



**AGRIVOC**

Reshaping of Agricultural Vocational Studies  
in the Western Balkans

## HANDBOOK ON TEACHING METHODS IN AGRICULTURAL STUDIES

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*The experience of higher education institutions  
from Serbia and Bosnia and Herzegovina*





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# CONTENTS

<b>3</b>	<b>Contents</b>
<b>5</b>	<b>Introduction</b>
<b>6</b>	<b>Agricultural study programs in Serbia and Bosnia and Herzegovina</b>
<b>12</b>	<b>Teaching methods in agricultural study</b>
16	<i>Standard teaching methods in agricultural study programs</i>
17	<i>University lectures (ex-cathedra lecture)</i>
20	<i>Interactive education</i>
23	<i>Seminar paper</i>
28	<i>Exercises in the practicum</i>
32	<i>Laboratory exercises</i>
36	<i>Calculation exercises</i>
39	<i>Field exercises</i>
43	<i>Field trip</i>
47	<i>Innovative teaching methods agricultural study programs</i>
48	<i>Student debates</i>
51	<i>Case study</i>
55	<i>Students' research</i>
58	<i>Visiting professor lectures</i>
61	<i>Simulation of projects</i>
<b>65</b>	<b>Entrepreneurial education in the agricultural study programs</b>
65	<i>Why is the focus on entrepreneurial education?</i>
66	<i>Teaching methods and activities that contribute to the entrepreneurial mindset</i>
<b>68</b>	<b>Concept of lifelong learning in agriculture</b>
<b>71</b>	<b>Glossary of terms</b>
<b>73</b>	<b>Bibliography</b>





# INTRODUCTION

Handbook on teaching methods in agricultural studies is prepared within the framework of the project AGRIVOC (2012-2015) with the aim of contributing to the advancement of the process of teaching and learning within the framework of agricultural studies at the partner institutions. The handbook is intended primarily to younger teaching staff, to young professors, docents, assistants and associates in teaching, who are expected to become agents of the teaching process in their institutions in the future. This handbook will be a useful source of information on the organization of the teaching process to all professors and lecturers who want to improve their practice and style of lecturing.

The structure of the handbook consists of 5 units. The first unit consists of explanation of the teaching process on study programs at partner institutions that are the subject of reforms in the framework of AGRIVOC project as follows: (1) field and vegetable crops, (2) fruit growing and wine growing, (3) cattle breeding, (4) protection of plants and (5) food technology. This part of the handbook is based on the materials prepared by colleagues from partner institutions. The second unit covers an explanation of teaching methodology in agricultural science and presenting

two groups of teaching methods: (a) methods that are common in teaching at the partner institutions, and (b) the methods that are considered innovative at partner institutions. The third unit is the explanation of the importance of entrepreneurship education of students of agricultural study programs as well as a description of the most commonly used methods that encourage an entrepreneurial mindset. The fourth unit deals with the whole concept and methods of lifelong learning in agriculture. The fifth unit is a glossary of terms.

The handbook is prepared by specialists at the Faculty of Agriculture, the University of Banjaluka, and the Western Balkans Institute from Belgrade with the support of colleagues from other partner institutions participating in the AGRIVOC project.

AGRIVOC project was implemented by a consortium of 15 institutions from Serbia, Bosnia and Herzegovina, Hungary, Greece and Slovakia in the period from October 2012 to October 2015 and is funded by the European Commission within the TEMPUS program.

*In Banja Luka, June 2015*  
Authors



# AGRICULTURAL STUDY PROGRAMS IN SERBIA AND BOSNIA AND HERZEGOVINA

This part of the Handbook seeks to explain the process of teaching in the first cycle of studies (undergraduate studies) at the partner institutions in Serbia and Bosnia and Herzegovina participating in the project AGRIVOC, at the study programs where field and vegetable crops, fruit growing and wine growing, cattle breeding, plant protection and food technology are studied.

It should be noted that these study programs in Bosnia and Herzegovina are implemented as a university academic programs lasting 3 or 4 years (6 or 8 semesters), while in Serbia they are implemented as a university academic programs lasting 4 years (8 semesters) or higher education vocational studies of the first cycle of studies lasting 3 years (6 semesters).

## *Field and vegetable crops*

The main objective of the study programs of field and vegetable crops is educating personnel that will contribute to improvement of all aspects of field and vegetable crops production. Field and vegetable crops are studied at Colleges in Prokuplje and Šabac, Faculty of Agriculture at the University of Banjaluka and Agro-Mediterranean Faculty, University Džemal Bijedić of Mostar. Specialist courses of field and vegetable crops are studied and the Faculty of Agriculture, University of East Sarajevo within the study program "Agriculture" and at the Faculty of Biofarming in Bač-

ka Topola, of Megatrend University as a part of program "Biofarming".

Colleges in Prokuplje and Šabac implement the study program "Field and vegetable crops" as a program of the first cycle of vocational studies lasting three years, and after graduation the title of a Bachelor of Applied Sciences in Agriculture is obtained. The instruction is implemented primarily via ex-cathedra lectures and consultations. However, laboratory and calculation exercises, field exercises and field trips are also included. Performing professional training and practical work within applied and professional courses is an integral part of teaching and educational process. The representation of teaching methods by courses is different. Ex-cathedra lectures are the basis of the teaching process in all courses. Consulting is more or less present in all courses and they are obligatory part of the teaching process. As for the instruction, the Agriculture College of Applied Studies in Šabac puts emphasis on the laboratory exercises and practical work that are present in more than half of the courses (52%). Field exercises that include field trips are represented in one third of courses (33%) while the methods of calculation exercises are less represented (9%) as well as a case study method (5%). College in Šabac has laboratories, equipment and experimental farm for teaching and practical work, and professional training is carried out in busi-



sses entities in the field of field and vegetable crops production with which schools have signed agreements on technical cooperation.

College of Agriculture and Food Technology in Prokuplje puts emphasis on the lab exercises that are present in as many as 88% of courses. The field (61%) and calculation exercises (54%) are represented too. Field trips appear as a teaching method in 3 courses, and case study in 2 courses. College in Prokuplje has laboratories, equipment, experimental farm, computer center and other facilities for implementing a high-quality teaching. In addition, there is a business-technical cooperation with relevant business entities in the field of field and vegetable crops production, where practice and study visits are carried out.

At the Faculty of Agriculture, University of Banjaluka, farming and truck farming are studied as a major at the study program "Plant production". Studies last 3 years, and after graduation one gets the title of a Bachelor of Science in Agriculture. The curriculum of the study program consists of compulsory and elective courses, practical training and final thesis. Farming and truck farming as a major at the study program are represented in two semesters for a period of 30 working weeks. The predicted weekly load is 40 lessons of which 20-25 lessons are aimed at working directly with students. The basic teaching method is ex-cathedra lecture (100%),

while seminars (83%), lab exercises (77%) and calculation exercises (53%) are some of the frequently represented methods. Field exercises are organized within 1/3 of courses (37%), mainly applied and professional courses, while the case study appears as a method in three compulsory courses (10%) as a part of major. Practical instruction that is implemented in the greenhouse within the university campus is an integral part of the teaching process and is currently undergoing the reform process.

There is a major "Vegetable Growing and Floriculture" at the Agro-Mediterranean Faculty of the University of Mostar, at the three-year undergraduate studies for acquiring the title of a Bachelor of Science in Agriculture.

At the Faculty of Agriculture, University of East Sarajevo, there is a study program "Agriculture" where specialist courses of field and vegetable crops are studied. Studies last 4 years and after graduation one gets the title of a Graduate Engineer of Agriculture. The most common teaching methods in the teaching process at this study program are as follows: teaching ex-cathedra is used in all courses (100%), auditory exercises in 8 of 10 courses (80%), followed by group work (64%), field trips (48%), seminar paper (46%), laboratory exercises (44%), calculation exercises (40%), homework (40%), experimental field (36%) and project simulation (2%).

Study program of academic studies at the Faculty of Biofarming Megatrend University is called "Biofarming". This four-year program provides a title of an Agricultural Engineer. The study program "Biofarming" is aimed at educating and training students for direct work in agriculture, improvement and expansion of agricultural production based on organic engineering principles and basics of biotechnology applied in crop and animal production. For the purpose of development of separate branches of organic agriculture in the biofarming system, students get deepened expertise in several fields (biofarming, bio truck farming, bio fruit growing, bio wine growing, bio cattle breeding, management and production of organic food). Weekly class load of active teaching process is 30 lessons. The study program of undergraduate studies comprises of 32 compulsory and 5 elective courses. Four groups of courses stand out as follows: (1) academic general-education courses that provide basic knowledge in the natural sciences: Biology, Chemistry, Biochemistry, Meteorology, Mathematics, Computer Science and Statistics; (2) theoretical and methodological courses such as: the Fundamentals of Economics, Microbiology, Genetics, Physiology of Plants and Domestic Animals, Soil Science, Agrochemistry, Anatomy of Domestic Animals; (3) Scientific subjects: Agricultural Machinery, General Biofarming, the Principles of Sustainable and Organic Agriculture, Biodiversity and the Preservation of the Gene Fund of Natural Resources, General Bio Vegetable Growing, General Bio Cattle Breeding, Animal Nutrition, Plant Breeding, Seed Production, Agroecology and Environmental Protection, Domestic Varieties Breeding, and General Bio Fruit Growing, Bio Wine Growing, Integral Protection of Plants, English Language; (4) applied and professional courses relating to the specialized education in some fields of plant and animal production. In their programs field exercises take up a significant part as well as manufacturing practices that ensure immediate learning of different types of agricultural production as

well as the organization and economics of farms. One of the characteristics of the teaching process at the program "Biofarming" is fewer ex-cathedra lectures, and more demonstrations and demonstration type lectures. Changes in interaction and evaluation of activities at the lecture itself are also significant. The exercises are organized in small groups because students work more actively. Part of the exercise is carried out in greenhouses and in the field. Laboratory and field trips are also present.

### *Fruit Growing and Winegrowing*

The main purpose of the study programs of fruit growing and winegrowing is educating personnel who will contribute to the improvement of all aspects of fruit and wine production. These agricultural branches are studied at colleges in Prokuplje, Šabac, Faculty of Agriculture, University of Banja Luka and the Agro-Mediterranean Faculty of the University Džemal Bijedić in Mostar.

At the Agro-Mediterranean Faculty of the University Džemal Bijedić in Mostar, and at the Faculty of Agriculture, University of Banjaluka, fruit growing and winegrowing are studied as a major at the study program of a three-year undergraduate studies for acquiring the title of a Bachelor of Agriculture.

At the colleges in Prokuplje and Šabac, fruit growing and winegrowing are studied as a separate study program of a first cycle of applied studies that last three years. After graduating, one gets the title of a Bachelor of Applied Sciences in Agriculture. At the Faculty of Agriculture, University of East Sarajevo, fruit growing is a part of the major "Plant Production" within the scope of the four-year study program "Agriculture". As a part of the major, fruit growing is studied through specialist courses on fruit.

## Cattle breeding

The objective of study programs in the cattle breeding is implementation of educational, professional and research goals and tasks in the field of breeding of domestic animals. The objective of the study process at the academic level of study is making professionals who will be able to apply modern biotechnology based on the achievements of fundamental science (Ecology, Biology, Chemistry and other sciences, and Economics).

Cattle breeding as a separate study program is implemented at colleges in Prokuplje and Šabac. Cattle breeding specialist courses are studied at the Faculty of Biofarming in Bačka Topola, Megatrend University at the study program "Biofarming".

Vocational study program "Cattle breeding" at the College of Agriculture and Food Technology in Prokuplje lasting three years, provides the title of a Bachelor of Applied Sciences in Agriculture. The program consists of 32 courses (26 compulsory and 6 elective lasting one semester) that are classified as general education (5), scientific and technical (19) and applied and professional (14) courses. Elective courses are provided from the fourth semester, two in each (courses from scientific-professional and applied and professional group). Professional training (internship) is envisaged as a special multidisciplinary subject after the 4th semester, and carries 3 ECTS (45 hours of working practices, 45 hours of manufacturing practices, 45 hours of technological and organizational practice). The course "Practical training" is performed as a special multidisciplinary course at the third year of study. The instruction is theoretical and practical in all courses.

Vocational studies at the study program "Cattle breeding" at the Agricultural College of Applied Studies in Šabac, last 3 years and provide title of a Bachelor of Applied Sciences

in Agriculture. Study program consists of 35 courses (23 compulsory and 12 elective). Courses are grouped into general education (4 courses), scientific and technical (12) applied and professional (15). All courses last one semester with weekly class load 2 + 2, 3 + 2, 4 + 2, 5 + 2, 4 + 0, while professional training has a weekly class load of 0 + 8. The instruction is implemented at the amphitheater, lecture hall, the lab, reading rooms and computer laboratories. The school has the necessary equipment for modern teaching, although procurement of modern devices used in animal production is necessary in order to improve practical instruction and exercises in applied and professional courses.

In both schools at all years of study, activities are aimed at awakening students' interest in livestock profession, referring them to independent and self-initiative research and informing in the field of livestock profession, creating awareness for permanent education in this profession, as well as referring students to critical approach to offered or available information. Teaching methods that are used are as follows: ex-cathedra lectures, laboratory exercises, field trips and interactive teaching methods. Interactive teaching methods that are used in the study programs are the following: individual, group and team collaborative and cooperative methods of active learning. Interactive methods are used in the classroom and outside of it (in the equipped library and computer center, in the field) in the context of individual and group work. The following are used out of these methods: panel discussions, formal debates, workshops, studying the case studies, keeping a journal and entering guidelines, writing essays and seminar papers, peer assessment and active sessions of reviewing the material. Practical instruction at the college in Šabac is designed as a special multidisciplinary course at the second and third year of study, while at the college in Prokuplje that course lasts only one semester. Special emphasis in both instructi-

on and learning is given to the discussion, cooperative learning, mutual learning, forming teams for learning and experience based learning, conceptual mapping, mapping of concepts or conceptual maps, simulation methods, mini-research proposals and projects. Within each course of applied sciences study program, there is a mandatory continuous monitoring of acquiring knowledge and skills of students throughout the semester via preliminary exams and knowledge tests as well as a final exam at the end of the semester.

### Plant protection

The main objective of the study program "Plant protection" is educating personnel for plant protection. Plant protection is studied at colleges in Prokuplje and Šabac at the study program of Applied Studies and at the Faculty of Agriculture, University of Banjaluka, as a major at the study program "Plant production". Studies at these institutions last 3 years. At the colleges in Prokuplje and Šabac students obtain the title of a Bachelor of Applied Sciences in Agriculture, while at the Faculty of Agriculture in Banjaluka students obtain the title of a "Bachelor of Science in Agriculture". At other institutions (Faculty of Agriculture in East Sarajevo, Faculty of Biofarming in Bačka Topola, Agro-Mediterranean Faculty in Mostar) plant protection is studied as a course in the context of various study programs.

At the study program "Plant Protection" at the Agriculture College of Applied Studies in Šabac, instruction is implemented primarily through ex-cathedra lectures and consulting, preparation of seminar papers, the laboratory and calculation exercises, field exercises and organizing field trips, performing internship and practical work within the courses, practical training in the context of applied and professional courses. Ex-cathedra lectures are represented in all courses (100%), while the lab exercises are the second most common teaching method applied in more than half of courses (54%). Field exercises are

used in a third of courses (33%). Calculation exercises are less represented (7%), primarily in the initial years of the study, and the methodology of the case study (6%). Consulting is considered mandatory part of the teaching process. One of the teaching methods in the study program "Plant protection" is the field trips that are usually implemented in pesticide factories where students have the opportunity to familiarize themselves with the process of production of plant protection products. Professional training for a period of 240 hours (30 days) is carried out on farms and in agricultural pharmacies with which the school has signed a contract on business and technical cooperation. The college has laboratories and equipment necessary to perform lab exercises, and it has a modern computer center and a library with a large number of contemporary literature. In addition, there is a business and technical cooperation with relevant commercial entities in the field of plant production, as well as with manufacturers and distributors of pesticides.

### Food Technology

The main objective of the study program "Food Technology" is educating personnel for the food production technology of plant and animal origin. This is a three-year study program that is implemented as a program of applied studies at colleges in Vranje, Požarevac and Prokuplje.

At the Technical College of Applied Studies in Vranje study program consists of 28 courses (5 elective), internship and final work. At the end of the study a student obtains the title of a Bachelor of Applied Sciences in Technology. Various teaching methods are used in implementing instruction including ex-cathedra lecture, discussion, calculation exercises, method of working with the text, the method of graphic works, demonstration, lab exercises, practical work, the production and operational method and others. Lectures ex-cathedra are the basis of the teaching process in all courses, while the prevalent methods include calculation and la-

laboratory exercises (present in 50% of courses at all years of study). Professional training (internship) of 120 hours is carried out in the 6th semester. The training is carried out in the food industry companies from Vranje and its immediate surroundings. Every year students visit the Agricultural Fair in Novi Sad and the Technology Fair in Belgrade, and study visits are organized to the manufacturing companies and other institutions of higher education. The final paper is student's independent project and it is prepared in the course that defines the profile of chosen specialty at the study program "Food Technology". Consulting, as a form of teaching work, is a significant aspect of direct assistance to students in acquiring program contents and preparing exams, and it is a regular responsibility of all teachers. Consulting between a teacher and a student is performed 2 hours a week after regular teaching process in accordance with a predetermined schedule adopted by the Teaching Council that is displayed on a bulletin board of the school. The College has optimal conditions for carrying out the aforementioned teaching forms (amphitheater, classrooms, laboratories for food technology, microbiology laboratories, computational classroom, CNC laboratories).

Technical College of Applied Studies in Požarevac implements study program of applied sciences "Food Technology" through 2 modules: (1) "Technology of Carbohydrate Food" and (2) "Technology of Canned Food" that differ only in elective courses. Students acquire the title of a Bachelor of Food Technology in the Carbohydrate and Fermentation Technology, i.e. a Bachelor of Food Technology in the Canned Food. Study program has 27 courses in total, of which 23 are compulsory and 4 elective. The compulsory courses are represented with 77%, the elective with 18%, professional training (internship) 2% and diploma dissertation 4%. Professional training is carried out in the 6th semester in duration of 80 hours. The instruction is theoretical and practical in all courses. The most common are ex-cathedra lectures (100%), laboratory (52%), problem solving

(26%) and calculation exercises (15%), professional training as a course that is implemented in food processing plants and study visits to the factories of the food industry, agricultural fairs and the food industry. (Summer) internship became an integral part of the course and while performing the internships, each student is assigned a professor in the role of a tutor. The school has laboratories with enough work places and adequate equipment for implementation of the study program content and it has an information center, a library and reading room. All teachers in the study program hold consultations with students before or after their lectures and exercises during each teaching week, and during the examination period.

Study program at the College of Agriculture and Food Technology in Prokuplje consists of 34 courses (of which 6 elective), professional training (internship) and final thesis. At the end of the study a student obtains the title of a Bachelor of Applied Sciences in Agriculture. Courses are divided into general-education (15%), scientific and professional (39%), and applied and professional (46%). Instruction is theoretical and practical in all courses. The following teaching methods are used: interactive teaching methods, labs and practical work, calculation exercises, field trips and ex-cathedra lectures, which are the basis of each course. Calculation exercises are present in half of the courses (50%) in all years of study. Calculation and field exercises are present in a quarter of courses. Interactive teaching methods are implemented in the classroom and outside it (in equipped reading room and computer lab) using video presentations, consulting within the framework of individual and group work. Practical work is designed as a special multi-disciplinary course in the third year of the study and carried out in order to increase the involvement of students in acquiring practical and applied knowledge. Practical instruction is implemented through professional training (internship) in the fourth semester for a period of 180 working hours.



# TEACHING METHODS IN AGRICULTURAL STUDY PROGRAMS

Teaching process in the field of agricultural sciences can be achieved by applying a number of teaching methods. The correct and appropriate choice of teaching methods is very important for successful learning of specific subjects (modules or courses - hereinafter "subject"). Successful teaching process implies work, which should result in having a student with a creative and critical attitude. For the implementation of this process, it is necessary to choose teaching methods which primarily encourage independence in work, curiosity, ability to adapt to the given situation, agile mutual communication with other colleagues, as well as desire for independent research and solving the anticipated problems.

The goal of teaching methods in the field of agricultural science (because of its specificity) is that students memorize new course material, which is often necessary to be deepened by the additional curriculum content, and to apply theoretical knowledge in practice. According to Klafki (1971), teaching methods are used to enable the successful teaching and successful learning for students. Teaching and learning are always directed towards contents oriented to the target - the knowledge or cognition, abilities or skills, behaviours or attitudes. Prior to researching, trying out or giving statement about which way or which method, in the given framework conditions, is more or less appropriate for a desired process of teaching and learning, one must know the goal or goals as well as chosen contents depending on the objectives that

should be passed on by teaching and adopted by learning. In addition to the clarity and individualization, a variety of methods often stand out as another component of the expertise of teachers. The diversity of learning objectives necessarily requires diversity of teaching methods. In this regard we talk about "know-when" (Which educational objectives and curriculum contents are appropriate for certain methods?) and "know-for-whom" (Which group of students has benefit or harm from a particular method?). In order to get to "know-when" and "know-for-whom", teachers should know the internal methods of logic and their goals as well as their disadvantages and boundaries. This requires testing, training and above all the reflection as well as viewing the results of applying certain methods in the teaching process (Helmke, 2003, quote VetForum, 2011).

In the teaching process in the field of agricultural sciences, selection of the appropriate teaching methods largely depends on the substantive reasons, but also a large number of organizational-technical capabilities of higher education institutions where teaching is implemented. Teaching methods to be applied within particular subject largely depend on the convenience of content for the presentation through the particular form of the teaching process. The choice of teaching methods depends on the number of students per year. Although there are certain norms regarding the number of students in a group, they are not always achievable. Smaller groups of students provide greater opportuni-

ties for developing skills of problem solving, development of skills of group work, communication skills. In case of larger groups of students, teachers have less choice regarding methods that can be successfully applied in the teaching process.

A very important aspect of the methods, which should not be left out, is the institutional framework in which the method is stored. The institutional framework of higher education institutions where teaching process is carried out, sets the conditions in which teachers can create teaching and learning processes. Thus, the responsible teacher cannot decide to have laboratory exercises in class if there is not adequate laboratory, or to have more field trips, if the financial framework for implementation of the teaching process does not allow that. The space for making a decision on which method to be chosen can be larger or smaller depending on the framework conditions, but they are an important determinant anyway. In particular, it is important to point out the role of teachers in the implementation of teaching method. It is not realistic to expect that one teacher can equally well apply all teaching methods. Nevertheless, the teacher should apply in his work the methods that he is not so successful in, so that the entire teaching process is various, complete and useful for students. Teachers should be trained for such work and must constantly develop and improve themselves in their educational practice. A larger number of analysis and various forms of surveying students at higher education institutions in the field of agriculture, shows that the objective to be achieved: passing on the knowledge and professional learning, is mainly implemented by the teacher (information coming from the teachers, discussion at the class that the teacher carries out by asking questions, etc.) and that approach is slightly more dominant than the open conception of teaching aimed at students. On the other hand, support and development of contemporary social and methodological competences takes place more in the open teaching process that is created on the principles of situating learning, which thro-

ugh co-operative forms of work with students enables more self-organized learning.

Changes that occur in the teaching process are inevitable and necessary in the field of agricultural sciences. The attitude of the Council of Europe (2002), that the essential question that student are asked, will no longer be "What are you required to do in order to obtain a diploma?" but "What can you do now when you've got a diploma?", will certainly affect the necessity of applying the implementation concept of the teaching process in the field of agriculture. This approach is important for the labour market and is undoubtedly much more flexible when lifelong learning is taken into consideration, non-traditional learning and other forms of non-formal learning (Council of Europe, 2002).

The traditional way of designing subjects and programs was based on the course content. Teachers used to make decisions on the content of the planned lectures in the course of the program and their implementation, and then checked out how well students have learned the content. This type of approach was centred on the teacher and his contribution, and on testing the knowledge, based on how well a student acquired the material. Descriptions of subjects were mainly related to the course content that would be covered in lectures. This approach to teaching is usually called the teacher-centred approach. Frequent criticism of this kind of approach in the literature (Gosling and Moon, 2001) consists in the fact that it is difficult to determine exactly what a student should be able to do in order to pass the examination or complete the program. International trends in education show a progress from the traditional "teacher-centred approach" to the student-centred approach.

That model is focused on what students are supposed to know after completion of the course or program. Hence, this approach is often called outcome-based approach (D. Kennedy 2007). For teaching in the field of agricultural sciences particular importance in education is a neces-

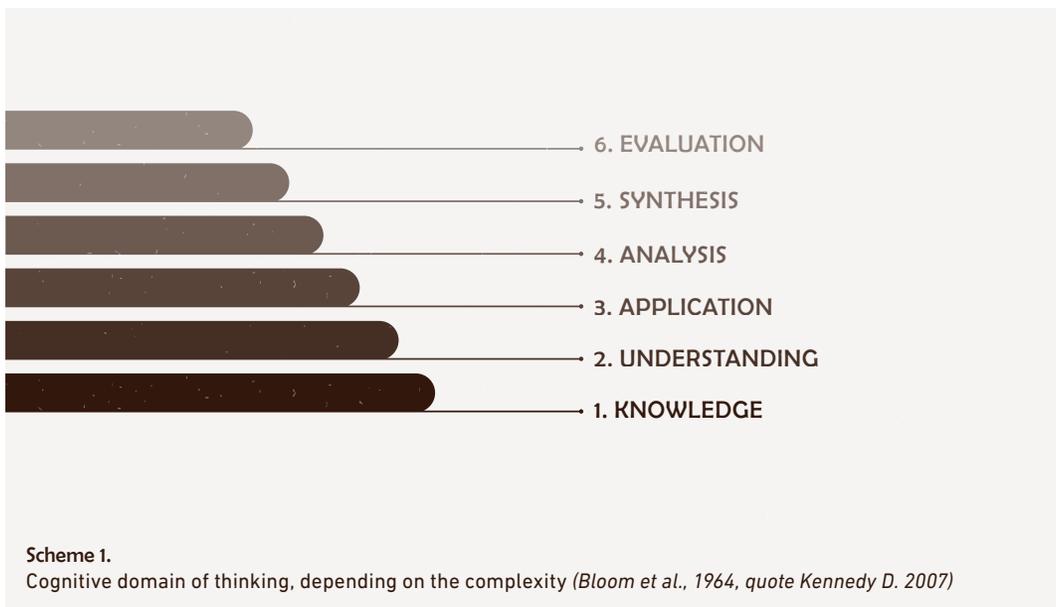
sity for practical application of knowledge and/or skills, which usually requires learning that goes beyond primary acquiring of knowledge and skills. Effective and creative demonstration of knowledge and skills and their application/use in real situations is particularly important, which includes everything, ranging from the general social and civic ones to the specific professional activities.

Creative teaching process in the field of agricultural sciences should be based on the development of a number of competencies in students. Competencies include attitudes, feelings, values and awareness on their own performance, as well as declarative and procedural knowledge. Competence is related to the management process of applying knowledge in a real situation, in the real tasks, and is usually gained through practice and thinking processes. Some aspects of behaviour in a real situation may depend on the innate qualities of individuals. To the extent to which such behaviour is not learned, it cannot be recognized as learning. Competencies also round out the extent to which an individual accepts his own limitations and based on that consciously plans to overcome them by further learning and training. Moreover, while the basic

knowledge and skills can be described as more or less independent than the context itself, it is essential to clarify the context in which an individual may demonstrate the acquired competencies (HETAC, 2006) in order to describe competence.

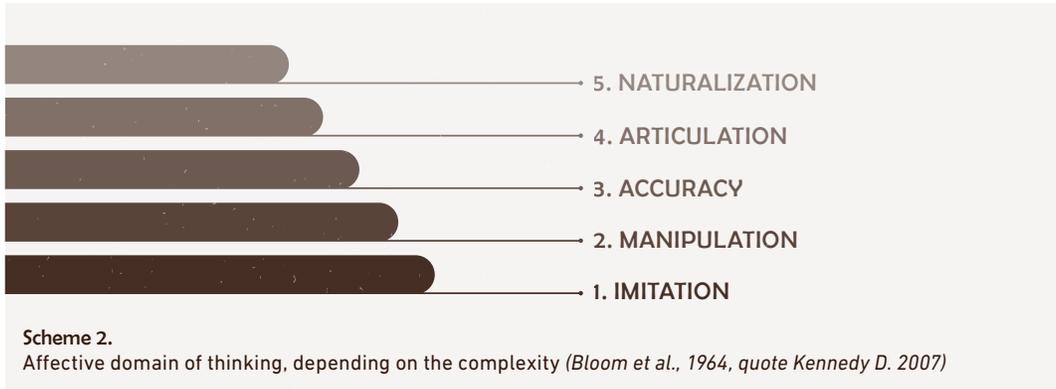
The teaching process in agricultural sciences is quite complex, because it requires not only the acquisition of knowledge but the development of specific competencies and skills too, which in the end must also be taken into consideration when evaluating the general knowledge of students. Teaching methods need to be designed in a way that the responsible teacher has the possibility to analyze all aspects of the knowledge acquired by the students.

D. Kennedy (2007), citing research by Bloom (Bloom et al., 1964) states that while teaching and assessing the knowledge, teachers should bear in mind that the learning is a process and the role of the teacher is to try to stimulate the thinking process of the student and brings it, as far as possible, to the levels of synthesis and evaluation. This field of "opinion" is usually called cognitive ("cognitive") domain, given the fact that it includes thinking processes (chart 1).



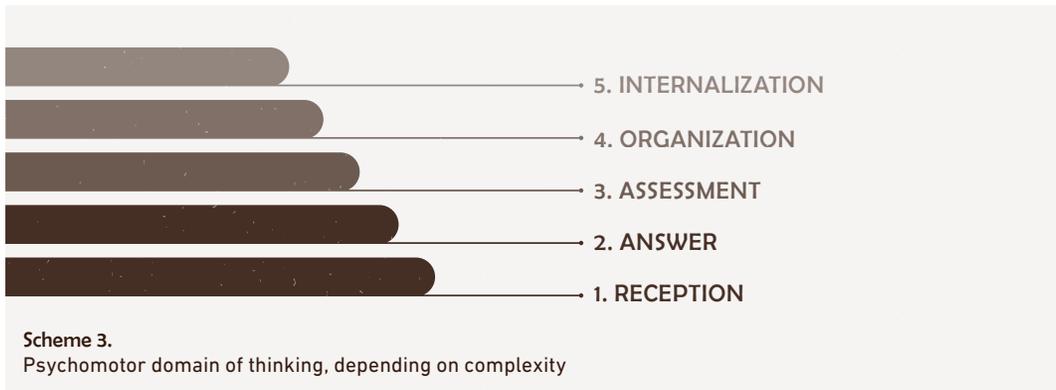
D. Kennedy (2007) also states that Blum and his colleagues carried out the research on the affective ("attitudes", "feelings", "value") domain (Bloom et al., 1964). This domain is rela-

ted to the issues of emotional components of learning, ranging from the basic willingness to receive information to the integration of beliefs, ideas and attitudes (scheme 2).



Psychomotor domain primarily emphasizes physical skills involving coordination of brain and muscle activity. Based on the research literature, one can undoubtedly say that in the

field of education this area is much less discussed, compared to the cognitive and affective domains (Dave, 1970, quote Kennedy D. 2007) (scheme 3).



Taking into consideration the above, as well as the fact that all three domains of thinking are present among students (with special emphasis on psychomotor compared to other science) within the framework of the teaching process in the field of agricultural sciences, it is necessary to pay significant attention to the selection of appropriate methods within a subject, in order to emphasize all aspects of thinking among students. At the same time, there is a need for continuous innovation of teaching methods, which would enable students to learn material in the best possible way during the studies.

Hereinafter is given the description of the (standard) teaching methods that are generally encountered in the implementation of the teaching process on studies in the field of agricultural science with a brief description of their meaning, advantages, disadvantages, importance for students, as well as some positive practice in their application. At the same time, it provides an overview of the teaching methods, which can be said to be innovative and that could provide a basis for further improvement of the teaching process in the field of agricultural sciences.



# STANDARD METHODS

## METHODS IN AGRICULTURAL STUDY PROGRAMS

① UNIVERSITY LECTURES (ex-cathedra lecture)

② INTERACTIVE EDUCATION

③ MID-TERM PAPER

④ EXERCISES IN THE PRACTICUM (CLASSROOM)

⑤ LABORATORY EXERCISES

⑥ CALCULATION EXERCISES

⑦ FIELD EXERCISES

⑧ FIELD TRIP



Teaching method	UNIVERSITY LECTURES (ex – cathedra lectures)
What are University lectures?	University lectures represent related presentations regarding the content that should convey specific technical and scientific knowledge to the students, having impact on their cognitive development, critical thinking and interest in specific issues they face in the course of study.
The purpose of application	The main purpose of the application of university lectures is to inform as many students as possible in a short period of time on significant information related to the professional development of students within a specific field (modules- courses, hereinafter referred to as subjects).
Advantages of the method	The most important advantage of this method is definitely efficiency (a significant amount of information can be presented to a large number of students in a short period of time), targeting students in further work, the availability of a large number of relevant and scientific-based information etc.
Disadvantages of the method	The main disadvantage of the method is reduced multiple perception (auditory perception is dominant), the mismatch of vocabulary of lecturer's professional terminology with the terminology that is understandable to students, monotony and passivity of students, often forgetting and missing very important information, rapid drop of concentration among students in particular when it comes to large groups etc.
The importance of implementation of the teaching methods for students	Students acquire basic information on the most important contents relevant to their professional development in the particular field. Through this mode, students do not develop specific skills related to their professional development and work after completion of the studies.

The importance and participation in the teaching process	This method has a greater significance for subjects that are designed to acquire more theoretical knowledge depending on the characteristics of each subject and the approach of teachers to work, percentage of teaching methods in the structure of the teaching process is relatively high (20 - 60%) and often dominant compared to other methods of implementation of the teaching process.
Method of application (individual/group)	This method of work is exclusively a group one, and will not be applied in the work if there is only one or a small number of students (up to 5).
Group size	Group size for implementation of teaching methods is determined by special acts and by-laws governing these issues or specific standards of higher education institutions. Group size often affects the success of the teaching process as well as the control of attention and interest of students for the lecture.
The method of forming groups for work	No special group of students are formed for this teaching method. A group is made up of all students in a particular year, when they attend lectures (in the case of compulsory subjects). When it comes to elective courses, group consists of students who have chosen a particular subject. The teacher has no direct influence on the formation of the group.
Selection of the topics addressed by the method	Topic to be addressed at the class is usually determined by the curriculum, but can be defined ad hoc if it is of special interest to students or if it is a current one at a given time.
Independent work of students	By applying this method students have no possibility for independent work.

Presenting the results	Within this teaching method, students do not participate actively in the presentation of results, since they usually have no possibility for any type of interactive activities.
Evaluation	Teachers' evaluation of this method lies in the fact that students have an obligation to attend lectures in order to access the pre-exam and exam assignments. Teacher verifies the presence at the lectures by his signature in the student booklet (logbook). Students usually perform evaluation of the teaching process, which is also a part of the quality system as defined in the framework of higher education institutions.
The best practice	The optimal group size for this type of classes is 30-35 students. Groups that are larger than 50 students are generally more difficult to control, students are not focused on lectures, and there is very often interaction among the students with topics that are not the subject of teaching. Therefore, it all has impact that effects of applying these teaching methods in such working conditions are decreased.
Other notes	Experience shows that this method of work is applied in the case of a large number of students in a group, but the better results and higher efficiency are achieved when groups for work are smaller.



Teaching method	INTERACTIVE TEACHING
<p>What is interactive teaching?</p>	<p>Interactive teaching represents a meaningfully associated presentations that with the use of teaching aids and communication with students during the teaching process (inclusion of students in the teaching process through various forms of interaction: questions, discussions, group work, etc.) are designed to convey a specific scientific and expert knowledge to the students and influence the cognitive development, critical thinking and interests in specific issues they face in the course of study. In this teaching method a major role lies on potentiating various forms of interactive teacher-student relationship. Assistive technology (flip chart, power point presentation, smart boards and other forms of multimedia communication) is very important tool in this method for passing information easily. In a technical sense, representing different thematic movies or featured stories, covering or touching thematic units is increasingly used in the teaching process.</p>
<p>Purpose of application</p>	<p>The purpose of applying this teaching method is to convey important information that are significant for further professional development by using available technical devices through encouraging the active participation of students in the course of work.</p>
<p>Advantages of the method</p>	<p>Efficiency (in a short time can be represented by a significant number of information to a large number of students), a common active work and increased communication between teachers and students, the opportunity to interact during lectures etc.</p>
<p>Disadvantages of the method</p>	<p>The main problem regarding implementation of this teaching method is reflected in the need for significantly increased engagement of teachers in leading and directing the activities of students. In the course of teaching, occasional distraction of classes from the essence is possible, which directly leads to non-efficiency (it is possible that a little scientific and professional knowledge is acquired for a lot of time consumed). During the work there is occasional irrelevant and unnecessary discussions with the teacher and the students, wandering in the group work, the activities of a small number of students (the problem of "silent majority"), occasional erroneous generalizations and conclusions of students in group work etc.</p>

<p>The importance of implementation of the teaching method for students</p>	<p>Students gain basic information about the most important elements relevant to their professional development from a particular scientific field. Through this mode, students acquire a part of skills concerning the possibility of reasoned discussion on particular expert topic, the basics of group work, proper judgment and making preliminary conclusions, etc.</p>
<p>The importance and participation in the teaching process</p>	<p>Thanks to the continuing technological development of teaching aids and elucidating the teaching materials to the students, the participation of this method in the overall structure of the teaching process is larger and takes precedence over the university lecture. The percentage share in the implementation of the teaching process ranges from 40 to 80%.</p>
<p>Application of the method (individual/group)</p>	<p>This method of work is solely a group one. If there are fewer than 5 students, it is not to be applied in the work.</p>
<p>Group size</p>	<p>For the successful implementation of this method, a group of students should not exceed number 30, especially in the implementation of teaching methods where students are actively involve. This group size allows effective and efficient interactive work with students, discussion, and possibility that each of the students expresses himself and actively participates in the work.</p>
<p>The method of forming groups for work</p>	<p>No special groups of students are formed for this teaching method, but the group consists of all the students in a particular year when they attend the (mandatory) subject. For elective courses, group consists of students who have chosen the respective subject. The teacher does not directly affect the way of formation of the group.</p>
<p>Selection of the topics addressed by the method</p>	<p>Topic to be addressed at the class is usually determined by the curriculum, but can be defined ad hoc if it is of special interest to students or if it is the current one at a given time.</p>

Independent work of students	<p>When applying this teaching method, students have the opportunity to work independently in the teaching process. Independent work of students can be individual or in a group, and depends on the characteristics of the subject, the subject topic, available time etc. Students participate by answering the questions, discuss on a particular topic, group analysis of the original problem etc. The level and scope of students' work within the subject is determined by the responsible teacher.</p>
Presenting results	<p>Students can introduce their activities through discussion, demonstration of specific skills, analysis of current issues etc. The responsible teacher defines the manner in which the student will participate in the work within the course as well as a way of introducing the results.</p>
Evaluation	<p>Students are required to be present at the class in order to approach to pre-examination and examination commitments. The teacher takes into account the involvement of students in the teaching process, as an element of pre-exam commitments, part of the final mark or overall impression on student's engagement. Students carry out an evaluation of the teaching process quality in the context of the module, which is part of the system of quality defined within the institution.</p>
The best practice	<p>Optimal group for this type of teaching is 15 to 20 students, so that all students get the opportunity to interactively participate in the teaching process.</p>
Other notes	<p>Experience shows that teaching method becomes dominant due to the technological solutions dedicated to the implementation of the teaching process. In defining the subjects, this teaching method should not be a substitute but an excellent complement to other (standard) methods of implementation of the teaching process.</p>

Teaching method	SEMINAR PAPER
What is a seminar paper?	<p>Mid-term paper is independent work of a student (or more of them in the group) in which under the guidance of a tutor - a responsible teacher, topic is addressed, which can be defined by the teacher or it can be the result of a student's own choice. Selected topics may be practical or theoretical, which determines the way of implementation and presenting results of mid-term paper. Mid-term paper that has practical character is the specificity of agricultural studies and has a special significance in the simulation of production processes.</p>
Purpose of application	<p>The purpose of the mid-term paper in the context of the subject in the teaching process is to develop the student's ability to independently solve practical and theoretical problems which generally do not have the character of originality. The aim of the mid-term papers is to develop the ability to apply and demonstrate the theoretical knowledge acquired. The essence of the mid-term papers is to familiarize students more with some important topic, given that in the ordinary teaching process there is no possibility that the entire material is handled in both quality and interesting way. Writing essay is also a kind of preliminary training for writing the final paper or scientific papers. This is particularly important for students who are planning to do scientific research work in their future engagement. In the mid-term papers which are made in order to further clarify certain matters, it is important that the results of preparation are presented in front of other students so that they are familiarized in details on the topic that has been addressed. The special significance of this method is the necessity that student adopts the rules of academic writing and presenting the results achieved.</p>
The advantage of the method	<p>By writing mid-term paper students are usually confronted for the first time with a form of writing professional and scientific work as the main form of communication of the results achieved, presenting their achievements and distinctive means of communication with the academic and the general public. Through mid-term paper students develop skills of analysis of available literature sources, analytical classification and use of useful information, their style of shaping and presentation in front of a wider audience (other students). In case of writing mid-term paper in groups, skills of group work are developed and the division of duties and responsibilities. There is also a more interactive communication with the responsible teacher.</p>

Disadvantages of the method	Inadequately chosen topic by a student is often a serious deficiency in preparing mid-term paper that deviates from the content of the module, the length of time required to collect the appropriate data and bibliographic sources suitable for the analysis of a given topic. The practice of “copying” the existing materials on the given topic is very present, so there is possibility that the mid-term paper is a result of another person’s work (which is not easily verifiable). In the case of group work, uneven redistribution of duties and responsibilities in the preparation and presentation is possible.
The importance of implementation of the teaching method for students	Through the preparation of mid-term papers, students acquire basic information and skills on how to write professional and scientific works, what is their structure like, how to properly use and cite used literature sources, how to prepare material for the press, in which way the results obtained are presented. Presentation skills in front of a wider audience is necessary to be developed in this way, given that it is a very important means of communication in the work of each agronomists, with other colleagues in the work or the transfer of information to end-users (producers).
The importance of participation in the teaching process	Mid-term paper can be of a special importance for the subject if it is addressing some important or current issues and its better understanding by the students. The percentage share in the subject ranges up to 30%.
Method of application (individual/group)	This method shows the best results when it comes individually, but may be a group work too, which is affected by a number of factors: the total number of students in the class, the bulkiness of the topic that is being addressed, the time frame in which to prepare the mid-term paper etc.
Group size	While preparing group mid-term paper of theoretical character (theoretical approach to analyzing specific topics), a group should have no more than 5 students. In preparing mid-term papers of practical character (analysis and demonstration of specific techniques in agricultural production - grafting seedlings of vegetables for example) priority should be given to small groups (2-3 students) to allow better supervision by teachers during implementation. Numerous group can influence uneven distribution of assignments that are under way. Some students in this work environment can take fewer obligations or be in a position that cannot express their real potential for work.

<p>The method of forming group for work</p>	<p>Group for preparing mid-term paper should be formed on the principle of random selection, regardless of the views and wishes of the students. Random selection enables development of new forms of cooperation among students and puts all participants initially to an equal position. Random group's selection reduces the possibility of uneven redistribution of assignments that are under way. Random selection can be made in one of the ways that are implemented for this purpose (assignment of ordinal numbers in the order that students sit and connecting in groups by a certain principle, withdrawing the same characters or symbols, the students with the same number of letters in the first or last name form one group etc.).</p>
<p>Selection of the topics to be addressed</p>	<p>Topics to be addressed through mid-term paper should be in accordance with the curriculum, addressing a very important question that in this way can be clarified to the students in order to understand it better. Topic can be actualization of a problem and drawing students' attention to it. The topic of mid-term paper is determined by a responsible teacher, but can be chosen by the student in terms of subject matter covered by the curriculum module.</p>
<p>Independent work of a student</p>	<p>Students independently work on a given topic. Prior to the implementation of the mid-term paper students can consult the responsible teacher in order to clarify any ambiguities about the topic, method of preparation or the possibilities to gather necessary materials for preparation. Regarding the group work, students allocate drafting and writing responsibilities on their own, as well as presentation of the results. Students determine the format and scope of the mid-term paper, but it is recommended to consult the existing recommendations or best practices in preparing and writing this type of material in order to facilitate the work. The role of the teacher is to give instructions to the students on materials that could be helpful in the preparation and to give the principal recommendations for writing the paper.</p>

<p>Presenting results</p>	<p>Mid-term paper presentation should have three basic components: a) a written version of the mid-term paper (most often in MS Word format) - through which students present their ability to distribute useful information in the proper order, using the style of writing characteristic for this type of work (it is preferable to follow the existing instruction guide for writing mid-term papers). The material can be printed before presenting a mid-term paper or only submitted in electronic form, which needs to be agreed with the teacher. It is recommended not to print mid-term paper until its public presentation, in order to correct mistakes; b) the technical drafting and preparing presentations (often MS PowerPoint presentation or preparing and providing necessary equipment and materials in the case of practical topics) - through which students present their ability to adequately process and present a given topic, and prepare everything necessary for a practical demonstration; c) presentation of results before the teacher and a group of other students - a segment in which the student presents the most important segments of his work, demonstrating that he has learned the given topic and shows the level of oral and nonverbal skills that he possesses as an individual.</p>
<p>Evaluation</p>	<p>Mid-term papers are usually an integral part of the assessment of students. In most cases, they represent a kind of pre-exam assignment or have a role of some tests. They give a good basis for the teacher who is in charge to get a general impression of the students individually, which is very difficult to determine through some other forms of work.</p>
<p>The best practice</p>	<p>The important rule regarding the essence of writing mid-term paper is that student should not just find some text (or more of them) and then copy it (make a compilation) or translate it (if it is a text in a foreign language) without any sense - thus falling into a trap of writing mid-term papers badly. It is recommended that the student explores the available literature, reads a larger number of articles on the topic, explains the</p>

	<p>topic to himself/herself first, tries to understand and then retells it in his own words by writing- thus a basis for writing a good mid-term paper is made.</p> <p>It is very important that the student does not put in essay some of the material he did not understand or cannot explain in his own words. If there is a lot of material that is not understandable while preparing the mid-term paper, the student needs to look for new sources of literature and to further (without fear and hesitation) consult with the responsible teacher. During the presentation of seminar papers it is desirable that the students comment on the work by the collegial and constructive criticism where appropriate - in this process the role of the teacher is very important. This is a unique opportunity for students to openly discuss having the role of teacher and the listener, which is very important for their future professional work.</p>
Other notes	<p>Experience shows that this teaching method is very useful for most students, and it has a special significance in students who plan to deal with scientific-research activities in the course of their future work or continue their education at higher levels of training (master's and doctoral studies).</p>



Teaching method	THE EXERCISE IN PRACTICUM
<p>What are the exercises in practicum?</p>	<p>The exercises in the practicum represent teaching method that is implemented through practical work of students under supervision of a responsible teacher/ associate, with the active use of available materials or equipment that follow the appropriate teaching unit within the subject. Practicum represents a specialized classroom with stationary equipment and other facilities for easier mastering of teaching material (or group of subjects) that this teaching method is used with. At institutions that implement the educational process in the field of agriculture, practicums are organized according to group related subjects (practicums for fruit growing, practicums for physiology and anatomy of domestic animals, practicums for agricultural machinery) so that their performance in the teaching process is more comprehensive. If technical abilities allow the practicums can be used for organizing regular classes under other (not necessarily related) subjects. If there are no specialized practicums, standard classrooms can be customized for performing this type of exercise, which requires additional engagement of teachers/associates in providing the materials before the beginning of each exercise. All types of exercises in the workshop (and other kinds of exercise) can be usually realized by responsible teachers and associates. Only associate will be mentioned hereinafter as the person who controls and supervises the implementation of the exercise for easier access in the description of methods (considering that usually associate implements this kind of teaching with students).</p>
<p>Purpose of application</p>	<p>The purpose of performing the exercises in practicums is that students through practical work with the appropriate material (or other practical content) that monitors and clarifies particular matter, phenomenon or process, understand better and experience the visual content of the teaching that is elaborated in this way.</p>
<p>Advantages of the method</p>	<p>In the course work students are in an environment that is associated with the teaching material. They acquire new visual and practical knowledge through practical work which is the best way to acquire knowledge. They familiarize themselves with the ma-</p>

	<p>terial or other content that allows them simulation of real processes. They acquire practical skills that can be useful in the work after graduation. A number of exercises in practicums requires group work which affects the development of the capacity for cooperation with colleagues in the realization of a particular task. Implementation of the method makes interactive teaching methods complete and thus makes the teaching process more complete.</p>
<p>Disadvantages of the method</p>	<p>There is a necessity of having practicum or specialized classroom for this type of exercise. Most often a larger number of such classrooms are to be adapted for teaching process in the specific field of agricultural science. It is necessary to equip classrooms with ancillary facilities and materials used in the teaching process. Associates have to have increased control during exercise and greater engagement. Students have the independence in work which is not always directed towards solving the given obligations.</p>
<p>The importance of implementation of the teaching methods</p>	<p>Carrying out practicum exercises increases the ability of students to solve certain problems by managing their own work, the possibility of applying the acquired theoretical knowledge, the ability to cope in the real situations and decision-making. It increases the practical skills necessary for implementation of a particular task, develops the ability to work under control and increases the ability to work in a group, through communication with the responsible associate and other colleagues. It increases the ability to analyze what has been done and to make preliminary conclusions, based on their own work.</p>
<p>Importance and participation in the teaching process</p>	<p>Practicum exercises are very important teaching method for subjects with teaching material, which can be successfully presented (showed) and addressed to via practical and demonstrative exercises in addition to theoretical presentation. It is usually added to interactive teaching or university teaching and completes the display and explanation of a specific teaching unit. Participation in subjects, in which it is applied, can be up to 50% since it is economical and efficient.</p>

<p>Method of application (individual/group)</p>	<p>Work in the practicum represents independent student's work within the group (students who attend a particular year of study) that implements the same task. Work in the practicum can be implemented in small groups or even individually (in cases where it is necessary to catch up on the missed lessons or to further clarify certain teaching material), but in such cases the implementation of exercises is uneconomical.</p>
<p>Group size</p>	<p>Group size must provide conditions so that every student can do the exercise individually and give opportunity to responsible collaborator to control the students' work and evaluate the results that students got during their work.</p>
<p>The method of forming group for work</p>	<p>Groups are usually made according to the number of students who are at a particular year of study. If a group is supernumerary and disrupts student's individual work, smaller groups can be formed that can be adjusted to the number of jobs in the practicum, organized by the principle of an equal number of students in a group or by another principle.</p>
<p>Selection of the topics addressed by the method</p>	<p>Topic for work within the scope of exercises is usually determined by the curriculum and thematic parts to be addressed. In exceptional cases the topics of exercises may be beyond the curriculum if there are justifiable reasons.</p>
<p>Individual student's work</p>	<p>During the exercises, students independently implement the planned process upon receiving instructions and, if necessary, the previous presentation of exercise by the responsible employees. During the work, students can have further consultations with associate or other colleagues if exercises allow that, and if the responsible associate approves this type of communication. Students who successfully complete the exercise before others, can help their colleagues as student-demonstrator with the approval of the responsible associate.</p>

Presenting results	Results are usually presented individually by each student (usually in the form of certified exercise) or through group presentation, if the exercise is carried out in the group (which is less common in this teaching method).
Evaluation	While creating exercises, responsible associate usually forms a specific format (form for filling in the work results) where students record their observations or enter data that is required while carrying out exercises (drawing, a schematic presentation of the sequence of operations). Associate usually certifies with his signature the exercise that has been done, and in a number of cases the exercise that has been done and certified in this way is the basis for access to the pre-exam.
The best practice	If possible, it is the best to provide practicums that will be used for implementation of a large number of related subjects in the teaching process. It is desirable to provide a greater number of accessories (models, mock-ups, charts) that simulate a specific matter as realistically as possible. The practicum is desirable to have the equipment that enables storing of raw materials for a specified period (refrigerators). The practicums should be located next to the classrooms that are intended for having theoretical part of lectures in a certain field.
Other notes	The practicum exercises are very common and very desirable form of teaching methods, which due to its interactive mode of implementation is acceptable to students and makes it easier to understand the teaching material. Although the teaching in the practicums is efficient and economical, the equipment is very expensive. Therefore, a small number of higher education institutions in the field of agriculture in both Serbia and Bosnia and Herzegovina has specialized practicums.

Teaching method	LABORATORY EXERCISES
<p>What are laboratory exercises?</p>	<p>Laboratory exercises are teaching method that is implemented in the laboratory by means of appropriate laboratory equipment, through independent work of students and under supervision of the responsible associates. Laboratory exercises are normally carried out after learning the theoretical part of teaching units. Through laboratory exercises students actively participate in the practical application of the acquired theoretical knowledge, understanding and interpretation of the results. The students themselves carry out the practical lab method under supervision of responsible associates.</p>
<p>Purpose of application</p>	<p>The purpose of application of this teaching method is that theoretical knowledge is explained to the students through practical work and implementation of process in laboratory conditions, clarifying teaching material that was mastered within the theoretical part of the teaching process. The concept for implementation of laboratory exercise is that students should think actively all the time during the implementation about the activities implemented and that the entire process can be understood integrally. The purpose of application is that a student after a certain time can independently repeat activities that they have been through. Students put their individual abilities in a joint work through group work within the scope of laboratory exercises.</p>
<p>Advantages of the method</p>	<p>Students are faced with the practical application of theoretical knowledge. Students expand their theoretical knowledge through laboratory exercises, since parts of individual teaching units can be successfully implemented in this way. Closer communication relations among students are established by working together in a group, as well as between students and associates. Laboratory exercises often represent first contact of students with research work.</p>
<p>Disadvantages of the method</p>	<p>Adequate organizational and technical conditions are necessary for successful implementation of laboratory exercises. If associates strictly (in too many details) set tasks for laboratory work, students relatively quickly lose interest in thinking, and the work is reduced to a mechanical fulfilment of given assignments. The theme of each laboratory exercises and method of</p>

	<p>performance should be set in a way that is stimulating for students. It is necessary to leave enough space for students to independently contribute in creation and implementation of laboratory exercises.</p>
<p>The importance of implementation of teaching methods for student</p>	<p>Students are familiar with the basic procedures of the laboratory work that enables them easier engagement in scientific-research work in future. Students are able to independently implement an experiment based on the acquired theoretical knowledge and skills adopted during implementation of the exercises. Students have experience of working in a group and targeted communication in such an environment.</p>
<p>The significance and participation in the teaching process</p>	<p>Participation of laboratory exercises can be up to 50% in the implementation of the teaching process. Laboratory exercises in agricultural sciences have special importance in implementation of basic subjects (chemistry, biochemistry, botany) and subjects that are partly based on certain laboratory analyzes (agrochemistry, pedology) as a basis for the expert's recommendations in production.</p>
<p>Method of application (individual/group)</p>	<p>Work in laboratories represents the independent work of students in the group (students who attend a particular year of study) that implement the same laboratory exercise. Work in the laboratory can be implemented in small groups or even individually (in cases where it is necessary to make up the missed exercises or to further clarify certain process). However, it is demanding in terms of organization and providing conditions for work. Therefore, it is applied only in exceptional situations. Some exercises may represent a joint work of a group of students, when it is more important for the acquisition of teaching materials.</p>
<p>Group size</p>	<p>Group size must be adjusted so that each student can individually do the exercise that is given to him and that each associate can control the student's work and assess the results. Group size for laboratory exercises mainly depends on the number of jobs in the laboratory. When the exercise is carried out by joint work of students in small groups, groups should not be larger than 5 students, because it is more difficult to organize homogeneous work in larger groups and monitor the results of work of each student individually.</p>

<p>Method of forming group for work</p>	<p>Smaller groups for work (if there is a need to work in a group) are mostly formed at random. If the module includes a greater number of exercises, it is desirable to change the composition of group for the different exercises, so that students can have contact with a number of colleagues while working. If teaching staff notices that some groups do not work while performing the exercise, it is necessary to intervene in a stimulating way to enhance positive relationships. Likewise, if some groups finish their activities earlier, they can join other groups in order to achieve effect that the students are involved throughout the exercise.</p>
<p>The selection of topics addressed by the method</p>	<p>Topic of laboratory exercise should be harmonized with the material that is being taught in the module, as it is common practice to carry out exercise after mastering the theoretical part. The selection of topics is most often caused by a number of other factors such as technical capabilities of laboratories, the financial resources for the necessary material, chemicals and creativity of teachers. Topics to be addressed within the scope of exercises should be selected in such a way that it is technically feasible, that allows a better understanding of the theoretical material, that it is stimulating for students and offers new insights to students.</p>
<p>Individual work of students</p>	<p>Students themselves under supervision of the teaching staff carry out laboratory exercises. Normally, a responsible associate explains the procedure and practical exercises and shows the proper performance prior to beginning work independently.</p>
<p>Presenting results</p>	<p>Students are expected to understand the process that is performed by them, as well as the results they get. If teachers consider it relevant, students can specifically present and interpret the results. It is desirable that teachers ask students some questions in order to check understanding of process that is implemented while performing exercise.</p>
<p>Evaluation</p>	<p>Given the specificity of the procurement and material value of the materials and chemicals used while performing exercise, attending laboratory exercises is mandatory for all students at the agricultural studies. Students can get a certain number of points for the activity</p>

	<p>while performing the exercises. Students that present the results to other colleagues in the group can receive additional points as the type of stimulation and encouragement of other students to increase their activity.</p>
<p>The best practice</p>	<p>Students need to be prepared for performing laboratory exercises. Students must be familiar with their task, the equipment that will be used, and security aspects of work in the laboratory. It is important for students to realize the meaning of laboratory exercises in the overall concept of the subject. Before coming to the lab, it is desirable that the students receive a written instruction that will enable them better understand of implementation of laboratory exercises. Instructions should include theoretical introduction, a description of the methods to be used in the work, a description of any problems that may arise during the exercise, description of expected results and the manner of their interpretation. At the very beginning, laboratory should be presented to the students who work there for the first time.</p> <p>Before starting work, students can be asked about the teaching material that they were given the manual for, with the purpose of motivation and efficient work. While performing exercise, teaching staff are required to be present all the time and monitor the work of students. The teaching staff should visit each student and make sure that the student understands the work procedure. The teaching staff should ask students some questions about the process, thus making them think and show that they understand the process.</p> <p>At student's question, teaching staff should make student make his own conclusion by asking him some follow-up questions, instead of giving him a clear answer. Having a break during the implementation of the exercises can be used to summarize your answers and connect with theoretical work by stimulating discussion. A lab technician should be present at all segments of implementation of laboratory exercises, who can also give useful instructions to students and control the process itself.</p>
<p>Other notes</p>	<p>Experience shows that this teaching method is very useful for the majority of students for easier understanding of the process, but it is the most significant for students who plan to engage in scientific research.</p>

Teaching method	COMPUTING EXERCISES
What are computing exercises?	<p>Computing exercises are teaching method in which students calculate on their own, i.e. mathematize the parameters or process concerned, based on the given parameters or defined input ones. The above calculation in the exercises is related to the application of the acquired theoretical knowledge and their practical use for determining the output parameters usable for specific processes within the module.</p>
Purpose of application	<p>Through computing exercises students master the techniques of calculating parameters and mathematization process that might be encountered in real life after graduation. The goal of computational exercises is to teach students the method of quantification of defined parameters and processes in the field where this method is used.</p>
Advantages of the method	<p>The students realise the opportunity and necessary quantification which is essential in terms of determining the optimal values of given parameter for the successful implementation of certain processes in agricultural production. They acquire the skills necessary to engage in real production processes after graduation. Using the numerical values of certain parameters, the theoretical knowledge of the specific processes is completed and numerical and logical component expertise is developed. Results of the applied method are relatively easily verifiable through the results obtained. There is a possibility of a larger number of repetitions in a relatively short time. There is no need for special technical requirements for the design and implementation of exercises, etc.</p>
Disadvantages of method	<p>It requires greater involvement of the responsible associates regarding control of the work of each individual student. It is essential to prepare students well and to point out the connection between exercise and the acquired theoretical knowledge. Students often do only mechanical computation and application of the given formula without understanding the meaning of the results for a defined process. It requires a relatively low level of creativity of students in the course of work. The method is not applicable in most modules in the field of agricultural sciences.</p>

<p>The importance of implementation of the teaching method for students</p>	<p>Students acquire the ability that is required to perform the quantification of certain processes that they might face during the practical application of acquired knowledge. Students gain the necessary knowledge to place calculation that they got into in the context of the process in regular production and give their interpretation. Greater application of this method increases the work routine which has more expeditious work of students and increases their efficiency.</p>
<p>The importance and participation in the teaching process</p>	<p>For the modules that require this method of application in order to be implemented, participation is very important in such cases and may be up to 30% of the entire teaching process.</p>
<p>Method of application (individual /group)</p>	<p>Computational exercises are mainly carried out by students individually and very rarely this method is applied as a group work.</p>
<p>Group size</p>	<p>In case if work is applied in groups (if necessary), the group should not be larger than 2 students, due to technical and organizational specifics of implementation of exercises.</p>
<p>The method of forming group for work</p>	<p>In case that work is organized in group, it is better to make a group at the initiative of students who want to work together on the implementation of computing exercises.</p>
<p>Selection of topic addressed by the method</p>	<p>Topic for work within the computational exercises should be in accordance with the curriculum and modules, and should be implemented immediately after adopting information within the theoretical part. The accumulation of material that needs to be followed up with computing exercise is not the most productive for learning the teaching material.</p>

Student's independent work	Upon theoretical preparation and practical demonstration of exercise by the responsible associates, students independently perform computational exercises. "Students demonstrators"- students who have mastered the subject material and can help other colleagues, can be included in this method to support responsible associates in the work. Success in mastering and performing computing exercises is based a lot on the existing previous knowledge of students in mathematics and related subjects.
Presenting results	Students do not present their results to other colleagues, but only to the responsible associate. Public presentation can be applied only in cases when it comes to calculating complex processes, which requires additional explanations or responsible associate estimates that this would have a positive impact on attracting other students to more successful implementation of mathematical exercises.
Evaluation	In subjects where computational exercises are an important teaching method, they are usually part of the tests, pre-exam obligations or the exams themselves. Calculation exercises are evaluated by the responsible associate and their successful implementation is verified by signature.
The best practice	In implementation, it is desirable that the task of computational exercises is practical situation in a particular field of agricultural production to the extent that it is reasonably possible to adapt to the teaching process. The concept of those exercises is much more current and more effective, which affects an additional interest of students for their implementation.
Other notes	The introduction of modern accessories in the teaching process and regular use of computers in daily work creates the opportunities for improving the level of implementation of this teaching method. While implementing computing exercise, a particular attention should be paid at explaining the importance of results that they got and their connection with the acquired theoretical knowledge, and not just mere mathematization and the use of modern tools for data processing.

Teaching method	FIELD EXERCISES
<p>What are field exercises?</p>	<p>Field exercises are teaching method based on the active participation of students in the real production operations or processes.</p> <p>A part of acquired technical knowledge is applied by students within the scope of this process through practical work on the field (experimental or production facility at which a particular process is being implemented in agricultural production or processing) and the students also implement a segment of the production process under the control of the responsible associate.</p>
<p>The purpose of application</p>	<p>The main purpose of applying the field exercises as a teaching method is the practical application of acquired knowledge and the acquisition of practical skills in real production conditions.</p>
<p>Advantages of the method</p>	<p>Field exercises enable students to apply their knowledge and adopt new practical knowledge that cannot be transferred completely by theoretical teaching. Within the field exercise students have a much greater responsibility for their work whose results can be seen immediately after implementation of the exercise or after a certain period (depending on the specifics of the production process). Students have a much more active role than in other forms of teaching methods, greater autonomy in the implementation of the given work operations and acquire the habit of how to manage the work process (the time required for implementation, the pace of work, a critical phase in the implementation, the need for additional clarification). Through this method, students learn how to apply their knowledge in real professional life.</p>

Disadvantages of the method

Successful implementation of field exercises implies the existence of the object to be used for carrying out the exercises (farm, industrial plant) whether it was a good experiment of higher education institution or business entity in the state or private ownership. It requires more time in the organization (preparation, selection of appropriate facilities, the organization and implementation) and financial resources for the implementation. It implies the existence of additional preparation of students before going to the field and getting to know what will be done in the field and in which way. It requires much more independence in the work of students and the need for decision-making in the course of its implementation. Additional monitoring of workflow (supervision) by associates (with the desirable presence of Lab technicians) is required during the implementation.

The importance of implementation of the teaching method for the students

This teaching method develops and exercises greater number of competencies and skills of students in particular: practice for the use of certain operations in the production process, repeated many time, innovation- creative use of knowledge sources that students encountered during the theoretical part of the teaching process; ability to solve problems with the support of responsible associates; ability to make decisions on the application of appropriate treatment in realistic conditions; ability to manage their own work process (to do a particular job in a certain period), but also the ability to communicate effectively with co-worker and other colleagues in order to seek an optimal solution for a specific task.

The importance and participation in the teaching process

Field exercises are especially important for subject with practical character of study programs in the field of agriculture and their successful implementation is almost inconceivable without this teaching method. The percentage of participation should be adapted to the real possibilities, but it should not be less than 20% in the structure of subjects. It is desirable that this percentage is as large as possible (up to 50%) in implementation of the entire teaching process.

Method of application (individual/group)	Field exercises can be carried out as the group ones (for specific forms of work in the field) but they are much more functional and more effective if they are implemented through individual work. In individual work, each student will be liable for his share of implemented activities, which makes it easier for the responsible associate to have more successful and easier evaluation. Individual work enhances students' self-assessment, professional competitiveness and peer review, with the aim of pointing out the positive aspects, as well as shortcomings in the work.
Group size	If the method is applied through group work, the group should have no more than 2-3 students who will be working on one activity within the field exercises. If the field exercise is implemented in larger groups, then their usefulness is questionable.
The method of forming group for work	Groups can be formed by random selection or on one's own initiative. If groups are already made because of the need to work together, better results will be achieved if students voluntarily form groups because of the initial work efficiency.
Selection of topic addressed by the method	Selection of the topic that is addressed through field exercises must be strictly in accordance with the curriculum that follows the dynamics of its implementation. If possible, the field exercises should be implemented immediately after completion of the theoretical part, in order to make it more understandable for students and easier to learn. If this is not possible, field trips should be organized when conditions are fulfilled.
Individual work of students	During field exercises, students individually do their tasks defined by exercise (regardless of whether they work alone or in a group). During the work, student takes care of the accuracy of the procedures applied, which is why it is necessary to consult with other students or responsible associate before the final implementation.

Presenting results	Students present the results of their practical work before the responsible associate by demonstrating what has been done with a detailed explanation on how the action is implemented. It is desirable that other students who attended the exercises are also present at the presentation of results of one student's work.
Evaluation	Assessment of this kind of work requires more time and is more difficult than the classic assessment of theoretical knowledge. An associate has an obligation to examine the practical work result of university students during the exercises and evaluate their completed actions by the students, as well as to make a general assessment of the whole process. At the end of the exercise students assess the appropriateness of field exercises and share their observations (preferably in writing), which can be used as a good basis for associate for further quality improvement of field exercises.
The best practice	Field exercise is best realized on experimental farm that higher education institutions possess. Establishing this type of facility in the form of educational and training centres should be primarily designed for implementation of field exercises. Although a great number of business entities is generally ready to approve the implementation of field exercises in their production facilities, sometimes it can be a problem for many reasons: defining the optimal timings for businesses entities, which often do not coincide with the teaching process, disturbing the established protocol at the facility, uneven quality of applied activities at the facility, often the inability to have more timings for the implementation of the exercise or their control, difficulties in monitoring the results of the implemented measures etc. These work difficulties are eliminated by working on the experimental fields of higher education institutions.
Other notes	Successful implementation of field exercises in most cases implies the existence of specific equipment for the implementation of planned activities on the field, which needs to be provided on time. Field exercises can often serve as a segment of practical activities in drafting the final work of students.

Teaching method	FIELD TRIPS
What is a field trip?	<p>A field trip is a short trip with the purpose of professional development on a particular issue (or more of them) from production. Implementation of the field trip includes detailed designing and organization itself. Within the field trip, the contact is usually made with commercial entities that are visited the most often, and they are dealing with specific vision of modern agricultural production (processing), which is a subject of the subject (or groups of subjects), within which the field trips are organized.</p>
Purpose of application	<p>The purpose of implementation of the field trips is effective verifying of the acquired knowledge within the theoretical part of the teaching process as well as establishing strong links between theory and practice. Field trips have their broader social dimension that is certainly not to be neglected.</p>
The advantage of the method	<p>Students have the opportunity to meet production process on the spot, which is the subject of a specific course, thus achieving a better connection with the acquired theoretical knowledge. Students gain new practical experience, share their knowledge with the participants in the production cycle, get ideas about their obligations after graduation, make contact with the representatives of the economic entity etc.</p>
Disadvantage of the method	<p>Disadvantages are mainly in the financial, organizational and technical aspects of implementation. Higher education institutions in the field of agricultural sciences in Serbia and Bosnia and Herzegovina do not usually have pre-defined implementation plans of field trips with precisely defined tasks, holders and deadlines of implementation. It is not good to organize study tours ad hoc without a defined content. With regard to the socio-economic changes in recent years (the privatization of agricultural farms) it is more and more difficult to establish legally-formal cooperation with economic entities that are willing to enable students' visits and devote some time in presenting their activities, as a part of their regular production process.</p>

The importance of implementation of the teaching methods for students	Students who take part in implementation of the field trips have a higher level of capability of linking theory and practice, more precise picture of the production process in real conditions and the possibility to realize advantages and disadvantages of the production itself. Students are much more informed about the specific production and holders of that production in a specific region.
The importance and participation in the teaching process	Field trips are important teaching method in the course structure which implies application of practical knowledge on specific thematic units. Field trips should have important place within these courses in the implementation of the teaching process and contribution for better linking of theory and practice. Field trips are important for modernization of curricula and diversification of the teaching process. Participation in the implementation of the teaching process depends primarily on the characteristics of the module content and other organizational and technical capabilities. The representation of the course structure is up to 20%.
Method of application (individual/group)	Field trips are organized exclusively as a group activity, when it is also the most effective.
Group size	Group size depends on the aim of field trip and planned method of implementation. If a field trip is for the informational purposes only (access to specific manufacturing process, visit to the fairs and other professional events) group may be bigger (up to 50 students). If the aim of the trip is more detailed introduction to the specific manufacturing process, where students are expected to be more active by participating in certain phases (discussion, interview with the holders of the manufacturing process), the group should be smaller (25 to 30 students). Excessive groups make it difficult to control and implement trips, and the effectiveness of its technical expediency might be questioned.
The method of forming group for work	Group for field trips is formed usually on the basis of the number of students at the year of study (visit to the production entity) or on the basis of the interest of students for a specific type of the field trip (visit to the agricultural fair).

<p>Selection of the topics addressed by the method</p>	<p>Business entities in which it is possible to check the acquired theoretical knowledge in a particular subject or subjects (or events) that have broader implications for a large number of students in various fields at the study programs in the field of agriculture, are mostly visited as a part of the field trip.</p>
<p>Individual work of students</p>	<p>There is usually no space for independent work of students within the scope of this method, but it is very important that every student is an active participant during the implementation of the field trip.</p>
<p>Presenting results</p>	<p>It is very helpful that students give their opinion after the implementation about the field trip via the list for assessment and discussions with the responsible teacher. In this way, the teacher has the opportunity to evaluate the activity of students during the field trips and the level of understanding of what he has seen.</p>
<p>Evaluation</p>	<p>Evaluation of field trips may be of interest to the teaching staff and students. The teacher can assess the behaviour and the interest of the students during the implementation of excursions, which can be an integral part of the final grade in the framework of a module. On the other hand, it is very useful for students to do the assessment of the implemented field trips on a pre-defined form and thereby assess the quality and appropriateness of the field trips, as well as the importance of improving their knowledge. This assessment can be a good indicator to the teacher of whether a field trip was well thought out or it needs to be improved (changing realization time, group size, facilities that are visited, etc.).</p>

The best practice

Field trips can last one or more days. One-day field trips are implemented most often through visiting facilities, manufacturers or companies, that are close to the higher education institutions and that can be visited in one (working) day. While carrying out one-day trips it is necessary to focus on a small number of facilities with a specific production. The organization and implementation of one-day trips is not too demanding. Multi-day trips (up to three days) have a broader meaning and can be implemented in a wider area within their own country or they may have an international character, if you visit a specific industrial operators located in another country. When implementing multi-day trips, it is necessary to plan a tour of a large number of different economic entities due to the effectiveness of the trip. The implementation of multi-day trips should be led by a team of experts coordinated by the responsible teacher.

Other notes

Planning and organizing field trips (regardless of the number of days) includes administrative and technical problems that are not insoluble, but can make the process of implementation complicated. It is very important that the question of the organization of field trips is not formalized, but perceived as a serious need to train young people. In doing so, it is expected that all parties participating in the implementation of teaching methods demonstrate their responsibility. In the implementation of field trips, it is necessary to adhere to a code of conduct that is defined by the economic entity that is visited.



# INNOVATIVE METHODS

## METHODS AGRICULTURAL STUDY PROGRAMS

① STUDENT DEBATES

② CASE STUDY

③ STUDENTS RESEARCH

④ VISITING LECTURES

⑤ SIMULATION PROJECT

Teaching method	STUDENT DEBATE
What is a student debate?	Student debate is a kind of formal discussion in which two opposing groups of students exchange arguments in support of a variety of viewpoints on the occasion of a particular subject, respecting the pre-agreed rules. Unlike the usual debate where individuals are free to choose which side to represent, students are usually assigned the side that has to be presented on a particular topic.
Purpose of application	The purpose of application of the debate as teaching methods is development of communication skills, debating skills and confrontation of arguments, the culture of speech and the ability to rapidly analyze, reasoning and use of expert arguments.
Advantages of the method	The debate as a teaching method increases the involvement and motivation of students to learn, helping them to apply their knowledge in a variety of situations. Debating also leads to improved communication skills, including the development and use of native and foreign language. Participation in the debates gets student in a simulation of real life and business situations in which they need to defend their views and opinions. Debate has positive effect on strengthening the ability of students to work in a synchronized group.
Disadvantages of the method	It takes a lot of time to prepare the students in terms of understanding the rules and the spirit of the debate. Students need more time to gather preliminary material preparation itself and the implementation of debates. A problem of different approach and responsibilities of students in the preparation and implementation of the debate may occur. Appropriate organizational conditions for successful implementation are necessary. The debate develops only one topic in the teaching process. There is a danger that the debate is not being implemented within the framework that would be satisfying and affirming for student participants that can have potentially negative impact on other participants.
The importance of implementation of the teaching method for students	Students who are engaged in debates in the course of study and who participate in the debate workshops increase critical thinking skills. The ability to analyze information is increased, which is one of the most important tools in contemporary social circumstances.

<p>The importance and participation in the teaching process</p>	<p>The percentage presence of the debate should move to 20%, since the small number of debate workshops can include relatively large number of students (in the role of debaters or listeners). The importance for the subject is reflected in the diversification of the teaching process and the analysis of conflicting opinions on a specific topic, allowing students a better knowledge of the specific questions.</p>
<p>The method of application (individual/group)</p>	<p>The debate in the form of teaching methods in higher education institutions is implemented only as a group activity.</p>
<p>Group size</p>	<p>Group size for the implementation of the debate depends on the topic being addressed, the conditions for the realization of the debate, the available sources of information and the tendency of students to this kind of work. Group for the debate should not be smaller than three but not bigger than 5 members, in order to have successful debate, and all the debaters are in a position to participate actively in the debate: starting from preparation to the implementation.</p>
<p>The method of forming group for work</p>	<p>It is the best to form the group based on the wishes of the students to be part of the team that will represent a specific point of view on a particular topic. Forming a group as a self-initiative is important because of the dynamics of the work, the preparation, but especially the very act of debate, when students are expected to work as a team, that they complement and complete their discussion during the debate. Team spirit in work is very important in the debate as teaching method.</p>
<p>Selection of the topics addressed by the method</p>	<p>Responsible teacher suggests the topic because he must define clear tasks for two groups that debate. It would be helpful that the debate addresses the topic that is included in the curriculum because of the efficiency in the work, but it is not mandatory. Topics of debate can be real issues in the field of agriculture (hot topic at a given time, a specific legal solution, specific ethical questions in the field of study, new biotech solutions in manufacturing etc.)</p>

<p>Individual work of students</p>	<p>During the debate, students mostly prepare material on their own on the basis of pre-agreed rules, which is mainly channelled by the responsible teacher. The responsible teacher has the ability to direct students to the relevant sources of information on a particular topic, but he does not participate in their processing. Students self-organize all the steps in the preparation and implementation of the debate.</p>
<p>Presenting results</p>	<p>The act of debating is the final step in the debate, when in front of other students, two groups of students defend their different perspectives. The debate has a public character, and besides students of the group attending a particular module, other interested students may attend, if allowed by technical conditions. Responsible teacher does not affect the course of debating but monitors the entire process and, if necessary, directs the debate in the right direction.</p>
<p>Evaluation</p>	<p>The debate will be evaluated in two ways. Debaters are evaluated by the students attending the debate to determine more successful group, which represents a kind of recognition for the winning team. The debate is evaluated by the responsible teacher, who observes the activities of student participants as a special activity or takes it into account while making a final evaluation.</p>
<p>The best practice</p>	<p>In countries where the debate is part of the official educational programs, high school students who start dealing with it earlier, are more likely to enrol at better universities, because the debate promotes creative approaches to learning and development of self-esteem. Within the studies, the debate has special significance for better understanding and analyzing of the specific problems that are presented to the students in a simple way. Expanding horizons and developing a culture of awareness, debate contributes to a more open and tolerant society in general, where the role of students is especially important.</p>
<p>Other notes</p>	<p>For the implementation of the debate, as a regular teaching method, it is necessary to build a relationship between teachers that will support this kind of students' activity. For the beginning, it is good to start with the debates that do not require a lot of preparation, in order to help students learn about the process and the importance of this kind of work.</p>

Teaching method	CASE STUDY
What is a case study?	<p>It represents a form of active learning of students through finding solutions and answering the question (the case), real or imaginary, which can often have a provocative character. In order to get an answer to the problem and solve the case study, the student is forced to ask himself how he would react if he would find himself in such a situation for real, with a detailed description of potential challenges and possible directions of solutions. The key value of education through case study is the fact that a student is brought in a situation to respond to open question that has no unique and a predefined response. Student reflects on a complex of measures that can be a solution of the challenges.</p>
Purpose of application	<p>The purpose of application of the case study is reflected in facing students with a situation in which the need to apply the acquired theoretical (and practical) knowledge on the relatively new event that is linked to the processed material. In this way, student develops critical thinking, innovation, the ability to see problems from different angles and in the case of group work develops the ability to work in a group. Through discussions with individuals or groups, students develop the ability to defend their point of view, but also to adopt other people's constructive opinion.</p>
Advantages of the method	<p>The student applies theoretical knowledge to the specific case with which he can meet in real life. The student develops the capacity for analytical approach to problem solving, decision-making in a given situation, and dealing with potential ambiguities and overcoming them. Discussion on possible solutions between individual students within the group or groups reciprocally, can lead to new conclusions.</p>
Disadvantages of the method	<p>There is a real possibility that a student cannot reach enough quality information on the case topic in order to develop a critical attitude on the subject that should be analyzed. The student does not have to always have enough theoretical knowledge to visualize the situation from all aspects of importance for the analysis, which may affect the quality of the solutions (incomplete). The implementation of case studies requires a lot of time to prepare students for work and the work itself, while the possibility of repeatability is small (mainly due to time limits).</p>

<p>The importance of implementation of the teaching method for students</p>	<p>The student is able to independently analyze a particular problem, classifies its most important characteristics and proposes solutions as a response to the challenge that is set. The student develops the ability to analyze problems from different aspects, in order to bring a comprehensive decision or recommendation to overcome it. The student acquires the ability to defend his points of view with arguments and accepts constructive suggestions.</p>
<p>The importance and participation in the teaching process</p>	<p>The presence of this teaching method in the structure of subject can be up to 30%, which largely depends on the specific implementation of teaching within the subject. It is particularly important for subjects that analyze current developments (new technologies of production, GMOs, biogas and its importance, aflatoxins in the milk, the selling price of raspberries) when students are asked for a critical attitude towards the matter and the suggestion to overcome it. Apart from the real issues, the subject of case studies can be assumed topics that are addressed as a part of the teaching material in the subject.</p>
<p>The method of application (individual/group)</p>	<p>This method may be individual or group, depending on the topic being addressed or other specific characteristics of the teaching process within the subject.</p>
<p>Group size</p>	<p>Group size depends on the scope of the topic that is addressed by the students, and the number of students attending the subject in which this teaching method is applied. Group size may be from 2 to 5 students. Increasing the groups complicates the way of presenting the results of the individual evaluation of students' group work.</p>
<p>The method of forming group for work</p>	<p>Groups are formed by random selection of students. This approach to the formation of groups creates the conditions for encouraging work in a randomly selected environment. In this way, students in addition to the issue that is addressed, meet the new working environment where they must adjust during the work.</p>

<p>Selection of topic addressed by the method</p>	<p>Topics addressed by the students can be various. Most often the teacher chooses topics that are close to his research field, because in this way he can manage the process of applying the method in the most reliable way. There can be a wide range of topics, ranging from completely imaginary to the specific case that happened in practice. The significance and scope of topics that are subject of the study may affect the final assessment (more serious and complex topics require greater commitment of students, which can result in better evaluation by the teacher). The advantage in the selection of topics should be given to the particular and current topics, so that work is more useful and relevant to the students and the topic of the module.</p>
<p>Individual work of students</p>	<p>Students' abilities to work independently in order to find a comprehensive and final solution of the above problem come to the fore while implementing this method. Students look for the answer through searching available literature and at the same time develop their own attitude on the case being set.</p>
<p>Presenting results</p>	<p>The student or group of students get the topic title along with required form of presentation. Presentation may be in the form of formal or informal written text with mandatory power point presentation or any other form of presentation (flip chart, poster, wall papers, workshops) if it is more suitable for the presentation of the results. It is desirable that each student/group has the opponent that should critically ask questions or assess the perspectives expressed. Opponents are determined before starting with method implementation, and they also have an obligation to prepare and analyze material related to the given topic.</p>
<p>Evaluation</p>	<p>Assessing engagement of students by the responsible teachers is based primarily on the meticulousness with which the case was approached, i.e. taking into consideration all potential measures or solutions to the specific problem. Likewise, students should defend their decision in a proper, reasoned and academic standards based communication method, i.e. to try to defend the results of their work but also to accept constructive suggestions by opponents. Opponents receive points for active participation in questioning by pointing out omissions and other potential solutions. The highest value in the evaluation should have the original conclusions.</p>

<p>The best practice</p>	<p>After addressing theoretical part of the curriculum, students get the task to find a solution to a specific problem. Topic of the case study should be stimulating, interesting and attractive to students in order to stimulate their creative thinking. The teacher should clearly state the objective of teaching methods and influence as great involvement of students as possible. It is especially important to stimulate thinking and discussion of opponents, which further deepens the analysis. It is desirable (if conditions allow) that some of the teaching staff from related scientific fields attend presentation of solutions to case studies.</p>
<p>Other notes</p>	<p>Unlike other teaching methods, teacher's participation in the framework of implementation of case studies is minimized in all phases of operation, so as not to suggest solutions and recommendations.</p>



Teaching method	STUDENT RESEARCH
What is student research?	Students research is the active involvement of students in solving certain issues through setting up and implementation of researching the given problem under the supervision of responsible teachers. Through the work on a particular research topic the student analyzes the problem, not only theoretically but also practically. The knowledge gained in this way is not only applicable to the particular case, but the methodology of the research approach can be applied while implementing other research tasks.
The purpose of application	The main objective of the student research, as a teaching method, is the application of theoretical knowledge through practical research and mastering the basic elements of research.
Advantages of the method	A student routinely meets with research techniques that allow him to reach the desired results and conclusions related to the research problem. Student develops independence in the planning, preparation and writing of the report, or professional/scientific work. Student faces real situations in solving the given problem and the application of results. Contacts are made with the responsible teacher as part of a team working on a particular issue.
Disadvantages of the method	It requires a lot of time for successful implementation. Adequate workspace is needed (lab, demo or production facility) with adequate equipment. It is not suitable for a large number of students and the initial years of study at the study programs in the field of agriculture. Inadequately defined themes and ill-conceived approach to research can lead to disappointment in the work and loss of motivation among students.
The importance of implementation of the teaching method for students	The student is trained to access the analysis of the problem on his own by searching the appropriate and available literature, define the planning process of research work within the given timeframe, analyze the collected results and interpret them correctly. The student develops the capacity for analytical approach to the given problem by mastering the techniques of writing professional/scientific work.

The importance and participation in the teaching process	Teaching methods can be present up to 30% percent in the workload of student's points for a particular module. The method is particularly important in subjects, in which certain processes and phenomena can be clarified in this way. If the group of students at the year of study is smaller and there is a technical possibility to implement this method, it is preferable to be represented with the maximum presence percentage.
The method of application (individual/group)	Group work is the most frequent form of implementation as for this method, but students can work individually too.
Group size	This teaching method is usually carried out in groups of 2-3 students depending on available space and equipment as well as the complexity of the topic. The number of students in the group can be 2 to 5. As for the group work, certain activities could be divided among the students, so that they work together on the topic by processing its various segments. The results are summarizes and presented together at the end of the implementation process. If students do research on the same topic, the results of individual groups can be used in the form of a number of different repetitions and thus contribute to their quality and foundation.
The method of forming work group	Group for work can be formed on the initiative of the students or randomly by teachers. Since the research work is demanding with a lot of interaction among the participants, the teacher must ensure that the group regardless of the method of forming is efficient and works well, so that it can give the expected results.
Selection of topic addressed by the method	Topics for students' research work are selected by the responsible teacher in a way that students have the opportunity to apply theoretical knowledge, but also to spread knowledge through practical work. Topics for research should be such that they are technically feasible and that the chances of successful implementation are high, which is especially important for students who are confronted with this method for the first time. At the same time, topics should require student's extra effort for learning and mastering in order to improve the existing knowledge and skills. It is desirable that the topics are current and applicable in practice.

Individual work of a student	<p>Within the scope of the given topic and available technical possibilities, student plans on his own, carries out the research and interprets the results. The entire process of implementation should be under the supervision of teachers, to prevent the situation in which a student does not understand certain phases in the project. This prevents the absence of the desired results. Before starting implementation of this research, students are introduced to the issue through further research of literature in order to visualize the problem analytically. Afterwards, student makes a detailed work plan, depending on available resources and dynamics. Student may encounter difficulties during the implementation and he will overcome them with the help of teachers. At the end of implementation, the student should interpret the results and use them in the preparation of the research report. Through this teaching method, students are introduced to the research process and they master the skills of practical use of the knowledge acquired. Interpretation of the results is the ability of students to put the material acquired in this way, into a recommendation for future activities.</p>
Presenting results	<p>Students' work is presented through a Power Point presentation, and it is desirable to write the text in accordance with the form and the propositions of professional/scientific journal work, which topic is close to the subject of the research. If you have enough different themes when presenting the results obtained, it is desirable that students of other groups participate in the discussion.</p>
Evaluation	<p>The teacher assesses the overall engagement of students during the implementation of this teaching method. Assessed are the following: the level of use of literary sources (their reality), work planning, preparation of work, interaction in the group, as well as the ability to write and present the output. Originality and enthusiasm should be particularly rewarded.</p>
The best practice	<p>After theoretically addressed part of the curriculum, students are assigned a topic for research with the aim of implementing and upgrading the theoretical knowledge. The teacher should be all the time actively involved in monitoring the work in order to allow successive progress of students in the work.</p>
Other notes	<p>The method is of special importance for students who plan to continue their education, because they are introduced with the elements of research, the dynamics of its implementation and ways of presenting the results.</p>

Teaching method	LECTURES BY VISITING PROFESSOR
<p>What are visiting professor lectures?</p>	<p>Visiting professor lectures are the ones prepared and presented by the teaching staff of other higher education institutions (or research institute) intended for students, with the aim to explain in more detail scientific findings on the specific topic or field.</p>
<p>Purpose of application</p>	<p>Lectures are intended to convey narrowly specific scientific knowledge and research methods specific for a particular topic. Presentations should affect the development of critical awareness and interest in a particular topic, bearing in mind that the visiting professors are usually highly specialized in the topic or field that he holds the lecture about (or group of lectures).</p>
<p>Advantages of the method</p>	<p>Visiting professor lectures affect students' better knowledge because they are usually accompanied by contemporary information about developments in the thematic area. At the same time, they contribute to deepening of knowledge and enable the exchange of positive experiences with other teachers on a specific topic. Visiting professors lectures speed up development of academic skills to communicate with other teachers, which has a special significance for visiting professors abroad. Preconditions are made for establishing future cooperation. Visiting professors lectures deepen interest in the specific field in a certain number of students.</p>
<p>Disadvantages of the method</p>	<p>Lectures by visiting professors are rarely applied as a teaching method due to the difficulty of securing a professor of reference for a specific area. Likewise, it is difficult to fit in dates of regular teaching process with the dates of visiting professors. A particular problem is providing financial support for the arrival and stay of professors. Some of disadvantages of this method are lack of preparation of students for the new teachers and indifference during classes, as well as language barrier when visiting professors present their lectures in foreign (mainly English) language.</p>
<p>The importance of implementation of the teaching methods for student</p>	<p>Students gain a higher level of knowledge about a particular thematic area based on information from a number of different sources, which increases their output competences. Students establish cooperation with other teachers which opens possibilities for developing new forms of cooperation and communication.</p>

<p>The importance and participation in the teaching process</p>	<p>The method is of great importance for the subject regarding diversify of the teaching process through the inclusion of renowned lecturers for a particular thematic area. This method can be represented up to 20% as for the implementation of subjects. Due to a series of obstacles for implementation of the majority of subjects at the study programs in the field of agriculture in Serbia and Bosnia, this teaching method is rarely represented in the work with students.</p>
<p>Method of application (individual/group)</p>	<p>The method is particularly intended for group work because its organization and implementation, due to its complexity, implies the presence of a large number of students, not just those specifically attending a particular subject, but also other students who find lectures interesting and significant in the ordinary course of education.</p>
<p>Group size</p>	<p>For successful implementation of the method, the group should not exceed 25 to 30 students, especially when the lectures are held in a foreign language. Group size can affect the success of implementation of the teaching material as well as the control of students' interest in the lecture. Group size gets special importance in the part related to the interactive work of the visiting professor with the students through a discussion on the topic of the lecture.</p>
<p>Method of forming group for work</p>	<p>While forming the group, one should be guided by the regular teaching process because the group is generally defined by the number of students attending a particular subject. In the implementation of lectures in a foreign language group should be formed by students who are able to follow such lectures independently and later transfer their knowledge to other colleagues.</p>
<p>Selection of the topics addressed by the method</p>	<p>Chosen topic for visiting lecturers should be accompanied by a curriculum and thus modernizes and deepened. Through this approach, students do not have "additional" obligations on a specific topic, but the opportunity to hear that from renowned teachers who deal with these issues in their scientific work. Topics of the visiting lectures do not have to be a part of curriculum, if it is of great importance for agriculture in which students are educated or it has a high level of current events at a given moment.</p>

<p>Individual work of students</p>	<p>Students are usually actively involved in these lectures through discussion and exchange of information with a visiting professor, by asking questions related to the topic of the lecture. At the lectures by visiting professors, students have the opportunity to ask questions during the presentation, and direct the contents of the lectures.</p>
<p>Presenting results</p>	<p>Students do not present their own results within this teaching method, except for expressing their observations and thoughts during discussions with the visiting professor.</p>
<p>Evaluation</p>	<p>Visiting professors are usually evaluated by the students, which is a regular procedure and it is positive for both the visiting professor and the teacher responsible for the subject in which this method is applied. If there is no predicted model of assessment, the existing forms of assessment can be used for teacher and lectures. Evaluation forms can be adapted to the particular case.</p>
<p>The best practice</p>	<p>Visiting professors usually give lectures within 2 to 4 hours, and they are combined with discussion, talking with students and other forms of interactive teaching. Prior to the lecture, it is desirable to prepare excerpts from lectures and basic information about the visiting lecturer, which are given to the students. In the case when the visiting lecturers are from the same language area, the lectures are visited more and they are often more comfortable compared to the lectures in a foreign language. Simultaneous translation during the lectures complicates implementation and it often seems counterproductive to the whole process.</p>
<p>Other notes</p>	<p>Lectures by visiting professors are not common model of diversification of the teaching process, which unfortunately mostly justifies the lack of financial resources and organizational capacity. Lectures by visiting professors can be successfully combined with regular scientific conferences or some other form of professional cooperation, when experts from other institutions in the country or abroad reside at the higher education institution.</p>

Teaching method	PREPARING A PROJECT PROPOSAL
What's preparing a project proposal?	<p>Preparing the project is teaching method through which students are faced with the specific task on finding one or more solutions presented in the form of project documentation.</p>
Purpose of application	<p>Applying preparation of project proposal as teaching method in the agricultural sciences is present in two forms: a) preparing project proposal of a specific manufacturing process (project proposal for the intensive orchards management, project proposal for poultry farms) and b) project in the form of implementation of interdisciplinary activities, which aims to demonstrate certain legality (analysis of the impact of fertilization on maize yields). Bearing in mind that in the contemporary social processes, the project is used as the most common form of presentation of ideas and proposals for their implementation, the goal of this teaching method is also that the students learn the basic segments of the project preparation.</p>
Advantages of the method	<p>Preparing the proposal allows students to apply their knowledge. This method enables better understanding of certain thematic areas in which the project is implemented. The project motivates students to learn and work by offering them meaningful activities that are interesting and important to them (they have the ability to choose or independently formulate issues that are interesting and important to them personally). For the responsible teachers it often represents a more informative way of evaluating students in college compared to conventional written or oral forms of testing, because project preparation requires a complex combination of different mental abilities, knowledge and skills (including specific or expert ones in any field, as well as the general intellectual one) instead of meaningful reproduction of teaching material that is well understood. Student has much more responsibility for his own learning, a more active role than in traditional forms of learning/teaching, acquires greater autonomy in his work. During the preparation of the project, students are trained to manage time, to recognize the opportunities, threats and risks, and to think as an entrepreneur about the project idea.</p>

<p>Teaching methods</p>	<p>Implementation of this method requires student's greater engagement than traditional forms of work. This is especially true for independence in work (all activities in preparation of the project proposal are done by students, regardless of whether they are working individually or in pairs), initiative (when choosing a theme for the project, collecting the material, presenting your answers) decision making (how to choose the topic, how to obtain the relevant materials, how to analyze, how to present the results of the work).</p> <p>Project preparation requires careful definition of themes for the work, so that the projects are in line with the content of the module. Students must be prepared and trained to work on the project. Work on the project often requires additional costs (photocopying, printing, travel costs, etc.). Likewise, this method requires additional monitoring of workflow (supervision) by teachers, including the preparation for the conduct of activities of this type. Evaluation of this kind of work requires more time and is more difficult than the classic evaluation of theoretical or practical knowledge.</p>
<p>The importance of implementation of the teaching method for students</p>	<p>Simulation of project develops and trains more cognitive functions of students (organization, synthesis, analysis and evaluation of materials). Preparing the project develops important competencies of students, such as inventiveness, problem-solving ability, integrative skills, decision making skills, ability to manage their own work process, the ability of time management and the ability to communicate effectively with others. The skills that students develop by this method are planning, explaining project ideas and preparation of financial plan implementation.</p>
<p>The importance and participation in the teaching process</p>	<p>Teaching method when implemented within the teaching process requires a lot of time and usually cannot be successfully implemented if it is presented less than 30%. The significance of this teaching method at the study programs in the field of agriculture is particularly evident in the subject, which in its structure includes creating a projects solution for establishment of certain forms of production.</p>

Method of application (individual/group)	Preparing project proposal can be implemented as an individual method (which is less common in practice) and a group one. Multiple approach in work has a number of advantages (mentioned above) compared to the individual one and this kind of work is recommended in general.
Group size	Group size regardless of the nature and extensiveness of the project should not exceed 5 students, in order to enable the optimal conditions so that all students have the possibility of relatively equal participation in the preparation of project proposals.
The method of forming group for work	While forming the group, preference should be given to the principle according to which students independently determine the members of the working group, considering that it is a demanding job. Groups can be created and selected at random, but in this case it can happen that too much time is spent on “meeting and running-in” of groups which can delay the work from the very beginning.
Selection of topic addressed by the method	When choosing a topic for the project proposal, it is necessary to create the baseline situation and raise students’ interest in the topic. The initiative for the project proposal can occur spontaneously due to the idea of a student, or a teacher along with the students initiates the discussion on a particular topic and they decide together on the selection of topics. If a teacher wants to keep the right to choose the topic, then he can offer a list of defined topics to the students in which they select the most appropriate one.
Individual work of students	After an initial meeting with the responsible teacher, students work on their own on preparation of the project proposal in accordance with the already established plan of work: gathering information, collecting material, preparing presentations etc. It is recommended that while preparing a project proposal, consultations are arranged so that the teacher is informed about the progress of project development, problems and challenges in their work. On the basis of information obtained, a teacher makes recommendations to overcome the difficulties. Consultation helps in the prevention of taking responsibility and credit by only one part of the students in the group. In addition, the dynamics of preparing project proposal are discussed during the consultation.

Presenting results	Presenting results is usually done in the form of lectures, followed by appropriate presentation. All accessories that can make the presentation better (flip charts, leaflets, discussions) can be used during the presentation of the project proposal.
Evaluation	The teacher and students discuss together the entire process of preparation of the project proposal. They talk about the success that has been achieved, the results derived from work on the project proposal, as well as the knowledge acquired during the implementation. The teacher takes into account the involvement of students in preparing project proposals and incorporates it in a system of assessment. The work of the entire group as a whole should be taken into account while assessing, but also the individual effort of students.
The best practice	The implementation of the project proposal draft should result in a specific product (the product). In this case, it is the project documentation. For the successful implementation, the project proposal should be presented as a complex task, which is broken down into simpler ones, and each part has a certain amount of time for implementation.
Other notes	Past experience shows that the development of project proposals is very intensive method but is highly beneficial because of the following: orientation of students, establishing a partnership between teachers and students, openness to the problems and situations from real life, the correlation with other areas of science and human activity, methods of teamwork, development of organizational and communication skills of the students etc.





# ENTREPRENEURIAL EDUCATION IN THE AGRICULTURAL STUDY PROGRAMS

## ***Why is the focus on entrepreneurial education?***

Entrepreneurial education as a process that develops entrepreneurial spirit in an individual, occupies an increasingly important place on the deliberation of educational policies and strategies in Europe and creating the entrepreneurial and active citizens is defined as one of the most important tasks of education programs. There is a growing understanding in Europe that in order to solve many social and economic problems it is necessary to have active citizens (active participants of social life rather than passive observers) and to have an entrepreneurial mindset (i.e. the entrepreneurial spirit or entrepreneurial culture). In 2006, “a sense of innovation and entrepreneurship” is defined as one of the eight (8) key competences of a modern European citizen that are necessary for living and working in a global world<sup>1</sup>. A number of later documents<sup>2</sup> of the EU institutions have confirmed the high position of entrepreneurial education on the priority list in the development of education system and training in Europe as well as policies to strengthen the European economy and competitiveness.

Entrepreneurship as a key competence, entrepreneurial spirit and an entrepreneurial mindset as synonyms, refer to the individual’s ability to turn ideas into action. In other words, entrepreneurial person is someone who is creative, innovative and prone to taking risks, someone who can plan and implement. Entrepreneurial mindset is formed through entrepreneurial education in which all forms of education, learning and training are included, and it contributes to strengthening entrepreneurial spirit, competence or behavior, with or without a commercial objective<sup>3</sup>. In other words, entrepreneurial education is a set of courses (e.g. entrepreneurship, economics of enterprise, etc.), short courses (e.g. teamwork, strategic planning, time management, etc.) and teaching methods (e.g. business case studies and similar) through which an individual acquires the knowledge, skills and attitudes that are characteristics of an entrepreneurial person.

A recent European survey<sup>4</sup> done among graduates of all fields of science shows that entrepreneurial education has a positive impact on the development of the entrepreneurial spirit in young people, their attitudes about

<sup>1</sup> Recommendation of the European Parliament and the Council on Key Competences for Lifelong Learning, 2006

<sup>2</sup> “Education and Training 2010”, “Education and Training 2020”, “Rethinking Education: Investing in skills for better socio-economic outcomes”, Entrepreneurship 2020 Action Plan “Reigniting the Entrepreneurial Spirit in Europe” and “Small Business Act for Europe”

<sup>3</sup> According to UNESCO and European Training Foundation (ETF)

<sup>4</sup> Effects and impact of entrepreneurship programmes in higher education, DG Enterprise and Industry, Brussels, March 2012

starting a new business, the increase of their employability and their role in society and the economy.

Entrepreneurial education in agricultural study programs contributes to creating entrepreneurial agricultural engineers and manufacturers who see agriculture as business and market opportunity, and not as an activity for satisfying the basic needs of one's own household. While the purpose of the agricultural study program is to create a good agricultural professional- engineer or direct manufacturer, the purpose of teaching methods and content of entrepreneurial education is to make a businessman who will be able to recognize a market opportunity, create and manage a business and sell your product at the market.

### *Teaching methods and contents that contribute to the entrepreneurial mindset*

Business case studies, business challenge competition and short thematic training courses are the most common extracurricular methods and contents present at higher education study programs that encourage an entrepreneurial mindset.

**1 Business case study** is a form of business education in which multi-member team of students (3-4) discusses the real business problem given by professors and develops a solution to that problem with the use of theoretical and practical knowledge that the team members have gained so far. This method can be implemented in practice within one of the business courses or can be organized as an extracurricular activity. Students form teams by free networking. After the formation of teams, professor explains the task and gives instructions on how teams work in drafting solutions. Topic of the case study is defined by a professor and students pick it by pulling out the envelopes. After pulling out the envelopes, the topic is introduced to the

students and they consult the teacher about any ambiguities. After making preparations and introducing topics to the teams, there is a period of 3-7 days of teamwork during which teams discuss a business problem and look for potential solutions, investigate the circumstances, test the hypotheses and develop a final solution that will be offered for the business problem that is their case study. When this solution is agreed, the method of presenting solutions is discussed within the team regarding the audio-visual presentations and public speaking. During the next exercise, teams present their solutions for 15 minutes and professor and other teams have the opportunity to ask questions in order to understand the proposed solutions better.

Through business case study, students develop the following knowledge and skills:

- to apply their theoretical knowledge in solving particular problems within the profession
- to develop team spirit and inclination to work in teams
- to improve presentation skills and public speaking

**2 Business Case Challenge Competition** is a form of business education in which many business skills are developed (teamwork, presentation skills, public appearance, leadership, etc.) through competition in solving business situations. Unlike previous methods, this method is characterized by the rivalry and the fact that the students compete among themselves, and in addition to the aforementioned knowledge and skills, skills of strategic and operational planning (selection strategy) as well as leadership skills should be developed or possessed. Business case challenge competition can be organized at the level of the study program, at the level of the institution (university, college or higher education school), or a higher and more complex levels (e.g. national competition). Multimember teams (3-4) participate at the competition and the teachers or representatives of companies

participate as members of the jury. Teams are formed by free networking of students. Themes are defined by the professors along with companies. Themes are usually some real business challenges that companies face. After trainings on the rules of the competition teams pull out envelopes with tasks and learn about the business problem that should be solved. After the introduction, teams get 48 hours to study the problem and develop a solution as well as to prepare themselves for the presentation of solutions before the jury. The task of the jury is to hear the proposals of solutions, discuss the solutions with their authors, and then assess the performances of teams and offered solutions and announce the winners. In the evaluation of the performance, the jury evaluates not only the quality of the proposed solution, but also a public performance of the teams, persuasiveness, ambition, leadership and other essential characteristics. In this aspect, the winner is often announced in more than one category. The organizer (institution) issues the certificate for participation and competition ranking and enters it in the Diploma Supplement.

**3 Soft-skill training courses** are equally important for the good quality of entrepreneurial education of students at agricultural study programs, because in this way some social skills are developed (i.e. soft skills and transversal skills) that are not taught in the regular education system and are necessary for life and professional career of every modern man. The most important trainings that contribute to the development of an entrepreneurial mindset are as follows:

- teamwork,
- strategic and operational planning,
- time management,
- leadership,
- conflict resolution,
- working in a multicultural environment,

- the establishment of enterprises, entrepreneurial shop or cooperative etc.,
- entrepreneurship,
- preparing the business plan,
- preparing and managing the projects,
- public appearance,
- financial literacy;
- non-verbal communication,
- and other.

Such trainings usually last 2 working days (effectively 16 hours) and are implemented as extra-curricular activities. Training institutions can be organized independently or in cooperation with other institutions that provide non-formal education programs (non-governmental organizations and associations, adult education center etc.).



# LIFELONG LEARNING CONCEPT IN AGRICULTURE

In modern (European) education systems concept of lifelong learning (hereinafter: LLL) is considered the basis of development, on which the economy of knowledge is based in each country. Knowledge is increasingly treated as a social product and one insists that making knowledge is more common than individual experience (Mirkov, 2011). Focus is set on content (as a permanent truth) opposite to setting focus on students' skills (competencies).

According to one of the most quoted and most comprehensive definitions of lifelong learning (Delors, 1996), lifelong learning consists of the following four pillars of education for the future:

- ① **Learning in order to know** – based on being familiar with methods and means of learning rather than a structured knowledge
- ② **Learning in order to work** – gives people the skills to work that they need at a given moment and in the future (including innovation, adaptability to different working environments, etc.)
- ③ **Learning in order to live together and with others** – training people for the peaceful resolution of conflicts, discovering other cultures, strengthening personal competencies and capacities, economic independence and social inclusion
- ④ **Learning in order to be** – education contributes to holistic personal development of both mind and body, intelligence, sensitivity, aesthetics and spirituality

In 2001, the European Commission adopted a document entitled Making a European Area of Lifelong Learning, in which (p.9) LLL is defined through four broad and interdependent objectives: **personal fulfillment, active citizenship, social inclusion and employability/adaptability**. In this way, LLL, in addition to the dimensions of the duration throughout the entire lifetime, gets a dimension of depth which goes beyond narrow economic aspects of the concept and puts the emphasis on understanding the entire spectrum of educational and training systems from the perspective of lifelong learning, covering all levels and contexts of learning, including formal and informal learning (Figure 1).

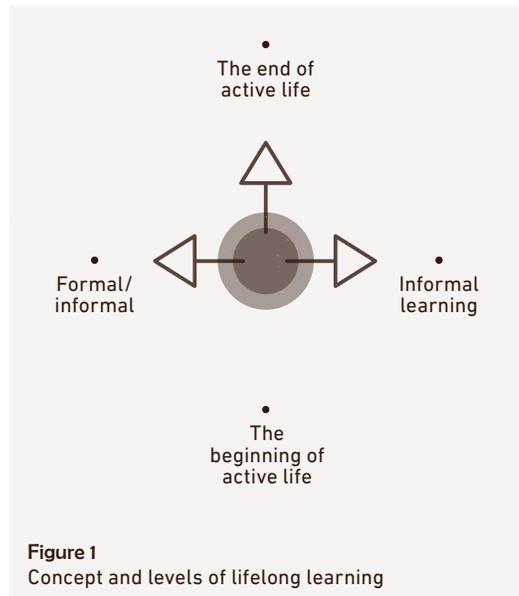


Figure 1  
Concept and levels of lifelong learning

Different forms of learning are very present in the field of agriculture, bearing in mind that the process of education and acquiring new knowledge is permanent and essential, not only for professionals but also for farmers. Transfer of new information in the field of agriculture (production technology and sales) is very dynamic and only by constant monitoring and upgrading of the existing knowledge is it possible to be competitive at the market. Although the learning processes are not clearly defined and precisely specified in the field of agriculture, they are present through various workshops, scientific and professional meetings, events and other forms of transfer of information and knowledge, mainly to the large number of users. A small number of manufacturers is ready for self-development and adoption of new knowledge because it entails certain requirements (time, financial resources etc). This approach to learning can also be a problem, since the manufacturers are usually in a position to get information and learn from available sources, and not from those that can provide the most relevant information on such issues. There is a huge need for detailed planning of LLL field in the field of agriculture in Serbia and Bosnia and Herzegovina, especially when it comes to non-formal and informal learning.

The European Commission<sup>1</sup> states 8 **key competencies** that contribute to the lifelong learning, as follows:

- ① Communication in the mother tongue - the ability to express and interpret thoughts, feelings and facts in both oral and written form and different contexts
- ② Communication in foreign languages - the ability of mediation and intercultural understanding in addition to those incorporated in communication in their mother tongue
- ③ Mathematical competence and basic competences in science and technology - the use of addition, subtraction, multiplication and division to solve problems in everyday situations; ability and willingness to use knowledge and methodology to interpret the world of nature
- ④ Digital competence - mastering the use of electronic media for work, communication and free time; logical and critical thinking, information management and communication skills
- ⑤ Learning to learn - ability to organize one's own learning; effective time management, problem solving, acquisition, processing and evaluation of new knowledge and its application in different life contexts, contributing to career management
- ⑥ Interpersonal, intercultural, social and civic competences - effective interaction with individuals and in groups, solving conflicts in the public and private spheres
- ⑦ Entrepreneurship - passive and active component; the ability and willingness of accepting others, i.e. creating your own innovation; taking responsibility for actions, development, strategic vision, setting and meeting goals and motivation for success
- ⑧ Cultural expression - evaluation of the importance of the creative expression of ideas, experiences and emotions in various media, including music, literature and applied arts

The concept of LLL and encouraging lifelong learning in the literature is more often associated with the so-called cooperative learning methods (Óhidy, 2009) that need to be adapted to the so-called generation "Z" (young people born from 1990 to 2000). Cooperative learning methods are opposed to traditional methods because they are focused on the active participation of every individual in the learning process, which is the basis for the promotion of LLL. Likewise, the implementation of cooperative methods in the learning process encourages the development of key competencies that contribute to LLL.

According to Damon & Phelps (1989) cooperative methods in the process of teaching are related to all aspects of learning, based on teamwork, where students within the groups share the responsibility for the results, not only for their own engagement. In this way, in

addition to intellectual skills and knowledge, the social skills of students are developed by influencing their team spirit and cooperation with other colleagues, rather than mutual competitiveness.

An example of the most frequently used cooperative learning methods in higher education institutions throughout Western Europe and North America is called **Jigsaw method** and applying it in agricultural studies can be very important, that is rarely or never used in the process of teaching in higher education institutions in Bosnia and Herzegovina and Serbia. The basis of this method is the concept of peer learning in which students learn from each other while working on a joint task. Jigsaw method requires the division into smaller groups of students (up to 5) working on a joint task, but so that each member of

the group gets his own mini-task that he is responsible for. In this way, each member of the group depends on all other colleagues in achieving the final result, which encourages active listening, understanding, empathy and teamwork.

In addition to the cooperative learning methods (team learning), the concept of lifelong learning is based on the following methods of learning that are applied in agricultural study programs:

- Learning through work
- Self learning
- Distance learning

If we compare the traditional method of learning with the concept of LLL, noticeable differences are the following:

TRADITIONAL LEARNING	LIFELONG LEARNING
The teacher is the source of knowledge	Teachers themselves are learning throughout life
The students are recipients of knowledge	Students themselves are carriers of knowledge
Students work independently	Students learn in groups, learning by doing and learning at a distance
All students doing the same things	Students have a variety of tasks that lead them to the same goal
Good students stand out	There is individual learning plan
The acquired knowledge is mostly declarative	Acquired knowledge is procedural- students know how to apply declarative knowledge in practice, contextual- student knows when to apply the knowledge, conceptual- student knows why the concrete knowledge is applicable in a given situation

**Table 1:** Traditional learning and lifelong learning

For these reasons, it is necessary to continue working on the development of effective methods of learning and improving the context for continuous lifelong learning at higher education institutions in the field of agriculture in Serbia and Bosnia and Herzegovina. This work implies a change in lecturers that should do the following:

- Direct the subject content as much as possible toward methods of visual learning;

- Focus the subject content as much as possible on critical thinking and problem solving, rather than merely memorizing information, which will contribute to applying the acquired knowledge of students and their entrepreneurial thinking;
- Adjust the subject content to the needs of students according to the criteria of time, through the development of methods of distance learning, e-learning platforms and systems that can be easily accessed at any moment

# GLOSSARY OF TERMS

## Formal education

It is organized activity of educational institution that is performed in accordance with approved programs, with the aim of improving knowledge and skills, self-reliance and responsibility for personal, social and professional needs, for which the public certificate is issued.

## Non-formal education

It indicates organizing learning activities aimed at improving knowledge and skills, self-reliance and responsibility for personal, social and professional needs that the public document is issued for.

## Informal learning

It indicates unorganized activities of acquiring knowledge and skills, independence and accountability of everyday experiences, and other influences and sources from the environment, for personal, social and professional needs.

## Lifelong learning

It indicates the use of formal, non-formal and informal learning throughout one's life which contributes to the continuous development and improvement of knowledge and skills that are needed in both the private and professional life.

## Entrepreneurial education

It indicates all forms of education, learning and training that contribute to strengthening entrepreneurial spirit, competence or conduct, with or without a commercial objective. The synonyms used for this term are entrepreneurial learning and education for entrepreneurship.

## Learning outcomes

Learning outcome is a clear definition of competence, skills and/or attitudes that student needs to acquire for a certain period of learning.

## Knowledge

Knowledge is the set of facts, principles, theories and practices related to the field of work or study originating as a result of acquiring information through learning process.

## Skills

It indicates the ability to apply knowledge and use the principle of "know-how" in order to perform a specific task and to solve the problem. Skills can be cognitive, practical and social ones.

## Cognitive skills

Cognitive skills indicate an ability to apply logic, intuitive and creative thinking.

## Practical skills

Practical or psychomotor skills indicate acquired physical dexterity of using pre-known methods, instruments, tools and materials.

## Social skills

It indicates a set of acquired skills that are necessary for establishing and developing interpersonal relationships (e.g. communication skills and cooperation, emotional intelligence and other).

## Transversal skills/competences

Transversal skills/competencies are general competences necessary in every profession regardless of the level of specialization of individuals. They refer to the integrated use of skills, personality traits, skills and values of an individual. Technical knowledge is practically transformed into an effective, efficient work by these skills. They are also called soft skills, i.e. macro-skills because they can be transferred to different working contexts, environments. Transversal competences are learned through formal, non-formal or informal education, and they can be improved at any time by attending specialized training required<sup>1</sup>.

<sup>1</sup> European Classification on Skills/Competencies, Qualifications and Occupations. For further reading please visit <https://ec.europa.eu/esco/home>

**Independence**

It indicates the right on your own management, and it is the basis for determining one's responsibility.

**Accountability**

It indicates taking over responsibility to carry out assumed tasks, in accordance with the autonomy of execution and management.

**Competences**

They indicate the ability to apply knowledge, skills and personal, social and methodological abilities, in the workplace or in the learning process, as well as in personal and professional development. In the context of the European Qualification Framework (EQF), competences are described as the responsibility and independence.

**Workload**

It indicates estimated time for all learning activities that are necessary for the achievement of certain learning outcomes.

**ECTS (European Credit Transfer and Accumulation System)**

It indicates the unit of measurement for the volume of workload and it is determined by the average time spent by students that is needed to acquire competencies.

**Practicum**

It indicates a specialized classroom with stationary equipment and other stuff for easier learning of the content of the module (or group of modules) and is used for performing instruction in the practicum or for applying theoretical knowledge in the workplace. At the institutions that implement the educational process in the field of agriculture, practicums are organized according to a group of related modules (e.g. practicum of fruit growing, practicum of physiology and anatomy of domestic animals, practicum of agricultural mechanization, etc.).

**Teaching method**

It indicates the lecturer's method of work that contributes to the acquisition of knowledge and skills development and skills in students.

**Peer review**

It Indicates evaluation of scientific, academic or professional performance or achievements by the colleagues of the same level and in the same field.

**Student-centered learning**

It indicates approach to teaching and learning that is student-centered and allows him/her to participate actively in the creation of his/her educational background<sup>2</sup>.

**Qualification**

Qualification is any official document certifying that the bearer of the qualification has gained certain competencies, usually through formal education program. Therefore, the term qualification in most cases indicates competencies acquired within the formal education system, and thus refers to the cycles of education that exist in a given education system (primary, secondary, vocational, higher, doctoral studies etc.). Far less often, qualification includes certificates which are acquired through non-formal education, which is, for example, given upon successful completion of short training courses (e.g. computer courses, language courses, different retraining programs), although some of these courses are entered into the employment booklet<sup>3</sup>.

<sup>1</sup> Student Centered Learning - An Insight Into Theory And Practice, European Students Union and Education International 2010

<sup>2</sup> "Nacionalni okvir kvalifikacija", CEP (2010)



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