sastanak u sklopu tekućeg projekta VIRAL, a domaćin je ovaj put bio Poljoprivredni fakultet Univerziteta „Bijeljina“. Nakon pozdravne riječi dekana Poljoprivrednog fakulteta prof. dr Bore Krstića, učesnici su imali priliku da kroz planirane tačke dnevnog reda u oba dana, razmotre činjenice i dogovore dalje aktivnosti vezane za radne pakete (WP3, WP2, WP 4 i WP8). U sklopu sastanka učesnici su posjetili poljoprivredno gazdinstvo Lazić iz obližnjeg sela Golo Brdo.

Ovo poljoprivredno gazdinstvo se duži vremenski period uspješno bavi proizvodnjom i preradom domaćih poljoprivrednih proizvoda, a na tržištu su poznati pod robnom markom kompanije „Mamex”.

Vlasnik kompanije je tom prilikom rekao da je kompanija „Mamex” formirana 2007. godine, te da je osnovana isključivo da bi se bavila otkupom i izvozom poljoprivrednih proizvoda. U tom periodu, kako je istakao vlasnik preduzeća, Rumunija, Hrvatska, Srbija bili su kupci za široku paletu proizvoda koju su nudili domaći proizvođači iz Semberije i Lijevče polja. Razvijanjem poslovanja kompanija nabavlja opremu za plastenički proizvodnju, te pakovanje i sor-

From the 10th to 11th May at the Faculty of Agriculture of the Bijeljina University, VIRAL project meeting was held. After the welcoming speech of the Dean of the Faculty of Agriculture prof. dr Boro Krstić, the participants had the opportunity to discuss the facts and agree on further activities related to work packages (WP3, WP2, WP 4 and WP8) according to agenda. As part of the meeting, the participants visited the agricultural holding Lazić from the nearby village Golo Brdo.

This agricultural holding has been successfully engaged in the production and processing of domestic agricultural products for a long time, and it is recognised under the brand name Mamex.

During the visit, the owner of the company said that the Mamex was formed in 2007 and established exclusively to deal with the purchase and export of agricultural products. In that period, as the owner pointed out, Romania, Croatia and Serbia were customers for a wide range of products offered by domestic producers from Semberija and Lijevče polje. By developing its business, the company Mamex procures equipment for greenhouse production, packaging and sort-

tiranje poljoprivrednih proizvoda i samo ulazi u proizvodnju poljoprivrednih proizvoda i uzima značajnu ulogu u snabdijevanju domaćih lanaca trgovina i tržnica širom BiH.

Velikom posvećenošću, dobrom organizacijom i poslovnom politikom, kompanija 2018. godine pokreće ideju o izgradnji fabrike za preradu povrća. Izgradnjom prizvodnog kapaciteta od 1000t gotovog proizvoda prerađuju viškove vlastite proizvodnje, kao i tržišne, u sjedištu firme na teritoriji Semberije. Samim tim pokreću brend „Od njive do trpeze“ i podržavaju akciju „Kupujmo domaće“.

U toku 2019. i početkom 2020. godine preduzeće gradi, te dovodi do završetka proizvodni pogon za preradu svježeg povrća iz domaće i vlastite proizvodnje.

Osim toga, Mamex doo posjeduje vlastitu proizvodnju cvekle, krastavaca, paprika, koju planira preraditi u svom pogonu. Kako ističe vlasnik kompanije, za prerađenu sirovinu ima zainteresovanih kupaca koji bi otkupili cjelokupnu proizvodnju i podržali ideju „Od njive do trpeze“ – kupujmo domaće.

Za više informacija posetite:
http://viralerasmus.org/en/mamex-company-to-meet-innovation/

Pripremili/Prepared by:
Miroslav Nedeljković, UBN
Boro Krstić, UBN
Jovana Vujić, UBN

ing of agricultural products and only enters the production of agricultural products and takes a significant role in supplying domestic chains of stores and markets throughout Bosnia and Herzegovina.

With great dedication and good organisation and business policy, the company launched the idea of building a vegetable processing factory in 2018. By building the production capacity of 1000t of finished product, it processes the surplus of its own production, as well as market, at the company's headquarters in Semberija. Thus, they are launching the brand "From the field to the table", and they are supporting the "Let's buy local" campaign.
During 2019 and the beginning of 2020, the company was building, and bringing to completion, a production plant for processing fresh vegetables from domestic and own production.

In addition, doo Mamex owns its own production of beets, cucumbers, peppers, which it plans to process in its plant. As the owner of the company points out, there are buyers interested in processed raw material who would buy the entire production and support the idea from the field to the table - let's buy domestic.

For more information visit:
http://viralerasmus.org/en/mamex-company-to-meet-innovation/

IoT u poljoprivredi
IoT for agriculture

WP.2, outcome 2.1.
Improved competences of use of ICT in agriculture

Mnogi poljoprivredni subjekti moraju uložiti ogromne napore kako bi nadgledali svoje usjeve, a napredno tehnološko doba može ponuditi rješenja za unaprijeđenje i pomoć. Na primjer, tehnologija interneta stvari (IoT) za poljoprivredu, poznata kao pametna poljoprivreda, sve više dobija na zamahu. Kao i kod primjene IoT-a u domovima, pametnim gradovima, logistici, zdravstvu, proizvodnji i drugim poljima, pametna poljoprivreda ima prednosti i izazove, a ovaj članak će podijeliti neke uvide u to kako započeti s njegovom primjenom.

Tržište pametne poljoprivrede bilježi značajan porast proteklih godina, dijelom zahvaljujući napretku i implementaciji tehnologija poput umjetne inteligencije (AI) i interneta stvari u pametnoj poljoprivredi i sve većeg pritiska na sistem snabdijevanja hranom, zahvaljujući brzo rastućoj populaciji. Svjetski ekonomski forum predviđa da će globalna populacija dostići 9,8 milijardi do 2050. godine, što znači da će se potencijalno morati uzgajati čak i duplo više od količine hrane u odnosu na trenutno stanje – uz postojeće ograničene resurse kao što su zemlja i voda. S druge strane, veliki uticaj su imale i klimatske promjene kao što su ekstremno vrijeme, propadanje tla i nedostatak hidratacije zemljišta. Uz nepredvidivu dinamiku današnje klime, nestabilne situacije tjeraju poljoprivredne kompanije da pokrenu projekte pametne poljoprivrede.

U poljoprivrednim aktivnostima gotovo dvije trećine aktivnosti spadaju u postupke nadzora dok samo jedna trećina uključuje radove na poljoprivrednim imanjima. Upravo za te postupke nadzora IoT sistemi predstavljaju logično rješenje.

Sa pametnim senzorima koji automatski prate svaki aspekt svakodnevnog rada, IoT tehnologija za poljoprivredu omogućava poljoprivrednicima da automatiziraju prik-

Many farmers have to put in tremendous effort to monitor their crops, and the advanced technological age can offer solutions for improvement and assistance. For example, Internet of Things (IoT) technology for agriculture, known as smart agriculture, is gaining momentum. However, as with the application of IoT in homes, smart cities, logistics, healthcare, manufacturing and other fields, smart agriculture has advantages and challenges. This article will share some insights on how to get started.

The smart agriculture market has grown significantly thanks to the advancement and implementation of technologies such as artificial intelligence (AI) and the Internet of Things in smart agriculture and increasing pressure on the food supply system, thanks to a rapidly growing population. The World Economic Forum predicts that the global population will reach 9.8 billion by 2050, which means that it will potentially have to increase even twice the amount of food compared to the current situation - with existing limited resources such as land and water. On the other hand, climate change such as extreme weather, soil degradation and lack of soil hydration has also had a significant impact. With the unpredictable dynamics of today's climate, unstable situations are forcing agricultural companies to launch smart agriculture projects.

In agricultural activities, almost two thirds of the activities fall under the control procedures, while only one third includes works on agricultural holdings. Therefore, these procedures for monitoring the IoT system represent a logical solution.

With smart sensors that automatically monitor every aspect of daily work, IoT technology for agriculture allows farmers to automate real-time data collection. This leads to increased production, reduced

upljanje podataka u realnom vremenu kako bi povećali obim proizvodnje, smanjili troškove i upravljali resursima, te poboljšali ukupnu efikasnost u mnogim različitim aspektima poljoprivrede.

Veliki broj prikupljenih podataka se može analizirati po unaprijed utvrđenim algoritmima i taj zadatak se može najbolje uraditi primjenom aplikacija u oblaku. Kreirane informacije se onda u odgovarajućem obliku prezentiraju poljoprivrednicima putem aplikacija na uređajima kao što su pametni telefoni, tableti i računari.

Korištenjem poljoprivrednih pametnih uređaja, životni ciklus usjeva i okolišne uslove uzgoja lakše je pratiti u realnom vremenu. Internet stvari za poljoprivredu može pomoći poljoprivrednicima da prate upotrebu vode i gustinu nutrijenata i prilagode količinu korištenih gnojiva i pesticida. Na ovaj način farmeri mogu osigurati optimalne prinose žetve i poboljšane sisteme upravljanja poljoprivredom.

Dugoročno gledano, potencijal pametne poljoprivredne industrije se još uvijek razvija, pa se prednosti pametne poljoprivrede zasnovane na IoT-u razlikuju. Ali neki od glavnih uključuju:

- Prikupljanje podataka

Najvrednija karakteristika IoT tehnologije je mogućnost prikupljanja podataka. Uz sisteme za praćenje i analizu u realnom vremenu, podaci prikupljeni pametnim senzorima omogućavaju farmerima bolju kontrolu procesa. Pametni poljoprivredni senzori mogu obavijestiti poljoprivrednike o mogućim promjenama u vremenu, kvaliteti zraka i tla, vlažnosti i drugim faktorima koji utiču na rast usjeva. Veoma važno je naglasiti da prikupljeni realni podaci pružaju mogućnost vođenja sistema na bazi podataka a ne kao što je to bilo kod klasičnih sistema na bazi iskustva.

- Kvalitet proizvoda

Poljoprivreda predvođena prikupljenim podacima može pomoći da se lakše definira ciklus usjeva. Uz ekosistem povezan s internetom stvari, održavanje zdravlja svakog usjeva ili odgovarajućeg stanja tla može pomoći performansama. Široka upotreba dronova za zračni nadzor, senzori tla ili usjeva također pomaže u poboljšanju kvaliteta proizvoda.

- Upravljanje troškovima i resursima

costs, managed resources, and improved overall efficiency in many different aspects of agriculture.

A large number of collected data can be analyzed according to predefined algorithms, and this task can best be done by using cloud applications. The information created is then presented to farmers in an appropriate form through applications on devices such as smartphones, tablets and computers.

Using agricultural smart devices makes crop life cycles and environmental growing conditions easier to monitor in real-time. For example, the Internet of Things for Agriculture can help farmers monitor water use and nutrient density and adjust fertilizers and pesticides. In this way, farmers can ensure optimal harvest yields and improve agricultural management systems.

In the long run, the potential of the smart agricultural industry is still evolving, so the benefits of IoT-based smart agriculture vary. But some of the main ones include:

- Data collection

The most valuable feature of IoT technology is the ability to collect data. In addition to real-time monitoring and analysis systems, data compiled by smart sensors allow farmers to control the process better. For example, smart agricultural sensors can inform farmers about possible changes in weather, air and soil quality, humidity and other factors that affect crop growth. It is very important to emphasize that the collected real data provide the possibility of managing systems based on data and not as it was with classic systems based on experience.

- Product quality

Agriculture led by the collected data can help define the crop cycle more efficiently. With an ecosystem connected to the Internet of Things, maintaining the health of each crop or the appropriate soil condition can help performance. The widespread use of drones for aerial surveillance, soil sensors or crops also helps to improve product quality.

- Cost and resource management

Smart sensors help mitigate the risk of overuse of resources, and the high cost of those resources mitigates the initial capital cost of investing in IoT devices. As a result, process agility helps farmers focus on using the right

Pametni senzori pomažu u ublažavanju rizika od prekomjerne upotrebe resursa, a visoki troškovi tih resursa ublažavaju početni kapitalni trošak za ulaganje u IoT uređaje. Kao rezultat toga, agilnost procesa pomaže poljoprivrednicima da se fokusiraju na korištenje prave količine resursa, pomažući farmerima da definiraju pouzdane metrike za upravljanje troškovima i resursima. Veoma je važno pojoprivrednicima predočiti ekonomsku analizu uvođenja IoT sistema jer početna ulaganja mogu dovesti da se veliki broj poljoprivrednika ne odluči za prihvatanje IoT tehnologije.

- Poboljšano upravljanje aktivnostima

Na osnovu podataka koje generišu pametni senzori, tehnologije pametne poljoprivrede mogu dodati vrijednost cjelokupnom upravljanju aktivnostima. Kako se proces uzgoja usjeva poboljšava, tako se poboljšava i produktivnost osoblja, efikasnost opreme i ukupni uslovi rada.

- Smanjen uticaj na životnu sredinu

Svi napori za očuvanje životne sredine – tj. optimizirano korištenje zemljišta i vode – pozitivno utječu na okoliš. Rješavanje gubitka i rasipanja hrane ključno je za postizanje klimatskih ciljeva i smanjenje stresa na okoliš.

Kako se tačno IoT primjenjuje u poljoprivredi?

U osnovi, IoT u poljoprivredi fokusira se na prikupljanje podataka o prinosima i stoci, procjenu njihovog zdravlja i podsticanje rješenja za odgovarajuća pitanja efikasnije od oslanjanja samo na ljudske resurse. Ukratko, funkcija IoT-a u poljoprivredi je da unese kružni proces ispitivanja, nadzora, donošenja odluka i djelovanja u postupak poljoprivrede. Prvo, senzori vrše tačna mjerenja stanja životinje ili usjeva. IoT sistem ima čvorove koji izvršavaju zadatke prikupljanja podataka od senzora te putem aktuatora djeluju na okruženje. IoT čvorovi su putem telekomunikacionog sistema povezani na IoT platforme u oblaku. Podaci sa IoT čvorova se akumuliraju i prenose na platformu u oblaku gdje se procjenjuju, a odobravaju se u zavisnosti od propisanih ograničenja ili kriterija. Ogromna količina podataka sažeta je i skraćena u format koji lako mogu protumačiti agronomi ili određene softverske tehnologi-

amount of resources, assisting farmers in defining reliable metrics for managing costs and resources. It is very important to present to farmers the economic analysis of the introduction of IoT systems because the initial investment can lead to a large number of farmers to avoid the introduction of IoT technology.

- Improved activity management

Based on data generated by smart sensors, smart agriculture technologies can add value to overall activity management as the crop cultivation process improves, staff productivity, equipment efficiency, and general working conditions.

- Reduced environmental impact

All efforts to preserve the environment - i.e. optimized land and water use - positively impact the environment. Addressing food loss and waste is key to achieving climate goals and reducing environmental stress.

How exactly is IoT applied in agriculture?

The IoT in agriculture focuses on collecting data on yields and livestock, assessing their health, and encouraging solutions to relevant issues more efficiently than relying solely on human resources. In short, the function of the IoT in agriculture is to introduce a circular process of testing, supervision, decision-making and action into the agricultural revolution.
First, the sensors make accurate measurements of the condition of the animal or crop. The IoT system has nodes that perform tasks of collecting data from sensors and act on the environment through actuators. IoT nodes are connected to the IoT platforms in the cloud via a telecommunication system. The data from IoT nodes is then accumulated and transferred to the cloud platform, where it is evaluated and approved subject to prescribed restrictions or criteria. Next, the vast amount of information is condensed and shortened into a format that agronomists or software technologies can easily interpret. This process is called creating information for end users. Finally, appropriate actions are performed based on them. The result can be the activation of actuators for irrigation, opening or closing of greenhouses, etc.

je. Ovaj proces se naziva kreiranje informacija za konačne korisnike. Na osnovu istih se vrše odgovarajuće radnje. Rezultat može biti aktiviranja aktuatora za navodnjavanje, otvaranje ili zatvaranje staklenika i sl.

Ipak, povećana efikasnost je svakako najočigledniji rezultat. Imajući relevantne i odgovarajuće podatke na dohvat ruke 24 sata, poljoprivrednicima više nije težak zadatak da donose odluke o zdravlju životinja ili osnovnim tretmanima usjeva. Oni također mogu predvidjeti žetve i organizirati povezane troškove rada ili logistike. Dakle, gotovo da nema sumnje da je IoT usko povezan s automatizacijom, i shodno tome, vodi ka manjem trošenju ljudskih resursa.

Na kraju možemo reći da pametna ili precizna poljoprivreda pruža bolje mogućnosti za proizvodnju i rast poljoprivrednicima u posljednjih nekoliko godina, ali je stopa usvajanja relativno spora. Glavni izazovi uključuju nedostatak dobre povezanosti ili loše performanse mreže, upravljanje ogromnim količinama podataka te strma kriva učenja.

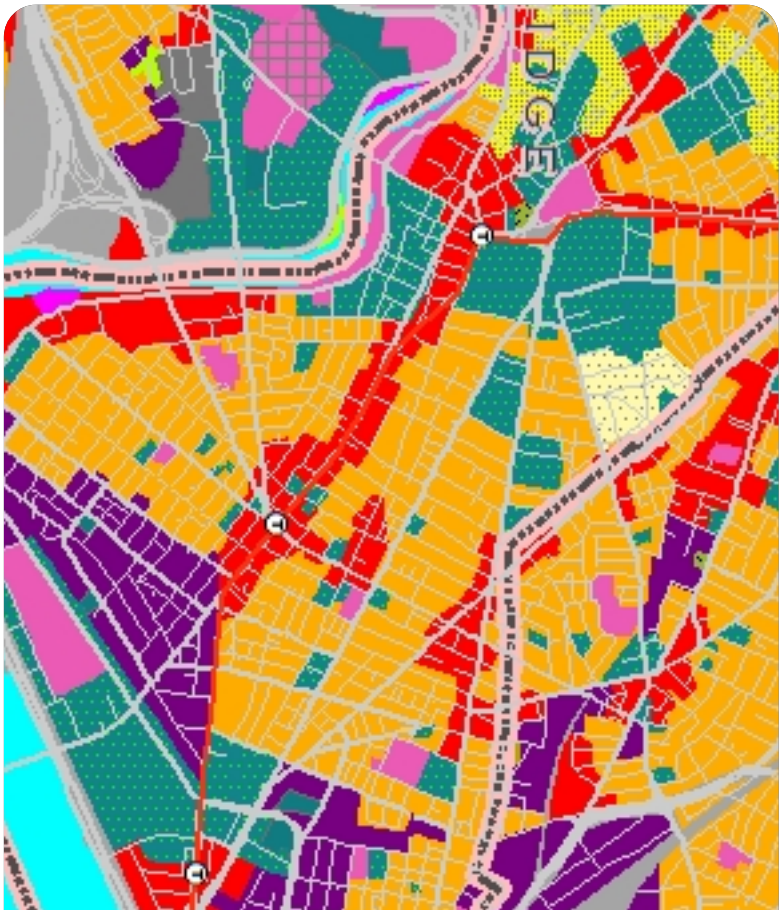
Da zaključimo, stabilno povećanje obima poljoprivredne proizvodnje treba da ide u korak sa rastom stanovništva. Usvajanje Interneta stvari je najnoviji pristup za povećanje efikasnosti poljoprivrede i ukupnog prihoda. Iako još uvijek postoje zabrinutosti u vezi s implementacijom pametne poljoprivrede, one se vremenom rješavaju i ublažavaju, a potencijalne složenosti je lako prevladati kada unaprijed shvatite koncept.

Pripremili/Prepared by:
Alma Šećerbegović, UNTZ
Aljo Mujčić, UNTZ

However, increased efficiency is undoubtedly the most obvious result. With relevant and relevant data at hand 24 hours a day, it is no longer a difficult task for farmers to make decisions about animal health or essential crop treatments. They can also anticipate harvests and organize associated labour or logistics costs. Thus, there is almost no doubt that IoT is closely related to automation, leading to less human resource consumption.

In the end, we can say that smart or precision agriculture has provided better opportunities for production and growth to farmers in recent years, but the adoption rate is relatively slow. The main challenges include lack of good connectivity or poor network performance; managing vast amounts of data and steep learning curves.

In conclusion, a steady increase in agricultural production should keep pace with population growth. Adopting the Internet of Things is the latest approach to smart agriculture and total income efficiency. Although there are still concerns about implementing smart agriculture, they are resolved and mitigated over time, and potential complexities are easy to overcome once you understand the concept in advance.



VIRAL prezentacija na UNMO
VIRAL presentation at UNMO

WP.7, outcome 7.4.
Disseminated project results

Na Agromediteranskom fakultetu Univerziteta „Džemal Bijedić“ održana je prezentacija međunarodnih projekata na kojima je Univerzitet bio uključen u 2020. godini. Ovo je bio osmi po redu događaj organizovan povodom proslave 44 godine osnivanja Univerziteta „Džemal Bijedić“ u Mostaru.Danas je na Agromediteranski fakultet. Ukupno je predstavljeno jedanaest Erasmus CBHE projekata.
Doc.dr. Alisa Hadžiabulić je ovom prilikom predstavila projekat Vitalising ICT relevance in Agricultural learning – VIRAL.
Prezentacija je sadržavalaosnovne detalje implementacijskih aktivnosti pr ojekta. Napravljen je pregled radnih paketa, i predstavljene su aktivnosti implementirane u 2020., koje su se uspjele uspješno završiti usprkos COVID pandemiji.

Prezentiran je plan budućih aktivnosti sa posebnim osvrtom na organitaciju hakatonu planiranu za proljeće 2021. godine u Mostaru, Banja Luci i Nikšiću. Akcenat je stavljen na učestvovanje studenata sa fakulteta in-

The presentation of international projects in which the University was involved in 2020 was held at Agromediterranean faculty University “Džemal Bijedić”. This was the eighth event organized on the occasion of the celebration of the 44th anniversary of the founding of the University “Džemal Bijedić” in Mostar. Today, the hosts was the Agromediterranean faculty. A total of eleven Erasmus CBHE projects were presented
On this occasion, Alisa Hadžiabulić asist.prof. presented the project Vitalising ICT relevance in Agricultural learning - VIRAL.
The presentation contained basic details of the project implementation activities. An overview of the work packages was made, and the activities implemented in 2020 were presented, which were successfully completed despite the COVID pandemic.

The plan of future activities was presented with a special focus on the organization of the hackathon planned for the spring of 2021 in Mostar, Banja Luka and Nikšić. Emphasis was placed on the participation of students

formacijskih tehnologija, elektrotehnike i agronomije zajedno.

Predstavljen je i plan razvoja specifičnih kurseva koji se planiraju, kao i pripremu velikog EXPO događaja.
Ovo je bio tradicionalan događaj, na kojem svi fakulteti Univerziteta „Džemal Bijedić“ u Mostaru predstavljaju svoj međunardni rad. Agromediteranski fakultet prestavlja svoje partnerske projekte već petu godinu za redom.

Za više informacija posetite:
https://www.unmo.ba/novosti/posts/2021/february/prezentacija-medunarodnih-projekata/

Pripremili/Prepared by:
Alisa Hadžiabulić UNMO

from the faculties of information technology, electrical engineering and agronomy together.

A plan for the development of specific courses which are planned was also presented, as well as the preparation of a major EXPO event.

This was a traditional event, at which all faculties of the “Džemal Bijedić” University in Mostar present their international work. The Agromediterranean faculty is presenting its partnership projects for the fifth year in a row.

For more information visit:
https://www.unmo.ba/novosti/posts/2021/february/prezentacija-medunarodnih-projekata/

IKT u poljoprivredi važan, ali još uvek nedovoljno razvijen segment

ICT in agriculture is an important but still underdeveloped segment

WP.7, outcome 7.4.
Disseminated project results

U sklopu X Međunarodnog naučnog simpozijuma i XXVI savjetovanja inženjera poljoprivrede Republike Srpske AGRORES 2021, organizovana je panel sekcija pod nazivom "INFORMATIVE COMMUNICATION TECHNOLOGIES AND AGRICULTURE – HOW MUCH DO WE KNOW, AND HOW MUCH DO WE ACTUALLY APPLY IN REGULAR PRODUCTION?". Panel sekcija je organizovana u okviru Erasmus+ VIRAL projekta. Panelisti su bili prof. dr. Vesna Maraš, sa Univerziteta Donja Gorica, prof. dr Radovan Stojanović, sa Univerziteta Crne Gore, Mr Mirko Jokić iz Ministarstva Poljoprivrede, šumarstva i vodoprivrede Republike Srpske i Mr Milan Šipka sa Poljoprivrednog fakulteta Univerziteta u Banjoj Luci. Moderator panela je prof. dr Miljan Cvetković sa sa Poljoprivrednog fakulteta Univerziteta u Banjoj Luci. Na panelu su učestvovali nastavnici i istraživači sa Univerziteta u Banjoj Luci, Univerziteta u Beogradu i Univerziteta u Novom Sadu. Zaključeno je da je IKT poželjan alat u pojedinim segmentima poljoprivredne proizvodnje, relativno skup ali i dosta pojednostavljen za korišćenje.

Za više informacija posetite:
http://viralerasmus.org/ikt-u-poljoprivredi-vazan-ali-jos-uvek-nedovoljno-razvijen-segment/

Pripremili/Prepared by:
Miljan Cvetković, UNIBL

As part of the X International Scientific Symposium and XXVI Conference of Agricultural Engineers of the Republic of Srpska AGRORES 2021, a panel section entitled "INFORMATIVE COMMUNICATION TECHNOLOGIES AND AGRICULTURE – HOW MUCH DO WE KNOW, AND HOW MUCH DO WE ACTUALLY APPLY IN REGULAR PRODUCTION?" was organized. The panel section eas organized within the Erasmus + VIRAL project. The panelists were professor Vesna Maraš, from the University of Donja Gorica, professor Radovan Stojanovic, from the University of Montenegro, MA Mirko Jokic from the Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska and MSC Milan Šipka from the Faculty of Agriculture, University of Banja Luka. The moderator of the panel was professor Miljan Cvetkovic from the Faculty of Agriculture, University of Banja Luka. Teachers and researchers attended the panel from the University of Banja Luka, the University of Belgrade and the University of Novi Sad. It was concluded that ICT is a desirable tool in some segments of agricultural production, relatively expensive but also quite simplified to use.

For more information visit:
http://viralerasmus.org/en/ict-in-agriculture-is-an-important-but-still-underdeveloped-segment/

Alisa Hadžiabulić predstavila rezultate istraživanja u okviru WP1 na skupu Agrores 2021

Alisa Hadžiabulić presented the results of the research within WP1 at the Agrores 2021 conference

WP.7, outcome 7.4.
Disseminated project results

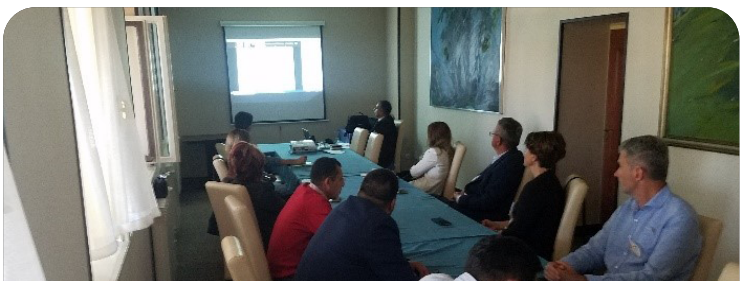
U sklopu X Međunarodnog naučnog simpozijuma i XXVI savjetovanja inženjera poljoprivrede Republike Srpske AGRORES 2021, rezultati istraživanja u okviru Erasmus+ VIRAL projekta prezentovani su u formi rada pod nazivom "Comparative analysis of University-business cooperation in agriculture in the Western Balkans and EU". Istraživanja su deo aktivnosti u okviru radnog paketa WP1. Rad je predstavila Alisa Hadžiabulić, sa Univerziteta "Džemal Bijedić" Mostar.

Za više informacija posetite:
http://viralerasmus.org/alisa-hadziabulic-predstavila-rezultate-istrazivanja-u-okviru-wp1-na-skupu-agrores-2021/

As part of the X International Scientific Symposium and XXVI Conference of Agricultural Engineers of the Republic of Srpska AGRORES 2021, the results of research within the Erasmus + VIRAL project were presented in the form of a paper entitled "Comparative analysis of University-business cooperation in agriculture in the Western Balkans and EU". The research is part of the activities within the WP1 work package. The paper was presented by Alisa Hadžiabulić, University "Džemal Bijedić", Mostar

For more information visit:
http://viralerasmus.org/en/alisa-hadziabulic-presented-the-results-of-the-research-within-wp1-at-the-agrores-2021-conference/

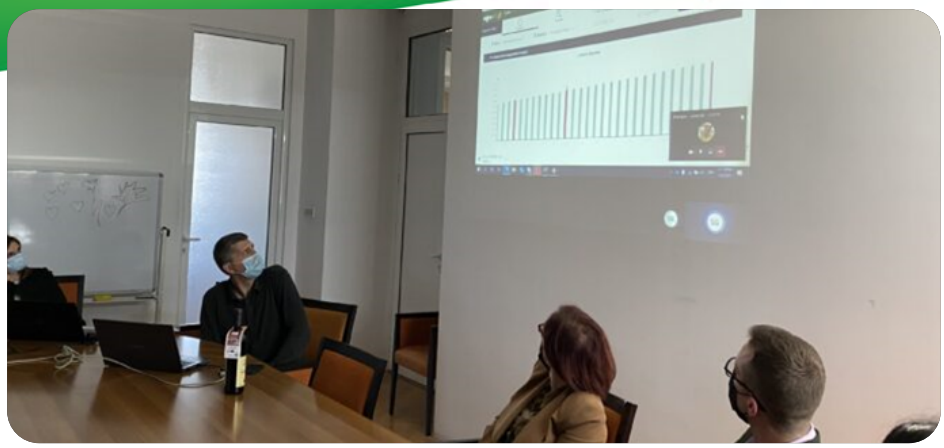
Pripremili/Prepared by:
Miljan Cvetković, UNIBL
Alisa Hadžiabulić, UNMO



Predstavljanje projekata o preciznom vinogradarstvu i digitalnoj poljoprivredi

Presenting Projects on Precision Viticulture and Digital Farming

WP.7, outcome 7.4. Disseminated project results



Kompanija 13. jula Plantaže i Univerzitet Donja Gorica su bili organizatori sastanka za rukovodstvo kompanije i zaposlene na kojem su predstavljeni projekti o preciznom vinogradarstvu i digitalna rešenja za primenu u vinskoj industriji. Nekoliko prezentacija održali su predstavnici sektora za razvoj u Plantažama, Univerzitetu Donja Gorica i kompanija DunavNET. Najistaknutije su bile prezentacije projektnih aktivnosti pod H2020 DEMETER, DIPOL (Ministarstvo nauke Crne Gore), Erasmus + VIRAL i H2020 TagItVine. Izlagači su dali hronologiju razvoja partnerstva i razgovarali o rezultatima postignutim kroz ove projekte. Posebna pažnja posvećena je predstojećim aktivnostima u okviru projekta H2020 DEMETER i mogućnosti organizovanja edukativnih događaja i radionica za zaposlene u kompaniji za upotrebu instalirane precizne opreme za vinogradarstvo i digitalnog sistema upravljanja farmama.

Za više informacija posjetite:
http://viralerasmus.org/predstavljanje-projekata-o-preciznom-vinogradarstvu-i-digitalnoj-poljoprivredi/

Pripremili/Prepared by:
Jovana Drobnjak, UDG
Tomo Popović, UDG

Company 13. jul Plantaže and University of Donja Gorica organized a meeting for the management and employees of Plantaze to present projects on precision viticulture and digital solutions for applications in the wine industry. Several presentations were given by the representatives from the Development sector in Plantaze, University of Donja Gorica, and DunavNET. The most prominent were the presentations of project activities under H2020 DEMETER, DIPOL (Ministry of Science of Montenegro), Erasmus+ VIRAL, and H2020 TagItWine. The presenters gave the chronology of the partnership development, and discussed the results achieved through these projects. A special attention was given to the upcoming activities under H2020 DEMETER project and the possibility to organize training events and workshops for the company employees to use the installed precision viticulture equipment and digital farm management system.

For more information visit:
http://viralerasmus.org/en/presenting-projects-on-precision-viticulture-and-digital-farming/

Precizna poljoprivredna u okviru projekta VIRAL na MECO 2021 konferenciji

Presentation of Smart/Precise agriculture results on MECO 2021 Conference

WP.7, outcome 7.4.
Disseminated project results

Ove godine projekat VIRAL je predstavljen na MECO konferenciji. Projektni partneri iz kompanije „13. Jul Plantaže“, Crnogorsko udruženje za nove tehnologije (MANT), Univerzitet Donja Gorica i Univerzitet u Banjoj Luci, predstavili su rad pod nazivom „Izvodljiv IoT-bazirani sistem za preciznu poljoprivredu“. U radu je prikazan razvoj primene digitalnih tehnologija u oblasti poljoprivrede, sa novim primenama i dizajnerskim rešenjima, što doprinosi primeni tehnologija koje podržavaju pametne računare. Autori rada su Radovan Stojanović, Vesna Maraš, Sanja Radonjić, Anita Martić, Jovan Đurković, Katarina Pavićević, Vasilije Mirović i Miljan Cvetković.
MECO pruža priliku naučnicima, inženjerima i istraživačima da razgovaraju o novim aplikacijama, problemima dizajna, idejama, rešenjima, rezultatima istraživanja i razvoja, iskustvima i radu u toku u ovim važnim tehnološkim oblastima.
MECO je konferencija najvišeg naučnog i stručnog priznanja, indeksirana u istaknutim bazama podataka ili digitalnim bibliotekama kao IEEE xPlore. SCOPUS, WoS, Microsoft Academic itd

Za više informacija posjetite:
http://viralerasmus.org/en/presentation-of-results-of-the-work-of-the-viral-project-at-the-meco-conference-2021/
https://mecoconference.me/

Pripremili/Prepared by:
Radovan Stojanović, MANT
Jovan Đurković, MANT
Ivan Stojanović, MANT

This year, the VIRAL project was presented at the MECO conference. Project partners from the company “13. Jul Plantaže ”, the Montenegrin Association for New Technologies (MANT), the University of Donja Gorica and the University of Banja Luka, presented a paper entitled“ Feasible IoT-based system for precision agriculture ”. The paper presents the development of digital technologies in the field of agriculture, with new applications and design solutions, which contributes to the application of technologies that support smart computers. The authors of the paper are Radovan Stojanović, Vesna Maraš, Sanja Radonjić, Anita Martić, Jovan Đurković, Katarina Pavićević, Vasilije Mirović and Miljan Cvetković. MECO provides an opportunity for scientists, engineers and researchers to discuss new applications, design problems, ideas, solutions, research and development results, experiences and work in progress in these important technological areas. MECO is a conference of the highest scientific and professional recognition, indexed in prominent databases or digital libraries as IEEE xPlore. SCOPUS, WoS, Microsoft Academic, etc.

For more information visit:
http://viralerasmus.org/en/presentation-of-results-of-the-work-of-the-viral-project-at-the-meco-conference-2021/
https://mecoconference.me/

Predstavljanje projekta VIRAL na MECO 2021 konferenciji

Project presentation on MECO 2021 Conference

WP.7, outcome 7.4.
Disseminated project results

Ove godine projekat VIRAL je bio predstavljen u okvirure renomirane MECO konferencije koja se održavala u periodu od 7-10 juna 2021. godine. Profesor Miljan Cvetković je predstavio projekat kao i najznačajnija dostignuća postignuta tokom njegove implementacije sa osvrtom na buduće aktivnosti u toku trajanja ovog projekta. MECO je jedna od najrefentnijih konferencija u oblasti ugrađenog računarstva, sajber- fizičkih sistema kao i internat stvari. MECO konferencija ima faktor uticaja SJR od 2012. godine i H indeks = 7 prema američkoj rang-listi konferencije, a radovi sa MECO konferencije su citirani preko 5.000 puta u Google Scholar-u, dok su odabrani radovi štampani u Elsevierovom časopisu iz SCI. lista „Mikroprocesori i mikrosistemi – MIPRO" . Prema prihvaćenoj metodologiji, MECO je u 20 odsto prvih konferencija iz oblasti hardvera, robotike i elektronike (Hardvare, Robotics & Electronics) i među prvih 20 odsto u oblasti softverskog inženjerstva i programiranja (Softvare Engineering & Programming). Na konferenciji je učestvovalo preko 250 naučnika i istraživača iz preko 40 zemalja sa 5 kontinenata.

Za više informacija posjetite:
http://viralerasmus.org/en/viral-project-presented-at-meco-conference-2021/

Pripremili:
Radovan Stojanović, MANT
Jovan Đurković, MANT
Ivan Stojanović, MANT

This year, the VIRAL project was presented as part of the renowned MECO conference, which was held from June 7-10, 2021. Professor Miljan Cvetković presented the project as well as the most significant achievements achieved during its implementation with reference to future activities during the duration of this project. MECO is one of the most prominent conferences in the field of embedded computing, cyber-physical systems and boarding school. The MECO conference has a SJR impact factor since 2012 and an H index = 7 according to the US conference rankings, and papers from the MECO conference have been cited over 5,000 times in Google Scholar, while selected papers have been published in Elsevier's journal SCI. list "Microprocessors and microsystems - MIPRO". According to the accepted methodology, MECO is in 20 percent of the first conferences in the field of hardware, robotics and electronics (Hardware, Robotics & Electronics) and among the top 20 percent in the field of software engineering and programming (Software Engineering & Programming)

For more information visit:
http://viralerasmus.org/en/viral-project-presented-at-meco-conference-2021/

Viral projekat prezentovan u okviru događaja Noć istraživača

Viral project featured during the Researchers' night event

WP.7, outcome 7.4.
Disseminated project results

Noć istraživača, festival koji je bio održan 24.09. širom Evrope, ove godine održan je i u Crnoj Gori. Organizatori su bili Fondacija za promovisanje nauke PRONA i Prirodnjački muzej Crne Gore.

Dvanaestočasovni program, od podne do ponoći, bio je posvećen nauci i naučnim dostignućima, kao i promjenama koje donose nove tehnologije dramatično mijenjajući svijet.

Tokom sesije tribina istraživač Stevan Čakić izlagao je prezentaciju na temu Vještačka inteligencija sa primjenama i tom prilikom je prezentovan i projekat Viral. Izlaganje možete pronaći na linku.

Pripremili/Prepared by:
Stevan Čakić, UDG
Tomo Popović, UDG

Researchers' Night, the festival held on 24.09. across Europe, was held in Montenegro this year.

The organizers were the Foundation for the Promotion of Science PRONA and the Natural History Museum of Montenegro.

The twelve-hour program, from noon to midnight, was dedicated to science and scientific achievements, as well as the changes brought by new technologies, dramatically changing the world. During the panel session, researcher Stevan Čakić gave presentation on AI and applications that also featured the Viral project.

You can find the presentation at the following link.

INTSIKT 2021: ICT – pokretač procesa digitalne transformacije

INTSIKT 2021: ICT – a driver for digital transformation

WP.7, outcome 7.4.
Disseminated project results

InTsikt 2021. je međunarodni simpozij koji se održava na godišnjem nivou, na kojem industrija, akademska zajednica i vladine institucije razmjenjuju znanje i iskustva unutar ICT domene. Simpozij tradicionalno organizuju Elektrotehnički fakultet - Univerzitet u Tuzli, Elektrotehnički fakultet - Univerzitet u Ljubljani i BIT Centar Tuzla. Glavna tema InTsikta 2021 bila je „ICT-pokretač procesa digitalne transformacije“.

INTSIKT 2021 is an annual international symposium where industry, academia and government institutions exchange knowledge and experiences within the ICT domain. The symposium is traditionally organized by the Faculty of Electrical Engineering University of Tuzla, Faculty of Electrical Engineering University of Ljubljana and BIT Center Tuzla. The main topic of INTSIKT 2021 was “ICT – a driver for digital transformation”.

Otvaranje konferencije

InTsikt 2021 održan je 22. i 23. novembra 2021. godine. Zbog pandemije Covid-19, simpozij je održan online putem platforme Zoom. Prvi dan bio je posvećen procesu digitalizacije energetskih mreža, dok je drugi dan bio posvećen digitalnoj transformaciji i upotrebi ICT tehnologija u poljoprivredi.

Opening ceremony

InTsikt 2021 took place on 22. and 23. November, 2020. Due to covid-19 pandemic, this symposium was organized as a hybrid event, including online Zoom event. The first day was dedicated to the digitalization of power systems, and the second day was dedicated to the digital transformation and the ICT technologiies in Agriculture.

Više informacija o simpozijumu INTSIKT može se naći na web stranici simpozijuma: www.intsikt.ba

U okviru simpozijuma je organizirana posebna sekcija: ICT tehnologije u poljoprivredi. U okviru te sekcije održana su tri izlaganja:

1. "Informacijsko komunikacijske tehnologije u poljoprivredi – izazovi u edukaciji (VIRAL, Erasmus + projekat)", prof. dr. Miljan Cvetković, University of Banja Luka, Faculty of Agriculture
2. "SMARTWATER projekat, inovativno upravljanje potrošnjom vode u poljoprivredi u Bosni i Hercegovini", Nataša Čereković, University of Banja Luka, Faculty of Agriculture
3. "Upotreba sigurnosnih tehnologija u zaštiti poljoprivrednih dobara", Tarik Hošić, B. H. T. Code

More information about the INTSIKT symposium can be found on the symposium website: www.intsikt.ba

A special section was organized as part of the symposium: ICT technologies in agriculture. Three presentations were held within that section:
1. "Information and communication technologies in agriculture – challenges in education (VIRAL, Erasmus + project)", prof. dr. Miljan Cvetković, University of Banja Luka, Faculty of Agriculture
2. "SMARTWATER project, innovative agricultural water management in Bosnia and Herzegovina", Nataša Čereković, University of Banja Luka, Faculty of Agriculture
3. "Application of security technologies in the protection of agricultural goods", Tarik Hošić, B. H. T. Code

Detalji sa online konferencije u Tuzli

Cjelokupni dojam je da organizacija online simpozija omogućava posjećenost većeg broja publike na panevropskom nivou te ostvaruje veći uticaj. Zaključak je da takve događaje u budućnosti treba organizovati hibridnim modelom, uz fizičko prisustvo radi održavanja društvenih aktivnosti, zajedno sa online prezentacijama kako bi se dosegla šira publika i ostvario veći uticaj.

Details from oline conference held in Tuzla

The overall impression is that organization of online symposium enables reaching more audience at pan-European level and make a higher impact. The conclusion is that such events in the future should be organized with a hybrid model, with physical presence to maintain social activities and networking together with online presentations to reach wider audience and make bigger impact.

Pripremio/Prepared by:
Amera Sinanović, UNTZ

Učešće na rektorskoj konferenciji opravdalo očekivanja

Participation in the rectors' conference justified expectations

WP.7, outcome 7.4.
Disseminated project results

U sklopu rektorske konferencije Republike Srpske, održane u periodu 08-10.10.2021. prof. dr Miljan Cvetković je učestvovao sa predavanjem na temu "Potreba, izazovi i poteškoće učešća u obrazovnim programima Evropske unije – Erasmus+ VIRAL". U sklopu prezentacije predstavljeni su i drugi projekti Evropske unije u kojima je učestvovao Poljoprivredni fakultet Univerzitet u Banjoj Luci sa posebnim akcentom na projekat VIRAL. Na primeru ovog projekta diskutovano je stanje, potreba, izazovi i poteškoće učešća u obrazovnim projektima Evropske komsije.

Za više informacija posetite:
http://viralerasmus.org/ucesce-na-rektorskoj-konferenciji-opravdalo-ocekivanja/

Pripremio/Prepared
Miljan Cvetković, UNIBL

As part of the Rectors' Conference of the Republic of Srpska, held in the period 08-10.10.2021. Prof. Dr. Miljan Cvetković participated with a lecture on "The need, challenges and difficulties of participation in educational programs of the European Union - Erasmus + VIRAL". As part of the presentation, other projects of the European Union were presented, in which the Faculty of Agriculture, University of Banja Luka participated, with a special emphasis on the VIRAL project. On the example of this project, the situation, needs, challenges and difficulties of participation in educational projects of the European Commission were discussed.

For more information visit:
http://viralerasmus.org/ucesce-na-rektorskoj-konferenciji-opravdalo-ocekivanja/

Tijekom Znanstvenog dana
During Science Day

WP.7, outcome 7.4.
Disseminated project results

Češko Sveučilište Prirodnih znanosti u Pragu, zajedno sa Agronomskim i prehrambeno-tehnološkim fakultetom Sveučilišta u Mostaru i Agromediteranskim fakultetom Džemal Bijedić 10.12.2021. održalo je 3. Znanstvene dane sa ciljem popularizacije znanosti u raznim znanstvenim područjima poput ekologije, biotehnologije, zoologije i prehrambene tehnologije. Ovaj događaj dio je projekta Ministarstva vanjskih poslova Republike Češke br. 2021-PKVV-02 „Povećanje znanstveno-istraživačkih kapaciteta i podrška obrazovanju na Sveučilištu u Mostaru i Univerzitetu „Džemal Bijedić“ u Mostaru pod pokroviteljstvom Češke razvojne agencije i Ministarstva vanjskih poslova Češke.
Predstavljen je i Erasmus+ projekt pod nazivom „VIRAL“ koji je važan za suvremenu poljoprivredu koja se u velikoj mjeri temelji na novim tehnološkim rješenjima usko povezanim sa sve većom uporabom informacijskih i komunikacijskih tehnologija (ICT) i različitim softverskim rješenjima, ne samo za praćenje, već i za upravljanje proizvodnim procesima. Oprema nabavljena u sklopu projekta VIRAL prezentirana je u suradnji sa studentima APTF-a.
U isto vrijeme na Agromediteranskom fakultetu Univerziteta “Džemal Bijedić” u Mostaru studenti, učesnici hakatona, su podjelili svoje iskustvo uz prikazivanje after movie-a sa hakatona održanog u Mostaru ove godine.

Czech University of Life Sciences in Prague, together with the Faculty of Agriculture and Food Technology, University of Mostar and the Agromediterranean faculty „Džemal Bijedić“ of Mostar on December the 12th 2021 held the 3rd Science Day with the aim of popularizing science in various scientific fields such as ecology, biotechnology, zoology and food technology. This event is part of the project of the Ministry of Foreign Affairs of the Czech Republic no. 2021-PKVV-02 “Increasing scientific research capacities and supporting education at the University of Mostar and the “Džemal Bijedić” University of Mostar being sponsored by Czech Development Agency.
This was great opportunity for Erasmus + project “VIRAL” to be presented, as the project very important for modern agriculture, largely based on new technological solutions closely related to the growing use of information and communication technologies (ICT) and various software solutions, not only for monitoring but and for managing production processes. Equipment procured within the VIRAL project was presented in cooperation with APTF students.
At the same time, at the Agromediterranean faculty „Džemal Bijedić“ of Mostar, students, participants in the hackathon, shared their experience by showing an after movie from the hackathon held in Mostar this year.

Pripremili/Prepared by
Ana Mandić, SUM
Alisa Hadžiabulić, UNMO

Slika 1. S lijeva na desno: raspberry pi kompleti, leafmetar – uređaj za mjerenje površine lista (skener lisne površine), prijenosno računalo i ekoNet uređaj koji mjeri kvalitetu zraka. Uređaj ekoNet spojen je na prijenosno računalo te se u stvarnom vremenu prikazuju parametri kvalitete zraka.

From left to right: raspberry pi kits, leafmeter - a device for measuring leaf area (leaf surface scanner), laptop and ekoNet device that measures air quality. The ekoNet device is connected to a laptop computer and air quality parameters are displayed in real time.

Slika 2. Prikaz rada skenera lisne površine. Skener se može koristit u kombinaciji s drugim uređajima za brzo dijagnosticiranje opskrbljenosti biljke hranivima. Na slici je prikazan i uređaj za mjerenje dušika u biljnom soku.

Demonstration of leaf surface scanner operation. The scanner can be used in combination with other devices for quick diagnose of the plant's nutrient supply. The figure also shows a device for measuring nitrogen in vegetable juice.

Slika 3. Studenti prezentiraju korištenje skenera lista učenicima iz Mostarskih škola

Students presenting use of lef scanner to the Mostar elementary scool students

Slika 4. Testna komora s mogućnošću programiranja temperature i vlažnosti te osvjetljenja.

Na Znanstvenom danu predstavljeno je korištenje komore za ispitivanje klijavosti sjemena te proizvodnju mikrogreensa i klica. Dio je predstavljen na slici.

Slika 5. Studenti APTF-a pripremaju prezentaciju primjene testne komore u novim trendovima u korištenju hrane.

Test chamber with temperature, humidity and light setting

The use of the chamber for testing seed germination and the production of microgreens and germs was presented at the Science Day. The part is presented in the picture.

APTF students preparing presentation of test chamber use in new novel food trends

Slika6. Jedan od učesnika hakatona u Mostaru predstavlja svoje iskustvo

Figure 6. One of the participants in the hackathon in Mostar presents his experience

Slika 7. Priprema za uzgoj pšenice za analizu listova

Preperation for cultivation of wheat for leaf analyses

VIRAL

VIRAL
Validating ICT Relevance in Agricultural Learning

Prepared by

WEBIN