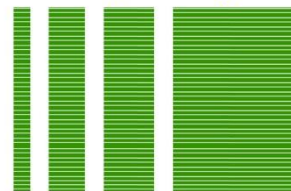# Challenges for Agricultural Education – Digitalization, Internationalization and Sustainable Development

Assoc. Prof. Dr. Svetla Yancheva
Agricultural University – Plovdiv, Bulgaria

STATE-OF-THE-ART

- Bulgaria covers an area of 110 900 km², of which 81 % is rural.

- 46.1 % of the total area is agricultural land and 37.4 % forests.

- 39% of the total population live in rural areas.

- The average agricultural holding in Bulgaria utilizes 12 ha of land, but 91 % of the agricultural holdings have less than 5 ha.

- The age structure of the farming community in Bulgaria is on average older than in the 28 EU member countries:

    6.9% of farmers are under 35 years old (7.5% in EU-28)

    and 37.3% are older than 64 (30% in EU-28).

KEY CHALLENGES FACING THE AGRICULTURE
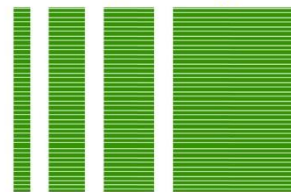
- the increase of the assortment range of crops grown,

- overcoming of unfavorable factors related to the climatic changes,

- control of plant diseases and pests,

- environmental protection against pollution, circular economy and sustainable development

Bulgaria provides an end-to-end solution to developing the AgriFood sector
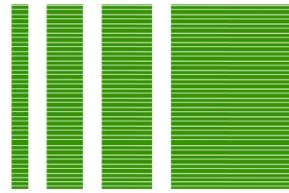
- Unique natural conditions for the cultivation of a wide variety of crops, fruits, and vegetables

- Ecologically clean and fertile soils

- Very high quality of organic products (ban on GMOs)

- Established local producers and a strong tradition in the sector

- Qualified human resources providing agricultural education and science with practical application

- Very high health and environmental protection standards make Bulgarian products fully prepared to meet even the highest and most complex consumer requirements

- The growing demand for new and local foods in Europe and beyond will boost the demand for traditional Bulgarian products, such as:

The tradition called "Bulgaria"

- Rose oil
- Lavender oil
- Fruits and vegetables
- Red and white wine
- Honey
- Peppers
- Meat
- *Lactobacillus Bulgaricus*
- Milk and dairy products
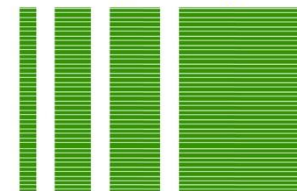- Herbs and medicinal plants

PLOVₑDIV

- The city with ancient history, often referred to "The City of the Seven Hills" and "The Capital of the Agricultural Science"

- Agricultural University
- University of Food Technology

- Fruitgrowing Research Institute
- "Maritca" Vegetable Crops Research Institute
- Institute of Fishery and Aquacultures
- Institute of Food and Canning Industry
- Tobacco Research Institute - Markovo
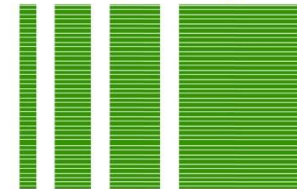- Institute of Plant Genetic Resources – Sadovo
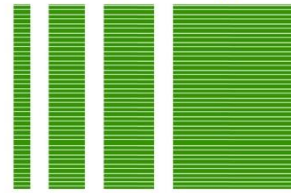
Agriculture in Plovdiv Region

The fertile lands in Plovdiv region preconditioned the cultivation of over 120 different agricultural crops.

It was the basic reason for establishing the Agricultural University in the city.
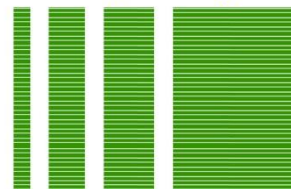
AGRICULTURAL UNIVERSITY

Agricultural University is the only specialized state-funded university in Bulgaria training specialists in all the areas of agriculture, plant and environmental protection, rural development, agribusiness and agro-tourism.

AGRICULTURAL UNIVERSITY

In the last 10 years the Agricultural University occupies the leading position in the Bulgarian University Ranking System in three educational fields:

- Plant Science
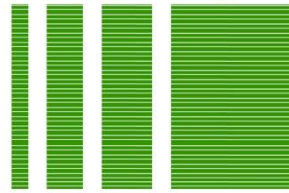- Plant Protection
- Animal Science

Hundreds of foreign citizens have graduated from the Agricultural University, working as esteemed professionals, and experts at governmental positions.

We are proud that the Minister of Agriculture of Czech Republic (2002-2005) –
Mr. Jaroslav Palas was also student at AU.
In 2004 he was awarded with the honorary degree Doctor Honoris Cause of the University .

PRACTICAL TRAINING

The activities are realized on the training-and-experimental fields, spreading on 185 ha round the city of Plovdiv and the village of Brestnik.

More than 1500 biological units, including field crops, pome and stone fruits, vegetables and aromatic plants are grown under high agro-technology, and applying latest innovations .
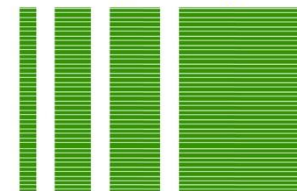
UNIVERSITY VINEYARD AND WINERY

A vineyard was established with a collection of 450 table and wine grape cultivars. The experimental wine cellar produces high quality wines, awarded on many competitions in the country and abroad.

COOPERATION BETWEEN THE AU AND INDUSTRIES ON MODERN AGRICULTURAL TECHNOLOGIES

Cooperation with the industries complies with current requirements on quality of education and practical skills of students according to business needs.

Key activities of our University are directed to:

- Industry as a partner in student education and practice

- Activities related to curricula development and internationalization by ERASMUS+ and bilateral agreements

- R&D projects realized with the participation of agricultural producers

- Establishment of new centers for advanced studies and research.

Industry is our partner

* Discussions with perspective employers on curricula, study programs and the necessary knowledge to be gained at the University;
* Open days, demonstrations and practical training and site visits of students to farms and agricultural enterprises;
* New BSc and MSc courses connected with digitalization of agriculture, animal husbandry and engineering.
* Agricultural managers participate as examiners in the graduates State Exam.

Traditional partners from the industry and the business

R&D projects

Herbitour project has been going on over 20 years and it is implemented on the area of herbicide innovations and technologies for weed control.

University partners are large multinational companies, such as

Bayer Crop Science Bulgaria, BASF, Syngenta, Sumi Agro Bulgaria,

Corteva Agriscience™Bulgaria, etc.

First **Student's Herbitour** was organized in 2021 with 3 field demo-events.
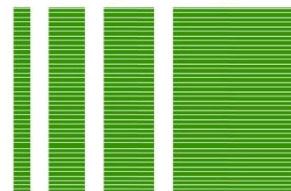
Digital and unmanned technologies for sustainable and precision farming

- Fruitful cooperation with the leading German Companies CLAAS, FENDT, LEMKEN, BASF, HL TOPMIX, IFW-EXPO

- Public lectures and Discussions with the students on: Protecting humans, plants, animals, soils, waters and environment, assuring high yields and quality of food and feed

- Practical training and field demonstrations

- NIK ELECTRONICS – precision farming, drones and robots application in agriculture – "NIK Academy"

EDUCATION AND PRACTICAL TRAINING RELATED TO CURRICULA DEVELOPMENT AND INTERNATIONALIZATION

The strategic vision guiding the activity of AU starts by assuming that the internationalization of HE is a resource with multiple possibilities for developing and increasing the competitiveness of the institution.

* Erasmus+ Program is the main tool for:
- study periods abroad
- PhD study and research
- Practical training

* Our partners are :
104 institutions from 23 EMC
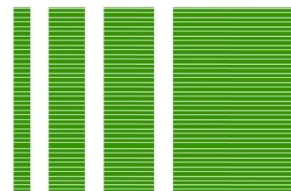and 9 HEI from 7 countries out of EC

* Traditional partnership with:
Czech University of Life Sciences in Prague
University of South Bohemia in České Budějovice
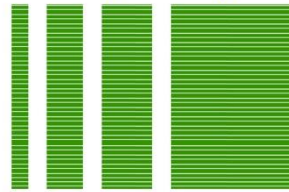Jan Amos Komensky University in Prague

New Educational Projects in 2020-2021

- CEEPUS "Resilient management of bioactive compounds from plants and organic wastes in Middle-Europe" coordinator University of Novi Sad, Sebia.

- Erasmus+, КА 107- "Innovative Training for Sustainable Shepherds", EU4SHEPERDS

- Erasmus+, - "Good Teaching Practices in Experiential Learning for Effective Education in Embedded Food Systems", GOODFOOD, № 2020-1-PL01-KA203-082209

- Erasmus+, Strategic Partnership, Agricultural Policy and Sustainability in Vocational Education, AGRIPOL, 2020-1-DE02-KA202-007483, 2021 – 2023

- Active farmers for adaptation to climate changes

- „Influence of fertilisers on the contaminant status of soil and crops. Heavy metal transfer in the food chain"; PJSC PhosAgro mate changes, Association of the Green Fertilizer Producers- ACF/567

CENTRE OF INTEGRATED MANAGEMENT OF PLANT DISEASES

Modern plant protection system applied in various agricultural crops in support of the research and the agricultural producers.
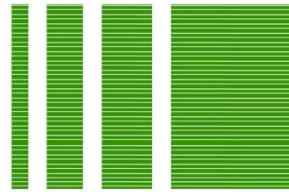
Methods to be used include: internet based forecasting models, locally developed database of diseases and pests, and carrying out field and laboratory experiments.

The results are available on the Internet and quickly accessed by those interested.

DEMONSTRATION CENTER FOR
E-Commerce 16+1

16+1 Demonstration Center for e-commerce with agricultural products is the first-ever demonstration territory to promote young entrepreneurs. It was established at the AU in collaboration with the Association for the Promotion of Agricultural Cooperation between China and CEE Countries (APACCCEEC) at the Ministry of Agriculture, Food and Forestry of the Republic of Bulgaria.

The Center is part of the 'Demonstration Zone of Agricultural Cooperation between China and the CEE Countries', launched in 2018 by the Prime Ministers of EC and China. The new joint project creates conditions for young people from China and CEE countries to develop e-commerce through the developed platform used as a digital warehouse of products.
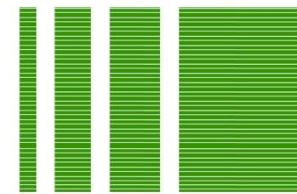
R &D

The National Research Program "Healthy Foods for a Strong Bio-economy and Quality of Life" of the Ministry of Education and Science- coordinator AU-Plovdiv

The program will help to build capacity and pool resources and knowledge in the flagship areas of the Priority: Food Security, Sustainable Agriculture, Maritime and Inland Water Research and Bio-economy under the European Union Framework Program for Research and Innovation Horizon 2020 and the future Horizon Europe Research Framework Program 2021-2027.

NATIONAL SCIETIFIC PROGRAM
SMART AGRICULTURE 2021-2024

C1: **Digital, IoT and robotic technologies in crop production.** Construction of infrastructure for intelligent crop production - Development of models for robotic technologies monitoring the parameters of soil and crops, and the amount of greenhouse gases using unmanned aerial vehicles.

C2: **Diagnosis and prognosis by artificial intelligence** - Investigation of computer vision capabilities and spectral remote sensing methods for information on plant condition (developmental stages, weeds, diseases, herbicide toxicity and biotic stress) through advanced monitoring and cultivation technologies.

C3: **Intelligent management system for agricultural processes** - Identification of opportunities for digitalization of management processes in agriculture and development of a multi-layered supporting infrastructure of intelligent agriculture (software environment for AI in accordance with the specifics and dynamics of the sector.

C4: **Artificial intelligence and digital technologies** - the engine of innovative management systems, sectoral dynamics and change in quality of life - Analysis of standard software systems for business process management, assessment of compatibility with the management needs of agricultural systems and definition of basic parameters. Influence of artificial intelligence and digitalization on the attractiveness of work, quality of life and migration processes in rural areas - assessment of the change of quantitative and qualitative characteristics and analysis of the impact.

NATIONAL SCIETIFIC PROGRAM
SMART ANIMAL HUSBANDRY 2021-2024
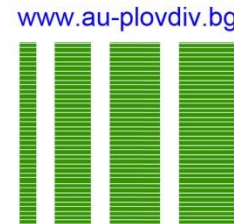
WP1: Robotic milking systems.

WP2: Robotic systems and forms for animal husbandry.

WP3: Intelligent Systems for Ensuring Genetic Progress

WP4: Intelligent systems for monitoring and analyzing productivity on pastures and meadows - stationary and mobile sensor complexes.

WP5: Cyber-physical monitoring systems - including IoT devices and sensor systems.

WP6: Cyber-physical systems for control of animal husbandry complexes.

WP7: Unmanned aerial vehicles - equipped with cameras and outdoor animal counting

WP8: Service robots and drones for storage and / or delivery of finished goods. production - to increase capacity and reduce the time for delivery.

WP9: Stock Management - Animal Food and Fluids, refrigerated warehouses for meat and milk. Processing and distribution of supplies.

WP10: ICT technologies in financial, economic and accounting activity - risk assessment, databases, communications, internal network, internet.

WP11: Digital technologies in teaching, learning, working with young talents and special target groups.

WP12: Intelligent waste management as an element of the circular economy - including the disposal of biodegradable waste, reducing environmental pollution and increasing energy efficiency in livestock farms.

National Research Infrastructure: "CENTER FOR DIAGNOSTICS AND TECHNOLOGIES FOR PLANT HEALTH - PLANTHELT" 2021

ПЛАНТХЕЛТ

PLANTHELT provides an opportunity for:
* conducting research at a modern systemic level of the factors influencing plant health in the soil-plant-plant product chain
* technological solutions for safe bio-based plant products and feed for the country and the European Union (EU).

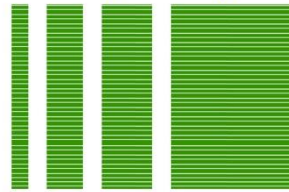## Main characteristics of PLANTHELT

Construction and operation of a laboratory diagnostic and technological complex, including state-of-the-art conditions and equipment for complex research of plant health of crops and tree species, to address the three main health challenges - forecasting, prevention and protection

Functioning of scientific and administrative units for conducting research and project management.

Functioning of a unit for exploitation of the obtained results and products, connection with their public users, communication, dissemination and protection of intellectual property

SUWANU EUROPE

SUWANU EUROPE is a Thematic Networks co-funded by the European Commission under Horizon 2020 programme.

SUWANU EUROPE is based on a previous project called SuWaNu: Sustainable Water treatment and Nutrient reuse options, which consisted in developing strategies based on water reuse projects to solve problems such as the scarcity or the availability of nutrients.

SUWANU EUROPE is focused on water reuse projects in Europe through the reuse of treated wastewater in agriculture. The reason behind is that wastewater treated according to appropriate standards and methods has a strong potential to complement conventional water resources used in agricultural irrigation.
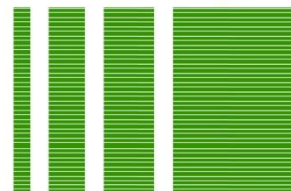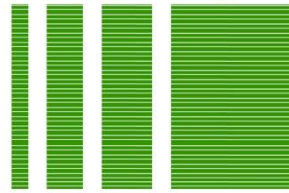
EUROPE 2030: FOOD, AU–PLOVDIV, 14-15 JUNE 2018
a key event during the Bulgarian Presidency of the Council of the EU in 2018

www.au-plovdiv.bg

Perspectives in AgriFood Research

1.   Agro-food biotechnologies

2.   Biologically active substances

3.   Sustainable agro-ecosystems and plant protection

4.   Adaptation of crops to climate and environmental changes

5.   Smart technologies in Agriculture