Boosting Adult System Education In Agriculture- AgriBase project consortium encompasses the professional competencies and expertise of eight institutions (OCULL Vanco Prke, R Macedonia, University of East Sarajevo, BH, University of Foggia, Italy, Polytechnic University of Cartagena, Spain, College Iliria, R Kosovo, Technical University of Varna, Bulgaria, Cukurova University, Turkey, and University 1 Decembrie 1918 Alba Iulia, Romania) aiming at contributing to the improving the system of adult education in the field of agriculture and rural development through strengthening the competences of the agricultural experts. This project purpose is in line with the European strategy (Europe 2020) for sustainable economic development as well as its modest benchmark of 15% adult participation in learning by 2020 supported by the actual need for improvement in the adult education in agriculture.

The scope of project activities started with a publication on the survey on the actual conditions and needs in this regard, upon which the bases for the creation of the learning materials was made. The materials within the third project output O3 (Creating educative materials in the field of agriculture) are developed on specific topics and particularly designed according to the target group in order to contribute to the improving the basic and transversal skills of the agricultural experts. This innovative approach will bring to strengthening the added skills at the beneficiaries and incorporating the best practices from eight countries in terms of adult education.

Beneficiaries may choose among the variety of thematic units divided into two sub-categories:

1) **Agriproduction**

-Alternatives to mineral fertilization: organics and bio-fertilizers

-Climate change adaptation and mitigation

-Crop rotations – subject matter, classification, organizing principles

-Effect of soil tillage systems on some physical properties of the soil

-Energy generation from vegetable biomass

-Greenhouse technology

-Integral raspberry production

-More energy efficiency technologies of winter greenhouse lettuce production in small scale farms

-Optimizing and calibrating sprayers

-Soil and land management: land degradation

-Soil and land management: soil formation

-Soil tillage systems for field crop production

2) <u>Agribusiness</u>

-Business intelligence in agriculture – a practical approach

-Economics of agro-food safety and international market for agro-food products and legislation

-LCA for sustainable agriculture

-Leadership in agriculture

-Networking

-New trends in agro food market

-The history of EU environmental policies

-Tools for planning in agriculture – linear programming approach

Brief introduction into the course materials

Agriproduction

-Alternatives to mineral fertilization: organics and bio-fertilizers

xxxxxx

-Climate Change Adaptation and Mitigation

Climate change is expressed as one of the biggest problems on the global scale that we face today in the world. Climate change affects every phase of our lives (physical and natural environment, urban life, development and economy, technology, human rights, agriculture and food, clean water and health) and obliges governments to increase their solution efforts in this regard.

The Earth's climate is changing. Average surface temperatures are rising, glaciers are melting, sea levels are rising, snow and rainfall patterns are shifting, and more extreme weather events – including heavy rainfall and droughts bushfires, hurricanes and extreme hot days are already happening. Many of these detected changes are related to the high levels of carbon dioxide and other greenhouse gases in the atmosphere, caused by human activities.

Some policies of the government such as reducing emissions by boosting energy productivity, reducing waste, rehabilitating degraded land, increasing renewable energy and driving innovation are important to mitigate effects of climate change. On the other hand, it is important to know all the effects of climate change on the ecosystem to identify the measures to be taken and the approaches to be developed.

Thus, skills and practices that minimize climate change effects on the agricultural sector in particular, can be developed. The important items of the agenda on this subject are drought control, irrigation management, adaptation and development of drought-tolerant and salt-tolerant plants, reduction of carbon release, use and dissemination of renewable energy resources.

This course enables participants to learn and develop the knowledge and skills necessary to overcome climate change effects and ensure adaptation of necessary practices that minimize climate change effects.

Key words: Climate change, carbon dioxide, irrigation management, agriculture, renewable energy

-Crop rotations – subject matter, classification, organizing principles

Crop rotation is the consecutive annual or periodical alternation of the agricultural crops in a certain number of fields for a given interval of time. The growing of the cultural plants for several years on the same area without any alternation is called monocrop. Under continuous cropping, the species composition of weeds decreases as a rule, at the expense of the density of the adapted species. It is especially harmful and unacceptable to plant repeatedly crops, which are attacked by parasite weeds.

The proper rotation of crops preconditions the quality tillage of soil, the rational usage of fertilizers and irrigation water, etc., with a view of obtaining higher yields with better quality and low cost. The different field crops must be cultivated after proper predecessors. Depending on the type of the main production, the crop rotations can be divided into three major types: field, forage and specialized. Depending on the number of the fields, crop rotations can be two-, three-, four-, and multi-field (most often from 5 to 10 fields). The number of fields is important when the crop rotation involves crops, for which the time of planting the crop in the same field is strictly fixed. For example, the best interval for sunflower is 5 years. When there are no crops with such requirements, the number of fields depends on the composition and ratio of the crops and groups of crops, on the area size, and on the type of terrain.

Key words: crop rotation, monocrop, predecessor

-Effect of soil tillage systems on some physical properties of the soil

The systems involving annual tillage with ploughshare destabilized the soil units and decreased the percent of water sustainable soil units along the entire depth of the cultivated profile. The permanent intensive cultivation at the some depth through

disking devices, although temporarily decreasing the bulk density of the cultivated layer lead with time to high compactness of the horizon under the cultivated layer. Total porosity in the soil layer (0-10 cm) decreased as a result of long-term use of with a tillage without turning of the plough layer. Replacement of ploughing with a tillage without turning of the plough layer, with minimal and with no-tillage led to decrease of soil temperature in the surface layer both in cold and warm days during the year. The losses from the available soil moisture strongly decreased when applying tillage without turning the surface layer, shallow and no-tillage. Deep ploughing and tillage without turning the surface layer ensure higher moisture content and higher moisture reserves along the soil profile under conditions of abundant and intensive rainfalls. The capillary rise of water in the soils with minimal and no-tillage was higher in comparison to the soils subjected to intensive tillage.

Key words: soil physical properties, soil tillage

-Energy generation from vegetable biomass

xxxxxxxxxx

-Greenhouse technology

Greenhouse crop production is a growing reality throughout the world with an estimated 405 000 ha of greenhouses spread over all the continents (FAO, 2013). The degree of sophistication and technology depends on local climatic conditions and the socio-economic environment. Greenhouse technology is an efficient and viable option, especially for the sustainable crop production in the regions of adverse climatic conditions.

The purpose of this course is to introduce students to greenhouse technology. It is intended that students know the systems used for climate control in greenhouses, cooling and heating systems, as well as the techniques for light management and carbon dioxide enrichment in order to increase crop quality and productivity. Finally, students will learn to identify the types and structures of greenhouses as well as the cover materials used, including main properties and characteristics of each type of these materials.

Keywords: greenhouse, climate control, crop quality, productivity, cooling system, heating system

-Integral Raspberry Production

The main objective of the integrated raspberry production is the production of healthy raspberries, healthy food, which is not treated with various pesticides, herbicides, or pesticides. The purpose of the course is to provide basic theoretical and practical knowledge of conventional and integrated production of raspberries, and to point out the advantages of integral in relation to the conventional production of raspberries. Guidelines for integrated production are presented within the course upon which the rules for the integrated production of raspberries, and in general, berries are established.

-More energy efficiency technologies of winter greenhouse lettuce production in small scale farms

The objective of this course is to provide basic theoretical and practical knowledge for the production of winter lettuce, as well as to point to the usage of the specific agro technical measures in terms of economic efficiency of winter lettuce. The course offers directions for lettuce production on open and protected field. The purpose of the course is to point to the advantages of the usage of specific agro-technical measures which contribute to the growth, yield and the quality of lettuce.

-Optimizing and Calibrating Sprayers

In agricultural production, the plant protection has an important place in increasing the quantity and quality of the products obtained from the unit area in addition to basic production inputs such as breeding studies, irrigation, and fertilization. Today, although sustainable integrated pest management methods is recommended, the most widely used plant protection method is spray applications (chemical protection) among all plant protection methods.

A successful spray application is possible by using the minimum amount of pesticides, ensuring the highest biological efficiency, minimizing environmental pollution and applying an economical pesticides. In order to achieve this purpose, some factors are needed to be considered during chemical protection applications. These include selecting the appropriate pesticides, adjusting the appropriate pesticide dose, selecting the appropriate application time and using the appropriate machines. However, it is necessary to operate these equipment under the most suitable operating conditions, with the correct settings and maintenance of the equipment. Unfortunately many operators fail to calibrate their sprayer and know little about their equipment and accessories. The results of improper sprayer use can be damaged or dead crops, high cost or poor pest control.

This course enables the learners to learn and develop the knowledge and skills necessary to apply crop pesticides using a sprayer in accordance with legislation and recommended safety practices.

The main objective of the course is to prepare experts able to apply spray optimization and calibration approaches by linking all appropriate and innovative techniques and by minimizing the economic, health and environmental risks.

Key words: Sprayer optimization, sprayer calibration, spraying quality, spraying techniques, pesticide application

-Soil and Land Management: Land Degradation

Soils are the basis for the production of food. The area of arable land is limited. Given the growing world population and the area of soils that are already degraded, sustainable land management is crucial. Soil degradation is a global process, yet it has most severe effects on arid and semi-arid zones, Soil degradation is increasing worldwide. The depletion of nutrients and soil organic matter as well as erosion are the principal forms of soil degradation. Soil degradation can be defined as a process by which one or more of the potential ecological functions of the soil are harmed. This process lowers the current and/or future capacity of the soil to produce goods and services. Soil degradation can be classified into four different types: water erosion, wind erosion, chemical and physical deterioration. The intensive and increasing pressure on land leads to its degradation and pollution, which may result in a partial or complete loss of its productive capacity. Soil degradation can be either a result of natural hazards or due to unsuitable land use and inappropriate land management practices. Mismanagement of arable areas by farmers, cultivation practices that are not adapted to local environments and overgrazing by livestock are seen as the major causes of soil degradation.

Natural hazards which can lead to soil degradation include land topography and climatic factors such as steep slopes, frequent floods and tornadoes, blowing of high velocity wind, rains of high intensity and drought conditions in dry regions. The most prominent degradation feature worldwide is erosion by water.

Soil degradation can be classified into four main types of degradation: water erosion, wind erosion, chemical deterioration and physical deterioration.

Key Words: soil degradation, erosion, water erosion, sheet erosion, gully erosion, wind erosion, draught, soil fertility

-Soil and Land Management: Soil Formation

Soil can be defined as the solid material on the Earth's surface that results from the interaction of weathering and biological activity on the parent material or underlying hard rock.

Functions of Soils are: medium for plant growth, regulate water quality and supply nutrient cycling, habitat for soil organisms, engineering medium for plant growth. Soils provide mechanical support, water, nutrients and root aeration and also buffer temperature in the root zone.

As regulator of water quantity and quality, soils limit surface runoff, recharge ground and surface water supplies, and filter and purify water. General soils maps are showing variability in soil associations (groups of soils that typically occur together). Via recycling of nutrients, soils prevent sequestering of C, N, P and other nutrients, thereby ensuring a continued supply of these nutrients to plants. As a habitat for diverse organisms, soil is an integral part of the terrestrial ecosystem, indispensable to plants and water quality. Soils also affect engineering design due to variable bearing strength, compressibility, shear strength and stability.

Distinct from geologic deposits of unconsolidated material, soils exist due to actions of pedogenic processes over time. Soils exhibit lateral variability across the landscape and internal (vertical) variability. Soils overlie consolidated rock and may have formed from rock weathered in place or formed in unconsolidated material transported from elsewhere.

General Composition of Soil is composed of mineral and organic particles and pore space. The latter is filled with air and water. Mineral Particles These vary in size and mineralogy. The, individual particles are typically aggregated together. Size classes divided among coarse fragments (> 2 mm) and fine earth (< 2 mm). The latter are divided among sand, silt and clay separates.

Mineral soil typically contains 1 to 6 % organic matter. It consists of living biomass, partially decomposed plant and animal residue and products of microbial biosynthesis. The dark colored colloidal fraction of soil organic matter is called humus. Soil organic matter is important because it increases the water holding capacity of soil and provides nutrients to plants and other soil organisms.

Key words: soil, soil formation factors, soil minerals, organic soil matter, horizonation, soil structure, soil texture, soil moisture

-Soil tillage systems for field crop production

The most even vertical distribution of wheat and maize seeds was provided after well performed direct sowing. At stage autumn tillering of wheat, the root mass per plant was highest after direct sowing. At this stage of the crop development, the amount of roots per wheat plant was lowest after ploughing. The root mass of maize formed till stage milk maturity was highest after chisel ploughing. The long-term alternation of both disking and no-tillage reduced the mass of maize roots in the active soil layer. The reduction of the number and depth of the soil tillage operations retarded the growth of the wheat, sunflower and maize plants at the initial stages of their development.

After leguminous predecessors, the variations in the productivity of wheat grown under different types of pre-sowing tillage are relatively low. The reasons for this can be related to the conditions which the predecessor creates with regard to soil moisture by the time of planting. The systematic usage of ploughing and chisel ploughing without turning of the plough layer did not cause significant differences in the seed yield from sunflower (hybrid San Luka). This hybrid had lower plant height after direct sowing and annual disking. The brief replacement of the deep ploughing with chisel ploughing without turning of the surface layer and direct sowing lead to a slight increase of grain yield from maize with 1.0 and 2.8 %, respectively.

Key words: field crops, plant growth, quality, soil tillage, yield

Agribusiness

-Business Intelligence in Agriculture – A Practical Approach

This course aims to present the possibilities of using business intelligence in agriculture by help of the available software tools. At first, we shortly introduce the concept of business intelligence and present available platforms and tools that could be used for implementation of business intelligence systems. We also investigate the use of business intelligence in agriculture, based on available literature. A set of practical examples of using simple business intelligence tools on a set of agricultural data is provided to demonstrate possibilities of data display and analysis using different tools and visualizations in Microsoft Excel. Due to the use of these tools, decision-makers should have the ability to independently create views of the data from different perspectives, and receive timely information tailored to their own needs.

-Economics of agro-food safety and international market for agro-food products and legislation

The Course aims to provide the students with: understanding of public choice on agro-food safety including the impact of chemical and GMOs on domestic and international trade, understanding of agro-food markets and the

impact of agro-food safety issues and legislation, learning the basics of trade and policy analysis, understanding scientific and economic literature on the issue, learning how to make a proper use of data. People that will take this course should be able to define and identify economic terms and key concepts of the economics of agro-food safety and legislation. They should be able to: interpret market analysis, understand scientific and economic literature, apply the rationale and tools of analysis to predict the economic consequences of agro-food safety policies and events.
The target groups are educators in the system of adult education and agricultural advisors.
The contect of the course concern basic economic concepts (demand and supply), definitions and basic concepts of agro-food safety, history of agro-food safety policies and regulations, market impact of agro-food safety policies and regulations, international trade regulations and impact on exchange, quantities and price, basics of economic analysis, case studies.

xxxxxxxxxxxxx

-LCA for sustainable agriculture

The process of agrarian intensification of the last century has brought with it a series of environmental, and even social, impacts. It is therefore necessary to re-establish the balance between agriculture, livestock and the environment. The key tool for analyzing the globality of the system and evaluating the major environmental impacts of a product or service is the life cycle assessment, LCA. LCA allows selecting the option with greater sustainability and consequently a lower environmental impact from "Cradle to Grave". A LCA study consists of four steps: Purpose and scope, Inventory analysis, Impact analysis and Interpretation. Inside yje impact a nalysis, the evaluation is carried out using a number of categories of impact (which varies depending on the method chosen), wich the more used in agriculture are acidification, eutrophication, global warming and abiotic depletion. In the Interpretation phase inventory analysis results are combined with impact assessment. It allows determining in which phase of the product life cycle the main environmental loads are generated. There are several methods for conducting LCA that vary among countries, trends, categories of impact and characterization values within categories. Finally, students will learn the use of LCA methods, the usefulness, and that the process and products can be improved in a environmental point of view.

Keywords: environmental management system; ecoinvent; categories of impact;

-Leadership in agriculture

Organizations continuously come upon forces driving them to change. Because change means doing something unknown and new, the expected reaction is to resist it. Leaders and managers must overcome this resistance and implement innovative and efficient techniques to remain high performers. They must advance their personal, team, and cultural management skills if they hope to adjust themselves to a changing world. The idea is that since people closest to the work in the agribusiness

are likely to know the most about solving problems in that area, they should be involved in the decisions concerning that area. An additional advantage is that they are more motivated if they have some control over their work and over their own fortunes. It is important for leader to understand the factors influencing the organization's success and performance. Extensions and extension workers are of a great importance for agricultural organizations and they often play a crucial role in the development and sustainability of many agricultural organizations and ventures.

-Networking

Networks can be extremely valuable and cost-effective mechanisms for enhancing agricultural development whether they are international or national and whether formal or informal. They are particularly effective for sharing information, stimulating interaction, strengthening professional support and raising of awareness.

A light, facilitating approach to network coordination is likely to prove most effective. This should be based on concrete objectives, delegation, decentralised initiative, broad participation, flexible responsiveness and regular monitoring. Networks can survive on low overheads but do need adequate resources to sponsor regular sharing opportunities. The network members, committees and sponsors should ensure that networks evolve and develop effectively in order to meet changing needs. If network objectives are appropriate and inter-institutional linkages are in place, active, decentralised programmes of farmer-orientated network activities can continue to make a significant contribution to agricultural development.

-New trends in agro food market

Objective. The Course aims to provide the students with a deep understanding of the complexity of individual agro-food choices using economic terminology. More specifically this teaching programme provides useful tools to understand the analysis of new agro-food consumption patterns and the factors that favoured the change.
The course will also expose the student to scientific literature in applied economics focusing on main concerns of agro-food choices.
Expected outcomes. Students that will take this course should be able to define and identify economic terms and key concepts of the new trends in agro-food consumption. They should be able to:

- *analyse agro-food consumption and current food consumption patterns*
- *understand economic literature*
- *apply the rationale and tools of analysis to understand the economic consequences of agro-food consumption issues*

Target groups. The most important group refers to Educators in the system of adult education, who are responsible for the upgrading of human capital employed in the agricultural sector (e.g. farmers, workers). Secondly, Policymakers are also a potential target. . Finally, the third group refers to Market analysts

Basic knowledge. Regarding the theoretical background, students are expected to detain some basic knowledge in statistics and English language.

-The history of EU environmental policies

Objective. The Course aims to provide the students with the key concepts of the real economic value of natural resources, the difference between renewable and non-renewable resources, the sustainable exploitation of natural resources, to achieve an economically viable sustainable farming. In addition, the Course will provide the essential knowledge of participatory approaches adopted in the valorization of local resources, such as common goods, landscape, and rural amenities.
Expected outcomes. Students will be able to learn how to analyse the trade-off between economic viability of farm and the conservation of natural resources (e.g. groundwater, soil fertility), to pursue a sustainable farming. They will be able to perform the Management of Natural Resources, that is, to make the best use of natural resources for economic purposes. Students will learn how to organize and conduct a Participatory approach. They will be able to promote the dialogue among local economic players, in order to favourite horizontal integration (among farmers) and vertical integration (with other players of the value chain) in order to valorise the agricultural products and services.
Target groups. The most important group refers to educators in the system of adult education, who are responsible for the upgrading of human capital employed in the agricultural sector (e.g. farmers, workers). Secondly, agricultural advisors are also a potential target, especially for those providing services to cooperatives, farmers' associations, and consultancy to public institutions. Finally, the third group refers to managers of public institutions, involved in policy design, implementation, monitoring and control.
Basic knowledge. Regarding the theoretical background, students are expected to detain some basic knowledge in micro-economics and structure of the Common Agricultural Policy (CAP). Basic knowledge in Agronomy and Farm Management is also highly desirable. In order to conduct some practical exercise, they are also expected to have some basic pc skills to use Office suite software (e.g. Excel, Word, Powerpoint) to conduct some quantitative exercise. Basic skills to conduct a descriptive statistics from database (primary or secondary data) is also determinant to gain some capacity of applying the knowledge to some practical problems.

-Tools for planning in agriculture – Linear programming approach

The quantitative methods of operational research have been used in the scientific and professional occupation activities in agriculture and agribusiness for some time now. The development of easily accessible software tools, like MS Excel Add-inn Solver provides for a relatively easy usage of the methods of linear programming to the wider group of beneficiaries. The purpose of this course is to provide to a theoretical bases of the users regarding the basic aspects of the linear programming and its usage in agriculture and agribusiness. Through two case studies, the

algorithm of usage of the linear programming in the process of planning in agriculture and agribusiness is presented. A complete process is encompassed, starting from the defining of the problem, to the understanding of the results.

Key words: linear programming, agriculture, optimizing, agribusiness, crop production, livestock production